Another epistemic culture

Reconstructing knowledge diffusion for rural development in Vietnam's Mekong Delta

Inaugural-Dissertation
zur Erlangung der Doktorwürde
der Philosophischen Fakultät
der Rheinischen Friedrich-Wilhelms-Universität
zu Bonn

vorgelegt von Quy-Hanh Nguyen
aus Hue, Vietnam

Bonn, 2014

Gedruckt mit Genehmigung der Philosophischen Fakultät der Rheinischen Friedrich- Wilhelms-Universität Bonn

Zusammensetzung der Prüfungskommission:

1) Prof. Dr. Christoph Antweiler, Institut für Orient- und Asienwissenschaften (IOA)
(Vorsitzende/Vorsitzender)

2) Prof. Dr. Hans-Dieter Evers, Zentrum für Entwicklungsforschung (ZEF)
(Betreuerin/Betreuer und Gutachterin/Gutachter)

3) Prof. Dr. Solvay Gerke, Zentrum für Entwicklungsforschung (ZEF)
(Gutachterin/Gutachter)

4) Prof. Dr. Conrad Schetter, Bonn International Center for Conversion (BICC)
(weiteres prüfungsberechtigtes Mitglied)

Tag der mündlichen Prüfung: 26. Juni 2014

Table of Contents

Abstract

In the age of "post-industrial society" and "knowledge economy," how do agrarian communities in developing countries talk, think, and apply knowledge for their everyday life and production? Does a farmer become a "knowledge worker," or are knowledge workers only scientists, experts, development practitioners, and agriculture managers? More generally, is there a culture that nurtures knowledge production processes among interactive actors and across traditional boundaries and niches? Globalisation has transformed the way knowledge is produced, transmitted, and applied, as research results from one part of the world are transmitted over long distances to users who need it for their development. A wide gap has often arisen between epistemic culture, the culture of knowledge production, and the social and cultural conditions in which knowledge is applied. This problem is by no means new, but it has taken on new dimensions and practices. Founded on constructivist perspectives of systems thinking and symbolic interactionism, this research scrutinises knowledge diffusion for rural development within the interaction of different types of knowledge, knowledge processes and the four knowledge systems of agricultural extension, research, agribusiness, and farming community in the Mekong Delta, the largest and most active agriculture region in Vietnam.

Placed in a broad analysis of the delta's river and water civilisation (*van minh song nuoc*), modern hydraulic society developments and recent natural and social change impacts, the present research has revealed the duality of knowledge diffusion for agriculture and rural development in the Mekong Delta. The conventional model is still prominent in the knowledge diffusion landscape of the delta; researchers are knowledge producers, and agricultural extensionists and development experts are the main knowledge transfer agents of research results and technologies to rural residents as passive receivers. Sets of actors remain confined to their own life worlds, reading from their own scripts while farmers are perceived as passive knowledge and development receivers. The research has also illuminated a restructuration of knowledge diffusion from grassroots, informal, bottom-up efforts and networks conditioned on interactive environment, new identity of actors, and hybridity of knowledge work organisations. What is accentuated from multiple research case studies is that another epistemic culture of rural development is emerging. It is characterised by three principles of inclusionality, co-creation and reflexivity. Inclusionality promotes dynamic relational influences and co-evolutionary processes between nature and humans, environment and structure, community and individuals, knowledge source and receivers. The "I know better" fence that divides actors into the binarism of development experts-beneficiaries, knowledge source-passive receivers, and agencies with interest and knowledge work clashes is demolished. Co-creation relates to the active and creative participation of actors in development and knowledge development construction. Knowledge co-production can be formally performed in transdisciplinary research or everyday practice of collaborative informal grouping. It has to be built upon partnerships. Reflexivity refers to reflexive management of mega-knowledge in creating new knowledge at various levels of learning. Reflexivity creates opportunities for enhancement of conceptual readiness and effective implementation of innovation in more complicated and uncertain contexts of development as well as enrichment of local imaginings that potentially reshape and transform global issues and regimes.

Another epistemic culture of development is emerging with an increasingly important role to play in constructing knowledge for sustainable rural development practices in the Mekong Delta, yet it is often "hidden" from the mainstream development and knowledge for development landscapes. It is from the internalist reconstruction and transformation within reflective communities and hybrid knowledge developed from interaction and networking logic that the alternative epistemic culture is beginning to spring, and in this same orientation it should be promoted. Yet, in the vast ocean of knowledge and emerging islands of new epistemic practices, micro-to-macro knowledge governance has to bridge and breed knowledge-processes-based interaction and learning cultures among communities and networks. If not, distributed transformations of the described epistemic culture of development only fall into being marginalised, budding, and unstructured features of knowledge-based societal change projects and cannot effectively lead (to) rural development transformation.

Deutsche Zusammenfassung

‚Eine andere epistemische Kultur: Wissensdiffusion für ländliche Entwicklung im Mekong Delta, Vietnam'

Globalisierung hat Auswirkungen darauf, wie Wissen produziert, weitergegeben und angewendet wird, indem Forschungsergebnisse aus dem einen Teil der Welt über weite Distanzen zu EndnutzerInnen in anderen Teilen der Welt transferiert und für Entwicklung benötigt wird. Oftmals weist dieser Transferprozess eine große Diskrepanz zwischen epistemischer Kultur, der Kultur der Wissensproduktion und dem jeweiligen sozialen und kulturellen Kontext auf, in dem Wissen umgesetzt wird. Dieses ist kein neues Problem, jedoch nimmt es neue Dimensionen und Praktiken an. Demzufolge stellten sich für meine Forschung die Fragen, wie ländliche Gesellschaften in Entwicklungsländern im Zeitalter von ‚Wissensökonomie' und ‚Wissensgesellschaft' über Wissen reden, denken und dieses in ihrem durch landwirtschaftliche Produktion geprägten Lebensalltag anwenden. Ob, wie und in welchem Ausmaß ist wissensbasierte Arbeit relevant für ländliche Entwicklung und ländliche Gemeinschaften? Werden Bauern und Bäuerinnen zu ‚WissensarbeiterInnen' oder ist das Konzept der Wissensarbeit ausschließlich WissenschaftlerInnen, ExpertInnen, EntwicklungspraktikerInnen und landwirtschaftlichen ManagerInnen vorbehalten? Wie unterstützen moderne Kommunikationstechnologien den Wissensaustausch und die Wissensgenerierung in Bezug auf agro-ökonomische Aktivitäten? Allgemeiner gefragt, existiert eine Kultur, die Wissensproduktionsprozesse zwischen interagierenden Akteuren sowie über traditionelle epistemische Grenzen und Nischen hinaus befördert?

Die vorliegende Forschung stellt sich damit der Herausforderung, die Praktiken der Wissensproduktion in landwirtschaftlich geprägten Gemeinden vor dem Hintergrund der Annahme zu rekonstruieren, dass es vielfältige Wissenswelten (Pluralismus epistemischer Kultur) gibt, die über Interaktionen mit einander verbunden sind. Dies umfasst die Abkehr von Konzeptualisierungen einer epistemischer Kultur, die eine dichotome Gegenüberstellung von Wissenschaft und Erkenntnisobjekt annimmt. Vielmehr geht es darum, die Interaktion zwischen WissenschaftlerInnen und der Organisationskultur, der Kultur der Wissensdiffusion sowie der Anwendungspraktiken ländlicher Gemeinden zu fokussieren (Konvergenz epistemischer Kultur). Dieser Ansatz eröffnet neue Denkweisen und Möglichkeiten zur Steuerung von Wissensprozessen für (ländliche) Entwicklung und für eine alternative epistemische Kultur sozialen Wandels. Das epistemologische Ziel dieser Arbeit ist die Integration von epistemischen Wirkungen und Entwicklungszielen. Epistemische Leistung soll dabei epistemische und entwicklungsrelevante Werte gleichermaßen unterstützen. Die dargestellten Ansätze ergeben also folgendes überwölbendes Forschungsinteresse: Aus der Perspektive systemischen Denkens und des Interaktionismus stellt sich die Frage, wie Wissen im Mekong Delta für (nachhaltige) landwirtschaftliche und ländliche Entwicklung transferiert wird. Des Weiteren wird untersucht, inwiefern Praktiken der Wissensdiffusion und -Generierung die aktuelle epistemische Kultur der Entwicklung und Entwicklungszusammenarbeit in der Region und in Vietnam im Allgemeinen geprägt haben.

Das Mekong Delta ist als größte und produktivste landwirtschaftliche Region Vietnams bekannt. Als ‚Reiskammer' des Landes trägt es zur nationalen Ernährungssicherheit und einen signifikanten Anteil zum Export von Reis, Obst und Aquakultur in Vietnam bei. Das Mekong Delta wird zunehmend als eine moderne hydraulische Gesellschaft konzipiert, in der Wasserwege und -Netzwerke durch den Ausbau von hohen Deichen und neuen Technologien reguliert und kontrolliert werden und Maßnahmen agrarwirtschaftlicher Revolution drei Reisernten pro Jahr und den Aquakulturboom ermöglichen. Ebenso bekannt ist, dass das Delta eine vom Klimawandel stark bedrohte Region ist, und das ökologische System und lokale Lebenshaltungsstrategien durch den Bau von Dämmen am Oberlauf des Mekongs und durch die lokale Degeneration der Wasserressourcen gefährdet sind. Weniger bekannt ist, dass die über 300-jährige wasserbasierte Zivilisation noch heute die lokale Wahrnehmung von Mensch-Umwelt Beziehungen prägt und an nachfolgende Generationen weitergegeben wird und damit als prägende kulturelle Dimension das Verhalten der lokalen Gemeinschaft und Gesellschaft strukturiert. Lokale Gemeinschaften greifen nicht kontrollierend in die Wasserumwelt ein, sondern passen sich an diese an. Das alljährliche saisonale Hochwasser, das von außen fälschlicherweise oftmals mit einer ‚Flut' verwechselt wird, wird lokal willkommen geheißen, wie

ein von der Natur ausgesandter ‚alter Freund' und als ein Symbol des Reichtums verstanden. Die Delta Gesellschaft zeichnet sich dabei durch ein offenes System aus, welches durch Toleranz, Affektivität, Dank und Anerkennung, Dynamik und Zweckmäßigkeit charakterisiert ist.

Die konzeptionelle Entwicklung dieser Forschung basiert auf Ansätzen des systemischen Denkens und des symbolischen Interaktionismus. Ein solcher systemorientierter Ansatz untersucht im Besonderen die in sozialen Strukturen eingebetteten Akteure. Die Perspektive des symbolischen Interaktionismus bietet sich für das Forschungsziel an, sich eingehend mit der Interaktion und Kommunikation zwischen einzelnen Akteuren und Gruppen von Akteuren bezüglich ihrer Konstruktion und Rekonstruktion von Wissensproduktion, -Diffusion und –Anwendung zu befassen. Die Kombination dieser beiden theoretischen Ansätze unterstützt die mikrosoziologische Untersuchung der strukturell eingebetteten und im lokalen Lebensalltag ablaufenden Prozesse der Wissensgenerierung und -Diffusion. Der systemische Ansatz ‚Wissen für Entwicklung' gewährleistet die Analyse der Interaktion der Akteure im Rahmen ihrer strukturellen Umwelt. Die vorliegende Arbeit zieht Ansätze des radikalen Konstruktivismus als analytischen Untersuchungsrahmen heran. Systeme, Umwelten und Strukturen werden untersucht hinsichtlich ihrer Fähigkeit der Selbstproduktion und Interaktion zwischen handlungsfähigen Akteuren. Die einjährige Feldforschung im Mekong Delta (04/2010 – 04/2011) basierte auf einer qualitativ-orientierten Methodologie und einer entsprechenden Datenerhebung und Analyse, die der Exploration von Entwicklung und Wissenspraktiken als sozial konstruierte Phänomene diente. Gemäß einer theoretisch angeleiteten Fallauswahl konzentrierte sich die Forschung auf sechs Provinzen des Mekong Deltas. Intensive Fallstudien wurden in der Provinz Can Tho City durchgeführt. Mit insgesamt 340 Personen, eingeteilt in fünf Gruppen, wurden qualitative Interviews durchgeführt: mit RegierungsvertreterInnen, landwirtschaftlichen BeraterInnen, UniversitätsdozentInnen/InstitutsforscherInnen, RepräsentantInnen des Agrobusiness sowie mit lokalen LandwirtInnen. Alle Interviews dauerten ca. eine Stunde und wurden digital aufgenommen. Weiterhin wurden 10 Fokusgruppendiskussionen mit Bauern und Bäuerinnen durchgeführt und neun teilnehmende Beobachtungen dokumentiert, in denen der Forscher jeweils Einblick hatte in unterschiedliche Events der Wissensweitergabe und lokale Lernprozesse. Fragebögen, Beobachtungen und Sekundärmaterial vervollständigten die Datensammlung.

Im Entwicklungskontext des Mekong Deltas wird die Wissensdiffusion für landwirtschaftliche und ländliche Entwicklung als ein komplexes interaktionistisches System innerhalb von Systemen konzeptualisiert. Systeme landwirtschaftlicher Extension, Forschung und Agrobusiness werden hinsichtlich ihrer Fähigkeit der Wissensdiffusion in ländlichen Gemeinschaften im Mekong Delta untersucht. Das konventionelle Model des Wissenstransfers bleibt weiterhin das dominante: ForscherInnen produzieren Wissen, während landwirtschaftliche BeraterInnen für die Weitergabe von Forschungsergebnissen und Technologien an die ländliche Bevölkerung zuständig sind. Bezüglich ihrer Vorteile im Bereich produktionsbasierten Wissens und weitreichenden Vermarktungsnetzwerken werden Agrobusinesses zunehmend für die Weitergabe von Wissen an die ländliche Bevölkerung im Mekong Delta wichtig. Diese ‚triple helix' basierend auf staatlicher landwirtschaftlicher Beratung, Forschung und Privatunternehmen wurde in der landwirtschaftlichen Forschung und im Bereich bäuerlicher Produktion und Konsumtion gefördert. Allerdings stößt diese viergliedrige ökonomische Verknüpfung von Staat, Wissenschaft, Agrobusiness und LandwirtInnen an Grenzen. Bestimmte Akteursgruppen bleiben ihren eigenen Lebenswelten mit ihren je eigenen Rationalitäten verhaftet; Bauern und Bäuerinnen werden in dieser divergierenden Logik als passive EmpfängerInnen von Wissen und Entwicklung wahrgenommen. Das lokale Wissenssystem hat sich aus diesem Grunde darauf eingestellt, auf externe Veränderungen und auf eine sich modifizierende Umwelt lediglich zu reagieren. Anstelle Wandlungsprozesse des internen Systems zu aktiv zu gestalten werden lokale Produktionspraktiken somit lediglich an bestehende landwirtschaftliche Politiken angepasst.

Nachweisbar durchläuft jedes System eine interne Transformation. So konnten anhand einer Policy-Analyse beispielsweise drei Muster der Veränderung innerhalb des landwirtschaftlichen Beratungssystems seit seiner Gründung im Jahre 1993 nachgezeichnet werden: (1) die Repositionierung als eine professionelle Organisation innerhalb des staatlichen Sektors; (2) die Neudefinition des Ziels landwirtschaftlicher Beratung vom reinen Technologietransfer und der Umsetzung von entsprechenden staatlichen Politiken hin zu einer an landwirtschaftlichen Akteuren orientierten, diversifizierten und nachhaltigen Beratung; sowie (3) die Konzentration auf die Entwicklung und

Ausweitung lokaler Beratungsnetzwerke. In der Praxis jedoch werden das staatliche bürokratische System und seine Strukturen reproduziert: physische, finanzielle und personelle Ressourcen konzentrieren sich hauptsächlich in den höheren Organisationsebenen und werden von diesen verteilt. Als ernst zu nehmende Konsequenz zeigt sich, dass sich auf der einen Seite professionalisierte BürokratInnen zu einer strategischen Gruppe formieren, während sich auf der anderen Seite die Strukturen der landwirtschaftlichen Beratung an der Graswurzel in einer Motivations- und professionellen Krise befinden. Auf diese Weise solidiert das System die Bürokratisierung der landwirtschaftlichen Beratungsarbeit, die sich durch einen generalisierten Technologietransfer im Sinne eines ‚one-size fits all' Modells auszeichnet. Öffentliche landwirtschaftliche Beratungsdienste büßen dadurch an lokaler Legitimation ein und müssen den LandwirtInnen dadurch regelrecht ‚hinterherlaufen'. Das landwirtschaftliche Beratungssystem im Mekong Delta hat seine Mission jedoch auf die Schlüsselbereiche Forschung und soziale Entwicklung ausgeweitet. Aktuelle Forschungsarbeiten beschäftigen sich intensiv mit internationaler Kooperation, ‚brennenden' regionalen Forschungsproblemen, interdisziplinärer Forschung und Politikberatung. ForscherInnen und sowie Bauern und Bäuerinnen gehen eine enge komplementäre Beziehung ein, die sich in Form von diversen formellen und informellen Kanälen der Wissenskommunikation manifestiert. Sie ergänzen sich im metaphorischen Sinne wie das ‚Wasser und der Fisch'. Nichtsdestotrotz limitieren starre Zeitfenster und vorgegebene Modelstrukturen in Fortbildungs- und anwendungsorientierten Projekten die Wissensinteraktionen zwischen landwirtschaftlicher Beratung, ForscherInnen und LandwirtInnen. Trotz guter Absichten kommt man nicht über das konventionelle Model des Wissenstransfers hinaus. Agrobusiness entwickelt sich im Speziellen für die ländlichen Gemeinschaften im Mekong Delta zu einer wichtigen Ressource für landwirtschaftlichorientierte Technologien und Know-how vornehmlich im Bereich chemischer Inputs. Jedoch führen Profitstreben und die entsprechend strategische Kommunikation von widersprüchlichen Empfehlungen zu einer Blockade der potentiell produktiven Kooperation zwischen Agrobusiness und anderen Akteuren.

Weiterhin hat die Forschung die Restrukturierung der Wissensdiffusion von informellen, bottom-up Netzwerken an der Graswurzel untersucht. Im landwirtschaftlichen Beratungssystem lässt sich eine karriereorientierte Gruppe von BeraterInnen ausmachen, die ihre Beratungsleitung als Profession und Karriereweg ansieht. Diese Gruppe zeichnet sich durch die enge Zusammenarbeit mit den ländlichen Gemeinden aus. Trotz der strukturellen Bürokratisierung des Systems erhalten sie sich ihre Motivation zum gegenseitigen Lernen von und mit LandwirtInnen. Eine kleine Anzahl an hoch-qualifizierten MitarbeiterInnen in Führungspositionen, die sich intensiv in die Forschungsaktivitäten einbringen, ist ebenfalls in dieser Gruppe vertreten. Durch die Umsetzung ihres Ansatzes einer reflexiven Lernkultur, die sich durch gegenseitiges Lernen und kooperative Forschung auszeichnet, sind sie es, die Wandel vorantreiben. Ebenfalls dokumentiert die vorliegende Studie Fälle, in denen LandwirtInnen als WissensvermittlerInnen und -ProduzentInnen in diversen informellen und formellen Interaktionen mit WissenschaftlerInnen aufgetreten sind. Getragen durch soziale Beziehungen konnten manche Bauern und Bäuerinnen Lernmöglichkeiten und langfristige Partnerschaften zu ForscherInnen institutionalisieren. In der Entwicklungspraxis arbeiten ForscherInnen in Forschungseinrichtungen, die in der Nähe von ländlichen Gemeinden gelegen sind. Einige private Unternehmen haben interdisziplinäre Forschungsmöglichkeiten aufgebaut, in denen LandwirtInnen und ihre praktische Expertise dazu eingeladen werden, z.B. den UniversitätsdozentInnen zu assistieren oder sich in landwirtschaftliche Projekte (z.B. Züchtungen) als ForschungspartnerInnen einzubringen.

Was sich stark in der Forschung herauskristallisiert hat ist die Manifestation einer anderen epistemischen Kultur der Entwicklung im Mekong Delta. Wissensbasierte Interaktionen zwischen sozialen Akteuren im Mekong Delta sind Grundlage für die Erreichung mehrerer Ziele wie zum Beispiel erfolgreicher Wissenstransfer, handlungsorientierte Wissensgenerierung, Anwendung von neuen Wissensdiffusionsansätzen, struktureller Wandel von Wissensinstitutionen, nachhaltige Entwicklung von Landwirtschaft und ländlichen Gemeinden oder sogar die Entwicklung von lernenden Organisationen und einer lernenden Gesellschaft. Der Kern der Interaktion zwischen Akteuren ist der Prozess der strukturellen Transformation von Wissenspraktiken, die die Nachhaltigkeit des ländlichen Mekong Deltas befördern: Eine andere epistemische Kultur der Entwicklung lässt sich daher charakterisieren durch die drei Prinzipien Inklusion, Co-Generierung und Reflexivität. Inklusion unterstützt dynamische relationale Einflüsse und co-evolutionäre Prozesse zwischen Natur und Mensch, Umwelt und Struktur, Gemeinschaft und Individuum, Wissensquelle und

WissensempfängerIn. Dualistische Akteursmodelle wie ExpertIn versus Begünstigte/r, Wissensquelle versus passive WissensrezipientInnen werden obsolet, da jeder Akteur über ‚gutes' Wissen zum Weitergeben verfügt und so entwickeln sich kontinuierlich interaktive Wissensflüsse zwischen den Systemen. Co-Generierung ist ein Ausdruck von argumentativer Stichhaltigkeit und der Potenz der Inklusionsfähigkeit. Die Co-Produktion von Wissen kann formal in transdisziplinärer Forschung oder in den Alltagspraktiken kollaborierender informeller Gruppen ablaufen. In jedem Fall baut diese Form der Wissensproduktion auf dem Prinzip der Partnerschaft auf. Reflexivität bezieht sich auf das reflexive Management von Megawissen, welches für die Generierung neuen Wissens auf den unterschiedlichen Lernebenen der Akteure benötigt wird. Das Prinzip der Reflexivität ermöglicht die Revision und Anpassung von Wissen sowie eine effektive Implementierung von Innovationen in sehr komplizierten und unsicheren Entwicklungskontexten. Des Weiteren erlaubt es eine Rückkopplung lokaler Wahrnehmungen an globale Wissensregime und wirkt damit gestaltend auf globale Wissenssysteme ein. Wenn die Alternative zu Entwicklung eine auf Menschen ausgerichtete Entwicklung ist, dann kann die epistemische Kultur, die in der Arbeit fokussiert wird, als eine epistemische Kultur alternativer Entwicklung bezeichnet werden.

Spezieller gefasst, Bauern und Bäuerinnen können nicht mehr als homogene Empfängergruppe von Wissen für Entwicklung verstanden werden. Dies wurde eindrücklich in den Fallstudien gezeigt, in denen Akteure den Prozess der Wissensdiffusion aktiv durch ihre Schlüsselfunktion in Wissensnetzwerken mitgestalten. Außerdem konnte gezeigt werden, dass diese Akteure eine wichtige Rolle für den Aufbau von Netzwerken und sogenannten ‚communities of practice' spielen, indem sie ExpertInnen und die ländlichen Gemeinden des Mekong Deltas zusammenbringen. In diesen Netzwerken wird Wissen sowohl geteilt, angewandt und reproduziert als auch Nichtwissen aktiv formuliert. Entwicklungs- und WissensexpertInnen überwinden ihre disziplinären Grenzen und Arbeitsbereiche. Durch entsprechende Interaktionen von Wissen(-ssystemen) entstehen vielmehr neue Identitäten und hybridisierte Organisationen und Gemeinschaften. In diesem Sinne sollte das Management von Wissensdiffusion das Management von Wissenstranfer und –Generierungsprozessen umfassen und dabei sowohl die Wissensquelle und WissensempfängerInnen als auch das Wissen und das (relationale und rationale) Nichtwissen berücksichtigen. Weiterhin sollten die Lernstrukturen der Bauern und Bäuerinnen Berücksichtigung finden sowie deren oftmals vernachlässigten informellen Wissensflüssen mit den Zielen des Ansatzes ‚Wissen für Entwicklung' und dem Landwirtschaftssektor und ländlichen Entwicklungsansätzen verknüpft werden. In anderen Worten: das landwirtschaftliche Beratungs-, Wissens- und Innovationssystem sollte spezielles Augenmerk auf multiple Akteure, Dimensionen und interaktive Lernprozesse in landwirtschaftlicher und ländlicher Forschung und Entwicklung legen. Hinzu kommt die Notwendigkeit, Gestaltungsräume zu schaffen, in denen Lernen, Praxis und Wissens(re)generierung stattfinden kann. Transdisziplinäre Forschung sollte gefördert werden, speziell in Kontexten, die sich durch dynamische Arbeitskräftebewegungen auszeichnen. Informations- und Kommunikationstechnologien und Massenmedien, im Besonderen live TV-Programme sollten so konzipiert werden, dass thematische Dialoge und unterschiedliche Perspektiven dargestellt und Situationsanalysen angeboten werden, um nützliche Informationen und Trends weiterzugeben, die für Entscheidungsprozesse in ländlichen Gemeinden von Nutzen sein könnten.

Eine andere epistemische Kultur der Entwicklung ist im Entstehen, die eine zunehmend wichtige Rolle für die Konstruktion von Wissen für nachhaltige ländliche Entwicklungspraxis im Mekong Delta einnimmt. Dennoch wird diese oft von Mainstream Entwicklungsansätzen und Ansätzen des ‚Wissen für Entwicklung' überlagert. Obwohl strategische Planung und Regulierung weiterhin wichtig bleiben für die Entwicklung dieser alternativen Wissensproduktionskultur und der Staat und seine Politiken einen wichtigen Beitrag zur Wissensdemokratisierung und ‚Brückenbildung' beitragen, stellen bottom-up und lokale Wissensinitiativen und –Praktiken einen fundamentalen Orientierungsrahmen dar, um diese epistemische Kultur weiter zu entdecken, zu kultivieren und zu fördern. Die soziologisch institutionalistische Konstruktion lernbasierter Beratungssysteme, die zwischen Wissensprozessen an der Graswurzel und der gegenwärtigen Praxis eines bürokratischen Wissenstransfers abgrenzt, zeigt sehr wohl Mittel und Wege hin zu einer anderen Wissenskultur auf. Diese alternative epistemische Kultur der Entwicklung nimmt ihren Ausgang in der Wissensrekonstruktion und -Transformation innerhalb reflexiver Gemeinschaften, wie bspw. innerhalb landwirtschaftlicher ‚communities of practice', in denen hybrides Wissen durch Interaktion und innerhalb von Netzwerken generiert wird. Diese alternative Entwicklung befindet sich im Entstehen und sollte weiter gefördert werden.

Gradueller oder strategischer Wandel ist weder alleine abhängig von Bauern und Bäuerinnen noch von WissenschaftlerInnen/ExpertInnen sondern davon, wie Wissensmanagement und Regulationsmechanismen sowie strategische Entscheidungen die Interaktionen zwischen diesen Akteuren fördern. Wie in der vorliegenden Arbeit beschrieben, hängt die Ausbreitung einer alternativen epistemischen Kultur ländlicher Entwicklung von der Förderung interaktiver Wissenspraktiken, von Bewusstseinsveränderungen und entsprechender Handlungsplanung ab. Im übertragenen Sinne bedeutet dies, dass im weiten Ozean des Wissens Inseln neuer epistemischer Praktiken entstehen. Mikro-makro Wissenssteuerung muss Brücken schlagen und wissens- und prozessbasierte Interaktionen und Lernkulturen zwischen Gemeinschaften und Netzwerken etablieren. Ansonsten läuft die neu entstehende epistemische Kultur Gefahr marginalisiert zu werden und wissensbasierter sozialer Wandel kann nicht effektiv zu Transformationen ländlicher Entwicklung führen.

Diese Doktorarbeit ist eine der ersten, die die Wissensdimension für ein systematisches Verständnis ländlicher Entwicklung im Mekong Delta heranzieht. Wissen, Macht und Entwicklung werden zu einer Linse anhand derer vietnamesische Entwicklungsprozesse und die Staat-Gesellschafts-Beziehungen in Vietnam analysiert werden. Die Analyse ländlicher Transformation in Vietnam muss ebenfalls die Entwicklung von landwirtschaftlicher Gentechnologie, ökologischer Landwirtschaft, Landreformen, ländlich-urbanen Migrationsprozessen und Urbanisierung miteinbeziehen. Zudem könnten andere staatliche Behörden als das öffentliche landwirtschaftliche Beratungssystem untersucht werden, um allgemeinere Aussagen über staatliche Wissensproduktion und deren Nutzen für Politik und praktische Umsetzung auf den verschiedenen Ebenen treffen zu können. Wie verschiedene Wissensquellen für die Formulierung zentralstaatlicher oder dezentraler Politiken herangezogen werden ist ebenso von großem Interesse. Wie Wissen für Entwicklung von zivilgesellschaftlichen Organisationen genutzt und produziert wird kristallisiert sich als eine weitere wichtige Forschungsfrage heraus und komplementiert das Verständnis der entstehenden alternativen epistemischen Kultur.

Weitergehende Forschung bezüglich der Dynamiken von Wissensallianzen und –Netzwerken zwischen Akteuren des landwirtschaftlichen und ländlichen Entwicklungssektors ist nötig, um die sozio-kulturell eingebetteten Praktiken des ‚Wissen für Entwicklung' zu verstehen. Wissensdiffusion und –Vermittlung müssen in der jeweiligen epistemischen Kultur, in der sie eingebettet sind, sowie unter den gegebenen Bedingungen von Wissensmanagement und Steuerungsmodi betrachtet werden. Das Weitergeben von Wissen zwischen ‚communities of practice' könnte ebenfalls tiefergehend untersucht werden. So auch die Frage, wie Technologien und Wissen von verschiedenen landwirtschaftlichen Gruppen angenommen werden und die lokale Produktion und den Lebensalltag der Gruppen beeinflussen. Weiterhin ließe sich vergleichen, wie sich Wissen in formalen, extern-institutionalisierten Strukturen ausbreitet im Gegensatz zur Weitergabe von Wissen und Erfahrungen für Entwicklung, die über die informellen Netzwerke, die von der ländlichen Gemeinde selbst kreiert wurden, verläuft.

Diese Themen eröffnen interessante Wissenslücken für weitere Grundlagen- und anwendungsorientierte Forschung. Der Aufbau gemeindebasierter Wissenszentren in ländlichen Gebieten, kleinständischer Agrobusinesses oder von landwirtschaftlichen Forschungsprojekten, die von LandwirtInnen und ExpertInnen kooperativ gestaltet und durchgeführt werden stellt praktische Umsetzungsmöglichkeiten einer anderen epistemischen Kultur dar und schafft Zugänge zur Erforschung entsprechender Wissensprozesse. Ich hoffe, dass die vorliegende Arbeit eine wichtige Grundlage für zukünftige Forschungen zu einer solchen ‚doppelten Hermeneutik' im Mekong Delta in Vietnam geschaffen hat.

Acknowledgements

My first and most earnest acknowledgment must go to my supervisors, Prof. Dr. Hans-Dieter Evers and Prof. Dr. Solvay Gerke for guiding me through the new research domain of knowledge management and governance, contextualised in transitional rural development in Vietnam. The pursuit of such a novel topic is academically stimulating to me, since it provides me with an opportunity to combine and modify my earlier expertise in education, economics, and development studies with a reflection on my more than ten years of experience working in the development sector in Vietnam. It was also a major challenge for me because this field demands insights into a wide range of disciplines. My supervisors gave me all the freedom I needed for expanding my learning and using my creativity, while maintaining an "open-door" policy for whenever and whatever major or minor questions I continually thought about or abruptly came to mind. Their patience and tireless academic support helped me overcome the most perplexed times, develop my academic confidence, and sharpen my arguments. Significantly, their deep academic and life's understanding and experience of Southeast Asian people and cultures became both a generous source of empathy for and a precious source of criticism of any elements of my thoughts in bringing this research to fruition.

I am indebted particularly to Dr. Gabi Waibel, the coordinator of the Center for Development Research (ZEF)/Water-related Information System for the Sustainable Development of the Mekong Delta (WISDOM) project for her thoughtfulness, critical comments, and academic guidance on my research progress; this study forms a major component of that project. In addition to being funded by the Bundesministerium für wirtschaftltiche Zusammerarbeit und Entwicklung (BMZ) via the Deutscher Akadamischer Austauschdienst (DAAD) under a three-year PhD scholarship that I gratefully acknowledge, the research has been technically supported by WISDOM. I am deeply grateful to senior and junior researchers, particularly Sven Genschick and Farah Purwaningrum at the ZEF Department of Political and Cultural Change for direct comments on the proposal and preliminary finding presentations of the research, and other forms of knowledge-sharing through periodical colloquia and impromptu meetings. Comments and suggestions obtained from over ten international conferences and seminars where I participated and presented my research results over the last three years have been of great importance and integrated into this version of the research. From the Bonn Interdisciplinary Graduate School for Development Research (BiGS-DR), I am sincerely thankful to Dr. Günther Manske, Ms Rosemarie Zabel, Ms Maike Retat-Amin and other staff members for pre-field research course organisation, research-related logistical provisions, and administrative support during my stay and study in Bonn. I wish to extend my sincere gratitude to Dr. Judith Ehlert for her translation of the thesis's extensive abstract into German and Thay Lloyd Mclarty for English proof reading.

My deepest thanks must go to each and every participant in my research on the Mekong Delta. I am thankful to senior government officials and company managers for their time, warm welcomes, and candid discussions. My thanks also go to the mass media professionals and researchers participating in my two research surveys. Their expressed expectations for the dissemination of my research findings to a wider audience in appropriate channels have always remained in my mind. I can never forget the simple meals that local farmers prepared for me, entertaining stories they told in their everyday language, their attentive listening to my Hue accent, and their frequent thank-you expressions for my coming to talk and share interesting issues with them. The information I gained from all of them has been most valuable, and this research would not have been possible without their enthusiastic assistance. I am equally thankful to Simon Benedikter, ZEF/WISDOM coordinator in Vietnam, for his support in having my research permits approved during my one-year field research in the Mekong Delta, and to Mai Kim Ngan, who assisted me in identifying and connecting with local participants, joined me in interviews and group discussions, and prepared interview transcriptions.

My sincere thanks are due to Assoc. Prof. Dr. David Ip, who provided most valuable guidance and advice in the early part of my research career and continues to do so, despite geographical distance. He provided his elevated recommendation for my further training in a German research institute and much- needed motivation for any of my recent endeavours.

In Hue, I wish to express my sincere thanks to the leaders and colleagues at the Union Friendship Organisation and Department of Foreign Affairs of Thua Thien Hue Province for their

encouragement of my higher education pursuit and taking on extra work during my absence from the office. Thank you very much, Chu Anh, Vinh, Tuan, Nam, Tram Uyen, Ha, Co Hoai and Thien. I owe a very special gratitude to my extended family and close friends for their unfailing inspiration over time and distance. Most especially, I extend my heartfelt thanks to my wife for her tolerance, quiet assistance, useful academic debates, and unwavering love.

List of Figures

List of Tables

List of Abbreviations

ACCCRN	Asian City Climate Change Resilience Network
ADB	Asian Development Bank
AECID	Spanish Agency for International Development Cooperation
AGI	Agricultural Genetics Institute
AGPPS	An Giang Plant Protection Joint Stock Company
AGU	An Giang University
AIS	Agricultural Innovation System
AKIS	Agricultural Knowledge and Information System
ANT	Actor-Network Theory
APEC	Asia-Pacific Economic Cooperation
ASC	Aquaculture Stewardship Council
ASEAN	Association of Southeast Asian Nations
ASINCV	Northern Central Agricultural Science Institute
ASISOV	Southern Coastal Central Agricultural Science Institute
ATT	Adaptive Technology Transfer
BAFU	Bac Giang University of Agriculture and Forestry
BFF	Beyond Farmer First
BiGS -DR	Bonn Interdisciplinary Graduate School for Development Research
BiRDI	Biotechnology Research and Development Institute
BMZ	German Federal Ministry for Economic Development Cooperation
BPH	Brown Planthopper
CAAB	College of Agriculture and Applied Biology
CAES	Commune's Agricultural Extension Station
CCCO	Climate Change Coordination Office
CE	Commune Extensionist
CETDAE	Center for Technology Development and Agricultural Extension
CFA	Commune's Farmers' Association
CIDS	Can Tho City Institute for Socio-Economic Development
CLRRI	Cuu Long Delta Rice Research Institute
CoP	Community of Practice
CPC	Commune People's Committee
CRD	College of Rural Development
CTU	Can Tho University
DAAD	German Academic Exchange Service
DAES	District Agricultural Extension Station
DAFE	Department of Agriculture and Forestry Extension
DAH	Department of Health
DAO	District Agricultural Office
DARD	Department of Agriculture and Rural Development
DISED	Danang Institute for Socio-Economic Development
DOST	Department of Science and Technology
DPC	District People's Committees
DRAGON	Research Institute for Climate Change
FA	Farmers' Association
FAO	Food and Agriculture Organisation
FARZ	Flood avoidance residential zone
FAVRI	Fruits and Vegetables Research Institute
FBF	Farmer-Back to-Farmer
FCRI	Field Crops Research Institute
FF	Farmers' Friends
FFFL	Farmer-First-Farmer-Last
FFR	Farmer-First Research
FFS	Farmer Field School
FGD	Focus Group Discussion

FIPI	Forest Inventory and Planning Institute
FPR	Farmer Participatory Research
FSIV	Forestry Science Institute of Vietnam
FSR	Farming Systems Research
GAP	Good Agricultural Practice
GDP	Gross Domestic Product
GIS	Geographic Information System
GRDP	Gross Regional Domestic Product
GTZ	German Agency for Development Co-operation
HCMC	Ho Chi Minh City
HEP	High Energy Physics
HIDS	Ho Chi Minh City Institute for Development Studies
HISEDS	Hanoi Institute for Socio-Economic Development Studies
HUA	Hanoi University of Agriculture
HUAF	Hue University of Agriculture and Forestry
HYVs	High Yield Varieties
IAE	Institute for Agricultural Environment
IAS	Institute of Agricultural Science for Southern Vietnam
ICE	Institute of Construction Engineering
ICP	Inter-country Program
ICT	Information and Communications Technology
IED	Institute of Economics and Development
IFEE	Institute for Forest Ecology and Environment
IMP	Industrial Marketing and Purchasing
IPM	Integrated Pest Management
IPSARD	Institute of Policy and Strategy for Agriculture and Rural Development
IRRI	International Rice Research Institute
IWRP	Institute of Water Resources Planning
IWRT	Institute of Water Resources Technology
JIRCAS	Japan International Research Center for Agricultural Sciences
MAFI	Ministry of Agriculture and Food Industry
MAFI	Ministry of Agriculture and Food Industry
MARD	Ministry of Agriculture and Rural Development
MB	Molecular Biology
MDI	Mekong Delta Development Research Institute
MFi	Ministry of Fishery
MFo	Ministry of Forestry
MOIT	Ministry of Information Technology
MRC	Mekong River Commission
MRI	Maize Research Institute
NAEC	National Agricultural Extension Center
NARS	National Agricultural Research System
NAVG	National Association of Vietnamese Gardeners
NES	No Early Spray
NEZ	New Economic Zone
NFEC	National Fishery Extension Center
NGOs	Non-governmental organizations
NIAH	National Institute of Animal Husbandry
NIAPP	National Institute of Agricultural Planning and Projection
NIVR	National Institute of Veterinary Research
NLU	Nong Lam University
NOMAFSI	Northern Mountainous Agriculture and Forestry Science Institute
ODA	Official Development Assistance
PACCOM	People's Aid Coordinating Committee
PAE	Participatory Agricultural Extension
PAEC	Provincial Agricultural Extension Center

PAEM	Participatory Agricultural Extension Methodology
PAEX	Participatory Extension
PCD	Participatory Curriculum Development
PPRI	Plant Protection Research Institute
PRC	Plant Resources Center
PTD	Participatory Technology Development
R	Researcher
RBO	River Basin Organisation
RCRD	Research Center for Rural Development
RIA	Research Institute for Aquaculture
RIMF	Research Institute for Marine Fisheries
RWSS	Rural Water Supply and Sanitation
SAF	School of Aquaculture and Fisheries
SANSED	Closing Nutrient Cycles in Decentralised Water Treatment Systems in the Mekong Delta, Vietnam
SFRI	Soils and Fertilizers Research Institute
SIWRP	Southern Institute of Water Resources Planning
SME	Small and Medium Enterprises
SOE	State Owned Enterprises
SOFRI	Southern Horticultural Research Institute
STTCs	Science and Technology Transfer Centers
T&V	Training and Visit
TOT	Transfer of Technology
TPR	Trichogaster Pectoralis Regan
TUAF	Thai Nguyen University of Agriculture and Forestry
VAAS	Vietnam Academic of Agricultural Science
VAC	Horticulture (V), pisciculture (A), and animal husbandry (C)
VACB	Horticulture (V), pisciculture (A), animal husbandry (C), and biogas (B)
VACRRR	Horticulture (V), pisciculture (A), animal husbandry (C), rice (R), cash crops (R), and forestation (R)
VASEP	Vietnam Association of Seafood Exporters and Producers
VAWR	Vietnam Academy for Water Resources
VEW	Village Extension Worker
VFU	Vietnam Forestry University
VIAEP	Vietnam Institute of Agricultural Engineering and Post Harvesting Technology
VietGAP	Vietnamese Good Agricultural Practices
VIETSERI	Vietnam Sericulture Research Center
VIFEP	Vietnam Institute of Fisheries Economics and Planning
VND	Vietnamese dong (USD 1 ~ VND 20,000)
VUSTA	Vietnam Union of Science and Technology Associations
VVOB	Flemish Association for Development Cooperation and Technical Assistance
WASI	Western Highlands Agriculture and Forestry Science Institute
WAVR	Vietnam Academy for Water Resources
WISDOM	Water-related Information System for the Sustainable Development of the Mekong Delta
WPC	Ward People's Committee
WRU	Water Resources University
WTO	World Trade Organisation
WU	Women's Union
ZEF	Center for Development Research

For Khanh Van and An Khang

CHAPTER ONE

"SCHOLARS FIRST, FARMERS SECOND": KNOWLEDGE DIFFUSION FOR DEVELOPMENT REVISITED

"*Nhat si nhi nong*
Het gao chay rong, nhat nong nhi si"
"First come scholars, then farmers
In rice-shortage times when people roam searching for food,
farmers run before scholars"
(Vietnamese folk)

The above-cited folk verse, with no necessary intention to denigrate or diminish the role of the scholars, marks a humorous expression drawing the social recognition towards the important role of farmers with their production activities and basic products on which the entire society is dependent. Despite having unknown authors, folk songs, in a general sense, are developed as a form of solace for working men and women from their hardship, and at many levels, echo their aspirations for prosperity, happiness, and equity. Historically, in Vietnamese conventional feudal society, the two important classes that generated wealth, material and intellectual, included farmers and scholars, respectively. Even so, the social positions and professional work of the two classes were polarisedly differentiated and basically unconnected. Under the influence of the Confucian ideology, scholars gained great respect and esteem in the community; the scholarly path opened up a mandarin's career, and only after retiring or resigning as a mandarin could they return to a didactic life in their home villages. In contrast, farmers were presumed to be of humble status and under the draconian domination of the ruling class, always living in miserable conditions.

From the 1980s-1990s, during the years before and right after renovation (*doi moi*), the verse was repeated in Vietnamese teachers' families[1]. A great number of teachers gave up the teaching profession because salaries were too merger. To endure the economic difficulties, many lecturers from agricultural departments and universities individually or in groups had to intensify their involvement in agricultural production activities for income generation. Education became the least desirable choice in university entrance examinations when the belief was established that "medicine is first, pharmacy second, polytechnic not bad, education no way" (*nhat y, nhi duoc, tam duoc bach khoa, bo qua su pham*) or "only mice running to the end of the pole head to 'education"' (*chuot chay cung sao moi vao su pham*). The folk verses in these circumstances called for reform of the national education system, including salary policies for teachers, which the Vietnamese government is continuing to pursue.

Recently, within the times of the global food price crisis and "put food first" redebate[2], the folk verses have been once again popularly recited in discussing contemporary Vietnam. Such citations imply the

[1] Our interviews with several scholars from the Mekong Delta have also affirmed the situation in the region during this period.

[2] "The food price crisis, which dramatically hit global markets in 2008, underscored the legacy of this underinvestment and brought agriculture back to the forefront of the development debate. Concerns about the security of food supplies in the face of growing urban populations and of climate change have led to a renewed focus on efforts to improve agricultural productivity and growth, to new commitments to agricultural

demand of considerable attentions by policymakers to develop an agriculture that is sustainable and beneficial to farmers and that agricultural and rural development should be integral to the country's industrialisation and modernisation cause[3].

"Farmer first" arguments have been well established in the global development research and discourse and in a less systematically theorised in Vietnam. Criticising top-down, outsider-driven rural development that make the poor and their reality become unseen and unknown, Chambers (1983; 1997) discusses alternatives to empower those on a lower economic and social level and enhance voices, agendas, and priorities from below by suggesting participatory working and learning. *Farmer First* (Chambers, Pacey, and Thrupp 1989), *Beyond Farmer First* (Scoones and Thompson 1994), and *Farmer First Revisited: Innovation for Agricultural Research and Development* (Scoones and Thompson 2009) is another book series that was intended to make farmers and local communities the center of rural development research and practice. The successive books demonstrate farmer-first thinking's evolution from farm-centered to farm-interactive knowledge with power, education, and innovation systems (cf. McWilliam 2011). In Vietnam, many recent studies by local researchers from the Mekong Delta highlight the important role of farmers' knowledge. For example, Nguyen Ngoc De (2006, 101-108) describes a number of vignettes of farmers who work as local technicians, local innovators, and community motivators and who progress from growers to breeders of new seed varieties that are then widely adopted in the Mekong Delta (Tran Thanh Be 2009, 251-256). Generations of researchers from Can Tho University have devised a rural development approach based on the original farmers' experience (Nguyen Ngoc De 2006).

Vitalised with novel meanings from contemporary development debates, the old Vietnamese folk verse fittingly introduces this research study, which attempts to explore knowledge production, diffusion, and use for agricultural and rural development within the interaction of plural knowledge producers and users in Vietnam's rural development context through the case of the Mekong Delta[4]. Globalisation has transformed the way knowledge is produced, transmitted, and applied (Evers, Kaiser and Müller 2009), as research results from one part of the world are transmitted over long distances to users who utilise it for their development. A wide gap has often arisen between epistemic culture, the culture of knowledge production, and the social and cultural conditions in which knowledge is applied

---

investment, and to growing interest in more sustainable, low-carbon production systems. There is now an emerging consensus that, without significant increases in investment in agriculture, and in small-scale farming in particular, the Millennium Development Goals for poverty and hunger reduction cannot be reached" (Baden and Harvey 2011, 3).

[3] For example, it is suggested in a recent analysis article on *Vietnamnet*, one of the most popular online newspapers under the Vietnam's Ministry of Information and Communication, that "Vietnam is pursuing a dream of national industrialisation and modernisation while 70% of its population engages in the agriculture sector and many intellectuals have a farmer-related background. It might take centuries to build up a knowledge-based economy or knowledge society that can export knowledge. Why don't we thus take a reverse process by departing from agriculture industrialisation?" (Hieu Minh, *Vietnamweek* May 4, 2011).

[4] The Mekong Delta is one of the most active and productive agricultural development deltas in Vietnam and around the world, thus providing a thought-provoking case for understanding contemporary development and knowledge for development in Vietnam. Chapter 2 will pore over distinctive characteristics of the region's development and knowledge landscapes.

(Evers 2005). This problem is by no means new, but it has taken on new dimensions and practices. A number of interesting questions have inspired my research journey: In the age of "knowledge economy" or "knowledge society," how do agrarian communities in developing countries talk, think, and apply knowledge for their everyday life and production? Whether, how, and to what extent is knowledge work relevant to agriculture development and rural communities? Does a farmer become a "knowledge worker," or are knowledge workers only scientists, experts, development practitioners, and agriculture managers? How do modern communication technologies assist knowledge exchange and development in agronomic activities? More generally, is there a culture that nurtures knowledge production processes among interactive actors and across traditional boundaries and niches?

In a contemporary international development context and particularly in Vietnam, since the conventional developmentalist epistemological roots remain unchanged in practice, epistemic practices are only specialised within the expert systems and processes, even when the current knowledge for development[5] discussions have challenged the epistemic agency of development by centring farming communities and their knowledge in the knowledge/innovation system. Within this thinking system, there is a strong hierarchy and a clear-cut division of knowledge production, diffusion, and use functioned by scientists, practitioners, and farmer communities; in the belief that the truth exists and can be "known" through careful observation, these experts can solve development problems by providing problem-oriented knowledge and technology. This system identifies the monopoly of knowledge production and brokering roles of experts, while rural communities, despite their own knowledge sources and systems and advancing position of agents of development, are only passive recipients of development and knowledge for development. Even though the past has witnessed a number of failed or unsustainable development projects, "it is still believed that development experts have the means and competencies to cope with and solve local and global development issues" (Evers, Kaiser, and Müller 2009, 58).

In this thesis, I shall develop and pursue the challenge of reframing knowledge production practices in agricultural and rural development in Vietnam according to the appreciation of plural knowledge world interactions (epistemic culture pluralism) and also of unpacking epistemic culture conceptualisation beyond the relation between scientists and epistemic objects in laboratories but in connection with the embedded community/organisational culture and knowledge diffusion and use practices (epistemic culture convergence). This direction could open up a new way of thinking, making, and governing knowledge for (rural) development and build up an alternative epistemic culture of development serving the advancement of knowledge for transformation. The goal of epistemology in this thesis is

[5] Development here is referred to as social scientific development research. Because of the potential to be misled from over-time abuse of the concept, making it all-too-vague with dubious implications, Ziai (2011) proposed to use alternative concepts to be more careful and precise in expressing what we mean by "development," for example, *social change* instead of *processes of development*. In this research, development is used because even though agricultural and rural development is focused, broader development conceptualisation and practices in shifting and transformation are subsumed throughout the research.

defined in the inclusion of both epistemic outcomes with development outcomes. Epistemic achievements should support epistemic and development values. The development of the "epistemic cultures" concept and its construction in expansion of knowledge diffusion practices from a system perspective provides the fortified theoretical ground for my research. As such, this study goes well beyond the prominent knowledge for development approach in understanding the "developing" country context, in which knowledge is viewed as "ready" technology to be applied for development. The research by relinking knowledge and development arguments from a knowledge production culture perspective may therefore allow insights into understanding the broader development of transitional Vietnam, for example, rural-urban continuum, state-society relations, or disadvantaged community empowerment.

The objective of this research is two-fold. This research, contextualised in the dynamics and complexity of agricultural and rural development of the Mekong Delta in Vietnam, attempts to provide a systematic understanding of knowledge diffusion for development through an interactive systems reconstruction, which integrates various typologies of knowledge over cognitive, organisational, and societal analysis levels. Concurrently, the epistemic culture of development (the culture of knowledge for development generation and use) is explored and reinvented as the structural feature of the knowledge system on this basis that knowledge is regenerated and reconstructed throughout the diffusion processes. Commencing with the double reconstruction proposal of inquiries and analysis, implications are given as "knowledge for" diffusion management and governance. The foundation research questions are thus framed: How is knowledge diffused, from systems thinking and interactionist perspectives, for agricultural and rural development (toward sustainability) in the Mekong Delta in Vietnam? And how have knowledge diffusion and generation practices constructed the contemporary epistemic culture of development and development work itself in this region and in Vietnam as a whole?

1.1. Knowledge and development links

Until recently, the links of knowledge and development were obvious. There is an increasingly proliferous literature on knowledge diffusion, knowledge management, and governance at organisational and societal levels in both developed and developing countries (Torraco 2000; Foss 2007). In the globalised world, the role and flow of knowledge in solving problems of "underdevelopment" have (re) gained growing attention both in development research and practice (see for example Molenaar, Box, and Engelhard 2009). The information and communications technology (ICT) revolution, market development, and positive political and social change environments on a global scale have provided easier access to knowledge and information and thus opportunities for economic leapfrogging, resolutions for social problems, and sustainable development innovation (Ramady 2005; Mohamed, Stankosky, and Mohamed 2009). The increasing importance of knowledge as a resource for economic development has been strongly justified (Conceicção et al.

1998). In the 1998-1999 World Development Report titled *Knowledge for development*, the World Bank critically assessed the power of knowledge for development and the "knowledge is power" adage:

> "Knowledge is like light. Weightless and intangible, it can easily travel the world, enlightening the lives of people everywhere. Yet billions of people still live in the darkness of poverty - unnecessarily. Knowledge about how to treat such a simple ailment as diarrhea has existed for centuries - but millions of children continue to die from it because their parents do not know how to save them" (World Bank 1999, 1).

Under this knowledge-for-development umbrella, a number of large development institutions have started to provide knowledge-based development systems in which they identify themselves as development 'doers' and knowledge brokers or providers. The World Bank has been able to maintain its growth as the world-leading knowledge broker agency ("Knowledge Bank") so far due to the quality and relevance of its development research bank (Dethier 2007). This approach has been criticised since it suggests knowledge receivers are passive containers of poured-in knowledge while the Bank maintains "command and control over the 'right' type of knowledge management" (Ellerman 2000; Enns 2014). Knowledge is reductionistically considered as information, and the establishment of knowledge banks facilitates knowledge to flow to knowledge users in need. Given its power and promises[6], knowledge is not freely shared and used to enlighten the lives of people in need around the world. The power resides in knowledge sharing and diffusion rather than in the knowledge itself (Aguirre, Brena, and Cantu 2001, 65; Liebowitz 2001) because its value in development depends on its distribution[7] (Deane 2000, 240). The changing development landscape in fact deals with the twin issues of globalisation and localisation (Deane 2000). Foreign experts in technical transfer projects need to follow a collaborative exchange rather than a colonial model if they are to produce effective assistance and local autonomy (Grammig 2002). Development work has shifted its focus to the intangibles of knowledge, institutions, and culture (Stiglitz 1999; UN Millennium Project 2005).

The mainstreaming of knowledge for development has in fact grown out of the grand shift witnessed over the last few decades from the third industrial revolution, a post-industrial society, the information era, a networked society to a knowledge economy[8], a knowledge society[9], knowledge-based

---

[6] For example, knowledge is considered in many government's policies as a, if not the, main driving force of innovation, economic growth, modernization, and development (Evers 2005, 61-62). "Knowledge societies" are said to be the key to our future prosperity, and "nations that want high incomes and full employment must develop policies that emphasise the acquisition of knowledge and skills by everyone" (Marshall and Tucker 1992).

[7] Successful stories of knowledge diffusion suggest that "it's more about 'creating space' for the country stakeholders to 'learn by doing' than 'filling the space' with Bank-prepared solutions; it's more about creating the 'best local fit' than applying the 'best global practice'; and it's more about nurturing effective behavioral competencies than strengthening a staff 's technical skills" (World Bank 2005, xiii).

[8] OECD (1996, 7) defines economies as "economies which are directly based on the production, distribution, and use of knowledge and information."

[9] A knowledge society is believed to have the following characteristics: "(i) Its members have attained a higher average standard of education in comparison to other societies and a growing proportion of its labour force are employed as knowledge workers, i.e. researchers, scientists, information specialists, knowledge managers and related workers; (ii) Its industry produces products with integrated artificial intelligence; (iii) Its organisations – private, government and civil society – are transformed into intelligent, learning organisations; (iv) There is increased organised knowledge in the form of digitalised expertise, stored in data banks, expert systems,

development, or even knowledge civilisation (Laszlo and Laszlo 2002; Kenway et al. 2006; OECD 2004).

> "*The episteme of knowledge civilization is not formed yet*, but the destruction of the *industrial episteme* and the construction of a new *conceptual platform* started with relativism of Einstein, indeterminism of Heisenberg, with the concept of feedback and that of deterministic chaos, of order emerging out of chaos, complexity theories, finally – with the *emergence principle*. […] The *industrial episteme* believed in reduction principle – *that the behaviour of a complex system can be explained by the reduction to the behaviour of its parts* – which is valid only if the level of complexity of the system is rather low. […] It should be noted that *the emergence principle expresses the essence of complexity* and means much more than *the principle of synergy or holism* (that *the whole is more than sum of its parts*)" (Wierzbicki and Nakamori 2007, 272-273, emphasis in original).

The knowledge economy has become a dominant economic and ideological lever and driver in today's world (Kenway et al. 2006). There has been a plethora of buzzwords such as "intellectual capital," "knowledge management," "knowledge workers," and "knowledge organisations," words frequently lacking clarity and under-defined yet adopted despite their various combined and recombined configurations (Thorlindsson and Vilhjalmsson 2003). At the organisational level, especially for companies and the business community in general, determining how to harness and manage knowledge for organisational development have attracted both academic and corporate discussions and interventions. In more advanced, industrial economies, however, "the challenge of creating and nurturing a culture of innovation and change is no less daunting" (Stiglitz 1999). The democratisation of knowledge and bridge building between science, technology, and society has modified scientific and technical cultures (Santerre 2008). However, the economic, social, cultural, and ethical values that a knowledge economy fosters, regulates, privileges and marginalises are increasingly problematic and alerted (Kenway et al. 2006). The democratic deficit braced by the knowledge-based economy continues to widen the "knowledge gap" or "digital divide" in that ICT becomes the backbone of a knowledge system, between countries, regions, and areas within a country/economy (Evers and Gerke 2005; Evers, Gerke, and Menkhoff 2006; Evers, Genschick, and Schraven 2009).

> "Knowledge-based economies are growing all around us, but they do so without always acknowledging the democratic, ethical, and normative dimensions of science and scientific institutions. The knowledge economy is market-driven and performs according to a market ideology, which stands in a problematic but not necessarily conflicting relation to the norms and ideals of the knowledge society. The knowledge economies we live in suffer from a democratic deficit. This does not mean that they have to be overturned or rolled back—that opportunity may not even exist. But what seems clear is that the democratic deficit needs to be addressed if academic life and culture should survive in the era of fierce global competition, and if they should be able to spread and function in new regions of the world" (Sörlin and Vesture 2007, 2).

Considering that knowledge has been with us for a very long time (Cortada 1998), knowledge-based development can be realised based on the "radical" development of knowledge-based value systems and knowledge democratisation from the organisational into the social arena (Carrillo 2008). Knowledge-based developments are taking shape within the transformational discourse and agenda of knowledge for development, knowledge management, and knowledge societies.

---

organisational plans and other media; (v) There are multiple centers of expertise and a poly-centric production and knowledge utilisation" (Evers 2003, 362).

Upon closer examination, the link between development and knowledge can in fact be traced back to the early development framework and throughout the evolution of development paradigms:

> "Knowledge was an integral part of international development cooperation since its official beginning in the 1950ties. It was knowledge about "Others", knowledge about what (and who) has to be developed and how as well as knowledge about the desired effect of development cooperation. Often it was western knowledge and epistemology that was spread across the globe and claimed to be the valid, or true, knowledge" (Witjes 2011, 29).

Development in the post-World War II era has constantly discussed and critiqued both theory and practice and shifted over different paradigms: modernisation (development stages as western countries, trickle-down effect; state involvement, regional economic development), dependency (neo-colonialism, regional inequalities), neo-liberalism (free market, structural adjustment, one world), and alternative development (basic needs, grassroots, gender, sustainable development) (see Nguyen Quy Hanh 2007). Brooks, Grist, and Brown (2009) argue that development thinking and practice have been dominantly defined since the 1950s by a development paradigm with its concepts of modernisation, economic growth, and globalisation, which treat the environment as an externality. Therefore, a variety of alternatives of development seems unable to go much further than the changes of vocabularies in the *status quo* of mainstream development (Esteva 1992) and various "nice-sounding" methods, and tools like "participation," "empowerment," and "poverty reduction" used in global development strategies and goals have remained entrenched in the business-as-usual mindset (Cornwall and Brock 2005). Post-development theorists have advocated alternatives to development by totally dismantling "development" not merely because of its outcomes, but more importantly "its intentions, its worldview and mindset" (Pieterse 2001), its "westernisation of the world" (Latouche 1993; Sachs 1992), and its "space in which only certain things can be said or even imagined" (Escobar 1995). Criticisms of post-development vary[10], yet what is important is that post-development expands "development" dimensions in its complex relations with culture, indigenous and local knowledge and practices, and social movements.

Post-development is not necessarily anti-development in that the implementation of post-development theory requires the appreciation of the complexity, multi-laterality and knowledge in which development is practiced. Knowledge of development knowledge has urged all of us to work for transformative agendas towards sustainability (cf. Harcourt 2011). Knowledge is becoming a key agenda in development work, a core theme in development debates and problematisation, and the main driver of development approach transformation. Powell (2006) argues that development is

[10] First, post-development disregards positive aspects of development and assumes development to be 'singular, hegemonic and invariably negative' (Corbridge 1998). Secondly, development used by post-development theorists is in lack of 'historical depth,' since it limitedly refers to the development theories and practices of the post-second world war (Grischow and McKnight 2003). Third, post-development writers romanticise local traditions and social movements, not recognizing that the local is still in global power relations (Ziai 2004). Fourth, as also the most crucial critique, post-development does not offer a concrete alternative program for the future (Pieterse 1998). Hence, it is widely concluded that post-development is just a possible explanation for the poor effectiveness of 50years of development interventions (Nustad 2001) and/or a set of analyses of deconstruction rather than reconstruction (Pieterse 1998).

fundamentally a "knowledge industry." Over the years the development sector has indeed envisaged the role of knowledge in tackling of complexities, uncertainties, and long-term planning requirements of problems and opportunities it has faced (Stremmelaar 2009). However, reflexive development[11] or the incorporation of such critical literature into development strategies and practices has not gone far enough, resulting in a huge gap in practice and several deficiencies in the knowledge agenda: "a concentration on organisations rather than the development sector, an emphasis on larger organisations while ignoring smaller development actors, and inadequate conceptualisations of learning" (Jakimow 2008). The creation of a space for learning within development agencies, between headquarters and field offices, and between developers and developees seems difficult to implement despite the emphasis on learning and knowledge creation:

> "How many of us work in organisations where we are rewarded for reflecting on our work, for reading and listening to what others have to say, for systematising and sharing our experiences so others can critique our work, both within our institutions and in the broader development community? We are working with ever more ambitious NGO agendas, increasing numbers of relevant actors and stakeholders, and more complex change processes. As we learn by doing, real learning becomes even more important. Yet increased complexity increases demands on staff and strains existing infrastructure, meaning there is even less time for reflection and learning. When and how can this vicious cycle be transformed into a virtuous one of reflective practice?" (Roper and Pettit 2003, 14).

In short, despite recent enhancement within the knowledge for development approaches and inception of knowledge societies, the link between development and knowledge has taken a long time and has been developed throughout the evolution of knowledge and development frameworks themselves. This holistic view allows and urges the use of knowledge and meta knowledge theoretical developments in each field into the practice beyond hi-tech dimensions or post-industrial context curtailment of knowledge apprehension. As such, our notion of knowledge and knowledge production for development highlights an expansion of over reflexive learning across time and space.

1.2. The evolution of knowledge diffusion approaches

This section will systemise and scrutinise various models of knowledge diffusion for development. The models are explained and taxonomised under epistemological perspectives. I suggest three levels of knowledge diffusion to be conceptualised: as a process, as a system, and as knowledge management.

Knowledge diffusion as a process

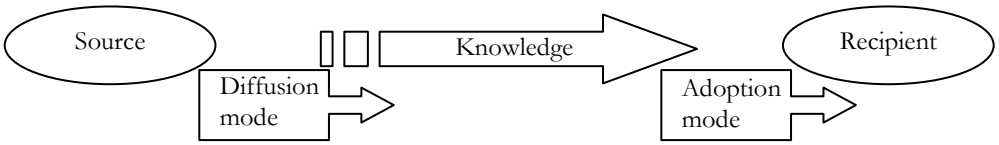
Prominent in the literature, knowledge diffusion, either illustrated with the most direct presentation between the source and the recipient or by a more complex arrangement with a vast audience and stakeholders who interact in the midst of a variety of influencing factors, has at its core the source-

[11] A "reflexive development" includes development approaches that "(i) reflect on development processes, challenging previous assumptions and instilling dynamism in discourses; (ii) incorporate multiple voices through a critical view of power relations; (iii)facilitate the creation and actualization of multiple approaches at the local level; and (iv) create opportunities for these local imaginings to be synthesized at regional and global levels, to enable a better understanding of global issues and advocate for the transformation of global regimes" (Jakimow 2008, 314).

recipient generic pipeline-flow from those who possess knowledge to those who wish to receive it (cf. Feng et al. 2010). Knowledge diffusion as a continuous or step-wise process emphasises knowledge flow to and adoption patterns of the potential recipients, which are determined by the nature and characteristics of transferred knowledge. Generally, knowledge diffusion is, as reviewed by Cummings and Teng (2003) and Kovačič (2008), conceptualised as an integrated framework with nine main affecting factors across four broad contextual domains: knowledge context (articulability, embeddedness), relational context (organisational, physical, knowledge, and norm distances), recipient context (learning culture, priority), and activity context (diffusion activities). A number of knowledge diffusion models have been developed and widely used in agricultural development, business, marketing, and organisational knowledge management. Such specific models can be divided into three main epistemologies: cognitivistic, pragmatic-connectivistic, and radical constructivistic views (see Table 1.1).

With its roots in the mid 1950s, cognitivist epistemology assumes that truth is the degree to which our inner representations correspond to the world outside (Venzin, von Krogh, and Roos 1998) and thus the goal of any cognitive system is to create the most accurate representation of what already exists in the world (Jelavic 2011). The cognitivistic perspective views knowledge as a representable fixed entity (data) that is stored universally in computers, databases, archives, and manuals and is easily shared across the organisation (Zarrinmehr and Rozan 2012). Thus specific characteristics of the knowledge, sender, and receiver are not indicated in knowledge diffusion. Transferability and appropriability of knowledge are focused, encouraging information processing, information management, and knowledge structures (Jelavic 2011).

Table 1.1: Major epistemologies of knowledge diffusion as process

Epistemology					
- Cognitivism (Human actions determined by mental programs)	Not specified	Transferability of knowledge	Technologies, explicit knowledge, knowledge as fix, universally-stored entity	Appropriability of knowledge	Not specified
- Pragmatic-Connectivism	Knowledge producer and supplier	- Dissemination - Utilisation - Communication	Technologies, knowledge, innovations	- Epidemic - Bass - Probit - Bayesian	Differentiated groups, needs, and knowledge
- Radical constructivist (Collaborative)	Co-knowledge producers	Dialogical communication, mutual learning	Socio-historical construction of technology and knowledge	Reflective learning	Partner, co-producers
(Material-semiotic)					Human and non-human

Source: Constructed from Christensen and Bukh 2012; Kovačič 2008; Jelavic 2011; Jensen 2012; Tidd 2006; Zarrinmehr and Rozan 2012

The pragmatic-connectivistic perspective holds that knowledge diffusion between source and recipient is influenced by differentiated groups, needs, prior knowledge and the nature of connections in social interactions, networks, and ties (Joshi, Sarker, and Sarker 2007; Zarrinmehr and Rozan 2012). Knowledge transfer embraces technology transfer, which encompasses the transfer of basic and applied research results to the development, through experiments and testing, and transmission, including commercialisation, of new products, services, and processes (cf. Reed and Simon-Brown 2006). The former, however, involves a more complicated and meticulous transfer of softer[12] and less structured aspects of knowledge, such as a skill, an internalised experience, or internalised domain knowledge in addition to its more explicit, structured, codifiable "harder" facets (see Kimble and Hildreth 2005). Beyond just making knowledge/technology available, such transfers of ready-to-apply knowledge, tools, and processes involve transmission effort (Reed and Simon-Brown 2006) or the cost of time and resources (Bae and Koo 2008; Reagans and McEvily 2003) of the knowledge provider so that new knowledge/technology is obtained, acquired, learned, and applied by the knowledge seekers, which may include clients, students, or development beneficiaries, to create a change in the knowledge and performance of the knowledge recipient (Bröchner, Rosander, and Waara 2004; Inkpen and Tsang 2005; Jasimuddin and Zhang 2011; Nokes 2009). Thus, despite its extended use over a broad spectrum of informal, social, and formal learning and engagement levels from two individuals[13] to groups, networks, organisations, and (inter) nations, the result of knowledge diffusion is believed to be optimally achieved by balancing the provider-seeker selective pull-push processes (Huang, Chang, and Henderson 2008). Rogers identifies the process of innovation diffusion as the interaction of four elements: innovation, communication channels, time, and social systems (Rogers 1995, 5). In contrast, human action is described as a "materially and socially embedded process that unfolds through concerted moment-to-moment efforts to maintain the coherence, meaningfulness, and mutual intelligibility of actions" (Jensen 2012). From the demand-side perspective, a number of adoption patterns have been developed based on different assumptions regarding the adopter's characteristics and defined approaches. Tidd (2006, 13) finds that innovation adoption is based on direct contact with or imitation of prior adopters (epidemic model), adopters consisting of innovators and imitators (bass model), adopters with different benefit thresholds (Probit model), and adopters with different perceptions of benefits and risk (Bayesian model). Accordingly, knowledge production, diffusion, and learning are the network.

[12] Even technology is composed of hard and soft technology. Hard technology refers to the tangible entity upon which an operation is conducted, while soft technology refers to an entity without physical form, such as management, organizational design, education for creativity and entrepreneurship, good governance, prudent regulation, and patent systems (Jin 2005). Jin (2005) points out that in emerging knowledge societies, the soft technologies are drivers of physical hard technologies.

[13] Knowledge transfer can be classified as "closed" or "open" based on the number of knowledge receivers: "Closed knowledge transfer takes place through the interpersonal form of communication between a single sender and a single receiver while open knowledge transfer transpires in a public form of communication between a single sender and multiple, unspecified number of receivers" (Kang, Kim, and Bock 2010, 586).

Radical constructivists believe that reality is constructed through human activity; knowledge as a human product is socially and culturally constructed, and learning is a social process (Kim 2001). This social constructivist view of knowledge is informed by different social science theories, such as Giddens's structuration theory, Lave and Suchman's anthropological research of professional work, Wenger's conceptualisation of communities of practice, and Cook and Brown's studies of one of the world's premier research and development laboratories (see the following sections for further analysis) (Koloskov 2010). Glanville (2005) distinguishes an observer-in from an observer-of in the way that the observer-in is involved as an agent who knows and produces knowing instead of knowledge that exists separately from the observer-of. Further, knowledge is seen as history dependent and autonomously developed (Venzin, von Krogh, and Roos 1998; Von Krogh and Roos 1995). This autopoietic perspective of knowledge highlights knowledge creation throughout conversion processes, such as Nonaka's model of knowledge dynamics. Constructivism also opens post-human space to include a material-semiotic approach toward knowledge and innovation users. Users are viewed as "the effect of a materially heterogeneous actor-network," which has "inspired a range of 'thick descriptions' of how users are 'enacted' in practice" (Jensen 2012). Radical constructivism, therefore, forwards the idea and practice that knowledge providers and receivers are partners and knowledge co-producers through mutual communication and reflective learning.

In the context of international development and especially in agricultural development, knowledge/technology transfer has been the most common and crucial method to create higher productivity and "development" in developing countries for decades. Knowledge diffusion for agriculture and rural development as a single transaction or in complex multi-directional and multi-agent interactions has a long history within the sociology of rural development and has evolved throughout different models and approaches that are compatible with the three aforementioned epistemological developments (see Table 2.1). Under "the most modern is the best" cogitation, Transfer of Technology (TOT) was dominant during the 1950s-1960s when farmers were passive recipients of new technology. The decades between the 1970s and the 1990s witnessed the emergence of new vantage points appreciative of farmers' specific locations, constraints, ability, involvement, and contribution to the success of technology and knowledge diffusion interventions. The main approaches include Adaptive Technology Transfer (ATT), Farming Systems Research (FSR), Farmer Back to Farmer (FBF), and Farmer First Farmer Last (FFFL). However, it was not until the 1990s-2000s that the weighty transformation of knowledge diffusion could be observed when farmers' capacity for experimentation and their own research was recognised under Beyond Farmer First (BFF) and the research process became democratised by virtue of Farmer Participatory Research (FPR). Under both models, knowledge is the outcome of a joint learning process between development actors.

Table 1.2: The evolution of agricultural knowledge/technology development and transfer models

Models	Scientist-managed ◆							◆Farmer-managed
	Transfer of Technology(TOT)	Adaptive Technology Transfer (ATT)	Farming Systems Research (FSR)	Farmer-Back to-Farmer (FBF)	Farmer-First-Farmer-Last (FFFL)	Farmer-First Research (FFR)	Beyond Farmer First (BFF)	Farmer Participatory Research (FPR)
Dominant era	1950s-1960s	1970s-1980s	1970s-1980s	1980s-1990s (Proposed by Rhoades and Booth 1982)	1980s-1990s (Proposed by Chambers and Ghildyal 1985)	1980s-1990s (Proposed by Chambers, Pacey, and Thrupp. 1989)	1990s-2000s (Proposed by Scones and Thompson 1994)	1990s-2000s
Main assumptions	- The most modern is the best. - Agricultural technology has global transferability irrespective of local ecological conditions. - Farmers' behaviour change is key to modern technology adoption	- Agricultural technology is location-specific - Farmers' behaviour is no longer seriously regarded as a barrier to adoption.	Agricultural technology must be adapted to the constraints of farmers, not vice versa	Farmers are more likely to accept changes if they actively participate in the final research process	The starting point of development is an active and equitable partnership between rural people researchers and extensionists	- Agricultural technology generation is still prominent with a linear process beginning with scientists and ending with farmers - Farmers have something to contribute to innovation and technology development	- The recognition of farmers' capacity for experimentation and their own research - The recognition of socio-politically differentiated views of development	- Farmers act rationally in using resources for their production. - Knowledge is the outcome of a mutual learning process between actors
Drivers	Supply-push from research	Locally adaptive transfer	Diagnose of farmers' constraints and needs	Farmer's involvement in innovation design and transfer	Exploration of farmers' ability to experiment, adapt and innovate	Farmer's involvement in innovation design and transfer	Articulation of on-farm research with farmers' own research projects and modes of injury	Democratised research process
Role of scientists	Innovators	Innovators	Experts	Experts, catalysts, facilitators	Experts, catalysts, facilitators	Experts, catalysts, facilitators	Catalysts, facilitators	Catalysts, facilitators, supporters of farmer-led research

Role of farmers	Passive recipients of new technology (adopters or laggards)	Passive recipients with limited feedback	Sources of information	Co-researchers, developers, and extensionists	Central actors in research and experimentation process	In partnership with scientists	Co-knowledge producers	Co-knowledge producers, partner in learning and action processes
Intended outcomes	- Technology adoption - Productivity increase	- Adapting new technology to local conditions - Removing the socio-economic constraints to adoption by farmers.	- Matching of research priorities with farmer needs - Farming system fit	- Farmers' knowledge and problems are acknowledged. - Solution better fitted to farmers condition	- Greater participation of farmers in on-farm research - Technology development is more attuned to local conditions and properties	- Continuous interaction between scientists and farmers - The supply and demand for innovations as a circular process beginning and ending with farmers	- Farmers' own experimentation is treated as a form of inquiry in its own right. - Effective linkage with formal science	- Enhancement of local adaptive management capacity and network - Creation of learning platforms - Strategic research planning

Sources: Developed from Do Kim Chung 2005; Klerkx, van Mierlo, and Leeuwis 2012; Klerkx et al. 2012; Ogunsumi 2010; Probst et al. 2005

Knowledge diffusion as knowledge management

Different approaches to knowledge and knowledge management have shaped and regulated knowledge diffusion theories and practices. A comparison of five main knowledge management models is provided in Table 1.3. The holistic model is important for the reason that it brings critical knowledge in interconnection with two other facets of knowledge in knowledge management and that knowledge managers can make use of the critical facet to produce more productive and transformative learning environments, knowledge access and sharing cultures, and organisational participants that are more motivated to use new knowledge (Yang, Zheng, and Viere 2009, 287).

Table 1.3: A comparison of knowledge management models

Knowledge management models		Knowledge creation model (Nonaka and Takeuchi 1995)	Knowledge cycle model (Demerest 1997)	Information space model (Boisot 1998)	4I framework (Crossan, Lane and White 1999)	Holistic theory (Yang 2003)
Knowledge facets and dimensions	Practical (implicit, perceptual)	●	•	●	●	●
	Technical (explicit, conceptual)	●	•	●	●	●
	Critical (affectual, emancipatory)	○	○	○	○	●
Knowledge conversion		Four modes: socialization (tacit to tacit knowledge), externalization (tacit to explicit knowledge), combination (explicit to explicit knowledge), and internalization (explicit to tacit knowledge)	Creation, mobilisation, diffusion, commoditisation	Alludes to implicit-to-explicit conversion in the codification stage of process	Not directly addressed, but the intuitive stage of process reflects implicit learning, whereas institutionalising may refer to conversion to explicit from implicit	Nine modes: socialisation (implicit to implicit), formalisation (implicit to explicit), routinisation (explicit to implicit), systematisation (explicit to explicit), orientation (explicit to critical), evaluation (critical to explicit) transformation (critical to critical), realisation (critical to implicit), and deliberation (implicit to critical)
Ontological dimension	Individual	●	○	○	●	●
	Group	●	○	○	●	●
	Organisational	●	○	○	●	●
	Societal	•	•	•	•	•

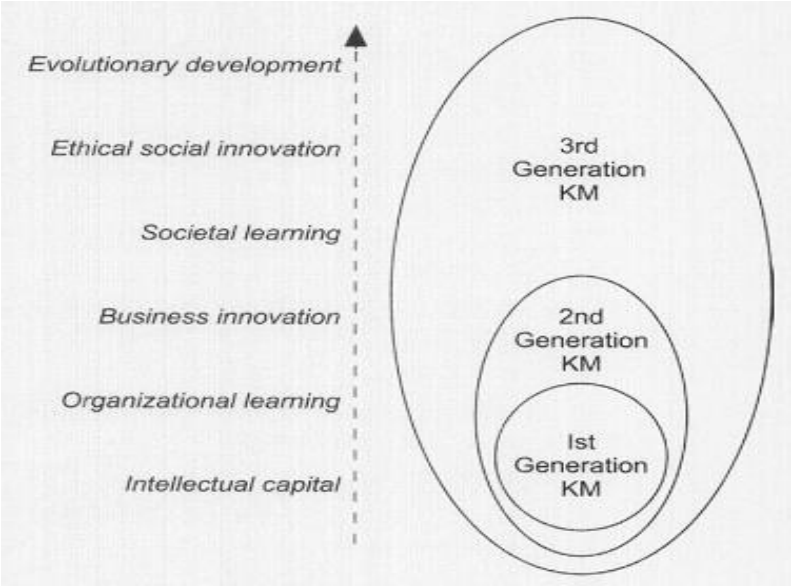
Notes: ● major focus • minor focus ○ not discussed
Source: Adapted from Yang, Zheng, and Viere 2009

Christensen and Bukh (2012) submit that there are two main knowledge management perspectives: artefact-oriented and process-oriented. While the former is criticised for having a restricted view of

knowledge in the form of specific information and technology, the latter implies continuous and dynamic adaptation of knowledge to "real life" (Christensen and Bukh 2012). Moustaghfir and Schiuma (2013) further identify our major schools of thought regarding knowledge management: information technology issues, human resource issues, organization's know-how, and knowledge engineering. As such, two strategies for managing knowledge include *codification* - a person-to-document approach (encoding and storing knowledge in online databases and various repositories where it can be easily used), and *personalisation* - a person-to-person approach (creating, using, and sharing knowledge peer-to-peer supported by appropriate communication facilities) (Zhuge 2006, 572). On a larger management scale, Evers (2008) proposes a knowledge architecture approach in which knowledge landscapes, knowledge clusters, and knowledge hubs are focused and designed.

In general, knowledge management can be defined as "all sets of processes, approaches, practices and systems used to generate, develop, renew and integrate knowledge-based resources into capabilities that the organisation can leverage to seize opportunities quickly and proficiently, to create market value and increase and sustain competitive advantage" (Moustaghfir and Schiuma 2013). Such a frame of reference appertains to the first and second knowledge management generations as defined by Laszlo and Laszlo (2002). In the third generation, according to Laszlo and Laszlo (2002), knowledge management is about gathering more meaning and knowing why beyond business applications and the democratisation of knowledge and contributes to the co-creation of sustainable and revolutionary futures (see Figure 1.1). In our more complex and rapidly changing world with increasingly pluralist societies that create solutions that may work in one place but not easily work in another, the skills to assess and debate knowledge are as important as access to the information and knowledge (Deane 2000, 240).

Figure 1.1: Evolving knowledge management



Source: Laszlo and Laszlo (2002, 408)

Knowledge diffusion as a system

Knowledge systems refer to "networks of linked actors, organisations, and objects that perform a number of knowledge-related functions that link knowledge and know how with action" (McCullough and Matson 2011). Knowledge diffusion as previously discussed implies a system construction in terms of actor inclusion, as well as knowledge development processes. Clearly, knowledge diffusion is more conceptualised within the interaction among the knowledge source and the receivers in transfer contexts and over the knowledge life cycle. Knowledge creation throughout the conversion process epitomises a systematic approach to knowledge dynamics. Notably, there is a growing body of literature regarding the triple helix of state-university-industry interactions in knowledge societies. Based on interactions and alliancing modes among actors, by Etzkowitz and Leydesdorff (2000) distinguishes three models: Triple Helix I (etatistic), II (laissez-faire), and III (Triple Helix). Etzkowitz (2008) argues that such interaction is the basis of societal creativity, yet interactions are largely discussed on and for the development and transformation of the helices themselves, whereas society development becomes a resultant outcome. Since development is "a core concept of the systems view of the world" (Gharajedaghi 2011, 69), rethinking sustainability needs new voices, perspectives, and actions as part of the collective effort (Juech and Michelson 2011), and societal users should be an integrative part of this tri-lateral network.

Knowledge systems have played a key role in promoting agricultural development over the last 50 years (McCullough and Matson 2011). The ideas and approaches for agricultural knowledge systems have evolved considerably (see Table 1.4).

Table 1.4: Three main knowledge system frameworks in the agriculture sector

Defining feature	**National agricultural research systems (NARS)**	**Agricultural knowledge and information systems (AKIS)**	**Agricultural innovation systems (AIS)**
Era	Starting in 1970s and 1980s	From 1990s	From 2000s
Scope	Productivity increase	Farm-based livelihoods	Value chains, institutional change
Knowledge and disciplines	Multidisciplinary	Interdisciplinary	Transdisciplinary, holistic systems perspective
Actors	Research organisations	Farmer, research, extension, and education	Wide spectrum of actors
Outcome	Technology invention and transfer	Technology adoption and innovation	Different types of innovation
Organising principle	Using science to create new technologies	Accessing agricultural knowledge	New uses of knowledge for social and economic change
Mechanism for innovation	Technology transfer	Knowledge and information exchange	Interaction and innovation among stakeholders
Role of policy	Resource allocation, priority setting	Linking research, extension, and education	Enabling innovation
Nature of capacity strengthening	Strengthening infrastructure and human resources	Strengthening communication between actors in rural areas	Strengthening interactions between all actors; creating an enabling environment

Source: Integrated from. Klerkx et al. (2012, 55); Klerkx, van Mierlo, and Leeuwis (2012, 460-461); World Bank (2012, 6)

The 1980s focused on research-based knowledge supply support through the national agricultural research system (NARS). Much more attention has been paid to links between research, education, and extension (AKIS) in fostering demand-side knowledge communication. Recently, the agricultural innovation system approach (AIS) has been reconstructed with a wide inclusion of types of actors and innovations. Innovation is not merely technology, rather it is a comprehensive vision of what the future should look like, which is textured by people's needs, ambitions, dreams and change in many ambits (Klerkx, van Mierlo, and Leeuwis 2012, 458). Interaction among actors, new uses of knowledge and enabling innovation are underscored. As such, "innovation is a collective process that involves the contextual re-ordering of relations in multiple social networks, and that such re-ordering cannot be usefully understood in terms of 'diffusing' ready-made innovations" (Leeuwis and Aarts 2011, 32).

In short, epistemologies, schools of thought, perspectives, and approaches on knowledge and knowledge diffusion have evolved significantly over the past decades. For knowledge work in development and agriculture development, in process, system or knowledge management frameworks, there has been a strong shift from artefactism, top-downism, expert-based, and business-focused views to multidimensionality, plurality, democratisation, and societal development orientation. It is in these directions that this research is designed for further empirical exploration.

1.3. Epistemic cultures: The second layer of knowledge for development research

The concept of epistemic cultures is developed by Katrin Knorr-Cetina (1995; 1999) in her ethnographic analysis of fact construction within molecular biology (MB) and high energy physics (HEP). She defines epistemic cultures as follows:

> "Amalgams of arrangements and mechanisms–bonded through affinity, necessity, and historical coincidence - which, in a given field, make up how we know what we know. Epistemic cultures are cultures that create and warrant knowledge, and the premier knowledge institution throughout the world is, still, science" (Knorr-Cetina 1999, 1).
>
> "… construction of the machineries deployed in fact construction. The machineries of fact construction include skilful scientists [...] ontologies of organisms and machines that result from the reconfiguration of self-other-things implemented in different fields, the use of 'liminal' and referent epistemologies in dealing with natural objects and their resistances, strategies of putting sociality to work through ... of the individual epistemic subject and the creation of social 'superorganisms' in its place, or the use of equipment as 'transitional' objects" (Knorr-Cetina 1995, 158).

Detaching from the traditional focus of the sociology of knowledge production, her emphasis is "on the construction of the machineries of knowledge construction" by an investigation into the "technical, social and symbolic dimensions of intricate expert systems" (Knorr-Cetina 1999, 3). Although his notion of expert system is useful in drawing attention to the whole context of expert work, Giddens (1990) focuses on the knowledge production output, whereas Knorr-Cetina looks into furthering the culture of expert systems (Evers 2005). As used by Knorr-Cetina, knowledge is defined to be close to knowing and culture, in a narrower sense, as practices, but as kinds of creative and constructive practices rather than customary or routine task performance (Knorr-Cetina 2001, 184-185).

> "The culture-as-practice approach, as I see it, takes culture out of the realm of the ideal, the spiritual and the non-material with which culture appears to be identified in many contemporary approaches. I am not suggesting that practices should somehow be understood as outside meaning contexts. To discover practices, it is 'necessary to gain a working familiarity with the frames of meaning' within which people enact their lives, and symbolic doings such as rituals or 'writing' are as much practices as any others. But one does not pay attention to the content of meaning structures, say the content of a text or a symbol, only, but also to their embodied use – and to the way meaning is nested in and arises from this use" (Knorr-Cetina 2007, 364).

Intensively engaging in two different sciences, Knorr-Cetina (1999) justifies the disunity[14] within the sciences and contends that different epistemic cultures exist in different scientific fields. She demonstrates that HEP is characterised by a scientist's self-reflection and self-analysis, complex sign systems, and negative epistemic approaches, whereas molecular biologists engage in intensive interaction of natural objects, experimental regimes, and searches for new evidence by applying variations of their procedures in response to a problem. At the organisational level, HEP laboratories maintain a "post-traditional communitarian structure" with a collectively focused collaboration because of work size, while MB experiments are organised with a focus on single scientist/scientist group formats with a more well-defined "logic of exchange" and competitive tensions (cf. Cutcliffe 2001). For Knorr-Cetina (1991), epistemics, the grounding of knowledge, is portrayed as "a richly textured internal environment and culture." Different epistemic cultures form different epistemic landscapes - "a whole landscape–or market–of independent epistemic monopolies producing vastly different products" (Knorr-Cetina 1999, 4).

Evers (2000; 2005) pioneered the practice of putting epistemic culture argumentations into broader development discussions. He offered widening dimensional and meaning perspectives on epistemic cultures in linking with global development discourse and practice:

> "Epistemic cultures are not only found in the laboratories of natural science research, but are institutionalised in various ways in the New Economy of globalised knowledge societies. I doubt whether science can still be called the premier knowledge institution; science is increasingly intermingled if not determined by the organisations that govern the knowledge-based world market" (Evers 2005, 11).

Such a new society is characterised by knowledge work, which goes beyond the knowledge-based work by educated professionals and skilled workers in an industrial society (Evers 2000). In other words, "a knowledge society is not simply a society of more experts, more technological gadgets, more specialist interpretations. It is a society permeated with knowledge cultures…" (Knorr-Cetina 1999, 7). Epistemic cultures as cultures of creating and warranting knowledge or cultures of knowledge setting can be seen as a structural feature of knowledge societies[15] (Knorr-Cetina 2007).

---

[14] Markovsky (2000, 557) expresses his disagreement with this contention. He argues that fabric of science is knitted by underlying logic of used methods rather than by concrete activities of individual and collective scientists. Knorr Cetina's recognition and magnification of homogeneous knowledge domains and fragmentation of contemporary science is, however, emphasised through an investigation into the cultural structure of scientific methodology (Knorr-Cetina 1991).

[15] A knowledge society is believed to have the following characteristics: "(1) Its members have attained a higher average standard of education in comparison to other societies and a growing proportion of its labour force are employed as knowledge workers. (2) Its industry produces products with integrated artificial intelligence. (3) Its

In such a distinct epistemic culture of development, as argued by Evers (2000; 2005), the idealised epistemic agent is no longer viable with "isolated scholars surrounded by books and papers in ivory towers." He claims that knowledge production has become polycentric in the emergence of the science-industry-governance triple helix instead of being a monopoly of basic knowledge production by universities. As such, the culture of markets and the culture of organisations are turned into epistemic cultures particularly when organisations are transformed into learning, innovative, or even intelligent organisations. For him, such transformations take place at the organisational levels and also beyond the boundaries of organisations. The conceptualisation of dynamics and flexibility of epistemic communities beyond academia and their knowledge production cultures allows insight into the understanding of formal and informal, local and global forms of formation, operation, and practices of such knowledge work communities, making them key components and active forces of knowledge production in globalised knowledge societies.

> "The researcher himself is transformed into an instrument of observation, but he also turns practices of everyday life into epistemic devices for the production of knowledge. Thus conversation becomes discourse, drinking tea in a staff canteen a method for the creation of an epistemic community. Collective practices, networks of social interaction and communication constitute epistemic communities beyond the boundaries of large-scale organisations" (Evers 2005, 12).

To this extent, epistemic communities get closer to the notion of communities of practice (CoP) on the assumption that knowledge and knowing is embedded in practices and cultures shared by CoPs despite an emphasis on networks of practitioners[16]. Wenger, McDermott, and Snyder (2002, 4) define communities of practice as "groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis." Three distinctive features of communities of practice include the mutual engagement of participants, a joint enterprise as a process of negotiation, and a shared repertoire combining both reificative and participative aspects (Wenger 1998, 72-85). Communities and networks of practice are self-organising, open activity systems, which develop on their own depending on the voluntary

---

organisations - private, government and civil society - are transformed into intelligent organisations. (4) There is increased organised knowledge in the form of digitalised expertise, stored in data banks, expert systems, organisational plans and other media. (5) There are multiple centers of expertise and a polycentric production of knowledge. (6) There is a distinct epistemic culture of knowledge production and knowledge utilisation" (Evers 2000; 2005).

[16] Collaboratively informal, independent, off-the-grid networks, a community of practice consists practitioners who develop shared understandings, engage in work-relevant knowledge building and create norms of direct reciprocity (Hara 2009, 118 cited in Correia, Paulos, and Mesquita 2010, 12; McDermott and Archibald 2010). It is a tightly knit group of members who know each other and typically negotiate, communicate and coordinate with each other directly (Wasko and Faraj 2005, 37). Conversely, networks of practice connote larger and more geographically distributed groups of individuals engaged in a shared practice with weaker relationships than those among the members of a community as participants who may not know each other nor necessarily expect to meet face to face (Tagliaventi and Mattarelli 2006, 294; Wasko and Faraj 2005, 37). Despite their indirect contacts and unfamiliarity, participants in networks of practice can share and exchange a great deal of knowledge, as "networks often coordinate through third parties such as professional associations, or exchange knowledge through conferences and publications such as specialized newsletters" (Brown and Duguid 2000 cited in Wasko and Faraj 2005, 37). Communities and networks of practice are self-organising, open activity systems, which develop on their own depending on the voluntary engagement of their members and internal leadership, and flourish whether or not the organisation/sector recognises them (cf. Wenger, McDermott, and Snyder 2002, 12f).

engagement of their members and internal leadership, and flourish whether or not the organisation/sector recognises them (cf. Wenger, McDermott, and Snyder 2002, 12f). As shared practices also draw boundaries, the creation of inter-CoP knowledge communication and/or CoP constellations built on interconnected practices becomes more challenging from an epistemic landscape perspective (cf. Gherardi and Nicolini 2002). A number of boundary traverse means and approaches have been proposed, including "boundary objects," "translators," "knowledge brokers," or "boundary interactions and cross-disciplinary projects" (Mørk et al. 2008).

Additionally, as Evers' (2000, 2005) arguments were developed, the transformative epistemic culture of development is extended as a culture of knowledge production and utilisation. A productive epistemic culture can no longer be locked with a dichotomy or discontinuance of knowledge production and use, or knowledge creation and absorption. An intelligent organisation can only form if the stored knowledge is put to use and used as a regime of governance (Willke 1998 cited in Evers 2005). For achieving development aims, knowledge is linked with economic and social returns apart from epistemological goal definitions.

Evers (2000; 2005) provides a transformative conceptualisation of epistemic cultures from a more static as-an-end view that epistemic cultures are a structural feature of knowledge societies, indicating a dynamic processes-based perspective in which "epistemic cultures of vast knowledge-producing and processing organisations increasingly structure society." In such new dimensions of epistemic cultures, as Evers suggests, this new sociology of knowledge[17] asks further research questions and conducts empirical investigations.

The discussed argumentation on epistemic cultures (of development) provides three main ideas of thought as theoretical departure points for the current research, despite its special focus on agricultural and rural development, to take to the fore and forward. First, it highlights the emerging epistemic landscape of polycentric knowledge production actors interdependent through both cooperation and competition interactions. Second, it is highlighted that individuals in communities become the epistemic agent. Knowledge production cannot fully be understood when isolated from the shared epistemic practices and cultures it is embedded in. Our theoretical framework will be built on these two premises in an integrated system to include multiple actors and their interactions (see Section 1.3).

[17] The aim of the sociology of knowledge "is to locate whatever body of belief a group accepts as a true account of reality and then try to illuminate it by reference to social variables" (Bloor 2010, 744). Viewing (scientific) knowledge as social institutions, knowledge sociologists aims to "identify such features as (1) the general character of the processes by which new cultural members are 'socialized', that is, trained and educated; (2) the specific institutions and authorities charged with this task in particular cases; (3) the mechanisms by which a body of culture is kept relatively stable and hence available for use; (4) the precise circumstances and purposes associated with its employment on particular occasions; (5) the processes by which change is managed and its locus and extent negotiated; (6) the distribution of taken-for-granted beliefs according to status and membership criteria, for example, professional or amateur, male or female, doctor and patient, scientist or technician" (Bloor 2010).

Third, knowledge in epistemic cultures should not be limited to first-hand, single-stand knowledge production within science laboratories or research centers. Knowledge production for development is indeed greatly dependent on how much such knowledge is diffused and applied in development practice, in both meticulously designed projects and less consciously recorded everyday life activities. It is important to make a distinction between the two types of knowledge: they are "knowledge of" what is (Ko) and "knowledge for" acting (Kf) (Glanville 2005; 2006). The sort of knowledge collected and valued in research, philosophical, and academic work is knowledge of what is. Development work and design require constant research usefulness and applicability or knowledge for. If the crucial role of scientific communities is the understanding of the growth of knowledge, the growth of scientific knowledge is in turn largely due to a diffusion process in which new ideas are transmitted from scientists to scientists, from scientists to end-users, and among knowledge users (cf. Chen and Hicks 2004). From a broader developmentalist perspective, the shifting of development paradigms from modernisation, dependency, and neo-liberalism to alternative development is rooted in the thinking system transformation and practice advancement of epistemologies that acknowledge multiple and complex paths of development human societies, with their interdependence, might take or experience beyond pure economic growth, free market, structural adjustment and take off while more emphasis is placed on local knowledge, capacity, and participation in promoting people-centered and sustainable development. Even post-development or alternative to development is thus not necessarily anti-development but correctly expands "development" dimensions in its complex relations with knowledge, practices, culture, and social movements beyond the unconditionally-accepted Western framework.

The epistemic culture concept originally theorised by Knorr-Cetina describes "truth-finding" machineries of natural science laboratories in post-industrial societies, which are increasingly governed by knowledge and expertise, with a strong focus on the cultural structure of scientific methodology centerd on expert-epistemic object relations (Knorr-Cetina 1991; 2001). Advancing the argument that the scientific method is a heavily context- and culture-textured phenomenon within social relations and the observation that inside the epistemic space is the "untidy" goings-on of various businesses of experimentation (Knorr-Cetina 1991, 107), my proposed research direction here posits that knowledge creation practices are investigated in the continuous spiral cycles of knowledge diffusion, adoption, and regeneration, allowing an expanded application of epistemic culture understanding into diverse contexts apart from the post-traditional society. Knowledge diffusion, which stresses multiple actor interaction and a different knowledge world interface, offers another study path to investigate the epistemic culture of development through knowledge-based work in knowledge producer-user interaction, including human and non-human actors, throughout knowledge production processes in "developing" societies.

1.4. Systems thinking and interactionism: The conceptual framework

The conceptual development of this research is founded on systems thinking and symbolic interactionism. A systems thinking approach allows for the scrutiny of actors within their social structures, which are amalgamated to shape this research's system of system analysis. Previous research on the agriculture knowledge system in Vietnam has often focused on one system, such as the extension system or the research system, despite the fact that decisions at the farm level are becoming increasingly dependent upon larger and more complex social environments and conditions. A symbolic interactionist perspective acquiesces in the research objective of delving interaction and communication among actors and groups of actors in the construction and reconstruction of knowledge production, diffusion, and use practices. The combination of the two approaches is reciprocally useful for this research's microsociological investigation into contextualised everyday knowledge generation and diffusion, while interaction with broader structural environments is taken into account in a knowledge for development system.

Systems thinking

Asian societies, including the Vietnamese since their ancient times, have developed systems thinking applications to aid in understanding the universe, human-environment co-actions, and even the self as a mini universe: for example, Yin-Yang (*Am duong*), Five Basic Elements (*Ngu hanh*), or Eight-sign Theory (*Bat quai*). Today inclusive science is promoted, and Western scientists have recalled the importance of inclusionality[18] in viewing our society in interdependent with bio-cultural diversity and complex situations of modern life (Stijkel 2006). Systems thinking is increasingly important in the creation of sustainability (Sandri 2013). Central to a systems approach is that the systems and the relationships between parts of these systems be taken as a whole:

> "The systems approach to problems focuses on systems taken as a whole, not on their parts taken separately. Such an approach is concerned with total-system performance even when a change on only one or a few of its parts is contemplated because there are some properties of systems that can only be treated adequately from a holistic point of view. These properties derive from the relationships between parts of systems: how the parts interact and it together. In an imperfectly organized system even if every part performs as well as possible relative to its own objectives, the total system will often not perform as well as possible relative to its objectives" (Ackoff 1971, 661).

Systems thinking has evolved significantly. From a third-generation systems view, Gharajedaghi (2011) claims that a system encompasses the five principles of openness, purposefulness, multidimensionality,

[18] In his *Inclusionality: The Science, Art and Spirituality of Place, Space and Evolution*, Alan Rayner (2004) wrote: "When space is included in our perceptions of boundaries, it becomes inseparable from the energy that makes us alive. Darkness is included with light, gravity with electromagnetism, and time and matter cannot exist as separable, absolute quantities in their own right. We neither see the world and Universe about us as an incoherent assemblage of independent objects or closed systems surrounded by emptiness, nor do we lose ourselves in a featureless oceanic infinitude. Instead we feel ourselves, with others, as inhabited places, distinct but not discrete expressions, ever-transforming through the dynamic, reciprocally breathing relationship of inner with outer through intermediary space. Aware now of our place as local expressions of everywhere, we are not alone – we belong with, but decidedly not to one another, together, coherent through the connectivity of our common space, unique in our individually situated identities. Identities that we can both express and accommodate, as needs arise for differentiation and integration."

emergent property, and counterintuitiveness[19]. According to Leischow et al. (2008, 196), some fundamental systems thinking perspectives that are shared across fields include the following: "(1) increased attention to how new knowledge is gained, managed, exchanged, interpreted, integrated, and disseminated; (2) emphasis on a network-centric approach that encourages relationship-building among and between individuals and organizations across traditional disciplines and fields in order to achieve relevant goals and objectives; (3) the development of models and projections, using a variety of analytic approaches in order to improve strategic decision making; and (4) systems organising in order to foster improvements in organizational structures and functions."

There is a growing body of literature that points to the importance of social networks[20] channelling the flow of knowledge among actors (Sorenson, Rivkin, and Fleming 2006, 997). For example, engaging in networks to gain (new) knowledge is discussed in both social network theory and the industrial marketing and purchasing (IMP) perspective. More and more, the network "has the impact on how to gain new knowledge, in terms of knowledge flows and problem solving, which in turn cause changes, in terms of relationship establishment and technology development" (Andersson, Holm, and Johanson 2007, 33). While social network theorists focus on how and why knowledge can flow and be transferred among actors in the network, IMP authors emphasise interaction in the network as the main source of knowledge (Andersson, Holm, and Johanson 2007, 33). In organisations, as Jashapara (2007, 756-758) argues, when new problems or situations arise, the collective consciousness takes place based on the dialogue, discussions, and interactions between individuals. The social network of the organisation (whether it is a team, a department, or the whole organization) determines the nature of the collective consciousness. In discussing the role of a network in knowledge transfer, scholars emphasise the importance of the network structure and or organizational performance, position in the network, tie strength, network cohesion, and network range (Reagans and McEvily 2003). The network can be described as either an open system (when the non-redundant, unique relationship between two actors is the paramount construct) or a closed system (as actors in the network coordinate their efforts

[19] Gharajedaghi (2011, 29-54) defines five systems principles as follows: "Openness means that the behavior of living systems can be understood only in the context of their environment." Purposefulness means that "to influence the actors in our transactional environment we have to understand why they do what they do." Multidimensionality is "the ability to see complementary relations in opposing tendencies and to create feasible wholes with unfeasible parts." Emergent properties are "the property of the whole, not the property of the parts, and cannot be deduced from properties of the parts." Counterintuitiveness means that "actions intended to produce a desired outcome may generate opposite results."

[20] Networks are in social sciences assumed as some sort of enduring social relationship. Tracing back to Simmels' fundamental distinction between groups (defined by some membership criterion) and "webs of affiliation" (linked through specific types of connections), the social network approach has mainly focused on network position and structure, for example, the *tertiusgaudens* (the third who benefits), "structural equivalence," non-redundant ties or "structural holes" (Grabher 2006). With Mark Granovetter's (1985) notion of embeddedness that stresses "the role of concrete personal relations and structures (or 'networks') of such relations in generating trust and malfeasance," network governance approach has evolved, in which networks are systematized along two dimensions of stability and forms of governance (from more hierarchical to more heterarchical) (Grabher 2006). Moving way beyond the two dominant tie-and-node imagery network traditions, based on the metaphor of the rhizome, Harrison White draws on publics (special moments or spaces of social opening that allow actors to switch from one setting to another) and polymorphous (of ties and social roles which creates tendencies to switch from one relational setting to another) network domains (Grabher 2006).

and actions) (Andersson, Holm, and Johanson 2007, 33-34). Regarding solving problems through collaboration and cooperation, an open system tends to facilitate knowledge transfer, while a closed one deals more with knowledge in the way that new knowledge is created as the actors solve problems rather than simply because new knowledge enters the system from the outside (Andersson, Holm, and Johanson 2007, 34). In this research, social networks are identified at both individual and organizational levels with respect to different types of interdependency related to knowledge and information as used for problem solving. The research covers both formal (membership, partnership and other alliances) and informal (communities of practice) environments[21]. For example, talking, debating, and participating in occasions, such as exhibitions and conferences or telephone calls, can be a means to convey and receive knowledge (Pyka 1997, 210). The research applies hybrid networks[22] so that part of a network that is not recognized prior to data collection can be included and then made available for all subsequent egos to see. The study tries to investigate how the current social formal and informal network/relationships[23] assist with gaining the knowledge needed by problem solvers and at the same time how they actively engage themselves in networks from which their required knowledge is accessible.

Giddens' structuration theory focuses on social structure and human agency. Giddens' "structure" is not an object or thing being external to actions but instead a holistic model embodying social systems and rules/resources, social order, and social reproduction. "Society only has form, and that form only has effects on people, in so far as structure is produced and reproduced in what people do" (Giddens and Pierson 1998, 77). Giddens differentiates structure, system and structuration as follows:

[21] It is useful to link six types of social structures ("patterned or regularized aspects of the relationships existing among participants in an organization" (Scott 2003, 18)) that exist in organizations today: (i) work groups, (ii) project teams, (iii) strategic communities, (iv) learning communities, (v) communities of practice, and (vi) networks (Blankenship and Ruona 2009).

[22] Hansen et al. (2008, 13-15) differentiate three types of social network data: egocentric or personal networks (when alters are not known in advance), complete or sociocentric networks (when all members of the network to be examined are defined in advance), and hybrid or snowballs networks (which start as complete networks and then expand based on the addition of alters as egos complete surveys).

[23] Communities of practice - informal, independent, off-the-grid employee networks - are an inexpensive and efficient way for experts to share knowledge and ideas (McDermott and Archibald 2010). An example is that: "Not long ago, a Fluor nuclear-cleanup project team had to install a soil barrier over a drainage field once used to dispose of radioactive wastewater. But environmental regulators mandated that Fluor first locate and seal a 30-year-old well, now covered over, to prevent contamination of the groundwater table. Poor historical data made it impossible to tell if the well really existed, and ground-penetrating radar also failed to discover it. Simply removing the contaminated soil to find the well would have been costly and risky for workers. When the team posted a request to Fluor's knowledge communities, one of the experts suggested using an alternative technology from a different industry. The team tried it and found the well. In fact, within two months, Fluor went on to use the same method to locate - or prove the nonexistence of - more than 100 wells and suspected wells" (McDermott and Archibald 2010, 84-85). The authors argue that communities of practice can work better if they are operated in an efficient way that the scare time of experts is respected but at the same time integrating themselves into the organization by focusing more on their human systems, including focus, goals and management attention (McDermott and Archibald 2010).

Structure:	Rules and resources organised as properties of social systems. Structure only exists as 'structural properties'[24]
System:	Reproduced relations between actors or collectives, organised as regular social practices
Structuration:	Conditions governing the continuity or transformation of structures, and therefore the reproduction of the system (Giddens 1979, 66)'

Structures are rules and resources on which agents draw in their social practices and which are created through the actions of individuals (Giddens 1984). Agency is defined as the ability to reflect on and monitor our own behaviour, the capacity to "make a difference." As such agency is critical to the transformation of societies. Notably, the subordinates can influence their superior's activities as all forms of dependency can offer resources – this is what Giddens calls the dialectic in social systems (Giddens 1984, 14-16).

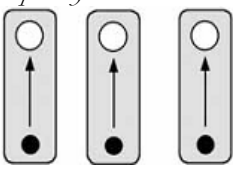
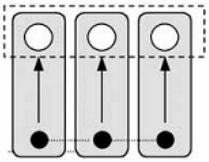
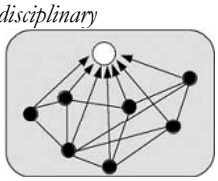
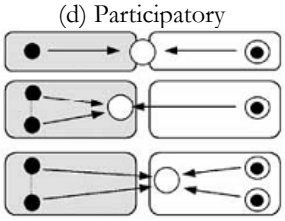
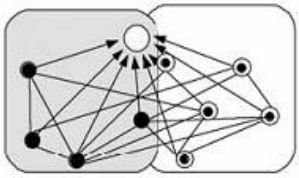
Actor-Network Theory (ANT) further suggests social research is approached in a more-than-human, more-than-social world (Latour 2005). For ANT, "there is no 'society' as such, in the sense of a domain consisting exclusively of relations between human subjects, as these relations are always mediated and transformed and even enabled by nonhumans of diverse kinds, whether objects, materials, technologies, animals or eco-systems" (Nimmo 2011, 109). The need to consider social reproduction and self-production has also been emphasised in sociocybernetic research, which emphasises the complexity of systemic interrelation of which solutions are proposed on the reciprocal effects of all appropriate factors (Luksha 2001). In the view of second-order cybernetics, the cybernetics are considered to be observing systems rather than observed systems (Lee, Geyer, Hornung 2000).

Systems thinking when applied to the understanding of natural and social worlds has changed the way scientific knowledge is produced – with an increase of collaborative research. Multiple disciplines not only cooperate within a project but also in a common goal setting. Transdisciplinary even crosses disciplinary and academic boundaries to develop integrated knowledge and theory among science and society (see Figure 1.2). Transdisciplinary research aims for the following:

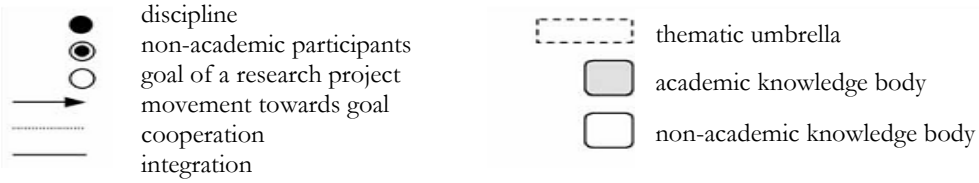
(i) It grasps the complexity of problems;
(ii) It takes into account the diversity of life-world and scientific perceptions of problems;
(iii) It links abstract and case-specific knowledge;
(iv) It develops knowledge and practices that promote what is perceived to be the common good. (Mollinga 2010, 4)

[24] They are domination (power), signification (meaning) and legitimation (rules). In social interactions, structures are presented in modalities: facility (domination), interpretive scheme/communication (signification) and norms/sanctions (legitimation) (Giddens 1984).

Figure 1.2: Typology and features of (non) disciplinary research

<table>
<tr><th rowspan="2">Disciplinary</th><th colspan="2">Non-disciplinary</th><th rowspan="2"></th></tr>
<tr><th>Lower integration</th><th>Higher integration</th></tr>
<tr><td>(a) Disciplinary
 
- Within one academic discipline
- Disciplinary goal setting
- No cooperation with other disciplines
- Development of new disciplinary knowledge and theory</td><td>(b) Multidisciplinary
 
- Multiple disciplines
- Multiple disciplinary goal setting under one thematic umbrella
- Loose cooperation of disciplines for exchange of knowledge
- Disciplinary theory development</td><td>(c) Interdisciplinary
 
- Cross disciplinary boundaries
- Common goal setting
- Integration of disciplines
- Development of integrated knowledge and theory</td><td>Academic participants</td></tr>
<tr><td colspan="2">(d) Participatory
 
- Involves academic researchers and non-academic participants
- Exchange of knowledge, bodies of knowledge not integrated
- May be disciplinary or multidisciplinary
- Not necessarily research, goal may be academic or not</td><td>(e) Transdisciplinary
 
- Crosses disciplinary and scientific/academic boundaries
- Common goal setting
- Integration of disciplines and non-academic participants
- Development of integrated knowledge and theory among science and society</td><td>Academic and non-academic participants</td></tr>
</table>

Notes:



Source: Adapted from Tress, Tress, and Fry (2006)

Hayek's (1937, 50 cited in Richter 2003, 40) claim is precise here perceived as "how combining the *fragments of knowledge*, residing in different minds, can bring about results which, if they were to be brought about deliberately, would require a knowledge on the part of the directing mind which no single person can possess." Schön's ([1973]2010) concept of "learning systems" can pave out a direction for developing applicable knowledge management mechanisms.

> "The loss of the stable state means that our society and all of its institutions are in *continuing* processes of transformation. […]
>
> We must learn to understand, guide, influence and manage these transformations. We must make the capacity for undertaking them integral to ourselves and to our institutions.
>
> We must, in other words, become adept at learning. We must become able not only to transform our institutions, in response to changing situations and requirements; we must invent and develop institutions which are 'learning systems', that is to say, systems capable of bringing about their own continuing transformation" (Schön [1973]2010, 5-6).

The learning system serves a basis for development of learning societies and learning organisations. However, I would argue that the use of learning systems in the two aforementioned notions is reduced

to individual and/or organisational knowledge management and learning processes. Knowledge governance needs to create mechanisms to initiate inter-learning between learning systems so that *fragments of knowledge* of a learning system can be cooperated and continually developed. Therefore, knowledge management and governance by nature facilitate institutions to enhance knowledge processes and learning for social systems themselves as well as inter-learning among social systems with their differences. I am indeed arguing for societies where knowledge processes are institutionalised for the sake of single learning systems, but also for societal problem solving and development through inter-system learning.

Interactionism

Symbolic interactionism is identified as having some parallels with the action frame of reference developed by Max Weber, yet it was mainly outlined and articulated by the Chicago School of Sociology (Cuff and Payne 1979; 1984). Even though the ideas of George Herbert Meade, the founder of symbolic interactionism, received various criticisms and comments, the theory has been applied to numerous studies and important subjects (Mazzotta and Myers 2008). From the perspective of symbolic interactionism:

> "*Society* is a web of communication or interaction, the reciprocal influence of persons taking each other into account as they act. Interaction is *symbolic*, proceeding in terns of meanings persons develop in interaction itself. The environment of action and interaction of humans is symbolically defined. Persons interact using symbols developed in their interaction, and they act through the communication of these symbols" (Stryker and Vryan 2003, 3-4).

Symbolic interactionism is often criticised for its social structure neglects.

> "For those who emphasise the macro-sociological strategy of structuralism, the Symbolic Interactionist approach ails because it does not attempt to take some overview of the total societal organisation. In so far as it does give an account of the overall organisation of society, then, for many sociologists, it overplays the significance of ethnic, religious and similar divisions at the expense of those arising from social stratification. On that argument, the Symbolic Interationalist approach is closely allied with the liberal-pluralist view of society; it neglects the extent to which the society is a system - and a class-system as that." (Cuff and Payne 1979;1984, 148-149).

Symbolic interactionism is also not a unified perspective; the interactionist approach is alive in pursuing a course of development by integrating within its general stance a reasonable conceptualization of social structure (Stryker 1981). Stryker developed structural symbolic interactionism by placing emphasis on the impact of social structures on social interaction:

> "Society shapes self shapes social interaction. The frame then takes as its starting point sociology's sense of social structures as patterned interactions and relationships, emphasizing the durability of such patterns, resistance to change, and capacity to reproduce themselves. This view sees social differentiation as a continuous process countering homogenization of interactional experience and the structures within societies. It sees society as composed of organized systems of interactions and role relationships and as complex mosaics of differentiated groups, communities, and institutions, cross-cut by a variety of demarcations based on class, age, gender, ethnicity, religion, etc. It sees the diversity of parts as sometimes interdependent and sometimes independent of one another, sometimes isolated and insulated from one another and sometimes not, sometimes cooperative and sometimes conflicting, sometimes highly resistant to change and sometimes less so. It sees social life as largely taking place not within society as a whole but within relatively small networks of role relationships, many - perhaps most - local" (Stryker 2008, 19).

Norman Long has developed an actor-oriented approach by linking structural analysis and agency, internal and external forces and relationships in development sociology[25]. Long's conceptualisation of "battlefields of knowledge" is instrumental to understanding the interactions of a wide range of social actors with different economic, cultural, and political interests and strategies.

> "This image of the 'battlefields of knowledge' was chosen to convey the idea of contested arenas in which actors' understandings, interests and values are pitched against each other. It is here – in the field of intervention primarily, though not exclusively since knowledge dilemmas and controversies also shape the writing and analysis of policy documents and reports, as well as research findings – that struggles over social meanings and practices take place. It is here too that we see most clearly the emergence of various kinds of negotiated orders, accommodations, oppositions, separations and contradictions. Such battlefields arise within and across many different institutional domains and arenas of social action" (Long 2004, 15; Long and Liu 2009, 71).

Interactionism is of assistance for this research intellection in many ways. One advantage is that knowledge diffusion and communication among actors can only be investigated through the web of interaction among systems of knowledge producers, brokers, and users. Importantly, systems and their transformations are seen within their interaction with other systems and environments. In Weber's view, even the most complex forms of social organisation, such as massive world civilisations, should be seen as a complex made up of relationships among its members (Cuff and Payne 1979; 1984, 114). What is most important is that with interactionist perspectives, people's real world contexts, situational knowledge, and voices of knowledge for development of minorities, disadvantaged and deviants are appreciated (vom Lehn and Gibson 2011, 315ff). Interactionalism emphasises "action and agency, social coordination and collective activity, production and construction, process and contingency, context and conditioning and temporality and history" (Hall 2003, 39). As such, an interactionist approach is instrumental to expedite exploration of machineries of knowledge construction throughout knowledge processes. When integrated within the system thinking approach, such structural interactionism allows for the investigation of knowledge interaction among actors and among systems within a system.

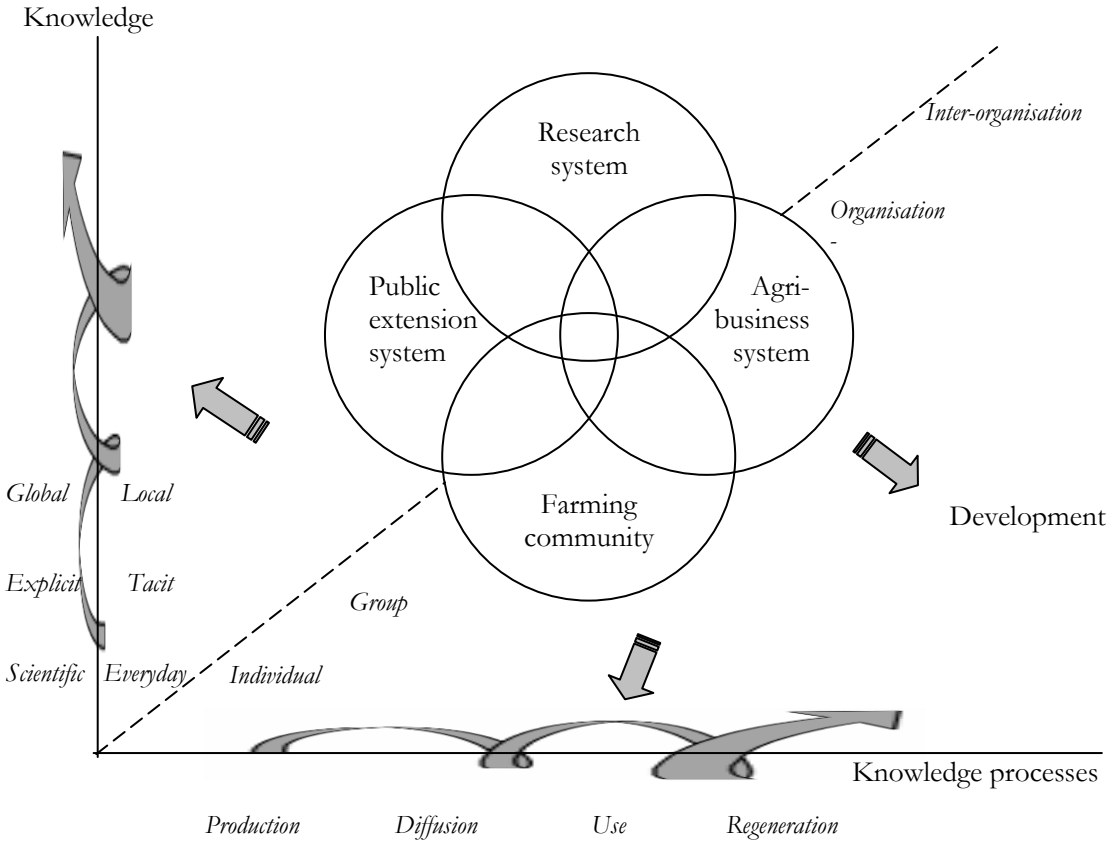
The conceptual framework: An interactive system of knowledge diffusion for development

The framework of analysis of this research is grounded on structuring of the interactionist knowledge system of agriculture and rural development in the Mekong Delta (see Figure 1.3). For conceptualisation purposes, the system of the four causes of Aristotle (ca. 384–322 BC) is applied – that is, the existence of a (any) thing includes four causes (i) *causa materialis*, (ii) *causa formalis*, (iii) *causa efficiens*, and (iv) *causa finalis*[26].

[25] Long (2001, 13) claims that "although it may true that important structural changes result from the impact of outside forces (due to the encroachment by the market, state and international bodies, it is theoretically unsatisfactory to base one's analysis on the concept of external determination. All forms of external intervention necessarily enter the existing lifeworlds of the individual and social affected, and in this way they are mediated and transformed by these same actors and structures."

[26] The four causes are explained as follows: "(1) Material cause: the substrate, substance out of which a thing comes to be and which persists; that in which a change takes place. (2) Formal cause: that shape (pattern, configuration) into which something is changed. The essence (the essential characteristic) being manifested in the

Figure 1.3: An integrated and interactive framework of knowledge diffusion for development



Material cause. Knowledge in this research ranges from information regarding context, awareness, and understanding about reality to the skills[27], expertise, technology, and wisdom[28] that actors in the development sector use to solve their problems. However, knowledge is not considered here as a static product or state but also as a process of knowing. Accordingly, viewing knowledge from five different angles as suggested by Alavi and Leidner (2001 cited in Cook and Cook 2005, 303) is useful for this research, namely "(i) a state of mind - knowledge from experience; (ii) an object - something to be stored and utilised; (iii) a process - knowing resulting in action; (iv) a condition to access information – ease to access to retrieve information; and (v) a capacity - ability to influence upcoming action." Knowledge here covers a wide range of concepts of technology, knowledge, and innovation used in recent approaches of diffusion. Knowledge itself "is almost as ambitious an idea as value or importance, and it has many guises" (Starbuck 1992 cited in Doswell and Reid 2002, 50), thus it can easily become "everything or nothing" (Alvesson 1992 cited in Doswell and Reid 2002, 50). The

process of becoming. (3) Efficient cause: that by which some change is brought about; that which initiates activity. (The efficient cause is often referred to as the propelling cause.) (4) Final cause: that for the sake of which an activity takes place; that end (purpose, goal, state of completion) for which the change is produced, or for which the change aims (strives, seeks). It'stelos or raison d'être. (The final cause is often referred to as the telic cause.)" (HarperCollins Dictionary definition of "Philosophy" cited in Müller-Merbach 2005, 183-184).

[27] This research applies the notions of skills, knowledge, expertise, technology, and wisdom used by Zeleny (2005).

[28] Visscher et al. (2006, 11-12) suggested taking into account local knowledge and wisdom when trying to solve problems related to water and sanitation at the community level. The authors presented an example where the wisdom from the elderly helped the well drilling team identify location with ground water.

literature shows there is sizeable confusion in defining what knowledge is, especially in its relationship with information and data and its division of tacit and explicit knowledge (see Appendix 1.1). Fundamentally, knowledge is approached from two main philosophical perspectives: structural (or scalar) and processual (or cognitive) (Correia and Sarmento 2005, 262-267)[29]. In addition to knowledge as data and knowledge as meaning, this research also emphasises knowledge as practice by taking into account tacit knowledge. Knowledge in this research also emphasises actionable knowledge or "the capacity to act" (Stehr 2007) because of new opportunities for sustainable development action instead of pure scientific discoveries that determine the status and success of knowledge generation and diffusion in rural, industrial, and knowledge societies.

It is also important to note that in the literature of knowledge management, knowledge, based on Nonaka and Takeuchi's knowledge creation model, is very frequently conceptualised to move in two epistemological dimensions from tacit and explicit and on two ontological dimensions from individuals to organisational (Torraco 2000; Evers, Kaiser, and Müller 2009; Yang, Zheng, and Viere 2009). While explicit knowledge "can be articulated in formal language including grammatical statements, mathematical expressions, specifications, manuals, and so forth," "tacit knowledge is hard to articulate with formal language. It is personal knowledge embedded in individual experience and involves intangible factors such as personal belief, perspective, and the value system" (Nonaka and Takeuchi 1995, cited in Hicks, Dattero, and Galup 2007, 6-7). The modes of knowledge conversion include socialisation (from tacit to tacit knowledge), externalisation (from tacit to explicit knowledge), combination (from explicit to explicit knowledge), and internalisation (from explicit to tacit knowledge). The spatial dimension of the model supplemented by Evers, Kaiser, and Müller (2009) allows it to encompass both global and local levels. This research also accounts for scientific and everyday knowledge. In Schütz's formulation, in the everyday world, commonsense actors have a stock of knowledge, including the following: (i) fundamental or universal elements, (ii) routine or habitual elements, (iii) knowledge of a unique biography, and (iv) specific knowledge of the present situation as a unique instance of its type (McDonell 1997, 836). The understanding of everyday practices and knowledge is not restricted in descriptive interpretation. It is of high potential that activation of the oft-hidden, typically repressed possibilities within daily life can be re-directed to transform the everyday world (Gardiner 2006).

Knowledge in this research focuses on agriculture and rural development in the context of the Mekong Delta. Tacit knowledge, knowledge as a process, and knowledge as everyday practices are thus especially highlighted. Agriculture here refers to the broad definition of agriculture, which includes

[29] Under the structural perspective, knowledge is regarded as a "discrete, objective, largely cognitive entity" and classifies as tacit and explicit and thus knowledge and information as closely related entities can be transformed into one another. The processual perspectives emphasize on the processes on knowing and that knowledge is "socially constructed and embedded in practice." Therefore managing knowledge according to the former viewpoint encourages development of knowledge stores while the latter supports managing people and interactions among them (Correia and Sarmento 2005, 262-267). Successful knowledge management should not embrace one single approach.

cultivation, animal husbandry, aquaculture, fishery, and forestry. Rural development includes agriculture development and rural community development[30]. In rural community development, my concern is expanded from economic and livelihood development to participation, empowerment, and agency. As such, a broader environment of development of the delta can also be determined.

Formal cause. Knowledge diffusion is not simply the dropping of colour into a glass of water until reaching equilibrium when new knowledge is obtained within the network or as heat dissipated under thermodynamic principles; as such, "knowledge can be transferred only from a person having a higher knowing level toward a person with a lower knowing level" (Bratianu 2010). Such a uni-directional knowledge flow is referred to as a process of knowledge transfer. Knowledge diffusion in this research emphasises the multi-directions and interactions between the source and the recipient. Knowledge diffusion includes moves of justified factual information to two-way cross-hierarchical knowledge-sharing episodes in which problem formulation, solution justification, and reflection stimulation are created (cf. Berends 2005, 104; Fliaster 2003, 51). As a complex process within social systems, knowledge diffusion is not limited to knowledge communication but also includes acquisition and application. For example, the diffusion theory popularised by Everett Rogers ([1962] 2003) provides an innovation decision model to explain how new knowledge is acquired and sustained over five defined stages: knowledge, persuasion, decision, implementation, and confirmation. Further, as argued in this research, knowledge diffusion informs and integrates into knowledge production, use, and reproduction processes when it encompasses knowledge feedback and learning mechanisms.

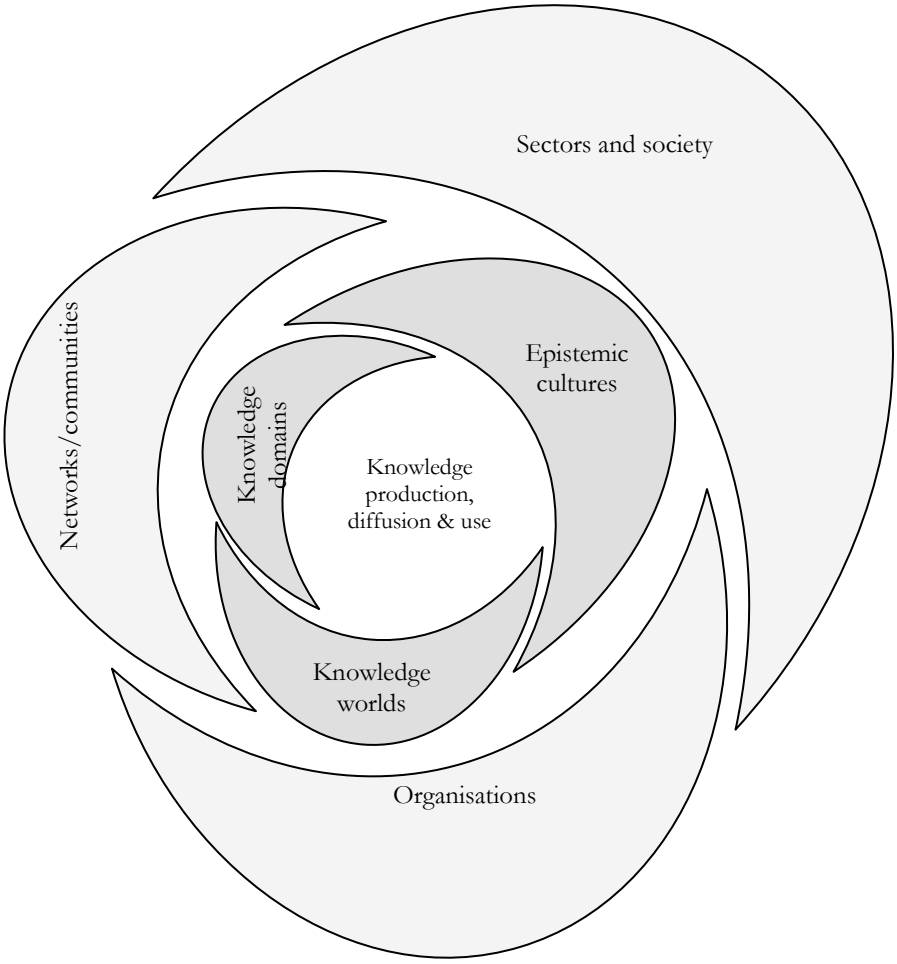
Our preliminary findings have suggested that four main systems should be included in our knowledge diffusion analysis: the agricultural extension system, the research system, the agribusiness system, and the farming community. International actors and civil society as mass organisations or registered associations are examined and depicted under the compatible system in which their engagement and interventions are realised (cf. Fabres 2011). The interaction of the four systems allows our understanding of groups of actors and also factors within and across systems that facilitate or hinder knowledge diffusion, in their interexchanged roles of either environments or structures. Conceptualising the four systems in their interactiveness and interference also displays intensive knowledge interpositions, for both converging and conflicting knowledge, among systems as structural change areas that can further the discussion at a higher development and knowledge landscape of analysis.

Efficient cause. Knowledge generation, diffusion, and use cycles are ontologically conceptualised in relations between, interactions of, and interfaces among different levels of individuals, groups,

[30] Or as Ellis and Biggs (2001, 445) describe a new paradigm of rural development, "it will be one in which agriculture takes its place along with a host of other actual and potential rural and non-rural activities that are important to the construction of viable rural livelihoods, without undue preference being given to farming as the unique solution to rural poverty. It is in this sense that the cross-sectoral and multi-occupational diversity of rural livelihoods may need to become the cornerstone of rural development policy if efforts to reduce rural poverty are to be effective in the future."

organisations, and inter-organisations. New knowledge generation from such interaction is explored in learning loop linkage and in continuous and on-going manners. What is important is that the research incorporates informal groups, networks, and communities across the hierarchical structure. Interactions among knowledge domains, knowledge worlds, and epistemic cultures are included (see Figure 1.4). Knowledge domains can be defined as any area of knowledge or field of study that is being researched in connection with agriculture and rural development. Domains may contain conventional fields of study, applications of pure disciplines, aggregates of such fields, or knowledge about everyday lives (Giunchiglia et al. 2011). The four knowledge domains Byosiere and Ingham (2002 cited in Byosiere and Luethge 2008) suggest are basic knowledge, experiential knowledge, creative/emotional knowledge, and innovative knowledge.

Figure 1.4: Areas and dimensions of knowledge interaction within this research



Source: Own presentation

Knowledge worlds in this research follow Dietrich Benner's (2007 cited in Engelhardt 2007) categorisation. Benner suggests six different forms of knowledge as follows:

- *Experienced understanding*: an immediate phenomenology that uses the experienced as material for forming an opinion about the world we live in
- *Scientistic knowledge*: represents the predominant understanding of the concept of science today.
- *Historically re-constructive knowledge*: adopts a hermeneutic tradition to exact knowledge from the existing corpus of texts and knowledge

- *Ideology-criticism knowledge*: examines the structure of the ideas and prejudices that underlie existing social structures
- *Prerequisite-critical knowledge*: examines the conditions for and limitations of knowledge
- *Utilitarian approach*: evaluates knowledge according to function and application

In the increasing social dilemma, "solutions can only be found by recognising all six forms of knowledge as legitimate in a shared public debate where the objective is to reach an agreement without any rules except those everyone can agree to" (Engelhardt 2007).

Final cause: The raison d'être of this conceptualisation of interaction of systems, actors, and types of knowledge in this research framework is dual: knowledge development and societal development. New knowledge creation through knowledge diffusion and interaction of actors is my research interest. Forms of knowledge networks and communities emerging from such interactions are also taken into account. This research puts additional emphasis on the process of making use of knowledge for sustainable agriculture[31] and sustainable development. "Knowledge valorisation" is increasingly used to encourage knowledge diffusion to create economic and societal benefits (Feldman and Kelly 2006). The uptake of the term "grand challenges" in European countries is to call for research communities to address their societal challenges (Pedersen 2012). Understanding knowledge diffusion practices in the Mekong Delta is intended to nurture an interactive knowledge creation culture, and this new mode of knowledge production finally aims to create developmental returns beneficial to all stakeholders.

1.5. Research methodology

This research uses radical constructivism as its guiding investigative framework. Radical constructivism is defined in the form of two basic propositions (Glasersfeld 1989 cited in Riegler and Quale 2010, 1):

- Knowledge is not passively received, but is learnt through a process of active construction by the knower.
- The function of this process of learning is adaptive, and serves the knower's organisation of her own experiential world, not the discovery of an objectively existing ontological reality.

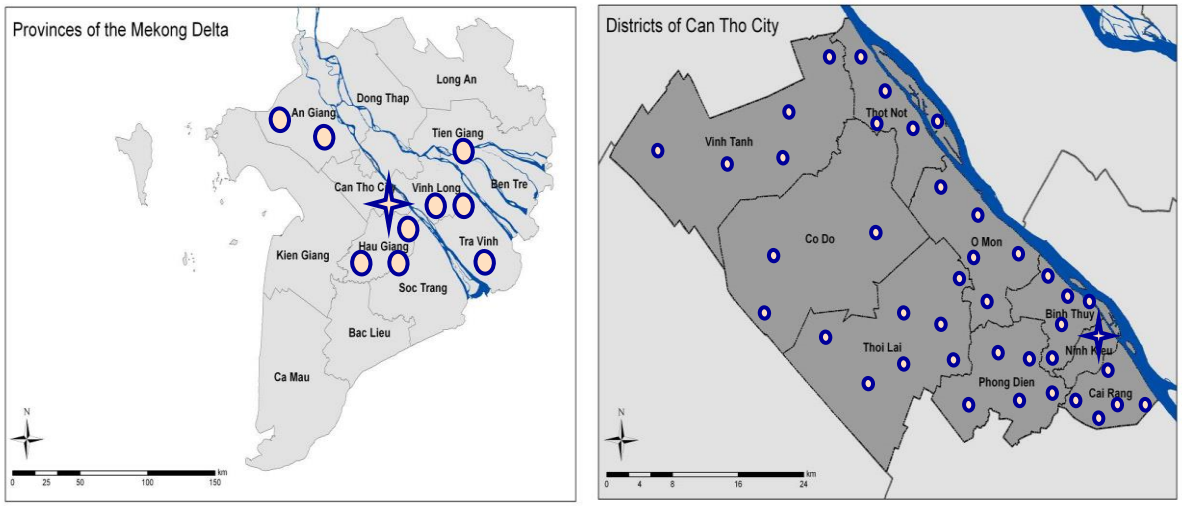
Systems, environments and structures are examined in observing systems, in their self-production capacity, and interaction among agents. Based on one-year field research project in the Mekong Delta within the period April 2010-11, this research is advanced mainly based on qualitatively empirical data and analysis, as the sociological vanguard for exploring development and knowledge practices as social construction. Research sites concentrated on, but not limited to, six provinces along the Mekong Delta with intensive cases in Can Tho City (see Figure 1.5).

A purposive sampling strategy was prominently applied in this research. As asserted by Patton (2002, 230), "the logic and power of purposeful sampling lie in selecting information-rich cases for study in depth." Based on pre-determined criteria for selecting samples to include those who have worked and experienced agriculture/rural development, government officials of functional organisations, university

[31] Bowler (2002 cited in Robinson 2008, 7) maintains that "a truly sustainable agriculture must represent a clear alternative to the industrial model as part of a transformation of both the farm economy and the society in which it is embedded."

lecturers/institute researchers, company staff in the agriculture sector and relevant sectors, and farmers as participants. The researcher firstly contacted and interviewed government officials and requested a list of farmers by district and commune levels. Different groups of farmers, for example, good farmers, farmer trainers, farmers who belong to co-operatives or local mass organisations, were selected from the available lists for interviews and focus groups. To include "hidden population" such as those who work as farmer trainers and cannot be easily contacted, the researcher employed snowball sampling for narrative interviews (see further in narrative interview). Many attempts were made to select participants from various localities that were different in terms of geographical characteristics (Can Tho and other provinces in the Mekong Delta), farming models (fruit, rice, GAP, animal husbandry, etc.) and social, economic, and cultural backgrounds (poor/rich communities, Kinh/Khmer communities) in order to collect diversified data from different perspectives and make comparisons as necessary.

Figure 1.5: Research sites by province and district levels



A total of 310 participants[32] in five main groups were invited for in-depth interviews: government officials, extension workers, university lecturers/institute researchers, agribusiness persons, and local farmers (see Table 1.5). All interviews lasted approximately one hour and were digitally recorded. Ten farmers' focus group discussions (FGD) were organised. Each approximately two-hour FGD consisted of two sessions where farmers were invited first to identify and rank their sources of knowledge related to their agricultural and rural development activities and later on to discuss sustainable agriculture concepts and practices they were engaged in. Nine participant observations were also made so that the researcher could experience different knowledge sharing and learning contexts.

[32] All of the interviews are numbered by chronological order. 310 out of a total of 340 interviews conducted during my entire field research period are used for this thesis. The 30 remaining interviews, which were conducted between May and August 2010, focused on exploring knowledge transfer in the water supply industrz in Can Tho City. The data of these 30 interviews were analysed and presented in an article published in *Social Science Briefs on the Mekong Delta: Selected findings from the WISDOM project - Work package on water resources and knowledge management 2011* by ZEF.

Quantitative and qualitative mixed-methods are increasingly valuable to illuminate different dimensions of the research problem by providing powerful evidence to inform both policy and practice (Hennink 2007, 12). Data were also collected from surveys, unobtrusive methods and supplemented secondary sources. A small-scale survey was implemented to assess knowledge transfer programs with the participation of local radio/television stations, and a two-round Delphi survey was conducted with experts to identify challenges in the process of information/knowledge transfer to local farmers and propose threshold concepts related to information/knowledge transfer. In addition, several agriculture-focused television programs, propaganda posters, pesticide prescriptions, leaflets, instructions, and researcher's consultation diaries were purposively selective for content analysis. The secondary sources used in this research include academic books and journals, archival records, government reports, statistical compilations, journal articles, maps, and development reports more specifically focused on the Mekong Delta. They were collected from rural private bookshelves, international library research, internet searches, and access provided by local government officers, researchers, and local people. Their validity and reliability as well as their authenticity and consistency were carefully checked and double checked before they were used. A detailed description of the research methods can be found in Appendix 1.2.

Table 1.5: An overview of methods used

Methods	**Description**	**Number**
Interviews	In-depth interview (incl. narrative interview and network analysis)	310
Focus groups	Homogenous farmer groups	10
Observations	Trainings, workshops, conferences, public activities (fair, local celebration)	9
Small-scaled surveys	- Local radio/television stations - Two-round Delphi e-survey	- 6/12 provinces - 16 experts
Unobtrusive methods	- Newspaper article one year collection - Television programs - Posters, leaflets, consultation diaries	- 257 articles
Field note and secondary sources	- Field diaries - Documents, books, articles, etc.	

The data collected was manually transcribed and systematically and thematically analysed by the researcher. The method for identifying, analysing, and reporting themes from data transcripts was applied. Narrative development and network analysis were also used in needed situations.

This research was carried out in accordance with ethical requirements when working with people. It is a common understanding that researchers must comply with ethical obligations to research participants in order to protect their dignity and safety (Marvasti 2004; cf. Perecman and Curran 2006). Before starting the study, the researcher submitted a document introducing the research purposes and research schedule for the approval of the Can Tho People's Committee and the WISDOM partner in Vietnam. Upon its approval, all participants were invited to take part in the research via postal mail, electronic mail, telephone calls, or direct personal interactions. Each interview, observation, or focus

group only commenced when the participants were fully informed of their participation and the research purposes and provided their consent to participate in the study. All participants were aware that their participation would be voluntary, that the information gathered would be treated in confidence, and they could withdraw at any time without prejudice, penalisation, and/or recrimination before, during, and after the research. Sources of information provided by participants were kept confidential by not revealing any identifying markers (e.g. names, ages, positions…) of participants.

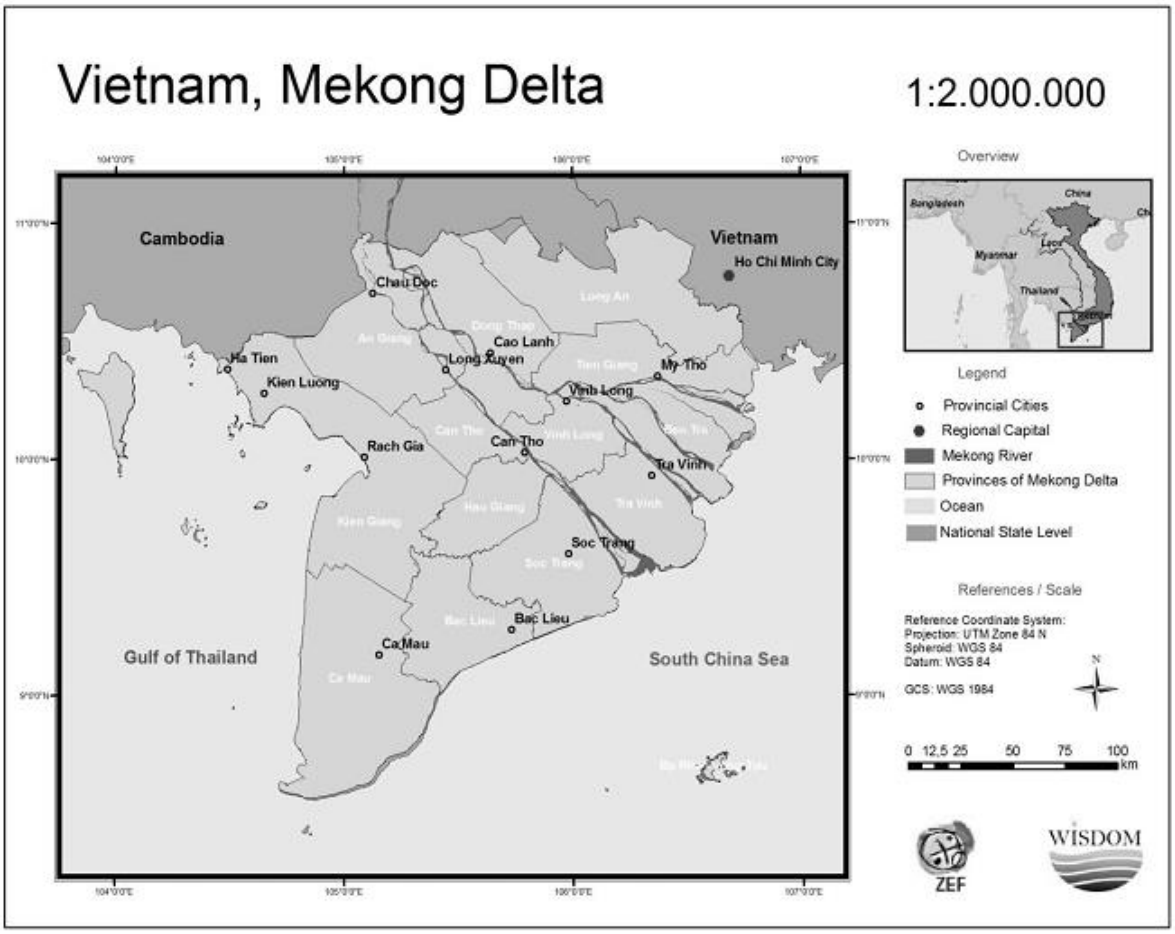
This thesis is structured into seven chapters. Chapter One presented the researcher's motivation and research objectives. It also illuminated the theoretical and conceptual framework of this research as well as the methodological considerations. Chapter Two introduces the background of the research site – the Mekong Delta in Vietnam. The main features of the historical socio-economic development of the delta are reviewed over the convergence of development paradigms. Characteristics of the Southern Vietnamese people are also sketched out to accentuate the living river and water civilisation, often undisclosed in developments of modern hydraulic society. Chapters Three to Six explore the functions, structures, and processes shaping knowledge diffusion practices within the public agricultural extension system, research system, agri-business system, and farming community system. Research inquiries are not for the sole understanding of internal transformation of each system but rather to examine such transformation within interrelation, interaction, and interface among systems throughout knowledge for development diffusion transactions, interventions, projects, and events. Localised, bottom-up, and from-within knowledge development initiatives and energies are scrutinised. Knowledge diffusion for sustainable agriculture and rural development in the Mekong Delta is examined within the duality of development practices, interaction among social actors and ever changing cultural socio-economic environments. Chapter Seven brings the research to a synthesis discussion of knowledge diffusion practices and analysis of another epistemic culture of development that is emerging. Suggestions for knowledge management and governance and further research are finally provided.

CHAPTER TWO
VIETNAM'S MEKONG DELTA: TRANSITIONAL LANDSCAPES

> "[…] an emphasis on the national government as the primary actor in shaping the water environment and the discourse concerning it neglects the important roles that provincial governments, local governments, private enterprises, international organisations, universities, and individuals have come to play in environmental management and development policies. Different visions for the Mekong Delta play out in different contexts and venues." (Biggs 2010, 233)

Vietnam's Mekong Delta, or Cuu Long (Nine Dragons), as the Vietnamese call it, forms the most downstream area of 3.96 million hectares comprising the Mekong Basin (Tran Thanh Be, Bach Tan Sinh, and Miller 2007) (see Figure 2.1). The delta is hydrologically divided into three regions: a high flood zone (Long Xuyen quadrangle and plain of reed), a fresh water zone (upper floodplain and tide-affected floodplain), and a coastal complex (East coast and Ca Mau peninsula) that differentiate production and living organisation of their respective regional inhabitants within the common features and culture of the entire delta.

Figure 2.1: Vietnam's Mekong Delta



Source: ZEF/WISDOM project 2010

The Mekong Delta comprises 12 provinces (An Giang, Ben Tre, Ca Mau, Dong Thap, Hau Giang, Kien Giang, Long An, Soc Trang, Tien Giang, Tra Vinh, and Vinh Long) and 1 central-governed city

(Can Tho) with a cumulative population of 18 million (approximately 21% of the national population) in which 5 million people are active labourers in the agricultural sector (Nguyen Thanh Binh 2008, 5). Approximately 80% of the delta's entire population live in rural areas (Nguyen Duy Can et al. 2007). The delta is represented by four ethnic groups of Kinh, Khmer, Chinese, and Cham. The Khmer mainly live in the provinces of Tra Vinh, Soc Trang, An Giang, Kien Giang, and Bac Lieu with a total population of more than one million individuals.

During the 16th century, pioneer Vietnamese emigrants migrated to present-day Vietnam's Southern region, a wild landscape shaped by dense river networks and out-stretching thick forests: "We are here in this fancy land. Even a bird's twitter or fish's water-thrash can make us jump" (Son Nam 2004, Author's translation). Until 1698 their ownership was attested on the land and villages they had reclaimed and built up with the support of the Nguyen reign. The Southern March (*Nam tien*) brought continual flows of Vietnamese to the delta region; in conjunction with the Khmers, who had long resided there scattered among the hilly and high land strips, later joined the Chinese ceaselessly clearing wastelands, establishing villages and merchant districts - and extending the distinctive river and water civilisation (*van minh song nuoc*) (Son Nam 2004; Son Nam 2005; Evers and Benedikter 2009).

> Based on immense forests, swamps, interlacing waterways to alluvium deposited land, our ancestors constructed boundless fields of paddy rice, luxuriant fruit garden strips, canals and ditches crowded with to-and-fro boats and junks and animated villages. The development history of the delta has created the distinctive South – with features that are seemingly not greatly different from those of Vietnamese culture but marked with strong local colours – features that are impossibly mistaken to any other lands of Vietnam (Son Nam 2005, 7, Author's translation).

After more than 300 years of development, the Mekong Delta is now known as the largest and most active agricultural region of the country. The most simplified description of the region's modern history indicates that improved water control systems, advanced technology applications, and appropriately altered economic institutions have led to a rapidly modernised and highly productive agricultural industry in the delta. To date, the delta is known as the national "rice basket," "rice granary," or even "cradle" of the country's agricultural production, occupying approximately 50% of the total national proportion of rice (80% of rice exports) and food production, 80% of fruit production, and 60% of aquacultural production (Nguyen Ngoc De 2006; Nguyen Thanh Binh 2008).

This chapter introduces the Mekong Delta in its changing water control, development, and knowledge landscapes. It argues the delta's river and water civilisation cannot be minimised in its material and technological aspects. The development landscape is convergent of three different development perspectives. Under old and new, theoretical and practical development challenges, the chapter further investigates how the local knowledge system of agricultural development has evolved for its own sake and for the resilience of the agricultural system it relies on.

2.1. The Mekong Delta as a river and water civilisation (*van minh song nuoc*)

The Mekong Delta landscape is shaped by dense networks of rivers and canals with more than 10,000 km of natural and man-made waterways (Miller, Nguyen Viet Thinh, and Do Thi Minh Duc 1999, 37).

All over the delta, there exist more than 1,000 man-made canals serving transport, flood and salinity protection, land reclamation, and urbanisation (Le Thi Viet Hoa et al. 2007). The canal system is distinguished by two main orders: the main canal system and internal field canals to individual farms.

Professor Tran Ngoc Them (2008) uses river and water attachment (*tinh song nuoc*) to signify an important trait of the Mekong Delta culture. Over generations, delta dwellers lived their lives intensively attached to and connected with water bodies, forming the river and water civilisation that can be prominently observed today. Water plays an important role in all aspects of local life from daily domestic uses and house construction to production organisation and transportation (Evers and Benedikter 2009; Käkönen 2008; Le Anh Tuan et al. 2007). In the South of Vietnam, people use a wide variety of dialects to refer to concepts and objects relating to water: *rach, xeo, lang, xang, lung, bung (water containers); cu lao, con, bao (water-surrounded areas); rong, nhung, uong (water movements); ghe, xuong, tam ban (in-water means of transportation)* (Tran Ngoc Them 2008).

The waters and rivers trait manifests itself in the way local people "behave" and interact with their water resource surroundings and environments. I could not agree more with synthesised comments such as "Mekong Delta farmers are very adaptable to the changes in water regime and apply sustainable production techniques" (Le Anh Tuan et al. 2007, 23). Unlike disastrous stormy floods in Central and Northern Vietnam, flooding in the delta, especially during the September – October rising water season, or *mua nuoc noi,* is always awaited. Our interviews with farmers during this time of year in 2010 in Can Tho show that they were very worried that the water level of this year would be not become high enough. Rising water is a symbol of prosperity as it brings about natural fish resources and other "free goods," land fertility and thus crop productivity (cf. Biggs et al. 2009; Dun 2008; Howie 2005; Nguyen Huu Ninh, Vu Kien Trung, and Nguyen Xuan Niem 2007; Tran Thanh Be, Bach Tan Sinh, and Miller 2007). Mekong Delta inhabitants use "nice floods" or "beautiful floods" to express this process of rising water levels between half a metre and three metres of depth (Ehlert 2012). Regularly rising water also indicates the return of an old friend who brings the message from nature that this year weather is favourable (*mua thuan gio hoa*). This mode of human-environment interaction of Mekong Delta inhabitants is in a large extent different from their northern fellow citizens in the Red River Delta, nationally the second largest in the northern part of Vietnam (cf. Ngo Van Le 2010, 330-346).

> "Early in Vietnamese history, possibly before the Christian era, the Vietnamese developed an elaborated system of dikes and canals and the rudiments of governmental authority to control and channel the supplies of water" (Sardesai 1998,12).

Nguyen Huu Hieu (2012) further argues that "*lu*" was widely used in the mass media over the last 30 years, but it is a foreign concept that inaccurately reflects the nature of Mekong Delta rising water and its relationship with local life. Terms such as "*mua lu*" (flood season), "*tran lu*" (an attack of flood), "*de bao chong lu*" (flood resistance dykes), etc., are strange and alien to the local language and culture of Mekong Delta residents.

Recent research on water resources in the Mekong Delta have often kept the focus boundary within the concept of a hydraulic society, originally used by Wittfogel in his Oriental Despotism. It is assumed that hydraulic management in water-based societies and economies has created strong hydraulic state bureaucracies (Evers and Benedikter 2009; Molle, Mollinga, and Wester 2009). Evers and Benedikter (2009) provide an in-depth analysis of the process by which the lower Mekong Delta has been transformed from a society adapted to its natural environment into a human-regulated environment or a modern hydraulic society. The process has taken place more dynamically over the past 30 years with the State's production-oriented water policy. Technological progress in hydraulic management has been applied, and hydraulic works are growing in size. In Can Tho alone, a large investment in dyke building has been made:

> "In the last 30 years, floods greatly damaged both the lives and property of the people of Can Tho city. The government of Vietnam has invested VND 1000s billion to build dyke works with the aim of controlling floods, exploiting the maximum available potential and benefits of floods and reducing the negative impact of floods for agricultural production and the lives of people. Thus, a series of dyke works has been implemented in recent years in order to control flooding levels between sub-areas, drain acid water, floodwater and protect even against floods in agricultural production activities (such as summer-autumn rice crop protection in inundated areas of Can Tho city)" (Pham Cong Huu, Ehlers, and Subramanian 2009, 5).

The result of this process is the dramatic development of agri and aquaculture in the region as well as the formation of new strategic hydraulic groups (Evers and Benedikter 2009). In fact, huge water regulation works, such as the Vinh Te Canal, were started under the first emperors of the Nguyen Court. The water resource landscape of the Mekong Delta was dramatically changed during the colonial time with "progress" and "oeuvre" projects (Biggs 2003; 2010).

From expert's perspectives, a hydraulic society is a useful concept to investigate the transformation of water-based societies in terms of water control resources development and management and associated power. A river and water civilisation might include technological, managerial, and power-related aspects, yet the civilisation underlines much broader human-environment interactions and human-human behaviour in the water-relied Mekong Delta society as earlier analysed, at least from the local researchers' and residents perspectives. It would be mistaken, then, to see the civilisation of waters and rivers as a past product without implications for the current development and construction of the delta. The fact is that the civilisation is of endosmosis into the lives of delta inhabitants and is thus renewed over periods of time. The values and knowledge developed over the local people's long ecological and social relationship have been identified to be crucial to the successful impact of water regulating interventions that aim to support local development or larger national construction. Biggs (2003) presents a significant conclusion in examining the delta's hydraulic landscape reorganisation by technology under French colonial engineers and administrators:

> "Like nationalist narratives, progressive narratives on colonial public works may ignore the role of the pre-existing conditions within which these projects were located. […] The same situation applies to environmental histories that begin by assessing history limited to the colonial oeuvre itself without considering how pre-existing ecological and social relationships shaped the conditions in which people located that work. The mistake in accepting object-oriented narratives in historical

> writing is that, they silence important social and ecological relationships that may precede and succeed the life of the project. Unlike the tangible solidity of a canal (or bridge or road), ecological and social relationships are invisible, and thus more difficult to define. The terms of their existence are a subject of open debate, whereas a canal is proof enough of its own existence. Yet these perceived relationships in ecology and society frequently determine the lifetime of a work and its continuing utility for such tangible things as increasing food supply, allowing people to move freely and quickly, establishing towns, etc." (Biggs 2003, 96).

Modern dyke systems in Can Tho City have shown several disadvantages in the long-term assessment due to State planners' ignorance of social aspects of the construction and consultation with local researchers and people.

> "The transformation from a rural society living with the natural rules of floods to one living with floods under human control has produced new challenges for the inhabitants of Can Tho city. Dyke system planning can obtain foreseeable benefits in short term, but can also lead to unpredictable negative impacts on the long – run. It changes the flood regimes and inundation levels between sub-areas within Can Tho city. Existing problems of dyke system planning have not been addressed adequately (such as water pollution, land fertility decline and fish reduction which have led to disadvantages for the lives of local people in the protected flooding areas). The natural rules of floods have been changed and are now under human control. The natural advantages of floods are gradually disappearing and are replaced by new disadvantages for the lives and livelihoods of local people in the long-term" (Pham Cong Huu, Ehlers, and Subramanian 2009, 24).

This is not to say that the Mekong Delta residents' practice of "living with floods" means no actions mitigating possible natural hazards should be taken. Instead, disaster reduction, mitigation, or compensation plans should not and cannot be hard technology-induced while neglecting local ecological and social conditions and relationships.

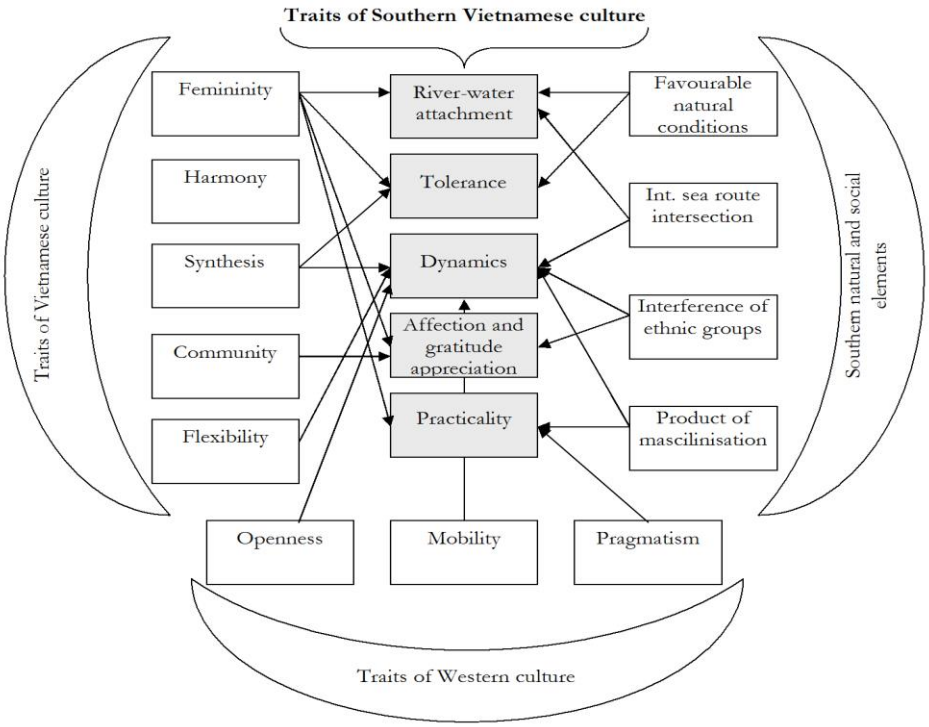
> One example of a hard-component focused project that is facing project sustainability challenges is flood avoidance residential zone (FARZ) construction. This program has been especially promoted by the central and provincial governments after the year 2000 historic flood, which produced serious damage in the Mekong Delta. Implemented in all Mekong Delta provinces (except Long An) in two phases from 2001-2010 and 2009-2013, the program is expected to build up 983 residential zones homing 185,000 households with 148.200 poor households (scatter poor households from flood prone areas are collected and provided a house free of charge while front houses are publicly sold to complement the governmental construction funding) (*Vietnam News Agency* May 28, 2012). The zone as an urbanised mini-area is well connected with internal roads, water, and electricity supplies, which provide the inhabitants safe and better infrastructure. However, the greatest challenge of such construction projects is the livelihood development for the poor who used to live along the rivers or canals with wild fish, shrimp, and snails as their main source of food and income. Even with microfinance support, some poor households just keep the money uninvested to return it on the maturity date because they do not have cultivation land, while animal husbandry becomes impossible in such a house-detached urbanised environment. We can observe several houses left desolate in a residential zone for a long time with closed doors, broken windows, and dirty furniture (Field diary 25.10.2010, 02.11.2010). Their owners are told to return to the water edges for their living (Interview 201, Khmer male, FARZ inhabitant, Can Tho, 25.10.2010). Several poor families have even sold their houses and land, gradually making FARZs a residential cluster of state cadres and rich urban families. The remaining poor households are those successfully engaged in marketplace activities or hired labour work, yet they are confronting the degradation of house facilities, which are not affordable with their modest wages. Many of them have to defecate in their neighbours' toilets or back in the fields because of a full toilet tank, which was not designed to be large enough for a 4-member family in some years (Interview 201, Khmer male, FARZ inhabitant, Can Tho, 25.10.2010).

Water resources are crucial in both practical and symbolic meanings to the local people in the Mekong Delta. However, the resources are challenged and adversely impacted by human development intentions, such as Mekong River upstream dam development, escalating pollution by domestic and

industrial waste, and climate change, often a product of the human development process. Many of these challenges need international and regional commitments and cooperation. In any case, local knowledge and practices should be integrated into hydraulic development plans. Local lessons of environmental and social interaction and relationships should be learned in the process of new knowledge and technology production. Natural conditions and historical development have created different water-shaped landscapes for the Mekong Delta and the Red Delta (Waibel 2010). Peasant social systems are described as distinctive in the two regions in that Mekong communities are seen as "open peasantry" while northern villages are represented by "closed corporate peasant communities" (Rambo 1973). Therefore, it must be very critical to take and introduce success elsewhere into the Mekong Delta, either with societal organisation or human-nature interaction models, especially ideas of mastery over nature.

For the purpose of this research, some important traits of Southern[33] Vietnamese culture are highlighted. Tran Ngoc Them (2008) systemises five main characteristics of the Southern Vietnamese people: river and water attachment, tolerance, dynamics, affection and gratitude appreciation, and practicality (see Figure 2.2). These cultural features are synthesised, reconstructed, crystallised, and developed in the relations with and interaction among the Vietnamese culture, Western culture and the social and natural conditions of the South.

Figure 2.2: Traits of Southern Vietnamese culture



Source: Tran Ngoc Them (2008, 13)

[33] Southern Vietnam is divided into two regions: Eastern South (*mien Dong*) and Western South (*mien Tay*). The Western South includes 13 provinces/cities in the Mekong Delta. The Eastern South consists of 6 provinces/cities: Ho Chi Minh City, Binh Duong, Binh Phuoc, Tay Ninh, Dong Nai, Ba Ria - Vung Tau with the total area of 23,545 km2 (7.15% of the national area).

The clearest manifestation of tolerance (*tinh hao* dung) is the harmonised existence of multiple ethnic groups and religions (Buddhism, Brahmanism, Catholicism, Protestant, Muslim, Hoa Hao, and Cao Dai) in the delta. Hoa Hao (Harmony) alone, as its name suggests, stresses the wide acceptance and altruism of different religious philosophies in this locally invented religion. Association and cooperation to create united power and mutual support in difficult times have shifted from a need to develop a rule of conduct among immigrants to the delta. They open their hearts to welcome others, even strangers. They are willing to help others in need without any expectation for reciprocation. It is not unusual that the Mekong Delta people will let guests stay at their home and treat them as their acquaintances (cf. Tran Phu Hue Quang 2011). During my fieldtrip, despite my Central Vietnam accent and the fact that I was meeting them for the first time, I was often invited to have lunch or dinner with villagers. They also prepared for me the best accommodation they could arrange in situations where I could not drive back to the city center within the same day. It was in my most difficult time of waiting for the interview approval with the State's agencies that I started talking with farmers who supplied me with all the needed information. I must admit that the Mekong Delta farmers' hospitality and sincerity encouraged my discoveries aided in the completion of my research objectives.

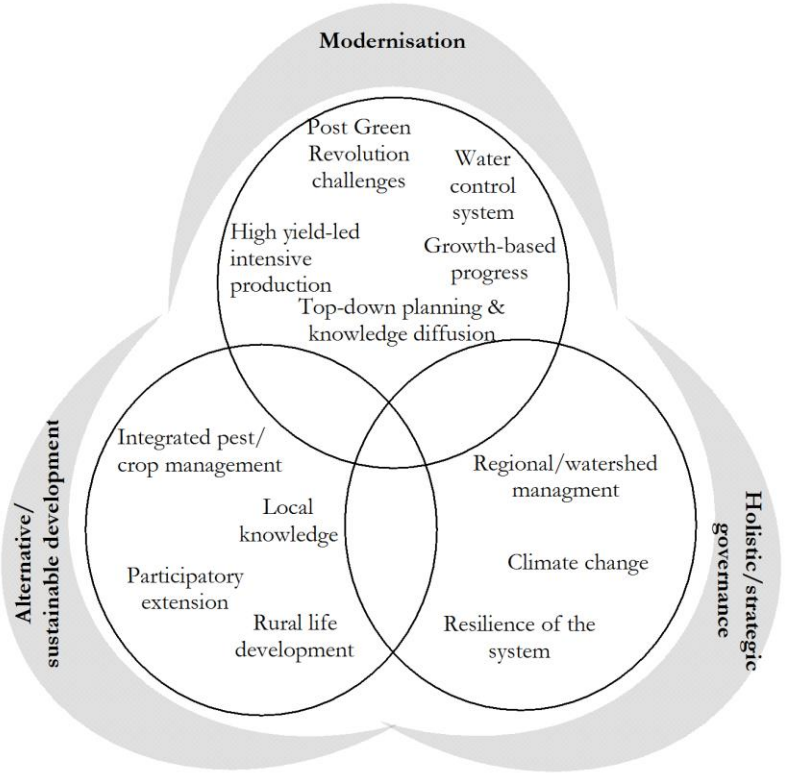
Mekong Delta dwellers value affection and gratitude appreciation (*tinh trong nghia*). They appreciate affection more than wealth. They wholeheartedly help and protect other people in their time of distress. They spend all their money on treating without thinking about the future. This trait is largely manifested in our analysis of knowledge-sharing patterns among farmers and by "advanced" farmers who have been trained by university researchers (see Chapters Four and Six).

The cultural traits of dynamics (*tinh nang dong*) and practicality (*tinh thiet thuc*) are evidenced through their high adaptability to changes and novelty. They promote trading and take the risks of carrying out large-scale business activities. They tend to simplify all matters, respect trading rather than literature, and prefer light humorousness over deep philosophy (Tran Ngoc Them 2008). Our case studies present a number of progressive and innovative farmers in the delta (see Chapters Four and Six). However, searching for large-scale production and trade without sufficient knowledge and strategic planning might lead to unnecessary losses (see Section 6.3). Also, the consumeristic characteristic of Southern Vietnam residents and farmers in particular is becoming their own trap in a consumerism society (Cao Tu Thanh, *Tia Sang* June 16, 2008) (see Section 6.2). In these situations, the support from State agencies and research organisations is very important.

2.2. The Mekong Delta at development crossroads

This section attempts to argue that agriculture and rural development in the Mekong Delta is not one single development paradigm. Its development landscape is indeed the interweavement of at least three development perspectives: modernisation, alternative/sustainable development, and holistic/strategic governance (see Figure 2.3).

Figure 2.3: The convergence of development perspectives in Vietnam's Mekong Delta



Source: Own presentation

The deterministic ideation of modernisation and industrialisation by 2020 has in several respects shaped the recent socio-economic development of both rural and urban Vietnam's Mekong Delta. However, under and through the centralised planning apparatus, the translation and implementation of the national development strategy at local levels have largely fallen into a reductionistic approach biased towards economic growth, industrialisation, and urbanisation.

> The development orientation of the Mekong Delta has been still questionable. The 10th National Party Congress put forward a national development strategy that Vietnam will be a modern industrial country by 2020. Following closely this industrialisation and modernisation orientation, provincial development plans have developed an economic structure in which industry share is the highest, followed by services; agriculture is to be kept as small as possible. This structure might be achieved at the national level. I have no knowledge to assess this. Even when we accept this structure for the whole country, it is not necessary that the Mekong Delta become all industrialised and modernised provinces. All provincial leaders in the Mekong Delta have built a strong industry inclined GDP, so finally what will the whole delta do with industry? (Interview 144, senior researcher, male, Can Tho, 21.9.2010).

When the economic structure, trends, and growth rate are guided and decided by provincial party committees' resolutions, which are developed on the concept of "higher targets compared to last period" principle without careful consideration of available resources and real capacity, eventually only illusory growth figures are reported. For example, in 2010-2011, the Gross Regional Domestic Product (GRDP) growth rate of 63 provinces nationwide was announced to be two-digit numbers, while the national GDP growth rate is respectively 6.42% and 6.24%; where has the rest of the value gone? (Bui Trinh, *VnEconomy* October 16, 2013). It is true that "industrialisation and modernisation by 2020"

achieves ideational power that has strongly influenced national and provincial development planning[34] (cf. Tan 2012); importantly, however, localitis and "achievement" disease have dismantled its practicable power when respect for local conditions, resources, and knowledge is under token agreement.

When a province becomes a central city and thus districts becomes quarters, many agriculture-pure communes are officially recognised as a ward, leading to the phenomenon of administrative urbanisation. Under these administratively urbanised subdistricts, the division of agriculture is replaced by the division of economic development and the position of deputy chair in charge of economic development is instated as a substitute of the agriculture predecessor. Accordingly, human and financial resource allocation for agricultural management and extension is sharply reduced. Uncontrolled suspended project owners of evicted agricultural land planned for urban and industry development have increasingly bankrupted production and life plans of rural residents (Interview 80, senior official, male, Cai Rang, 16.8.2010). The rapid development of industrial zones and parks with only in-paper or during-inspection operation of waste treatment systems are leading to alarming water pollution (Interview 48, Environment and Natural Resource Official, male, 17.08.2010). Rural vocational programs cannot yet provide industrial zones with qualified labourers (see Section 2.3). Although urbanisation is a key path for Vietnam in reaching middle income status (World Bank 2011), the current development planning and practices of the region have basically ignored the rural-urban continuum, which creates developmental vacuums where policy making and implementing are unmet and urban and rural inequalities widened.

Moreover, the region has a long pursuit of agricultural modernisation characterised by hierarchical institutional set-up, top-down planning, technology transfer, high yield-led production, and growth-based verification (Diglio and Siddivò 1998). "Good" farmers are mainly evaluated based on their gained yields and profits despite a long list of other criteria to be checked. At a commune's symbolic farmer conference where participants were eager to hear experience sharing towards production

[34] Even in the recent strategic *Tam nong* (agriculture, farmers and rural areas) policy that designs agricultural and rural development as comprehensive process and farmers as its agent, industrialisation and modernisation seems to be the journey's end. The goal of the policy writes: "It is to achieve a continuous improvement of the physical and spiritual life of the rural residents, harmonisation among the areas, creation of more rapid change in stricken areas; the farmers are trained so as to reach production level on a par with advanced countries in the region, well equipped with political constitution to play the role of owner of the new rural area. It is to set up *a comprehensively developed agriculture toward modernity*, sustainability, commodities production, high productivity, good quality, effectiveness, and strong competitiveness to ensure the national food safety for immediate and long termed demands. It is to build up a new rural area with *socio-economic infrastructure*; *proper structure of economies and production arrangements, with strong connection between agriculture and rapid development of industries, services, urban planned development*; to ensure a stable situation in rural areas, richness in national identity, improved knowledge, protected biological environment; the political system in rural areas under the leadership of the party is to be enhanced. It is also to build up a peasant class, to consolidate the ally of the worker -the farmer -the intellectual, creating a strengthened a socio-economic and political foundation for the cause of *industrialisation, modernisation*, construction and defense of socialist Vietnam Fatherland." (Resolution of the 7th Congress by the Session X Central Executive Committee on agriculture, farmers and rural areas) (Author's emphasis).

success, the audience was finally disappointed with proud income figures of the presenters with little "how to" knowledge shared with the farmers (Participant observation and short talks 30.11.2010).

The second development paradigm is alternative or sustainable development. Over the past decades, sustainable principles and practices have been introduced into the delta in part under the ascendancy of global sustainable development frameworks. On the other hand, the real production situation demanded local rethinking of their development approaches. Agricultural intensification and industrial development in the delta have put pressure on resources, especially water resources, use, and environmental protection, while conventional production management and practices turned out to be severely problematic, if not a cause of the actual problem. Further, the global market's requirements of production process and product quality are challenging unsustainable ways of farming. Good practices, integrated management models, and farming systems approaches have been adopted in different agricultural sub-sectors, restructuring them toward sustainable development:

> Some coastal provinces restructure production value based on value chain and enhancing link between processing and trading players and raw material suppliers. In which, the top priorities are given to the production of value-added products and the development of important seafood brands. Mekong Delta provinces are also expanding farming activities in compliance with Global GAP (Good Agricultural Practice) and Aquaculture Stewardship Council (ASC) standards; tightening quality inspections, quarantines of shrimp seeds and feed and vet drugs used in shrimp cultivation; as well as enhancing control of water sources in farming areas to mitigate pollution. (Ngoc Ha, *VASEP* September 23, 2013)

Sustainable development in the Mekong Delta is substantially criticised for its less people-centered focus (Käkönen 2008). Grassroots participation and knowledge should be further promoted, for example, indigenous knowledge of sustainable agricultural production. One important question in the context of developing countries like Vietnam is whether it is possible to take a short cut and yet sustainable path of development. A research study by Estellès et al. (2002) confirms the answer:

> "It is our impression after working with this subject, that yes, it is possible for the Mekong Delta, representing a region in a developing country, to develop in a sustainable way. The constraints are deep traditional believes (that might take generations to change) and lack of education. Overall, the major difficulty is the lack of a new regulation program regarding the principles of sustainable development, which can only be implemented if the policy-makers are going to start believing that sustainability is important in development" (Estellès et al. 2002, 97).

Though those optimistic comments are encouraging, I would doubt any short-cut approaches. At the implementation level, translation and diffusion of such new sustainable innovation have to overcome a number of epistemological, technical, and cultural barriers because of the more complicated nature of knowledge, even with foreign concepts.

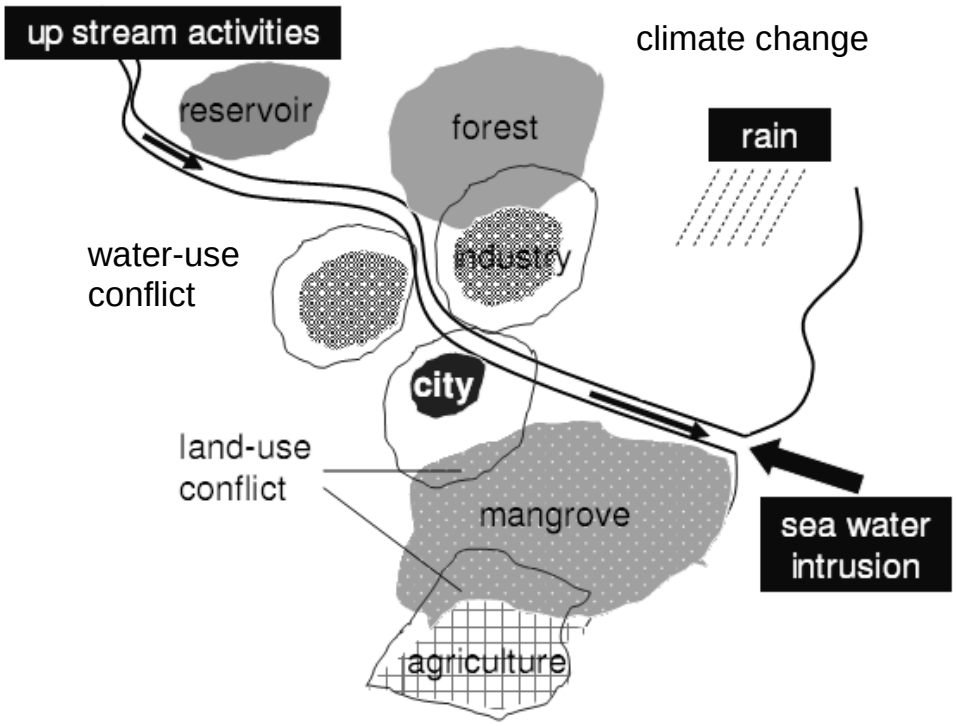
The third interwoven development perspective in the Mekong Delta is holistic or strategic governance. One might argue this archetype fits well under alternative development. The goal might be identical. However, approaches and methods towards the goal are divergent between the two paradigms.

In the delta's scale, attentions have been paid to inter-sector and inter-provincial planning and development (see Figure 2.4). For example, land use planning is starting to consider the needs, capacity, and development orientations for agriculture, aquaculture, industry, and rural development

purposes. Inter-provincial development planning focuses on provincial comparative advantages and benefits for the entire region. For example, it is an increasing concern how dyke-bounded intensive rice farming in the upper An Giang Province impacts water flow regimes in lower towns and the water quality of the downstream localities where aquaculture is more developed.

> Previously each province and each sector worked at its own discretion and preference (*manh ai nay lam*). Planning schemes of one sector might contrast with the other. For instance, the aquaculture sector put forward pond and lagoon construction. Meanwhile, agricultural agencies disapproved with this plan and advocated food security. Land planning is somewhat easier than water resource planning because land is not moving. Water runs from upstream down, thus water management is required for the whole delta, region, and basin. We are still very weak in such cooperation and management (Interview 144, senior researcher, male, Can Tho, 21.9.2010).

Figure 2.4: Holistic resource governance is needed in the Mekong Delta



Source: Adapted from Le Quang Minh (2010)

Moreover, the Mekong Delta is experiencing the double impacts of climate change and construction of upstream dams (Le Anh Tuan 2010). Climate change is a major environmental challenge for Vietnam in general and in the Mekong Delta in particular (Eucker 2011). Climate change-related hazards in the Mekong Delta include inundation and saline intrusion due to sea level rise, extreme weather events, increased average temperature, reduced precipitation during the dry season and additional precipitation during the wet season, and changes in wind speed (Mackay and Russell 2011, 9). With the scenario of a one metre sea level rise, 39 percent of the total area of the Mekong Delta is inundated and 35 percent of the delta's population is directly affected (Le Van Thang, Nguyen Dinh Huy, and Ho Ngoc Anh Tuan 2011). Moreover, 33 dam projects, with their either finished, operational, or pre-feasibility status are proved to create adverse effects on the Lower Mekong's environmental flows and ecosystems (Pham Cong Huu 2012).

> Because of the global climate change, the icebergs are melting and causing sea level rise. This area is considered as the most vulnerable place influenced by the salinity intrusion. This year, salty water intruded about 80 kms toward upstream surface water and about 100 kms for underground water. Another problem is water shortage because of dams in the upstream. In the dry season, the river flow is limited because water is kept in reservoirs. Moreover, countries such as Thailand, Laos, and Cambodia are expanding farmland. Forests are also one of the causes of difficulties for the Mekong Delta's water conditions. The forest coverage is reduced greatly, causing flood in the rainy season and a shortage of water sources in the dry season. We can obviously see the troubles of climate change and salinity intrusion that impact fresh water shortage. This is a serious issue since inhabitants also suffer a shortage of surface water for domestic purposes, while underground water is increasingly polluted because of delta inhabitants' overuse (Interview 22, senior researcher, male, Can Tho, 3.6.2010).

In such a context, regional and basin-level cooperation and governance, including knowledge generation and sharing, among stakeholders need, more than ever before, to be strengthened for efficient decision-making in terms of social, economic, and environmental sustainability (cf. Hirsch et al. 2006; Renaud and Kuenzer 2012).

It is very difficult to determine at this stage whether there is a clear paradigmatic shift in the development landscape of the Mekong Delta. What we are certain of is the coexistence, interweavement, and interaction among modernistic, sustainable, and holistic perspectives, which both facilitate and hinder the transformation of the local knowledge system.

2.3. The evolution of the agricultural and rural knowledge system of the Mekong Delta

This section traces the changes of the knowledge system of agricultural and rural development in the Mekong Delta. It examines the knowledge functions, flows and priorities of and among involved actors in various areas of rice production, crop diversification, pest management, fruit production, aquaculture, animal husbandry, agricultural mechanisation, rural vocational training, local participation, and quadruple association**.**

Rice production

Rice production has the longest history and is of the greatest importance in the Mekong Delta. The sector takes both national food security and international trading missions. Formerly, rice production prevailingly relied on the floating rice variety as it was suited to local flooding (Nguyen Huu Chiem 1994; Käkönen 2008). Floating rice production required little input and a low investment; however, farmers only yielded one crop per year (from July to January) (Howie 2005). The introduction of high-yield varieties (HYVs) into the Delta since 1967 together with short-term varieties development and the improvement of dyke and canal systems have enabled farmers to intensify from single to double and triple crops (see Appendix 2.1 for the delta's rice crop patterns and locations). In some high-dyke protected areas, farmers even manage seven crops over two years (Howie 2005).

Rice intensification has been challenged by pest outbreaks, increased use of fertilisers and pesticides, environmental pollution, land degradation, added value, and a fluctuated market. It is now under the State promotion and farmers' self-direction that crop diversification is gradually more practiced. Another challenge in rice production in the Mekong Delta is the use of verified seed as a replacement

of degenerated varieties and increased productivity. Verified seed socialisation has been promoted with the establishment of networks of verified seed clubs and trained farmers. These networks are intended to produce and supply verified seed in their areas. However, many farmers are still stuck with old varieties, for example the 504 varieties, since they do not see convincing advantages of this new method in terms of input-output comparison.

> To produce high-quality rice, farmers have to use verified rice varieties. However, many of them tend to be hesitant to apply these varieties due to the more expensive seed. Verified rice varieties bring higher productivity, but their rice selling price is not much higher than the old varieties. Thus, many farmers remain using unverified seed of old varieties (Interview 260, extensionist, male, Phong Dien, 22.11.2010).

Rice research in the Mekong Delta has shifted its focus from higher-yield, shorter-termed seeds to brown planthopper (BPH) resistance varieties, high quality varieties, and salinity-tolerant varieties. Also, participatory rice research has been encouraged. Farmers are trained to undertake some phases of the research process, and some of them even become rice breeders.

Crop diversification

Crop diversity has for decades been supported by the State's agricultural programs. It is also a traditional practice of Mekong Delta farmers as a risk reduction strategy.

> Farmers in our locality used to cultivate three rice crops per year; however, they earned little profits from rice production. Under the State's policy, they decided to perform crop diversification by planting different types of vegetables or doing aquaculture. Their current models of production are two rice crops-one vegetable crop and two rice crops-one aquaculture crop. Thus, their incomes have remarkably improved (Interview 89, senior official, male, Co Do, 19.8.2010).

> In the past, I cultivated one rice crop per year, then two crops per year, in which the winter-spring rice crop is the main one. I have decided to diversify my crops by integrating vegetable planting or aquaculture with rice production (Interview 196, farmer, male, Thot Not, 23.10.2010).

Crop diversity can be implemented by rotational crops or added production systems. Very often, farmers include vegetable or fruit planting, livestock rearing, and aquaculture in addition to their rice production (cf. Wilder and Nguyen Thanh Phuong 2002). Another crop diversity approach is the adoption of integrated farming systems, for example, integrated models of rice-fish, rice-shrimp, mangrove-shrimp, mangrove-rice, rice-upland crops or VAC, a symbiotic farming system of horticulture, pisciculture, and animal husbandry (cf. Miller, Nguyen Viet Thinh, and Do Thi Minh Duc 1999).

Beside their economic benefits, integrated systems are environmentally sustainable and small-scale household applicable. Since the system is complicated in terms of effective adoption and operation in the long run, rather than technological understanding and acceptance, on-the-spot and post-project consultations and support are required, as this need is hardly satisfied by a centralised project and its resource constraints. Besides "hard" technological issues related to subsystem installation and arrangement, production activities require further multidisciplinary and multi-stakeholder efforts. It is always challenging for both scientists and farmers to address the basic question: Which kinds of plants,

animals, and fish need to be grown within the integrated system, taking into account the dynamics of local conditions, needs, pest and disease outbreaks, as well as market demand? Furthermore, even when intensive dissemination is needed, it is crucial to keep in mind that the system is under investigation, theoretically and practically, for optimisation over the time-space axis (cf. Wieneke 2005, 24). Farmer-initiated farming diversification models thus need to be discovered and disseminated.

Pest management

In the Mekong Delta, farmers have a habit of exceeding use of seed and fertiliser and more pesticides than necessary as they believe that high seed and fertiliser inputs result in higher yields (Nguyen Huu Huan et al. 2005, 457). Pesticide misuse and overuse have caused serious air pollution, soil degradation, contaminated water, and human ill-health (Dang Minh Phuong and Gopalakrishnan 2003).

> Farmers use more agrichemicals than needed. For example, it is recommended that farmers mix a bottle of 50cc pesticide into 16 litres of water, yet farmers often dissolve 70-80 cc of the agrichemical with the same amount of water as they do not want to have to carry out a second spraying (Interview 199, farmer, male, Co Do, 25.10.2010).

Integrated Pest Management (IPM) was one of the first sustainable approaches to pest management introduced in Vietnam and the Mekong Delta to connect ecological principles and social scientific perspectives into traditional crop management (Håkan Berg 2001, 898). The IPM program in Vietnam provides farmers with farming knowledge to make better pest-control decisions (Nguyen Huu Dung and Tran Thi Thanh Dung 1999, 9). In addition, several programs including "Three reductions three gains" (*Ba giam ba tang*), "Four right things to do" (*Bon dung*) and "One must five reductions" (*Mot phai nam giam*) were formulated and promoted through trainings, conferences, consultation sessions, and the mass media in order to encourage farmers to reduce seed and fertiliser use (Nguyen Huu Huan et al. 2005).

> Many farmers start to reduce seed and fertiliser rates in their first crops and carefully monitor their crops to take appropriate measures. However, some continue using high seed and fertiliser rates. Those who cultivate rice in a large area or live far from their rice fields often take the "preventive" pest control method. In spite of no sign of pest outbreaks, they spray insecticides every ten days. Thus, their expenses for production are very high (Interview 161, farmer, male, Vinh Thanh, 13.10.2010).

Pest management in a sustainable manner is often complicated and different from farmers' perceptions of pest – that they should all be killed right away. Moreover, it involves multiple sources of knowledge, including researchers, extensionists, and agribusiness, even with conflicting messages. Therefore, IPM and the like should be "sustainable" in terms of repeated and extended programs of knowledge transfer and "integrated" in terms of transferred knowledge.

Fruit production

Fruit production has a long tradition in the Mekong Delta, well-known for garden strips (*miet vuon*). However, the sector has only made significant development under the government policy of agricultural diversification. The delta's total fruit production area increased from 92,000 ha in 1985 to 175,000 ha in 1995 and reached over 300,000 ha at present with a total fruit output of over 3,000,000

tons per year (Van Mele, Nguyen Thi Thu Cuc, and Van Huis 2001; *DCSVN* March 27, 2014). Tien Giang and Vinh Long are the two main fruit production provinces in the delta, with specialities such as Hoa Loc mango, Lo Ren star apple, and Nam Roi pomelo.

With the establishment of a fruit research institute in Tien Giang, fruit production research and technology transfer has been consolidated. Effective agricultural cooperative and global GAP application models can be widely observed in the fruit sector. However, recognition of global GAP is technically and administratively expensive. Many fruit cooperatives are becoming brand dependent to large companies for exports (Interview 314, farmer, male, Vinh Long, 9.3.2011).

Non-aligned farmers are prominent in the Mekong Delta fruit production landscape. They have to manage seedling and caring technologies based on their own experience and market evaluations.

> When *Hoa Loc* sweet mangos were in vogue, I had about 120 mango plants. Recently I have started to plant star apple. Sweet mango farming required intensive labour and high investment but did not create high yields and income. I have planted off-season star apple. This kind of star apple is large, and planned to be harvested in solar November; its quality is very good. I have learned techniques of star apple farming from my relatives who are growing star apple trees in the Phong Dien district, Can Tho City. Universities have not deeply studied these techniques yet (Interview 248, farmer, male, Binh Thuy, 15.11.2010).
>
> I had heard about "yellow" longan through the mass media. My brother and I went to Tien Giang to buy yellow longan seedlings. My fruit garden has an area of over 2 hectares. Yellow mango monoculture may bring many production and market risks for producers, so I decided to combine the planting of longan with *Hoa Loc* sweet mangos and yellow durian (Interview 250, farmer, male, Binh Thuy, 16.11.2010).

Pest and disease management in fruit production is another problem. IPM has been promoted, but the results are still far from what is expected. What Van Mele and his colleagues recommended more than 10 years ago is still relevant to the fruit sector in the delta: "It is imperative that participatory research and mass media campaigns be commenced to show farmers that alternative, more sustainable approaches for pest and disease management are possible (Van Mele, Nguyen Thi Thu Cuc, and Van Huis 2001, 14).

Aquaculture

The last decade has witnessed an aquacultural boom in the Mekong Delta, with escalating commercialised aqua-farms, fishery industries, and company workforces. The region has become the most productive region of both coastal and inland aquaculture under favourable conditions of water and fisheries resources and economic integration with new international market access (Tran Thanh Be 2007; Wilder and Nguyen Thanh Phuong 2002).

However, Vietnam's aqua-product exports have recently faced difficulty due to claims that they were contaminated by antibiotics and/or microbiologic organisms (Vo Thi Thanh Loc 2003). Our interviews with Pangasius farmers have pointed out many cases of empty dry ponds and farmers in debt because of market interruption and high interest bank loans. Therefore, Käkönen (2008) is right to indicate the paradoxical role of aquacultural development in the Mekong Delta because poor farmers and poverty diminution have not received sufficient support. In response, large aqua-

producers are applying strict quality control from the ponds to the final products. Small-scale farmers have reverted to more sustainable integrated agri-aquaculture models or/and local markets. Farmers are not encouraged to keep antibiotic diagrams.

> It is a problem of drug traders when they sell the wrong chemicals or drugs for farmers, mainly because they do not make the antibiotic diagram. So, we also have inspections at the drug store to check if they buy the allowable drugs. As we find out any drugs or chemicals are forbidden by the regulations, we fine them for selling them and impound the drugs. But it is not just about the responsibility of drug traders. If farmers are confused about the chemicals they should use, they can ask the local aquaculture station for advice. Or if they experience problems with techniques or chemical use, they can contact the CTU, particularly the Department of Aquaculture and Fishery (Interview 13, senior officials, male, Can Tho, 26.05.2010).

Another problem related to aquaculture is waste water. Despite new regulations on pond system design with a compulsory waste water treatment component, in reality the adoption of this model is very low.

> Some aquaculture households directly discard waste water into rivers that negatively affect water resources. Despite specific regulations on waste water treatment, aquaculture households have not abided by treatment procedures for waste water, and the management of water resources has not been properly implemented due to the lack of human resources and an appropriate control mechanism. For example, waste water is discarded into a canal, which is the main water source for the living activities of local people here. However, we cannot take any timely measures as the discharge of waste water occurs out of official hours (Interview 106, official, male, Thot Not, 23.8.2010).

Knowledge demands of the aquaculture industry are of a wide knowledge content spectrum from high-tech aqua-companies to limited resource households. However, in most cases, production technologies that meet market-required quality and environmental protection regulations need further investigation for the sector's sustainability (see Genschick 2011).

Animal husbandry

The livestock production of the Mekong Delta is mainly characterised by small-scale households for home consumption or income generation purposes. Large (semi)industrial farmers are mainly State owned. Private commercial farms have recently emerged (Le Thanh Duong, Nguyen Duy Can, and Tran Thi Phan 2005). The delta's animal husbandry priorities set by State management agencies include pig, poultry, and dairy cow farming (Le Thanh Duong, Nguyen Duy Can, and Tran Thi Phan 2005).

Integrated models of animal husbandry-agriculture and aquaculture are widely practiced in household backyard farms. Duck farming, especially field oviparous duck raising, is popular in the delta, which is encouraged as a natural method of pest control in paddy fields and a source of increased income for small farmers (cf. FAO 2010). However, avian influenza and blue ear outbreaks have for the last several years threatened both large and small producers.

> Challenges of animal husbandry include new epidemic diseases, increased production inputs, such as veterinary medicine and food, and underpriced outputs. For example, in 2009, the selling price of a 100-kg swine was about 3.4-3.6 million dongs, while swine food was only 7,600-7,800 dongs/kg. Currently, the selling price of a 100-kg swine has decreased at 2.2-3.1 million dongs while swine food costs 11,500 dongs/kg (Interview 264, farmer, male, Phong Dien, 29.11.2010).
>
> Swine farming is facing a blue ear outbreak. Farmers usually feed their swine with industrial food containing chemical components, and thus these swine are frequently diseased after 2-3 months.

> Breeding, feed, and water are big challenges to animal husbandry (Interview 216, commune official, male, Thoi Lai district, 29.10.2010).

It is important that farm households in the Mekong Delta get access to vaccination and veterinary services in their local areas (Mai Van Nam 2008). The orientation towards a sustainable husbandry industry thus might involve improved food safety and hygiene, competitive capacity building, and environment protection.

"Clean" agriculture

"Safe," "clean," and organic agriculture are different terms and different levels of agricultural production in relation to agrichemical embracement in the quest for agricultural sustainability. Organic agriculture tends to be an adoption of global knowledge that is international market-oriented while other clean types of farming are locally reproduced knowledge and targeted at domestic markets. These alternative agricultural models share environmental sustainability as a driving force, but marketability finally determines their outcome.

There are in general three groups of organic farmers, as defined by Willer and Yussefi (2006) and Simmons and Scott (2008): traditional (as normally practiced), reformed (cognitive to action change), and certified (with certificate) groups. Organic farming is emerging modestly in the Mekong Delta, as it is in Vietnam, frequently under international cooperation and for export purposes. For example, Binca Seafood, Naturland, and German Agency for Development Co-operation (GTZ) have worked together to produce organic Pangasius in An Giang. However, organic projects often neglect the participation of smallholders (Le Nguyen Doan Khoi 2011).

Good agricultural practice (GAP), defined as "the practices that farmers engage in to minimise the detrimental environmental impacts of farming operations; reduce the use of chemical inputs; and ensure a responsible approach to worker health and safety, as well as ensure animal welfare" (Nicetic et al. 2010, 1894) and its Vietnamese version, VietGAP, have increasingly been promoted in the last few years in Mekong Delta agricultural production. However, only a small number of production units have obtained a GAP certificate (La Thi Nga et al. 2012). Of particular note, certificate regranting is still in question for many current GAP producers.

> Application of GAP in aquaculture is very difficult. We can ensure food, raising techniques, and agrichemicals in GAP aquaculture. However, the water environment is a challenge. We can neither construct a deposition pond due to our limited area nor rearrange three ponds as designed by GAP. It often takes us 7-8 months to harvest a crop. Any careless interventions may affect our yields and business (Interview 235, farmer, male, O Mon, 9.11.2010).

> Compared to traditional rice farming, GAP-based rice production requires more labour and organic fertiliser use. The GAP yield is not much higher than that of traditional rice production, and GAP products are not very attractive to customers due to their less-competitive prices. However, rice production with GAP principles brings many benefits to farmer's health and the environment due to the use of organic fertiliser and the reduction in agrichemical spraying (Interview 307, farmer, male, Hau Giang, 7.3.2011).

Clean vegetable groups have developed in peri-urban areas as a source of fresh vegetable to the city dwellers. They can be registered as a clean vegetable club or cooperative and recognised with a three-

year valid certificate by the provincial department of agriculture and rural development. Alternative agriculture production needs strong supportive government policies and plans, involvement of research institutes, and the participation of large and smallholders.

Agricultural mechanisation

Mechanising farming activities is an irreversible trend of large field construction, lack of labour under urbanisation, and sector modernisation as elsewhere as in the Mekong Delta (cf. Nesbitt 2005).

> Formerly, I harvested rice by myself or hired labourers to harvest crops by hand. The cost of labour was quite expensive. Two years ago, I started to use a combined harvester for rice cutting and threshing. Adoption of a combined harvester helps me reduce expenses and time. The price of the harvester is not too high, and it is effective in carrying out all steps of rice harvesting. I only spend labour on tidying up rice fields (Interview 220, farmer, male, Thoi Lai, 2.11.2010).

> Regarding of the mode of production, engine-powered tractors are popularly used in agricultural production. Only field clearance is manually done. Row seeding and rice cutting are implemented by cutting and threshing tractors. Steps of land preparation and harvesting are mechanised. Only water plumping is still carried out by each household as local farmers have not harvested rice at the same time. In general, agricultural production has not been highly cooperative and specialised. Large-scale agricultural production is still less developed. Agricultural mechanisation has been promoted; however, it has still been limited and not met the demand of large-scale agricultural development (Interview 176, official, male, Thot Not, 18.10.2010).

Agricultural mechanisation in the Mekong Delta is still limited. Truong Thi Ngoc Chi (2010) determined that the important factors affecting farmers' use of rice harvesters and dryers include their educational level, perception of machinery, and available capital. Our interview data further suggest that natural conditions and poor infrastructure, for example, soft soil or muddy and narrow roads, also hinder the use of high-power imported machines in farming. However, several farmers have invented or improved machines based upon their daily working needs that are both appropriate with local conditions and widely accepted within and beyond their communities.

> I myself have manufactured a spraying machine installed in a rolling frame. I use this machine to spray insecticides instead of traditional handmade pumps. This machine has its own advantages and disadvantages, but it helps farmers remarkably reduce their labour. Many other farmers are now taking the model (Interview 174, farmer, male, Thot Not, 18.10.2010).

Rural vocational training

In the process of urbanisation, rural inhabitants in the Mekong Delta have undergone a career structural shift when land for agriculture is gradually reallocated for industrial activities. Local farmers are encouraged to participate in vocational training courses for alternative livelihoods other than agricultural production.

> The city and district give priorities to vocational training in order to make career structure shifts. We organise two vocational training courses per year. Each course consists of 30 trainees. However, these courses have not been successful. It is very difficult to mobilise local people to attend vocational training. Local people mainly live on small trading and unskilled labour as they can earn money quickly to spend on their daily living (Interview 265, senior official, male, Cai Rang, 1.12.2010).

> We organised coin hat making classes for local women. We hope that upon training, trainees are able to make complete products to be sold in the market. The class objective cannot be achieved. It cost us several million dong to organise a class for 30 trainees, but ultimately only a few of

> them are competent in coin hat making (Interview 225, farmer, cooperative head, male, Thoi Lai, 3.11.2010).

It is reported that from 2010-2012, Hau Giang organised 643 vocational classes for 19,238 participants, and that in 2013, Hau Giang, Vinh Long, and Can Tho have planned to provide vocational training for 8000, 17,000, and 5,700 rural labourers, respectively, while other Mekong Delta provinces keep their annual course offerings for 4,000 to 8,000 participants (Huynh Loi and An Binh, *Sai Gon Giai Phong Online* May 1, 2013). Vocational training managers often blame low attendance on the locals.

> A learning community center has been established in a locality where local people can attend supplementary education classes. These classes are often held in the evening for all. Participants are exempted from tuition fees. Participation of local people in these classes is still limited due to their age and laziness (Interview 249, ward Farmers' Association (FA) senior, male, Binh Thuy, 16.11.2010).

In fact, the link between training and post-training employment, which predisposes rural people to classes, turned out to be neglected in any vocational curriculum design.

Local participation

It is common knowledge that women fill an important role and participate in all agricultural activities and production phases, such as land preparation, irrigation, fertilizer application, pesticide spraying, harvesting, and paddy drying (in rice farming). In Mekong Delta households, in some cases the role of women in agricultural development is more decisive than that of men. However, rural women are in most cases not household representatives for training and extension services organised by farmer's associations or extension agencies (cf. Paris and Truong Thi Ngoc Chi 2005). When poorly equipped nor updated with new ideas and technology, they may occasionally become barricaded against innovation adoption, at least at the household level.

> Nowadays, women are "fierce." In our ward, women work on fields. Upon participating in an IPM course, I applied the good techniques I had learned from the course into rice cultivation on my fields, such as thin seeding. However, I was so afraid to take my wife to visit our fields at that time. I bet she would reprimand me soundly if she saw our fields were thinly seeded like that. After a couple of weeks, when the rice started growing up, I finally let my wife visit the field (Interview 315, farmer, male, An Giang, 10.3.2011).

Farmers are not Kinh males. Agricultural education and extension should allow for ethnic and cultural differences. Among many Khmer villages I had a chance to visit, there was only one Kinh-Khmer extensionist who effectively helped local farmers link new knowledge with their existing experience. Young and well-trained extension staff designated to areas with a high ethnic minority population cannot bring their professional capacity into play if they know very little about the region's ethnic language and cultural values.

In summary, the local knowledge system of agriculture and rural development of the Mekong Delta have evolved and created advances towards new challenges and demands of the sector and sub-sectors. Specific issues will be addressed with specialised knowledge and approaches. In other words, the evolution of the local knowledge system is constructed on other-other adaptation (Ackoff 1971, 668-669) in the way that it has mainly reacted and responded to external changes by modifying its

environment, using policy to change production practices. While this adaptation is necessary, more attention should be paid to create and support internal changes and system modifications (self-self adaptation) to such internal change for the sustainability of the sector and the system itself. The importunity is that the roles of actors in material production and knowledge production are also changing and becoming more interlinked, which provides an opportunity for boundary crossing between disciplines and between science and society and further cooperation along the ladder from participation to partnership.

Summing up

The Mekong Delta as a transformative system is being reinterpreted within the changing of river and waterways, development, and knowledge landscapes. It is argued that the characteristics of *a river and water civilisation* are a continuum toward contemporary development scenery. Conceptualising delta development within Wittfogel's hydraulic society cannot allow for inclusion of traditionally developed environmentalist thinking and practices of delta dwellers. The development landscape is not founded on one hegemonic paradigmatic avant-gardism but instead on the convergence of and interaction and among modernist, alternative, and holistic perspectives. On this interactive development foundation, the local knowledge system of agriculture and rural development has evolved in the face of cumulative socio-economic and climatic and environmental challenges, yet other-other adaptation has been the main pattern throughout this learning and change process.

Innovative changes of agricultural and rural development of the Mekong Delta, in its further integration into the knowledge-rich globalised world, are growingly directed, if not determined, by vigorous transformations of its local knowledge system of which functions are to bridge and nourish global and local knowledge interaction and new knowledge creation. It is suggested in this chapter that the resilience of the Mekong Delta's agricultural system to new development challenges more than ever before is greatly dependent upon the resilience of transformational knowledge system on which it based, and thus a fortiori, upon to what extent knowledge professionals and farming communities co-produce knowledge in partnership. In this sense, the system not only adapts and learns, but it also creates change.

CHAPTER THREE

EMBEDDED EXTENSION: BUREAUCRATISATION AND GRASSROOTS RECONSTRUCTION

> Without agricultural extension services, farmers in our region could hardly grow rice successfully. Currently, many people who have not accessed advanced scientific technology keep applying 30-40 kgs of seed rice per *cong*[35] when the use of row seeding would allow a reduction to 12 kgs or 13 kgs for the same area. Their inability to change their old practice of dense seeding increases input expenditure, pesticide use, epidemics and outbreaks, and a polluted environment, as well as negatively impacting farmers' health. (Interview 157, village FA senior, head of rice seed club, male, Vinh Thanh, 11.10.2010)
>
> I have the feeling that our agricultural extension system is chasing after farmers rather than taking the lead. Extension just repeats innovative models by farmers. Extensionists seem to be unable to run ahead. (Interview 149, senior researcher, male, Can Tho, 29.9.2010)
>
> An extension worker is an intermediary to help farmers sit together and facilitate their discussion on relevant issues. The majority of farmers have intensive practical experience in farming but lack theoretical knowledge. Some farmers find it difficult to express their understanding of an issue. Because of that, we as extension workers should take into account both technology to be transferred and the way we transfer knowledge to farmers. (Interview 217, extensionist, male, Thoi Lai, 1.11.2010)

The agricultural extension system in the Mekong Delta, as in Vietnam as a whole, was officially established in 1993 with the state extension as its nucleus. The system has so far developed a broad network from the central level to the provincial, district, and communal levels. In many areas, extension volunteers have operated within hamlets and villages. Agricultural extension work has been largely reported by government agencies to bring significant changes in local farmers' livelihoods by increased economic efficiency and resource use through advanced technology transfers.

However, public extension has been criticised through recent research that charges its services are unable to reach the wider rural population in need, because of the unwavering commitment to a top-down extension mechanism, reliance solely on technical staff, and thus the prominent practice of a one-way techno-scientific knowledge transfer. Thin extension coverage with lowered-qualified extension workers weakened by increasing brain drains is defying efforts to expand extension services to agricultural producers who are progressively more diverse and demanding modern knowledge and technology. Without deep structural changes, public agricultural extension cannot lead, but is more or less forced to "chase after farmers".

This chapter examines the formation, operation, and potential transformation of the public agricultural and rural extension system in Vietnam, using particular cases of the local level extension practices in

[35] *Cong* is a traditionally local unit of area measurement in the Mekong Delta. In a general use, one *cong* is equal to 1,000 square metres. More precisely, 12 square *tam* (1 *tam* is 31.20 meter long) make up one *cong* (= 2.60m x 12 = 973.44 m2). There are two variants of *cong*: *cong tam cat* which is equal to 1.3 *cong tam dien* (1,265 m2). The differentiation is thought to be developed from craftiness of feudal landlords: with the same area of land, when being hired, *cong tam dien* was used whereas *cong tam cat* was adopted when hiring harvesting labour. Otherwise specified, one cong in this paper is the equivalence of 1,000 square metres.

the Mekong Delta. The chapter first reviews the current situation of the system after three waves of restructuring in response to privatisation and demand-driven readjustment. The restructuring brings new opportunities as well as challenges to the system, especially at its lower levels. Examining in detail the information and knowledge flows among hierarchical levels of the system, the chapter shows that resources and power are concentrated at the central and provincial levels while, the knowledgeable communal staff play the role of information providers informing about the changes in the locality for which they are responsible. In other words, the hierarchical bureaucracy controls and turns educational work into their self-perpetuating administrative management. The discussion investigates further the working conditions and practices of communal extension workers. They seem to be undergoing both motivational and professional crises. Those who remain in the system have to do many other jobs for a living or only "work" perfunctorily. The newest recruits are less qualified and more distrusted by local farmers, who are rich in experience but need intensive education and technology. As the extension system including more than the the National Agricultural Extension Center (NAEC) system, the chapter scrutinises knowledge-based relations and exchanges among extension actors, including professional agricultural agencies and mass media organisations. The analysis puts forward the question of extension system socialisation on one hand while on the other, professionalisation is crucial if the system is to meet the demand of wider farming communities, as well as large-scale commercial farmers. The main argument of this chapter is that the hierarchical and administrative bureaucracy first and foremost serves the role of rural management of the state and maintain a top-down, paternalistic teaching framework of agricultural extension work. This is true even though knowledge diffusion is becoming an important factor in the context of current sustainable development pursuit and that current extension and education efforts are not without merit and success. Agricultural extension needs to be a knowledge-based work in which knowledge flows are facilitated and learning spaces are promoted. A sociological institutionalist construction of a learning system is discussed as an alternative to the current bureaucratised extension system.

3.1. The public agricultural extension system in transition: Policy change or power rearrangement?

The formation of the current agricultural extension in Vietnam is essentially the government's response to the acceleration of local extension services after the promotion of agricultural household autonomy in the late 1980s. The system inherited state-management culture and features but has undergone momentous transformations, though the question of whether such changes are state-centric or society-centric and at the policy or implementation levels needs further exhaustive exploration.

The formation of the agricultural extension system

The history of human agricultural development might be that of sharing and learning farming experience. In history, the development of agriculture towards a certain level required extension activities to promote unified and collective actions in natural resource use, crop damage control, and

revenue increase[36]. In ancient Vietnam, many successive feudal dynasties attempted different extension-style methods and organisations to promote the rice paddy-based economy, in addition to establishing irrigation infrastructure. Maintaining physiocratic policies since the 10th century, kings and mandarins ploughed the first rows for land tilling in solemn ploughing ceremonies (*le tich dien*) to start the crop of the year, and agricultural extension services were established with corresponding mandarin positions appointed down to the district level (Nguyen Duy Linh 2004; Nguyen Thanh Binh 2008). From the birth of modern Vietnam in 1945 through 1993's establishment of agricultural extension organisations, the developmental history of agriculture extension systems can be divided into three stages (cf. Do Kim Chung 2005, 18-19). The 1945–1975 stage involved land reforms and the establishment of agriculture institutes and universities in North Vietnam and agricultural development and extension aimed at contributing to the struggle for liberation of South Vietnam. In South Vietnam, an agricultural extension department was established by the government in 1960. After national reunification, in the period 1975-1985, collective agriculture was implemented in the entire country. Under the central planning economy, agricultural extension was primarily conducted for and via agricultural cooperatives. From 1985 to 1993, with the national renovation (*doi moi)* policy and sector renewal by the promulgation of Resolution No.10 recognising the farm household as the core unit of agricultural production, agricultural extension services became desperately needed. To meet the rising demand, several local governments such as An Giang, Bac Thai provinces in collaboration with local research institutes and universities, formed their own extension centers (Nguyen Duy Linh 2004). The new context suggested a need to manage extension activities by the central government as well as the establishment of a "conventional" extension system national wide.

The current agricultural extension system in Vietnam was officially established in March 1993 with the propagation of Governmental Decree 13/CP, mandating the creation and operation of a state-centered agricultural extension network from national to provincial and district levels. Agricultural extension has thus far been structurally and functionally divided and recombined several times in accordance with organisational changes of the responsible ministries and agencies. This agricultural extension system as the core and prominent service provider in the whole country stretches its activities into diverse fields including agricultural extension, forestry extension, fishery extension, agriculture-based industrial extension, agriculture-supplied water management, and rural sanitation and environmental protection. To date, the three main Governmental Decrees 13-CP, 56/2005/ND-CP, and 02/2010/ND-CP issued in the years 1993, 2005, and 2010 respectively, provide the main landmarks of agricultural extension system changes in Vietnam, including the Mekong Delta (see Table 3.1).

[36] Nguyen Thanh Binh (2008, 12) reviewed a number of archaeological evidence of agricultural extension-like activities aged more than 3,000 years, such as Mesopotamian clay tablets with advice on watering crops and getting rid of rats, Egyptian hieroglyphs who provided advice on avoiding crop damage and loss of life from Nile's floods, or Chinese agricultural minister, at approximately 800 B.C., responsible to train farmers to do crop rotation.

Table 3.1: Major landmarks of the development of the public agricultural extension system in Vietnam

Date	Legal documents	Effects
02.03.1993	Government Decree 13-CP	- Department of Agriculture and Forestry Extension (DAFE) was established under MAFI - Establishment of agricultural extension network from national to provincial and district levels
01.11.1993	Fishery Ministry Decision 766 TS/QĐ-TC	Fishery extension work was under the management of Department of Fishery Management (until 7/2000)
01.11.1995	Government Decree 73-CP	MARD was established on the basis of the mergence of MAFI, MFo and Ministry of Irrigation
07.07.2000	Fishery Ministry Decision 590/2000/QĐ-BTS	National Fishery Extension Center (NFEC) was established
04.2002	MARD Decision	Establishment of Central Agricultural Extension under DAFE
18.07.2003	Government Decree 86/2003/NĐ-CP	Dividing DAFE into Department of Agriculture and National Agricultural Extension Center (NAEC) under MARD
26.04.2005	56/2005/NĐ-CP	New regulations on agricultural and fishery extension work
28.01.2008	MARD Decision 236/QĐ-BNN-TCCB.	National Agricultural-Fishery Extension Center was established on the basis of the mergence of NAEC and NFEC (MARD and MFi were merged into new MARD by the government Decree 01/2008/NĐ-CP dated 03/01/2008)
08.01.2010	Government Decree 02/2010/NĐ-CP	- New regulations on unified agricultural extension - Present NAEC network is under a on-going perfection process
23.05.2011	MARD Circular 38/2011/TT-BNNPTNT	- Department (*vụ*) of Science, Technology and Environment, being the general focal point of state management of agricultural extension, directly manages general and multi-sector extension programs as well as regular extension missions. - General Departments (*tong cuc*) of Forestry and Aquaculture and Departments (*cuc*) of Cultivation, Animal Husbandry, Processing, Agro-forest Product Trading and Salt take state management functions on specialised sectors of agricultural extension. - Financial Department directly manages financial issues related to central extension missions.

Source: Own presentation

The agricultural extension system in transitional policy: Change or rearrangement?

In investigating the chronological changes above, one might argue that the restructuring of the extension system is highly dependent on and shaped by the reorganisation of its parent agricultural and rural development agencies. However, a close content analysis of the cited government documents shows that this argument is not completely accurate as extension work, despite changing policies, illustrates added values reflecting contemporary global development thinking and practice and local demands of agricultural and rural development. I suggest that we should emphasise at least three main concomitant waves of rearrangement and restructuring, as further analysed below, which were forces of change that are decisive to the internal transformation of extension: its positioning as a professional organisation within the state agency system, the defined objectives of extension services, and the development and expansion of its networking to all local levels.

During the initial structure, agricultural extension was undertaken by state management agencies under ministerial or provincial levels. At the central level, because several ministries were involved in agriculture and rural development—such as the Ministry of Agriculture and Food Industry (MAFI), Ministry of Forestry (MFo), and Ministry of Fishery (MFi)—MAFI was selected to be the government's permanent agency responsible for extension work with the establishment of the Department[37] of Agriculture and Forestry Extension under its auspices. In other ministries, such as MFi, extension work was also assigned to relevant sub-ministry departments. At provincial levels, centers of agricultural extension were established under Departments of Agriculture and of Fishery. These provincial centers continued to form a line of agricultural extension stations by region or communal cluster. This way of structuring gave extension organisations dual duties: state management and public service delivery, which was found to be of substantial 'inadequacy' at the operational level (MARD 2008). Since 2003, the Department of Agricultural and Forestry Extension has been divided into the Department of Agriculture, which focuses on state management duties of agricultural development, and the National Agricultural Extension Center, which concentrates on agricultural extension; accordingly, extension organisations at central and local levels have been recognised as professional units under the Ministry of Agriculture and Rural Development (MARD) and Departments of Agriculture and Rural Development (DARDs).

Neglected by the assessments in existing extension literature, the decision to reposition extension work from the state management mission is an important turning point in creating autonomous space for specialised knowledge and targeted education such as agricultural extension. Such labour division appropriately helps reduce the financial burden imposed and the directional dependence on the central level, but instead gives chances for local resource mobilisation, priorities, and development of local operational machineries and mechanisms that meet local needs. How to make use of the State's support while maintaining the system's agency, localised self-improvement requires changes in activity and strategy management that is far removed from traditional state management and its hierarchical and bureaucratic practices.

The second major change relates to re-identification of agricultural extension goals and objectives. Motivated by transfer of advanced technology, economic management skills, and market information to farmers, the agricultural extension mandate in Decrees 56 and 02 puts an emphasis on the increase in agricultural productivity in relation to the rural economic structure shift, poverty reduction, and agricultural modernisation (see Table 3.2). Furthermore, unlike Decree 56's prioritisation of the enhancement of agricultural producers' awareness of the state's guidelines, policies, and law of agricultural production and development, Decree 02 stresses household economy development. Decree 02 in particular connects economic development to international export demands, food security, new rural construction, and environmental protection. In other words, there is a change from

[37] For a briefing of the Vietnam's state management system, see Appendix 3.1.

hard technology and state policy dissemination towards more farmer-driven, diversity-appreciating, and sustainable development-based sources of technology and knowledge. As such, the policy direction makes good use of the current line of research argument that *khuyen nong*[38] or agricultural extension should include promoting agricultural and rural development in addition to the well-being of farmers as subjects of these development processes, as *nong* can be understood as *nong nghiep* (agriculture), *nong dan* (farmers) and *nong thon* (rural development) (e.g. Nguyen Thanh Binh 2008). In addition, the recent policy encourages participation and contribution from various societal actors in agricultural extension, including international cooperation and active involvement of local farmers, which implicitly promotes global-local knowledge exchange and local knowledge utilisation.

Such alternate mandates require different extension approaches that inform the heterogeneous needs of farmers and the diverse contexts and conditions in which new technologies and knowledge are applied, and demand that extension workers are not only qualified with expertise but also need a good understanding of the community and "soft" skills in organising community development activities.

Table 3.2: Redefined objectives of agricultural extension

Decree	Agricultural extension objectives
Decree 13-CP (Article 3)	- Disseminating advanced technologies of cultivation, animal husbandry, food processing and preservation of agricultural, aquaculture and forest products as well as good production practices - Building and developing farmers' skills and knowledge on economic management to promote effective agricultural production and business. - Collaborating with functional agencies to provide farmers with market information on which farmers can rely to effectively plan their production and business.
Decree 56/2005/ND-CP (Article 2)	- Enhancing agricultural producers' awareness on guidelines, policies, laws and their knowledge and skills on agricultural technology science, management and business. - Contributing to the promotion of the economic structure shift in agriculture and rural areas; increasing the productivity, quality, and efficiency of agricultural production in the direction of sustainable development, employment generation, income increase, hunger elimination and poverty reduction and contribute to foster agricultural and rural industrialisation and modernisation processes. - Mobilising resources from domestic and international organisations and individuals in agricultural and fishery extension work
Decree 02/2010/ND-CP (Article 2)	- Increasing the agricultural productivity and business efficiency of producers so as to raise income, escape from hunger and poverty and get rich through knowledge and skill training activities and agricultural service deliveries to support farmers to obtain high-quality production results and well adapt into various ecological, climate and market conditions - Contributing to the economic structure shift in agriculture in the direction of commercial production and an increase in productivity, quality and food safety in order to meet domestic and export demands; fostering agricultural and rural industrialisation and modernisation processes, new rural construction, national food security, socio-economic stabilisation and environment protection. - Mobilising resources from domestic and international organisations and individuals in agricultural extension work

Source: Own translation from government's decrees and presentation

[38] In the Vietnamese language, agricultural extension is called *khuyen nong*, which according to the Vietnamese encyclopedia, means propagandising, encouraging and facilitating agricultural development.

The third major change of restructuring focuses on the development and expansion of local extension networks. While Decree 13-CP regulates the formation of the local extension network from provincial and district down to communal clusters, Decrees 56/2005/ND-CP and 02/2010/ND-CP clearly mandate the establishment of extension network to the communal level with one or two extension workers and at the village levels with extension collaborators or volunteers and extension clubs. It is stipulated that the provincial government, via DARD, chooses its own local extension mode. Very often, the district extension sub-system is established as a complete organisation under the provincial extension system. Depending on the provincial socio-economic situation, available resources, and the provincial leaders' perception of the importance of communal workers, commune extension models are varied and the staff can belong to commune people's committees, district extension stations, or the provincial DARD (see Section 3.3 for further analysis). In implementing Decree 56/2005/ND-CP, there was a national program to assist several provinces in establishing grassroots extension organisations, from which a number of collaborators were collected and trained and villages' extension clubs coalesced. It is reported that there were 10,543 agricultural extensions working in 10,306 agricultural communes and 15,749 agricultural extension volunteers in villages (in 2007, NAEC website) with 3,676 extension clubs nationwide (in 2002, Le Ngoc Thach et al. 2007). Together with about 3,200 professionals employed under central, provincial, and district extension services, it is estimated that one extension worker on average has to provide service to 3,700 farm households nationally (Seth 2009, 30) and 1,500–2,000 farm households in the Mekong Delta (Le Ngoc Thach et al. 2007).

The development of a multi-levelled extension system is important to ensure smooth information and knowledge flows within a hierarchical structure of extension management. However, the true power in the system rests with the performance of extensions who work with local communities in everyday problem-solving, not with the state management staff of agricultural and rural development as designed in other functional state organisations. Thus, grassroots extension should not be a secondary component to make the system complete, but is a key link in both knowledge diffusion processes to local communities and the feedback loop of policy implementation. In the same manner, extension groups, unlike any other type of rural assemblage without a knowledge-based foundation, can trigger smoother and broader knowledge flows within rural communities.

This section has highlighted three patterns of change within the extension system since its formation in 1993, based on changing policy analysis and implementation. However, to what extent such policy-based orientations are comprehensively interpreted and realised in the practice of extension at various levels is greatly dependent on transformational practices of centralised power and knowledge entrenched in the current bureaucratic structure of the extension system. Otherwise, change may possibly go no further than the evident disjunction between written rhetoric and practical implementation.

3.2. "Elephant's head, little mouse's tail": The bureaucratisation of the extension system

As discussed above, the agricultural system at all levels has shifted from state management function into professional organisations. This is a crucial change that permits resources to be concentrated on professional development-oriented objectives and services. Examining the method of extension system structuring, including task allocation, resource distribution, and communication mechanism, it is argued that the extension system replicates the centralised and administration-styled model in managing knowledge-based work and staff. Using the metaphor of "elephant's head, little mouse's tail", this section argues that in replicating a state bureaucracy, extension resources, physical, financial and human are mainly concentrated at the upper-level organisations that are responsible for state management, planning, and monitoring while maintaining weak, dependent but extended lower-level organisations as mere implementers of decisions made by the higher levels. The metaphor also connotes the cultivation of achievement disease or tokenism at the extension performance level. Extension agents concentrate on the commencement of propaganda, projects, or programs, their outward successes and model practices, while ignoring monitoring and evaluation processes as well as service expansion to the wider rural population, who are mostly small farmers and resource-poor. Such insertion of bureaucratic structure and practice penetration on the agricultural extension system, which should be functioning as an expert professionalised organisation, has further abetted the soft, silent, and business-as-usual bureaucratisation of extension work in the Mekong Delta and elsewhere in Vietnam.

Mandates: "Top-down" versus "on-the-spot"

At the central, provincial, and district levels, extension mandates are operationalised into organisational objectives, while the role of communal and village extension workers is more related to personal performance of direct interactions with local needs. NAEC, functioning as a central extension manager and provider, carries out a wide range of tasks including proposing and promulgating of agricultural extension policies, operational mechanisms, and economic-technical norms of all levels; directing, organising, and implementing advanced technology transfer, information dissemination, training, and other extension service delivery; and engaging in international cooperation. Provincial agricultural extension centers and stations are the main planners for extension within their administrative areas, as well as direct implementers of upper-level mandated extension projects. The communal extension staff is mainly and merely the local need and extension feedback providers to the district level, due to their close and everyday contacts with local farming communities. In general, the mandates of extension of various levels, at least from as conceptualised by managers, can be described as follows:

Table 3.3: Mandates of agricultural extension organisations at different levels

Levels	Mandates
National	- Is a focal point on agricultural extension in the whole country - Synthesize extension demands from extension agencies and farmers - Provide guidelines on extension message, methods, monitoring and evaluation of extension activities, yearly report to ministry - Directly carry out extension communication at central level and cooperate with related organization to carry out training activities - Organize and participate in competition festivals, workshops, exhibitions and fairs relating to extension activity in seven ecological zones - Cooperate with other departments of science and technique to identify the advancements which relevant to audiences for extension in different periods
Provincial	- Propose extension project that suit the provincial conditions - Provide extension guidelines to district level and cooperate with district to carry out extension activities - Directly implement extension communication, trainings for district extension staff and key farmers in the province
District	- Directly carry out extension activities - Provide training courses for commune/village extension staff - Provide trainings to farmers
Commune/village	- Promote farmers to participate in extension activities - Reflect farmers' needs to higher level - Directly implement extension activities at village level

Source: Entries from national to commune levels are taken from Nguyen Van Van (2010, 5-6)

I argue that the above-cited mandates illustrate the state management system's way of thinking, in which the headquarters decides and local networks implement and report, or expectations of extension managers from higher levels to the lower levels, rather than reflecting the real tasks and missions of extensions as direct and indirect service providers to rural communities. It seems that the specified missions of extension workers from the district level upwards, where the managerial task is prominent, are more accurately reproduced while those who work directly and daily with farmers in the village find their missions are not fully acknowledged. Building wide and dependent local extension systems based on a centipede-foot-shaped network thinking merely demonstrates the controlling ambition of a power-centralised system. Some national-scale projects of grassroots extension capacity-building with participation of some selected provinces thus turned out to be no more than comfort taps on the vicious cycle of failure to recognise the full role of local direct extensionists, recruitment of low quality staff, low capacity and working conditions, and low extension performance. The grandiloquence of a broad local extension network might endanger the foundation of the whole extension system in its disguised and widening gap between local demand and trust and knowledge supply and capacity of local direct extensionists.

Human resources: Improvements or improved gaps

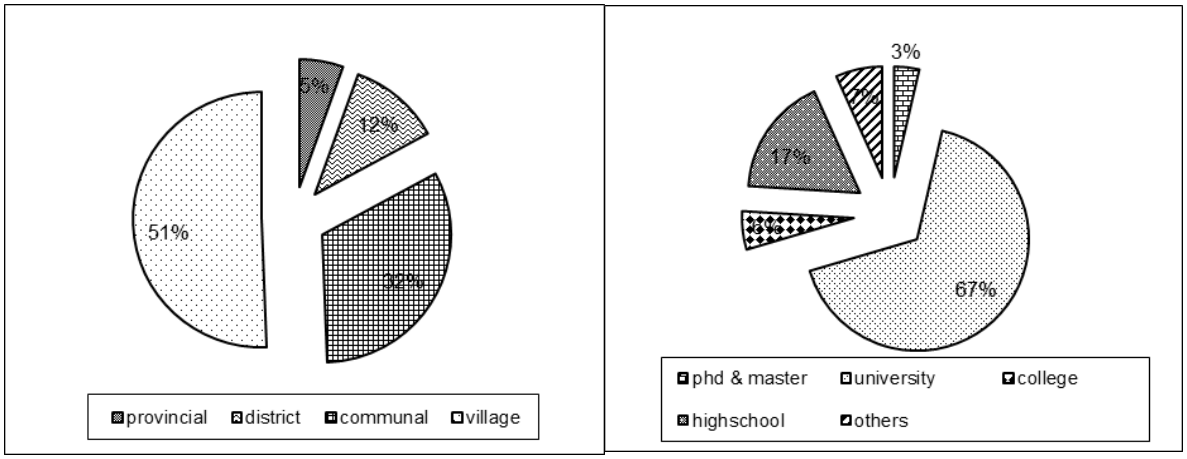
In 2010-reported data, NAEC comprises 82 staff, including 6 doctoral, 15 masters and 54 undergraduate degree holders, a fourfold increase from a 20 member staff in 2004. The Center includes nine divisions and a southern standing office. Recently, divisions of cultivation extension, animal husbandry extension, rural industry extension, forestry extension, and aquaculture extension

were clustered into the division of advanced technology transfer, and a regional office and training center added, making seven divisions, offices, and centers under NAEC:

- Divisions: General and planning, training and capacity building, information and propaganda, and advanced technology transfer;
- Regional offices: Ho Chi Minh City (HCMC)-based (Southern region), and Daklak-based (Southern Central and Central Highlands); and
- The Southern agricultural technology transfer and training center based in Soc Trang.

At the local levels, according to NAEC's 2011 statistics, the total number of agricultural extension workers is 34,747, of which approximately 31 percent are females and 35 percent belong to ethnic minority groups. Our data from interviews with local extension in the Mekong Delta provinces show an equivalent proportion of female extensions, but a much lower number with an ethnic minority background. This newly-announced number of extension staff of all levels presents an achievement of the sector in service provision coverage by allowing a rough egalitarian calculation that the extensionist/agricultural household gap has narrowed to 1/280. However, such an index tells another story when an examination is made into the number and quality of staff broken down by level. Only 17% of the reported staffing are "full" professionals (*chuyen trach*), who are registered as regular government officials with much higher educational background working at provincial and district extension organisations and the rest, 83%, are working at commune or village levels either by contract or on a volunteer basis with the educational attainment requirement of technical secondary or lower (See Figure 3.1).

Figure 3.1: (a, left hand side) Extension workers under national level in 2011 (b, right hand side) Qualifications of provincial and district extension workers in 2011



Source: Own presentation, data from NAEC Report 2012

More specifically, there are about 25–35[39] extensions, making up a total of 1,903 staff members (5 percent) from all 63 provinces and cities, working at provincial agricultural extension centers (PAEC)

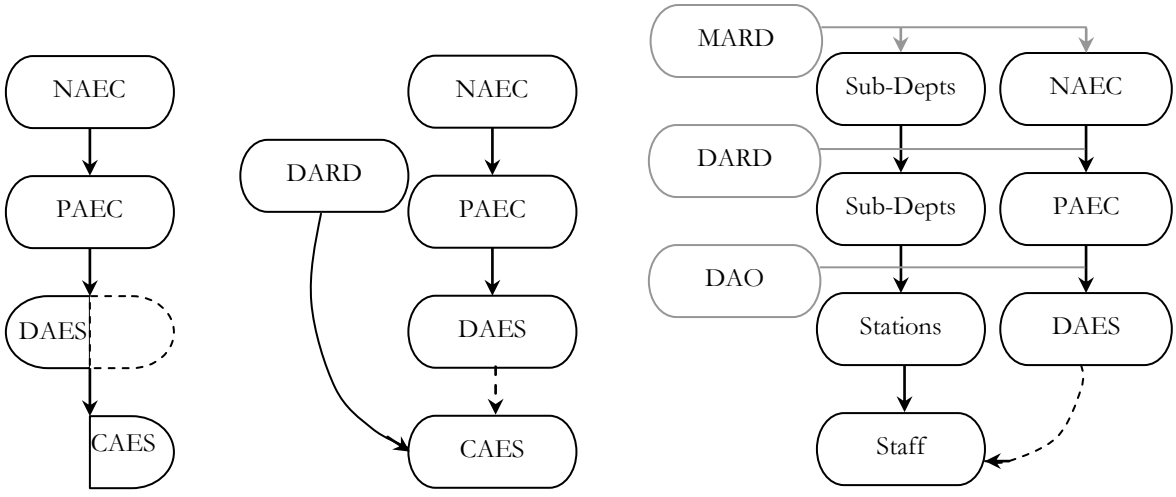
[39] Ironically still, the capital city of Hanoi is the provincial-level extension center recording the nationally largest staff number with 65 officials while Kon Tum in the Central Highlands has the smallest sum of 14 staff.

consisting of three main divisions: administration, advanced technology transfer, and information-training. The majority of provincial extension officials obtain a university degree and many with leadership positions have a master's degree or even a PhD. This qualification attainment is potentially increasing with quite a number of the current staff enrolling in postgraduate courses. Some of the officials we interviewed are involved in research or teaching activities at colleges and universities in the field of agricultural and rural development (see also Table 3.4). With a mounting well-educated staff, several provincial centers are now, apart from their extension missions, able to engage in scientific research, rural vocation and extension training, and development projects and programs.

At the district level, 585 out of 648 districts in the country have established extension stations with 4,025 extension workers (12 percent). Undergraduate degree holders' account for approximately 65 percent. District agricultural extension stations (DAES) can be under the direct management of district people's committees (DPC), PAECs, district agricultural offices (DAO), or combined DPCs and DAOs. The majority of DAES in the Mekong Delta follows the PAEC as governing body model.

At the commune level, a total of 11,232 staff members (32 percent) are recorded countrywide. They are supposed to have at least a technical secondary degree, although as our interview data exhibit, several of them were promoted from the ranks of experienced farmers with a lower formal education attainment. They are paid by an allowance, fixed amount by contract, or ideally as regular government cadres; the two latter methods are most heavily used in the Mekong Delta. To keep communal extensions at a certain quality and salary standardisation, the formation of this type of local system is unconventional in the Mekong Delta. There are three main types of communal extension developed in the region (see Figure 3.2):

Figure 3.2: Three communal agricultural extension models in the Mekong Delta



Under DAES model *Under DARD model* *Under cooperation model*

Source: Own presentation

– Under DAES model: This is the most popular model in the Mekong Delta which can be observed in Can Tho, Hau Giang, Vinh Long, Tien Giang, etc. Communal extension staff is

"mobile" DAES staff. They are contracted with and paid by DAES, which allocates them to relevant communes. They work at the commune and have a meeting every two weeks at DAES where they report about the situational difficulties and offer suggestions related to the commune extension work. These communal extensions work hand in hand with a communal agricultural officer. In Hau Giang province, communal extensions work with two other plant protection and veterinary officers in a uniform communal technical team.

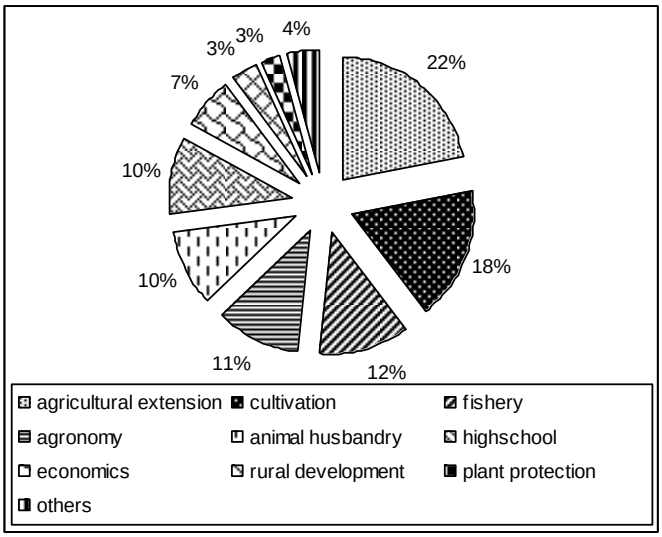
- Under DARD model: This model can be observed in Tra Vinh. Provincial DARD in cooperation with Department of Home Affairs recruits agricultural undergraduates to work in a commune's agricultural extension station (CAES). Recruits enjoy the rights and responsibilities of a provincial official. Often two agricultural staff members are appointed for each commune. They work with DAES extensions to conduct extension activities in the communes; however, they are responsible for reporting their work production to DARD through periodic meetings. They have to go back to the DARD office every two weeks for a plenary meeting. This meeting is organised in a large hall with the participation of 80–100 extension workers from all communes in the province. A microphone is used and information exchange is done through whole group. Weekly or biweekly reports are carried out via written documents sent to relevant agencies at the commune, district, and provincial levels. Despite their highly-qualified recruits, the downside of this model is that the extensionist are usually from other communes, so their relationship with the communities they are in charge of is loose and takes time to develop.
- Under cooperation model: This model was developed in An Giang. The province had for several previous years maintained an extension system from the provincial to communal levels. The discontinuance of communal extensions is determined by the withdrawal of district staff in the application of fixed budget and an increased organisational self-determination mechanism. At the same time it was aimed to promote inter-sector agreement that communal technical staff is paid by relevant state organisations (including plant protection and animal health) and can be utilised by and cooperated with extension workers from district and provincial levels in common tasks. With this change, it is ensured that commune's technical staffs enjoy the salary scale of a government official; however, effective cooperation is not always assured, as their main bureaucratic tasks are more prioritised rather than cooperative ones.

The lowest rank in the system, but the largest in proportion (over 50 percent), is the village-level extension, according to the NAEC's categorisation. This network is especially important in remote and ethnic minority regions, where extension services become less accessible both geographically and culturally. However, the inadequacy of capacity-building and incentive policies has prevented the network's reaching maturity. In the Mekong Delta, the operation of village-level extensions has been nearly frozen, largely because of the lack of governmental budget support. Village technical collaborators under the plant protection and animal health departments have experienced better support and are paid by participation in disease outbreak activities or in the main rice growing months. Examining its ideology-based formation versus in-practice support and operation, I question the inclusion of the village extension network into the "professional" extension system. Implementing Decree 02/2010/ND-CP (see Section 3.1) on grassroots extension development requires human development strategies with systematic support from all levels, but even similar difficulties are not presently well-addressed at the commune level. Otherwise, such inclusion is a mere index-based supplement for self-congratulation.

The last two decades have witnessed the improvement of extension human resource in various aspects. It is clear that there is a numerical increase in university and postgraduate degree-holding staff. At

NAEC and PAECs, more than 75 percent of staff have a university degree, while several seniors from national and provincial centers further their technical skills by obtaining masters and doctoral degrees and advance their engagement in academic activities. District and communal staff usually take college or university courses with a specialisation in agricultural extension as full-time or in-service modules with partial or complete funding from their organisations. For example, Can Tho PAEC has created a professional education program in cooperation with Nong Lam University in HCMC to send their local staff for intensive extension training. Thus despite the prominence of the local extensionist's professional departure of amateurism (*tay ngang*) (Interview 297, male, researcher, Can Tho, 15.12.2011), an augmentation of staff with agricultural extension background is visible in several provinces (see Figure 3.3).

Figure 3.3: Academic background of local extension workers in a Mekong Delta province in 2010



Source: Own presentation, data from a 2010 PAEC report

Thus, the extension human resource picture described by Poussard in 1999 currently becomes more vivid with diversified sources, fields, and levels of knowledge. Nevertheless, the educational gap he suggests must be filled remains a fully valid concern, especially when extension spans integrated agricultural and rural development:

> "Traditionally, technical advisers in cropping, horticulture and animal husbandry have agricultural, veterinary or agricultural engineering training at university or agricultural college level. Vietnam has a number of universities and colleges specifically dedicated to agricultural and forestry education and research. Many senior staffs have higher degrees, usually obtained from Eastern European universities over the last 20 years. Few have training in extension theory or practice, other than general communication skills like public speaking and writing technical information.
>
> The need for training in psychology and sociology is recognized but to date few on-ground staff has such training. Group extension methods are limited, with most advisers providing a one-way flow of technical knowledge. There is also a need to train advisers in modern agricultural technology, including biotechnology, plant and animal protection, soil conservation and land management, mechanized harvesting and drying, post-harvest protection and marketing. Pressure is mounting on the need for 'clean and green' production, which until recently has not been an issue" (Poussard 1999, 127).

Equally important, the inter-level gap is in widening. As evidence shows, human resource and staff development are significantly concentrated at the upper levels. Unlike a state management organisation, agricultural extension relates information and knowledge-based services between on-ground extensions and farmers, making the strength of local direct extensions and their capacity decisive to success or failure of extension advisory services.

> Our interviews with communal extensionist have revealed most of them are informed about local agricultural development situations to the higher levels and rarely instruct in a course. A PAEC senior explained: "Every commune on average organises four to five training courses and workshops with farmers annually, mainly with district staff as trainers. In some specialised courses or creation of "solemnity", trainers can be invited from provincial centers or institutes and universities. With external trainers, courses will be more effective because local extensions are familiar faces with local farmers and no man is a hero to his valet (*but nha khong thieng*)". While specialised external experts are importantly needed, I would argue it is not the familiarity of extensions that counteracts local interests and extension service efficiency. If there is something like such an element, it could be the familiarity of unproductive services and connections with local extensions that farmers have undergone. A DARD senior commented that: "several communal extension workers, because of their weak capacity and extension skills, talk for hours with farmers without conveying any new understanding to farmers" (Interview 312, DARD senior, male, Vinh Long, 9.3.2011).

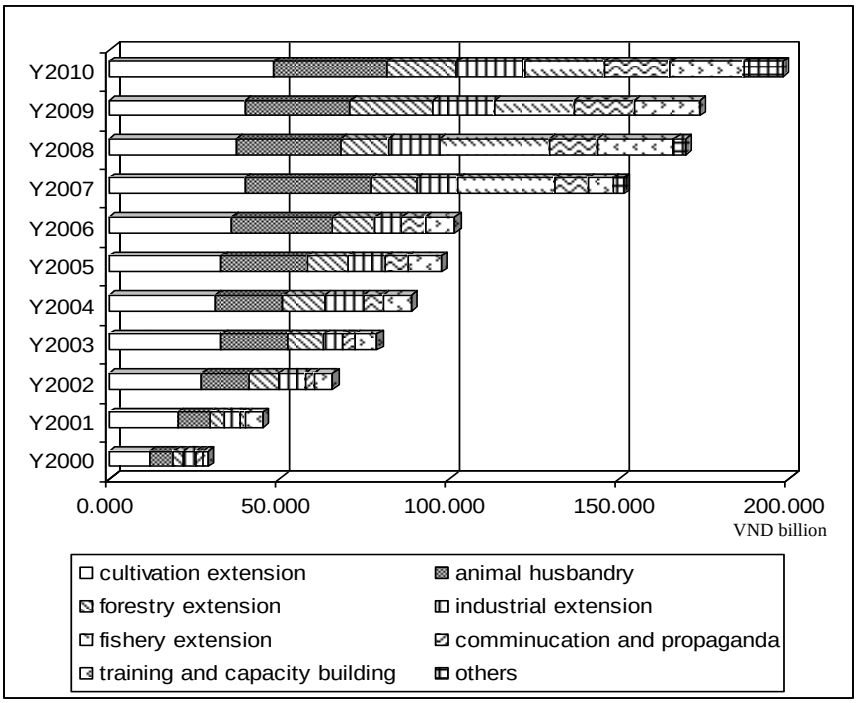
As evidence has demonstrated, mainstreaming local staff development has been fundamentally neglected in a hollow expansion of grassroots networks, resulting from the pursuit of the system's growing control through its extended coverage. Such human resource development deviation is a consequence of a "system error" by the replication of a state management system and its practices, and the invasion of centralised development and allocation of tasks, staff, and other resources including finance.

Financial sources: Centralisation and de-concentration

Financial sources for extension system operation come from central and provincial governmental budgets. The central budget over the past ten years has recorded an annual increase of 12 percent, making the 2010 funding nearly VND 200 billion (see Figure 3.4). The central budget is used for three main groups of activities: specialised extension model-building, communication and propaganda, and training and capacity-building. Accounting for over 80 percent of the total central budget, funding for construction of advanced technology demonstrations is prominent in cultivation, animal husbandry, forestry extension, industrial extension and since 2007 fishery extension, which are frequently distributed to local extension organisations. Although the decision-making process is less clear, budget allocation for provinces is greatly dependent on national priorities and local agricultural scales and comparative advantages, with an average of approximately VND 1 billion/PAEC/year[40].

[40] In 2011, for example, central budget despite a 50 percent reduction compared to the previous year because of project-based extension inception, is allocated to PAECs with various norms as follows: less than VND 500 million: 5 provinces, VND 500 - 1000 million: 23 provinces, VND 1000 - 2000 million: 27 provinces, and VND 1000 - 2000 million: 27 provinces, and VND 2000 - 3000 million: 8 provinces (NAEC 2012).

Figure 3.4: Issue-based allocation of the annual central extension budget



Source: Own presentation, data collected from NAEC reports 1993-2005, 2006, 2007, 2008, 2009, 2010

Central budget application and division processes are regularised financial transfers between NAEC as donors and PAECs as project receivers, but the main implementers are district and communal extensions. PAEC's proposed projects, if they are to reflect local demands, necessitate local need assessment, short- and long-term extension planning and strategies, which in turn depends heavily on the capacity of local extensions and obliges further resource allocation. Whereas, such applications are mainly regulated by fiscal timeframes and requirements whereas only funding use and output legitimacy is required by donors, which puts no pressure for demand-driven initiatives. Thus it is financially and professionally "safe" to develop a continuation of some repeated high-representative models of the province with possible added fad labels such as "high-quality", "biological safety", "safe and clean". Table 3.4 provides an illustration of this practice and finance-grounded extension result reports. The pressure is now relocated on the "success" of the demonstrations. Project beneficiary selection becomes model-biased and a large amount of funding from the provincial budget, from 30 to 40 percent, is invested in input and equipment support to ensure the failure-proof models (see next section for detailed analysis). One imperative phase within the project cycle being formative and summative evaluations go well beyond the scope of central financial management, and also become ignored in extension project implementation and reports, leading to empty lessons learned, based on feedback loops and questionable development impacts of engrossed extension efforts of all levels over years. Our review of annual extension performance reports submitted by PAECs and DAESs has established that the structure and contents of the reports are under a strong pressure of expense statement: how much is used, for what items, and who are the beneficiaries. Qualitative evaluation of such extension activities thus becomes overshadowed.

Table 3.4: Budget sources and activity allocation in a PAEC in the Mekong Delta (2004-2009)

Budget sources/ Activities	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Central	**554 mio**	**717 mio**	**772 mio**	**828 mio**	**759 mio**	**696 mio**
Pomelo planting	7% 10ha, 24hh					
Mango extensive farming	6% 10ha, 21hh					
Citrus extensive farming	16% 10ha, 20hh	19% 15ha, 150hh	19% 17ha, 85hh	21% 18ha, 90hh	14% 10ha,40hh	15% 10ha, 20hh + 6% Phase 2, 10ha, 40hh
Pig raising	17% 110pigs, 48hh	21% 165pigs, 91hh	24% 225pigs, 82hh	26% 270pigs, 78hh +2% Phase 2 of 2006	30% 144pigs, 50hh	29% 114pigs, 26hh + 1% Phase 2, 46pigs, 20hh
High-quality rice breeding	41% 155ha, 142hh	36% 180ha, 905hh	24% 105ha, 525hh	22% 130ha, 650 hh	14% 60ha, 65hh	13% 44ha, 44hh
Eucalyptus planting		14% 50ha, 50hh			7% 73ha, 73hh	4% 56ha, 71hh
Paddy straw mushroom farming		4% 60 tons, 12hh	12% 162tons, 324hh		7% 85tons, 85hh	6% 85tons, 85hh
Biological safety chicken raising			13% 9000chicken, 45hh	10% 8000chicken, 42hh		
Safe vegetable				17% 110ha,1100hh	7% 30ha, 60hh	7% 25ha, 50hh
Combine harvester					11% 2 machines	
Information support		2% 4.800 market bulletins				4% Extension festival
Extension training	14% 5 courses, 391 local EWs & farmers	4% 2 courses, 133 local EWs & farmers	8% 3 courses, 355 local EWs & collaborators	2% 1 course, 71 local EWs & collaborators	11% 3 courses, 90 local EWs & farmers	13% 3 courses, 90 local EWs & farmers
Provincial	**886 mio**	**1,043 mio**	**1,173 mio**	**1,292 mio**	**1,364 mio**	**1,469 mio**
Salary	22%	24%	30%	42%	48%	53%
Office expenditures, equipment, business trip fees, others	27%	27%	29%	21%	15%	16%
Training and workshops for farmers	6%	10%	6%	2%	3%	4%
Professional expenditures (seed supply, model aids, study tours, material printing, etc.)	46%	38%	36%	35%	34%	27%
Others	**74 mio**				**194 mio**	**74 mio**
Eucalyptus and fruit tree planting (MARD Department	40 ha, 40 hh					

of Forestry)		
Safe vegetable (DOST project)	45%	46%
Chicken raising (Under Food safety and sanitation program)		54%
Research on giant freshwater prawn (*Macrobrachium rosenbergii*) farming at different salinity levels(DOST project)	55%	

Source: Own presentation, data collected from PAEC reports 2005, 2006, 2007, 2008, 2009, 2010

Since 2011, the local budget allocation mechanism has changed. Instead of desultory technology transfer and training, PAECs have to submit longer-term budget planning and extension projects of two to three years for funding approval. Further, bidding has been applied to encourage eligible organisations of all types to be involved in central extension projects. In this inception year, among 89 approved projects worth approximately VND 187 billion, NAEC garnered 29 projects with 59 percent of the total funding, while another 25 projects at VND 44 billion were taken by under-MARD institutes, schools and centers, and the rest, including VND 32 billion funded 32 projects hosted by non-MARD organisations such as institutes, universities, associations, companies and PAECs (NAEC 2012). Such transformation brings about at least two certain positive factors: increased budgeting transparency and mobilised multiple knowledge sources into extension services. However, outcomes and impacts of extension projects again rely heavily on the extent to which projects fulfil their tasks over phases and how much they respond to and make use of local needs, participation, and resources and their cooperation with local extension organisations. Despite new opportunities created by transformational institutions, local extension systems have to re-design their both financial and human development plans in order to grasp them, as well as re-identify their service approaches and targets—this is not an easy mission where an extension system is embedded in state management structures and practices. For instance, in 2011, only two PAECs applied and were approved to preside over two centrally-funded extensions projects, which led to, as suggested by NAEC, MARD's further nomination of five PAECs with five projects, including one from the Mekong Delta (NAEC 2012).

What makes central funding important for local extension is not only its high proportion, normally making up to a half of the total local extension budget, but also its full spending for extension activities, not to mention its approaches and impacts. By contrast, the provincial budget is mainly applied to organisational expenses including salary, office and equipment costs, which have been recently increasing, for example as shown in Table 3.4 from 50 to 70 percent of annual financial statements over the last five years in one PAEC. Accordingly, training and workshops organised for local farmers have kept their low priority and tended to decrease in funding. This tendency has been widely observed in the Mekong Delta and possibly around the country since the introduction of per capita fixed-rate budget calculation (*khoan dinh muc bien che*). This financial policy has motivated internal cost-effective practices, which allows a share of saving among staff at the end of the fiscal year, but at the same time detrimentally discouraged active and effective organisation of training and workshops for farmers.

> One of our present difficulties is the lack of funding for training. With the three-year budget allocation tightly determined per head, now when we have to increase our number of staff leading to increased spending on salary, the budget reserved for extension activities is accordingly reduced (Interview 110, extensionist, female, Can Tho, 23.8.2010).
>
> Previously, we received photocopy refunds of VND 1000/participant. Now training and workshops are no longer covered, so if we need to do that, we have to pay all the cost ourselves. All I can do is to collect and distribute relevant leaflets to farmers instead (Interview 189, communal extensionist, female, Can Tho, 22.10.2010).
>
> With the current extension financial contraction, some local extensions have started to lose their working motivation and worked in a perfunctory manner (Interview 312, DARD senior, male, Vinh Long, 9.3.2011).

Reliance on a pro forma working mechanism beyond any doubt puts the entire extension system in danger of losing farmers' confidence, because it is local direct extensions who work with farmers on a daily basis, and their performance is the most powerful and direct depiction of the system. In the long run, professional work of local extensions could possibly turn into a ranking of administrative tasks. Knowledge-based service provision by local extensions could thus be effectively eliminated.

> The real situation of agricultural development in my locality is lively and thought-provoking. However, it is nonsense when thinking cannot lead to actions. I have developed some plans, but there is no available budget source I can access to realise them (Interview 170, communal extensionist, female, Can Tho, 15.10.2010).

To link with the above argument of neglected human resource building of grassroots extensions, insufficient financial investment is one of the main factors to discourage qualified staff. Most extensions with a university degree do not want to work in remote areas, but in offices from the district levels upwards (Interview 297, senior researcher, male, Can Tho, 15.12.2011). It even frustrates previous networking efforts when funding was unavailable. The current excision of communal extensions expansion, as earlier presented, in its models or of collaborator networks are among well-known examples.

> Previously we had a network of collaborators who had been selected from farmers and invited for short-term trainings; there was one in every village. On a daily basis, collaborators and the communal extensionist met for early-morning coffee and talked about the current situations of agricultural activities and difficulties of the areas they were in charge of. Periodically, the communal extensionist invited all the collaborators in the commune to have a longer discussion and deliver their monthly allowance of VND 30,000/person. From time to time, in training courses organised by PAECs, collaborators and local extensionists gathered and learned together and from each other for around one week. Training, accommodation, and travel expenses all were covered by the organisers. Such a training modality was very interesting and useful to us but has not recently been held because of lack of funding. For the same reason, since 1998 collaborator networks have been broken up. As a result, communal extensionists were distracted from professional work by information collection workload for upper-level reporting; this work had well been undertaken by collaborators (Interview 137, extensionist, female, Thoi Lai, 14.9.2010).

In short, the insufficiency of funding for extension besides a frequently-referenced meagre budget allocation is very much dependent on how well it is used. The problem lies first on the centralised system with its failure to distinguish between budget for the operation of the system with multi-leveled differentiation and that for the extension activities to serve the farming communities. Especially at the local levels, the overall increased budget means a small or even no investment increase in extension activities, because of increased operational costs. Furthermore, any unfavourable financial changes are

immediately transferred to grassroots extension workers and their services, such as cuts to salaries and extension incentives and consequently the destruction of local initiatives (see Section 3.4) because the rights and benefits of higher professionals as state officials must always be secured. Second, the over-budgeting on new technology demonstrations with lump-sum subsidy of agricultural inputs as participation profits while ignoring strategic and long-term training and capacity building makes extension work hover between both resource-poor vicious cycles of the system extensions are in and of the communities they work with, instead of making a breakthrough for community development impacts. Third, the dependence on upper-level budget distribution generates local extension with passive implementers. Nationally-funded projects with centralised priorities, application processes, and report requirements largely result in activities that see the state's agenda met rather than being responsive to local demand. The recent reform movement to open bidding as a significant step of decentralisation of national extension budget allocation, however, becomes no more than de-concentration among central organisations and local needs can still hardly be reflected in such top-down projects.

"Out"-networking and "down"-sourcing: Task implementation and communication

NAEC, as it is reported, co-ordinates every year with nearly 200 agricultural research, training, and communication agencies, organisations and associations and 63 provinces throughout the country to:

- Construct and promote approximately 3,750 demonstration-based models of technological transfer for agriculture and rural development in the fields of cultivation, animal husbandry, forestry, fishery, salt industry, irrigation, agriculture-forestry-fishery preservation and processing and rural vocational training. Such models are estimated to make a contribution of at least 15% increase in economic efficiency;
- Organise around 500 professional skill and knowledge training courses for nearly 5,000 extension workers and over 25,000 key farmers and compile an array of extension training manuals and materials;
- Implement information and communication activities on a regular basis on the NAEC's website with thousands of daily visitors. Make the publication of Vietnam Agricultural Extension Bulletin in 10,000 copies/36 issues/year delivered down to communes, villages, and agricultural extension clubs. Compiling and releasing millions of printed extension materials such as leaflets, pictures, brochures, tapes, and videos. Organise over 50 events like forums, contests, fairs which attract the participation of almost one million farming households;
- Cooperate with mass media organisations such as Vietnam Television, Voice of Vietnam, Vietnam News Agency, and Vietnam Agriculture Newspaper to propagate the party's and state's policies and strategies, as well as disseminate knowledge and good production models nationwide;
- Coordinate and manage international cooperation and projects. The main projects are extension capacity building (funded by the Asian Development Bank (ADB), agricultural science and technology, sustainable development of aquaculture (Danish government), GAP application in aquaculture (funded by the Spanish Agency for International Development Cooperation (AECID)
- Integrate extension plan into national rural development programs such as new rural construction (*nong thon moi*) or vocational program for rural laborers.

Source: Compiled from NAEC website www.khuyennongvn.gov.vn

The central-level extension tasks are mainly networked and implemented with three main groups of actors: international agencies, central organisations and PAECs. International projects are coordinated by NAEC and conducted in selected provinces as beneficiaries based on designed log-frames.

Beneficiary groups can be local extensions or groups of farmers who easily specify positive short-term outcomes of the project on their own and the community's development, but not for long following a project's conclusion, because of poor information delivered to the beneficiaries and follow-up activities.

> We talked to several farmers who were actively engaged in extension and development projects. Our conversations always awoke reminiscences of a good time the farmers had a chance to learn new things, meet with new people and even inter-city study tours. Through courses, they learnt about new farming technologies and new production practices as well as how to mobilise collective efforts for their development. They showed us piles of learning materials they collected during the project's training, carefully packed and tied, though fully covered with dust and cobwebs. They no longer read and used such materials since the project had ended, because they could not do anything without funding. They returned to their normal farming activities as they were before the project (Fieldwork diary, Can Tho, 03.11.2010).

The second group is central organisations, including research with which NAEC produces and disseminates knowledge for local extension capacity-building as well as specialised know-how for farmers.

> Extension training materials is a crucial capacity building tool for extensions at central and local levels. For several years, NAEC has cooperated with many foreign and national experts from research institutes, universities and organisations to compile series of materials on professional and technical issues. Every year, more than 10 publications are made available with improvements in both form and content, focusing on extension methods and skills such as organising training for farmers or formation of community organisations, and agricultural subsector-specialised technologies. Publications in simple language, adult learning-tailored style, multisector-covered contents and short and long-course formats have satisfied local needs for extension materials (MARD 2008).

However, central-published training materials face two challenges in terms of their local relevancy and timeliness. The biases of Northerner's farming models and a Hanoian accent in distributed extension programs deter the interest of and distract the target audience and potential users from other regions, including the Mekong Delta. As dissemination channels rely on extension systems and mass organisations which often stop with their leaders, members, and well-connected farmers, marginalised communities over time seem to be left with widening information and knowledge gaps. Also, since such materials as handbooks try to include core and basic knowledge, the dynamics of local application in practice can hardly be captured, making them a good source of reference for new recruits but rapidly out-of-date in professional improvement courses.

> Our city provides annual improved professional training courses for local extensions. All training materials are delivered by NAEC in Hanoi and have become outdated when reaching us. Thus our participation in such courses becomes a get-together for amusement with little learning of new things (Interview 195, female, extensionist, Can Tho, 23.10.2010).

The third group includes PAECs, who indeed take over the tasks of the construction of advanced technology demonstration in their localities, via either top-down allocation or contract-winning mechanisms, and local knowledge and skill training courses. The above-reported number of transfers and training courses is in fact the raw sum of work performance at the local levels.

At the provincial level, there are six main groups of "outside" organisations identified to have worked closely with PAEC in agricultural extension (see Figure 3.5). The first group is related to central-level

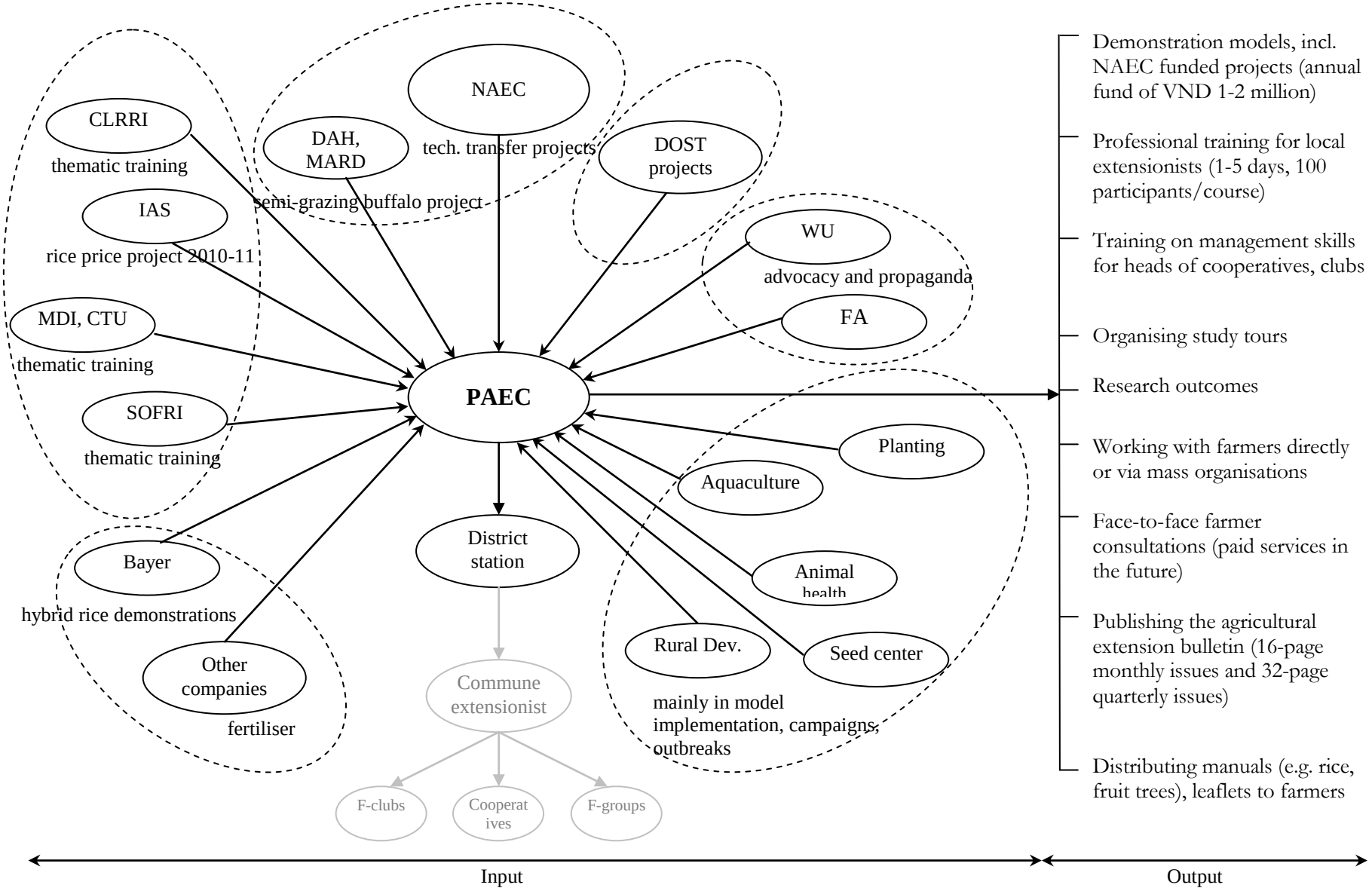
organisations such as NAEC or MARD departments. NAEC on a regular basis allocates annual or three-year planned funding under project contracts, sometimes accounting for half of a given PAEC's overall budget. By contrast, implementing projects with MARD departments is very much dependent on site and beneficiary selection decisions made by project designers, which are frequently the donors and national partners.

The second group includes provincial DARD sub-departments and agricultural centers dedicated to seed development and supply. Four main sub-departments include plant protection, animal health, fishery, and rural development. While the first two sub-departments have comprehensive networks from national to communal levels plus volunteers at villages, the latter two are halted at the provincial level only. In some provinces such as Can Tho, fishery extension remains with the fishery sub-department, whose district organisations based on real needs may be set up at the district level individually or in clusters of nearby districts. Provincial sub-departments, despite their state-management position, robustly take on specified extension work, mostly within their system and networks. The horizontal cooperation between extensions and sub-department officials becomes identifiable especially in mutual campaigns or pest and disease outbreak situations.

The third group is universities and research institutes. They are the main source of trainers and lecturers for capacity-building and training of both local extension workers and farming communities. Provincial extension officials are also research partners in relevant projects. The fourth group shows the emerging connection with the provincial Department of Science and Technology (DOST) through which extension integrated applied research projects are applied for, approved and implemented (see Table 3.4). The involvement of PAECs in local research activities is a result of human development over the past decade and suggests fundamental orientations for knowledge-based extension system development.

The fifth group comprises mass organisations, prominently the farmers' association and the women's union. Apart from their own projects, thanks to their broad membership coverage, such mass organisations are very helpful in gathering farmers and mobilising collective efforts in extension programs. The sixth group includes the private sector. Usually, cooperation is achieved through demonstrations of new seed varieties, fertilisers, or pesticides introduced by the firms. Larger projects can be developed in line with governmental policies or priorities, such as the quadruple association model (see Section 5.2). However, the cooperation is based on a superficial relation in which extension organisations provide any possible assistance to encourage farmers' participation, while all other procedures from technical to farmer-relational are determined by the companies involved.

Figure 3.5: The input-output network of a provincial agricultural extension center in the Mekong Delta



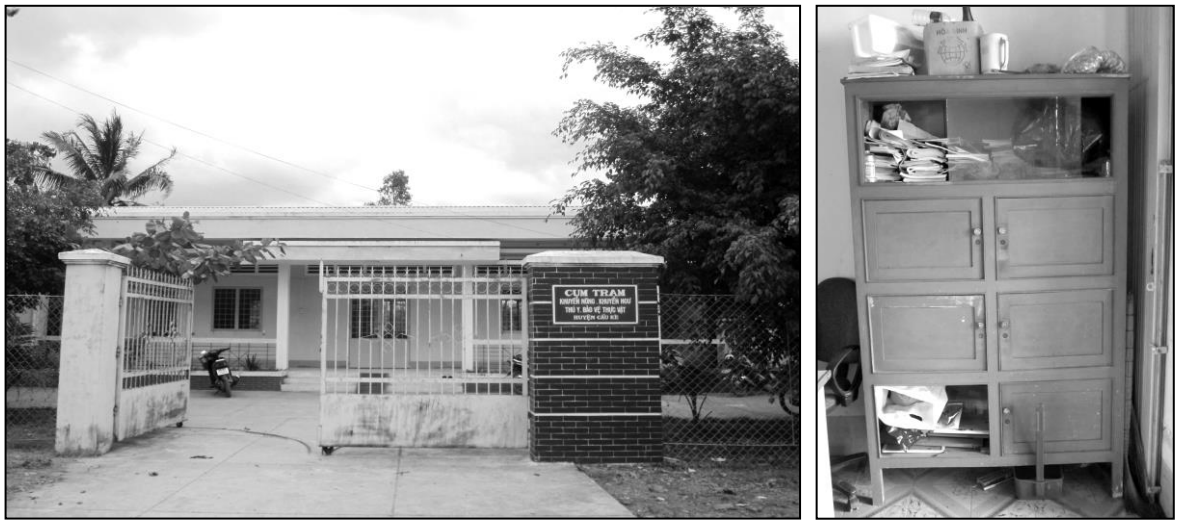
Within such large networking, outputs of PAECs vary from research, education, and extension areas. Main extension outputs include monthly extension bulletins, training courses, and technology transfer models. Once again, while training is mainly provided by PAEC extensions, construction of demonstration models continues to be down-sourced to district and commune staff.

> The majority of the provincial extension budget is distributed down to district stations. Every month we have a meeting with heads of all that DAESs to hear about (1) what they did over the past month: achievements, unmet tasks, and challenges, and (2) what they plan to do in the next month. Based on the plan with proposed extension and training activities, they will ask for funding (Interview 301, extension manager, male, Can Tho, 02.03.2011).

Thus the local relevance of the project is only one factor to its success; the other of equal importance is the management capacity of a PAEC and conducting capacity of involved grassroots extensions, whose role is completely neglected in the current discussion of design and implementation of central and provincial extension projects. The management tasks of a PAEC should not only be connected with NAEC as a donor in an individual project's application and reporting, but managing projects should aim for development impacts through strategic planning with grassroots extensions and local communities, and maintain communications among project sites for knowledge sharing and learning purposes, though current human and financial development mechanisms do not support such long-term efforts.

At the district level, it is revealing to focus on the narrower but closer network of agriculture-working offices. Quite commonly, because of their precise organisation, district offices including agricultural extension, fishery extension, plant protection, animal health, and sometimes water management are usually clustered into an administrative precinct in a chain of detached or semi-detached houses (see Figure 3.6a). These offices have two or three computers to share among officers, typically centered on a long table and with chairs arranged for biweekly plenary meetings with all extensions from the district office and district communes. Our observation of the working conditions of local extensions clearly indicates the insufficient infrastructure and equipment for extension work, which greatly hinders the performance of knowledge and information circulation, despite whatever counter-argument can be made that other state offices have the same conditions. How can we promote learning among extensions and effective knowledge diffusion to farmers when extension and training materials are untidily kept in broken cases (see Figure 3.6b)? Can it still be possible to further our discussion of management of knowledge storage and sharing in such a low-tech working environment? My point of view is that knowledge management in Vietnam's local agricultural extension context indeed should start to deal with those ground-floor issues within each office and project before a linkage to knowledge contextualised in integrated projects and multi-levelled organisations.

Figure 3.6: (a, left) A district's agriculture sector cluster comprising the offices of agricultural extension, fishery extension, plant protection, and animal health, (b, right) A cupboard bookcase to hold extension materials at a DAES



Source: Author 2011

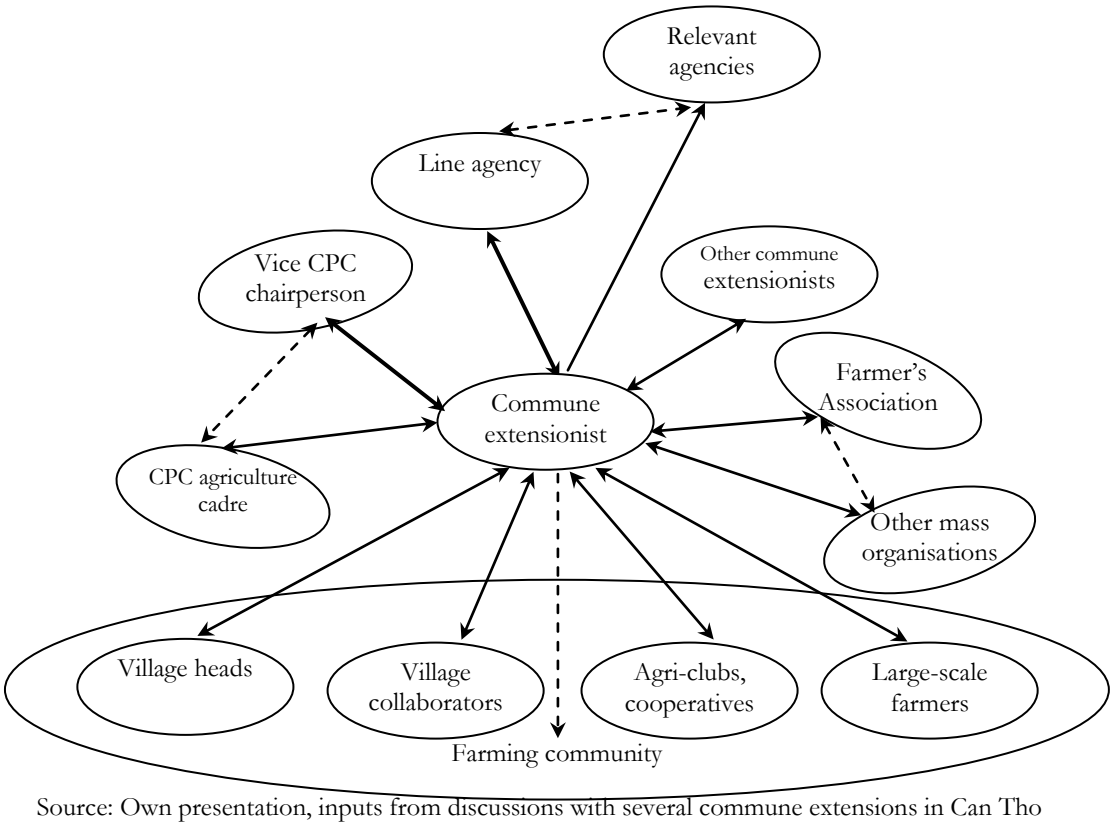
The clustering as a distinctive feature of the district's agriculture-related agencies in the Mekong Delta provide opportunities for increased acquaintance among inter-organisational staff, but increased knowledge sharing needs interactive space. As with provincial organisation interactions, mutual learning only takes place when joint forces are required in situations such as common campaigns or pest and disease outbreaks. In an everyday context, as we observed, a one-story house design with doors open to a shared yard, sometimes attached to a coffee shift shop is an appealing, stimulating context for officers from different agencies to congregate to talk, work together, and share ideas. A provincial extensionist who has moved to a new office in a huge multiple-floor building commented that unlike before, officers tended to be less sociable and stayed in their self-contained space behind often-closed doors (Interview 305, extensionist, male, Hau Giang, 07.03.2011).

> We visited a DAES cluster on a late morning, when extensions had just finished their every two week meeting. As usual, taking advantage of this occasion of commune and district extensionists together, they were preparing lunch as a small party together. Other officers were also invited. Like members of a big family gathering after a time, without senior and junior difference, while preparing food, they talked, laughed and shared funny and unhappy field experiences. More serious extension work topics were also commented on and discussed (Fieldwork diary, Can Tho, 08.11.2010).

The clustering despite poor infrastructure but with an open structure positively creates a favourable environment for knowledge-sharing and mutual learning. Such informal interaction and learning are important in regard to a lack of formal capacity-building programs and challenges of subtle and explicit knowledge provision. District extension managers, without much externally-dependent financial investment, thus can still foster informal interactive modes and create more (inter)-organisational learning practices by arranging periodic knowledge-sharing sessions either separately or integrated into administrative meetings. Nevertheless, a change-resistant leadership due to either a bureaucratic management style or low management capacity will not easily support these non-assigned and time-consuming jobs.

At the commune level, in parallel with the involution of grassroots extension tasks discussed earlier, the extension network of a commune extensionist are depicted in groupings of vertical, horizontal, and local community relations (see Figure 3.7).

Figure 3.7: A simplified extension work network of a commune extensionist



Source: Own presentation, inputs from discussions with several commune extensions in Can Tho
(Note: - - - - - - - Transitive relation, ——— Direct (normal) relation, ——— Intensified relation)

Commune extensions often have two strong connections with (1) their line agency, either DAES, DARD, or DARD sub-departments like the models presented in Figure 3.2, and (2) the CPC vice chairperson responsible for agricultural (rural areas) or economic (urban areas) development. Commune extensionist and higher management communications are maintained through biweekly meetings with all other local extensions in a district or province, monthly submissions of completed form with approval by the Commune People's Committee (CPC), and via weekly or urgent telephone conversations. Our interviews and local report analysis reinforce that reporting emphasises provision of data on the local agricultural development situation and how the funding has been used. Such data are certainly necessary but not sufficient for locally-adjusted planning. The report often ends with a few lines of work assessments and recommendations, but as noted by a commune extensionist, it is to complete the form rather than develop thoughts or due reflections, because none of them are taken seriously:

> Our difficulty is that we only know one plus one is two. When receiving local needs, we make a report as such to the higher level who answer that those needs are not in the program; what can we do then? Recently, local communities' wish to extend their coconut areas has been sent to DAES and then PAEC. PAEC replied that they are supporting a citrus program, so only citrus and not coconut plants are provided if we want them (Interview 234, extensionist, male, O Mon, 8.11.2010).

Even with training courses, important evaluative issues related to participant selection, contents and methods, local need satisfaction, and lessons learnt are never collected and saved. If it is not a financial requirement, perhaps a list of participants is not made, because managers care about and request statistical evidence only:

> - Researcher (R): For workshops and trainings organised in the commune, do you keep track of participating farmers and evaluations of the sessions?
> - Commune extensionist (CE): No. But I always have a list of farmers to be signed for allowance receipts and send it to the higher agency for reconciling the balance (Interview 263, extensionist, male, Phong Dien, 29.11.2010).

It would be mistaken on one hand to forfeit the quantity and quality of workshops and trainings that farmers badly need, as expressed in many of our interviews with them, because of fixed budget allocation mechanism supported by the frivolous review that the increased training number has not led to effective technology transfer, without appropriate judgments on how the courses have been organised and what methods have been used. The declining interest of farmers in training on the other hand must be carefully investigated and responded to with improvement rather than a simple withdrawal of the programs. It becomes clear that the roles of misperception of, low investment in, and misuse of the commune extension workforce within the system keep them occupied with simple administrative liaison work, in contrast with local expectations on their extensions as everyday problem-solver and advisors, a situation that predicts a high potential trust lost if commune extensions are not capable of serving local needs. Thus, the most challenging element of commune and higher level extension communication does not lie in how much information and knowledge are communicated between commune extensions and line agencies, but rather depends heavily on the degree to which ground-level needs and suggestions are mediated and realised in real-life practice. Otherwise, the system's paradox further emphasises perfunctory work and, more gravely, an inertia in thinking about work, knowledge sharing and diffusion, since what their repeated suggestions receive is a constant retort of "Here you go again" (*biet roi, kho lam noi mai*), which sooner or later leads to the ruination of agricultural extension as a knowledge- and technology-based diffusion system.

> R: What would you recommend for the improvement of the extension system?
> CE: You should ask higher levels because they have data about budget, work force and salary on which they make decisions while we work on their instructions. We have no ideas on extension development plans.
> R: What are your recommendations from your own experience?
> CE: We did make proposals such as those related to farmers 'training on pig raising for villages in need. It is not up to us to make recommendations for funding or development orientations. The higher levels can give you answers for those concerns (Interview 263, extensionist, male, Can Tho, 29.11.2010).

The second strong working relationship of commune extensions is with the CPC vice chairperson in charge of agricultural or economic development issues. The vice chairperson approves local agricultural development plans and extension reports that are submitted to higher levels. The effectiveness of professional cooperation relies greatly on the vice chairperson's capacity, experience, and priorities when it comes to agricultural development:

> I actively participate in any local affairs but I do not receive any co-operation to complete my work. Only the relationship between extensions and farmers is explicitly steadfast. Extensionists are likely to be pioneers in local affairs but their voices are often neglected. Obviously, it often emphasises an important role of extension workers in most meetings; however, they have not yet raised their voice in the People's Committees of the communities that they are working for and with. As extensions are seemingly disregarded, they tend to be very passive in the People's Committees. I sometimes give consultations to my boss about agricultural production but whether she takes it or not depends on her mood (Interview 189, extensionist, female, Thot Not, 22.10.2010).

In many cases, capable commune extensions with their intensive knowledge and wide network are the backbone of the commune's agricultural development management. Horizontally, they work closely with the commune agricultural officer, farmer's association, and other mass organisations, as well as extensions from other communes. The commune agricultural officer differs from an extensionist in focusing more on agricultural infrastructure management such as irrigation systems, village road and bridge construction, and the rural electricity supply. With an under-MARD model (Figure 3.2), the tasks of the commune agricultural officer and the commune extensionist are assumed by two cadres paid by and sent from DARD. The working relationship between a commune extensionist and the commune's farmers' association (CFA) is enhanced by appointing a commune extensionist as a permanent member of the CFA standing committee comprising a chairperson and vice chairperson. Such a role aims to help a commune extensionist easily mobilise local participation for extension activities, a key CFA mission and a strength of the CFA. In addition, a commune extensionist cooperates with other mass organisations in the commune to undertake specific programs for the benefit of those organisations' members. However, in several cases, from my interview data, a commune extension was not fully informed about CFA activities, and consistently the support from CFA was not always effective because of their own workload, low allowances, and low motivation for cooperation:

> I have the feeling that there is a weak connection among agricultural agencies such as extensions, irrigation agents, and the farmer's union. For example, I am not informed about the list of good farmers approved by the farmer's union (Interview 189, extensionist, female, Can Tho, 22.10.2010).

> The commune's People's Committee and farmer's union seem to shift their all agricultural tasks and responsibilities to me. I work with all delegations on agricultural issues. And the farmer's union asks me for information related to agriculture development situation. However, when I visited fields and requested their accompany, they joined me only unwillingly and many complaints. This is understandable because of their low allowances of about VND 100,000/month. Once, a farmer's union leader confided in me that he had to ask his wife for petrol money every morning. Since then, I've started to do all the work by myself. I guess if they were better paid, with their enthusiasm, they would work harder (Interview 170, extensionist, female, Can Tho, 15.10.2010).

Another important knowledge-sharing channel is among commune extensions themselves. Through biweekly meetings with all extensions in the district, updated extension information and policies from higher levels as well as effective farming models from other communes are circulated. Informal interactions among colleagues improve the knowledge capacity of junior extensions in a context of poor communication facilities:

> In meetings, heads of extension stations update information and assign tasks to commune staff (Interview 189, female, commune extensionist, Can Tho, 22.10.2010). The implementation process of effective production models is presented in details by commune extensions in charge and other extensions provide constructive suggestions for possible improvement (Interview 204, male,

> commune extensionist, Can Tho, 27.10.2010). Unknown diseases and unanswered questions asked by farmers are brought for collective discussion and proposed solutions and answers (Interview 97, extensionist, male, Can Tho, 21.8.2010).
>
> Junior extensions lack practical knowledge that can be supplemented from seniors and friends. Such knowledge sharing can take place in informal conversation or social settings. The contents of such talks are daily working problems, extension methods and local innovations. For example, planthopper control by cultivation scheduling and water level mediating will scarcely be applied in practice unless theoretical and practical knowledge is integrated through such informal knowledge-sharing (Interview 92, extensionist, male, Can Tho, 19.8.2010).

Unlike extension at higher levels, commune extensions have the closest relations and everyday contacts with farmers in the communities under their charge. The modes of extension-farmer interactions will be discussed in details in Section 3.4. However, in general, as shown in Figure 3.7, commune extensions prioritise their work with representative rural groups rather than with the participation of entire communities. Representative groups mean key farmers, model farmers, or early adopters under the terms of technology transfer; however, they are the large-scale and rich resource farmers and members of agricultural clubs and cooperatives which accounts for only a small minority of the community, leaving the majority excluded and hoping merely for trickle-down effects (see below). The reason is that commune extensions have to be responsible for a large land area, while insufficient resources are allocated under the pressure of models that must succeed.

In short, two conclusions should be highlighted in this section. First, given the human and financial resource concentration and decision-making centralisation, the central and provincial levels have developed a large network including donor and research partners for extension policymaking and planning while the districts, especially commune extensions, as dependent systems become weak and passive implementers of down-sourced tasks and mere information providers of local development situations. There is no acknowledgement of their important roles of direct and everyday knowledge-exchanging and trust-building with local communities, which is the vital purpose for the existence of the entire extension system. In this bureaucratic structure, transformation can hardly happen if it is not made systematically from the top down. Minor changes in everyday practices at the local levels to support knowledge-sharing and learning, however, can create more effective performance and service delivery. This would perhaps provide opportunities for building democratic learning from within a bureaucratic structure, which I would argue is best done at the grassroots level first. Second, upward communication among extension levels is well-established within a hierarchical extension system though local-need reflections on pre-designed programs are often ignored and cooperation among agriculture development agencies and associations seems to be unconsolidated and unsophisticated. The socialisation of extension work is first and foremost sustained by a strong core of locally-responsive extension workers and effective cooperation among organisations is its second layer. Otherwise, a centralised extension system with bureaucratic practices might become a paralysed service provider and extension becomes simultaneously everybody's business but nobody's business.

The concept of bureaucratisation, as reviewed and developed by Evers (1987), can be approached from four main aspects:

- Growth of governmental personnel in number (Parkinson);
- Increase use of formalised, rational principles and procedures through government administration (Weber 1921);
- Extension of overall government control (Orwell 1984);
- Development of bureaucrats as strategic groups[41] (Evers 1987);

Accordingly, bureaucratisation as a process can be differentiated by (i) characteristics: "hard" issues (the growth of governmental officers and organisations) and "soft" issues (the increased administrative principles and in use), (ii) intensification: runaway (e.g. rapid growth of bureaucracy as the result of political unrest or revolution or bureaucratic capitalism (Evers 1987) and silent (calm and constant bureaucratisation over time), and (iii) scale: such as entire state control or strategic groups. The bureaucratisation of the extension system as above analysed tends to follow a soft and silent process. Though there has been an gradual annual increase of staff at all levels, with a rapid growth after the issuing of the main Government Decrees (see Tables 3.1 & 3.2), the development of the local staff is dependent on provincial budgets that are substantially allocated for salary and subsidy for farmer's participation in new technology transfer models, making it insufficient for effective extension activities. The central level, through its resource concentration, centralised decision-making, and task downsourcing, coupled with cumbersome administrative procedures and communication mechanisms, have configured bureaucratic management structures and practices of the current extension system in Vietnam and the Mekong Delta.

The analysis above has made it clear that extension tasks of all levels, besides new technology transfer, aim to provide reports on local agricultural development situations for state management and planning, and enhance farmer's awareness of relevant state guidelines, policies, and laws, which effectively means an increased emphasis of government control on agricultural and rural development issues through extension work. Moreover, the active formation and operation of strategic groups at higher levels to maintain their power over extension resource management have been more blatant with their proposed re-establishment of state management functioning and structuring. For example, the 2012 NAEC report presents a detailed account of one-year achievements and challenges with a demonstration of the advantages and disadvantages of the newly-introduced bidding system for the national extension budget. It highlights the need for a professional organisation capable of fulfilling state management functions at the central level while at the same time providing guidance and instruction for the operation of local extension organisations over the whole country. The report recommends:

> Putting forward a proposal to the Central Government for an approval of the establishment of the Department of Agricultural Extension (*cuc khuyen nong*) under MARD as the head organisation to assist MARD in state management of agricultural extension nationwide (NAEC 2012).

[41] Strategic groups are defined as quasi groups whose members are, however, united by one common goal: to secure and share present and future chances to gain access to and appropriation of resources and resource distribution through actively developing and promoting their own strategies and economic or political goals (Evers and Gerke 2009). Major strategic groups in modern Southeast Asia might include civil servants, the military, teachers, professionals, and Chinese businessmen (Evers and Gerke 2009).

The reinstatement of NAEC as a department under MARD as it was in 1993 (see Table 3.1), if realised, would surely sustain the central power and bureaucratic structures and practices, while any positive change for local extension systems and extension services are still uncertain. Though further research is needed on resource manipulation and redistribution tactics among these strategic groups[42], what is clear for us is that being embedded with the state bureaucracy at high levels secures their power in extension resource management within and beyond the extension system (see Section 3.4).

3.3. "Peel feet to fit shoes": The bureaucratisation-embedded extension work

Against this background, this section concentrates on how extension work is delivered within such a bureaucratic structure. It will analyse conventional extension approaches, their impact on target beneficiaries, and the application of participatory methods as alternatives. The underlying argument that comes out from this section is that the bureaucratisation of extension work is built-in and ossified within the bureaucratic extension system.

"One-size-fits-all" transfer

Our field-research data indicate that there are at least six extension approaches in Vietnam, including the Mekong Delta (see Table 3.6) (cf. Thai Thi Minh, Larsen, and Neef 2010; Thai Thi Minh, Neef, and Hoffmann 2011). Extension activities within the government extension system are very keen on technology promotion though programs of advance technology transfer. The budget of such extension activities comes from there main sources: national target programs, NAEC, and PAECs, which greatly regulates and orients approaches of to extension implementation. As discussed earlier, influenced by the top-down and hierarchical extension structure, in order to obtain central funding local extension divisions have to "adapt themselves to meet the criteria without consideration of local needs and ecosystem suitability" (Nguyen Ngoc De, Uchiyama, and Ohara 2005, 85). Under the pressure of a short-term project framework to build successful models for trickle-down effects, larger-scale, better-off and technology-progressive farmers are best selected as model farmers. Beyond input subsidy for the model construction, on-site training and public lectures on project and its achievements are organised. As the success of the model is rationalised by attractively visualised economic parameters such as yield, the underlying assumptions of technology development, the viability of the model in case of contextual change, and its sustainability values are simply neglected.

The second approach is socio-economic development, which concentrates on appropriate farming technologies for disadvantaged communities. In fact, this component belongs to a larger comprehensive state program to support poor villages, as categorised by the government. Especially important in this type of project, the innocent and naïve adoption of everyday technology transfer

[42] An experienced technology transfer professional has commented that the allocated funding from above downwards is undergone a loss (Interview 297, male, senior researcher, Can Tho, 15.12.2011). Recent disclosed cases of budget misuse of Japanese or Danish ODA for road construction and development research projects have increased public suspicion about the transparency and effectiveness of current centralised resource managment mechnisms in Vietnam.

techniques without an understanding of the socio-economic conditions of the target population cannot produce appropriate and applicable models, despite a full input subsidy. Such requirements challenge to a great extent the conventional technoeconomic-transfer based extension.

> We have also conducted extension activities under the state's program of poverty reduction. Our target farmers are the poor with a certified poor book (very poor households). However, such farmers do not have (field) land, which has obliged us to select marginally poor households. When marginally poor households are lifted up, very poor households will follow. It is very difficult for us to support the participation of poor farmers with low education and low awareness. Many of them cannot read and write, while our program has promoted crop-long diary keeping. All we could do was use drawing and video programs (Interview 137, extensionist, male, Can Tho, 14.9.2010).

The third approach, which is not discussed in Thai Thi Minh, Larsen, and Neef (2010) but is emerging in the Mekong Delta, is applied research implemented by PAEC extensionists under funding from DOST (see Table 3.4 & Figure 3.5). Yet, the way knowledge is transferred to target communities remains model farmer-based.

Table 3.5: Six main extension approaches in Vietnam

Extension approaches	**Implemented by**	**Target farmers**	**Contents**	**Methods**
Technology promotion	State extension system	Model farmers, all farmers	Advanced farming technologies (of all farming system)	- Demonstration models with input subsidy - Training and lecture
Socio-economic development	State extension system (farming technology component)	Model farmers, farmers in marginalised areas	Advanced farming technologies (of farming system applicable	- Demonstration models with input subsidy - Training and lecture
Applied research	Provincial extension centers	Model farmers, all farmers	Advanced farming technologies (of all farming system)	- Demonstration models with input subsidy - Training and lecture
Risk mitigation	Plant protection system	Model farmers, all farmers	Techniques for risk mitigation	- Demonstration models with input subsidy - training and lecture - Mass media
Agricultural commodity promotion	Agribusiness in the assistance of Extensionists	Large-scale and area-connected farmers (via contract farming)	Advanced farming technologies for high-quality agricultural production regions	- Training - Input service and credit provision - Legal consultation
Commercial services (input supply)	Extensionists as sales agents	All farmers	Guidance on use of inputs supplied by the companies	- Demonstration models with input subsidy - Mass training and lecture

Source: Own presentation, developed from Thai Thi Minh, Larsen, and Neef (2010) on own fieldtrip data

The fourth approach to risk mitigation mainly deals with pest management and crop management. Plant protection systems, through international research and development cooperation and their strong six-level network down to every village, have taken the lead in promoting pesticide use reduction and integrated pest management (IPM) (see section below). Although demonstration models with input subsidies are used, what has made these programs reach large audiences is the use of mass media from posters to infotainment radio soap operas and television series. The fifth and sixth approaches tend to be linked with agribusiness. Agricultural commodity promotion through contract farming is supported

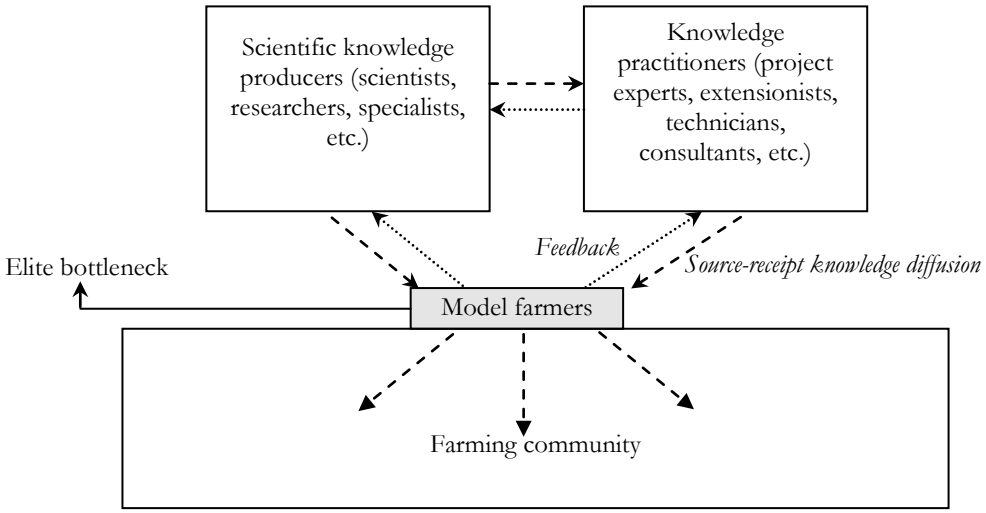
by the government's policy (Decision 80/2002/QD-TTg, 24 June 2002). The role of extensionists here is extended from technology transfer to linkage agent between companies and farming communities and legal consultant relative to contract making. Otherwise, the lack of knowledge on the business partners and legal regulations of the extensionists might lead to a breach of contract and loss of local trust that can be widely noted in the delta (Interview 203, male, CPC official, Can Tho, 26.10.2010). By contrast, working commercial services provided by extensionists as sales agents for agri-companies are more related to "informal" extension activities and personal interests, i.e. added income (Thai Thi Minh, Larsen, and Neef 2010). Thus this approach brings up the question of the informational legitimacy in the messages transferred by an extensionists working as sales agents for commercial companies.

In general terms, agricultural and rural extension in Vietnam prominently adopts a top-down, techno-economic approach based on "one-size-fits-all" concepts running from model farms to extensive fields. The transfer process is chronologically implemented as follows: eligible pilot households are selected by the project and local government, models are established with subsidised inputs and technical support by project technicians and development practitioners, and finally dissemination seminars and meetings are organised for broader communities, in order to inform them about the model and share experiences when initial results are achieved. It is expected that innovative practices be multiplied when the model's principles and outcomes are obtained and proven through this process.

The elite bottleneck

Such knowledge transfer approaches can be captured within a dual system, which includes (1) the institutionalised process whereby knowledge transfer is funded, planned and implemented by project experts and targeted at a certain group of participants and (2) the un-programmed or non-institutionalised process whereby knowledge is diffused from project participants to the larger farming population (see Figure 3.8). While institutionalised knowledge transfer has concentrated on transporting knowledge from project scientists/researchers to selected model farmers, it is widely assumed that in the non-institutionalised sub-system knowledge is spread from model farmers to other farmers – without difficulty – via farm visits and observations.

Figure 3.8: Model farmer-based knowledge transfer and the elite bottleneck



Source: Own presentation

We argue that in a less exchange-enabling environment, horizontal farmer-to-farmer knowledge transfer can be impeded further by amalgamative conditions and factors such as motivation, capacity and knowledge tacitness[43] (cf. Blackman and Benson 2010; Feng et al. 2010). Obviously, in disseminating the VACB system (see Section 4.4) from model farms to wider communities, knowledge transfer becomes impossible when knowledge sharing and receiving are totally restricted by model farmers and/or refused by recipient farmers. From the side of the model farmer, the case possibly occurs when the selection and development of model farmers are biased and lacking in knowledge transfer orientations. The aforementioned farmers' stories listed a number of model farmer selection biases: by project (nicely demonstrated models), by person (advanced or "qualified" farmers or those in close relationships with local government officials) or by location (easily accessible for researchers and visitors) (cf. Zolvinski 2008, 42f). Accordingly, the model farmer's willingness to transfer newly acquired knowledge to wider recipients is not always pledged[44]. Besides the willingness to share, the ability to share draws more attention, as it suggests "people have to engage in similar or shared practices to be able to share knowledge about those practices" (Duguid 2005, 117). There are many possible reasons why "incomplete" knowledge, with or without being recognised by the transferring side, is transferred from farmer to farmer. Although trained within the project, model farmers' dissemination capacity is still in question. Besides that, due to its tacitness, farming practical knowledge needs practical involvement and learning from doing and practice, rather than merely through farm visits and talks. More serious than it is very often thought, the application of partially understood

[43] Blackman and Benson (2010, 3f) state that knowledge stickiness constitutes inhibitors to the knowledge transfer process through nine main predictors: causal ambiguity, unproven knowledge, source lacks motivation, credibility of source, recipient lacks motivation, recipient lacks absorptive capacity, recipient lacks retentive capacity, arduous relationship and the unrecognised "freedom to" possibilities for learning.

[44] Nguyen Thanh Tuyen (2010, 137ff) uses the metaphor of a "knowledge oasis" to describe the accumulated knowledge locked in the Vietnamese rural communities. Knowledge is not shared, he proffers, due to the lack of media channels (knowledge oasis on island) or because it becomes a business secret (knowledge oasis in the mindset).

knowledge can result in knowledge traps[45], which are dangerous in the way they mislead localised technology and knowledge application, misinterpret its applicability or even undermine the development impact's philosophy. The breakdown of new technology replication by wider farmers is a lucid explanation of a knowledge trap created from failing to understand the unknown, particularly when confronting the complex system-based knowledge and technology. Equally importantly, experience supremacy triggers knowledge traps. For example, farmers who insisted on applying higher fish density than recommended by trainers explain their experience based on visual cues and simple calculations that higher fish rates produce higher yields. In other cases, knowledge traps are caused by complexities, particularly locally specified conditions.

Keeping inhibitors of farmer-to-farmer knowledge diffusion in mind, model farmers can only carry out their assigned transfer work if they feature a combination of the willingness to share, the capability to disseminate and an understanding of the environment in which knowledge transfer takes place. In other words, model farmers, to some extent, are required to work as knowledge brokers if knowledge is to be transferred appropriately to their farming communities. Otherwise, new knowledge and technology are held with and by some local privileged and ending up within the elite bottleneck instead of being shared for the development of the community.

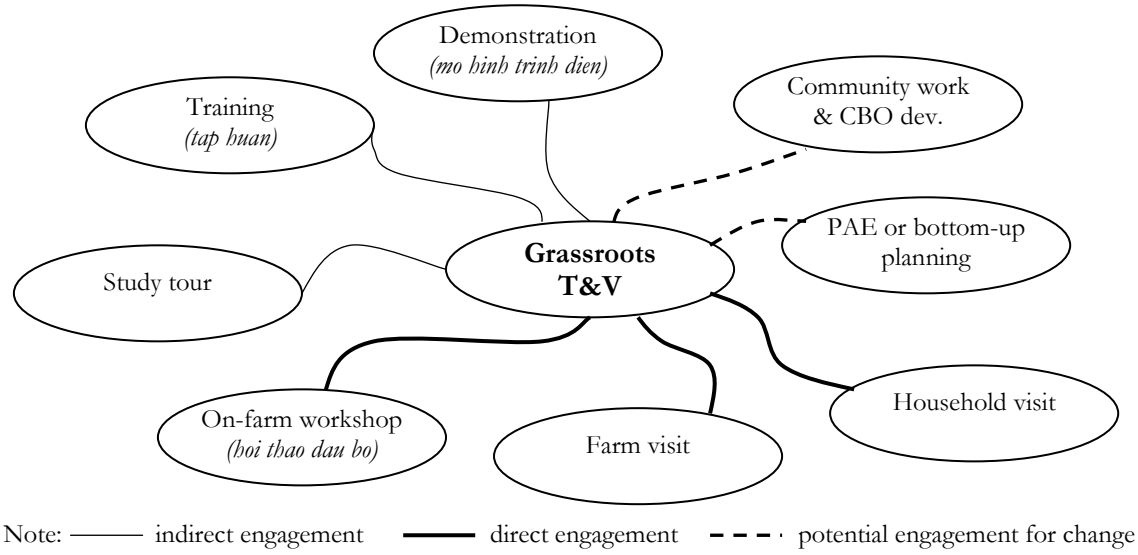
In sum, six extension approaches, despite different objectives and contents, share a common route of new knowledge and technology transfer: model farmer based construction and dissemination. Model farmers chose to warrantee the successful model construction are often big landowners with higher economic and political power, and they sometimes enjoy higher educational attainment compared to average farmers. However, the success of the model does not lead to that of transfer, which aims at wider application results in the community. Thus our strong criticism is not towards the model-based transfer approach per se, rather its bureaucratised version in a centralised system coupled with technically-oriented extension practices – which makes the model stuck in its flow to a larger farming follower community. As such, intensification of "hard" technology extension without careful consideration of political and cultural issues embodied merely strengthens local elites and elite farmers, forming the elite bottleneck of knowledge flows to marginalised farmers.

Paramount training and visit (T&V) modes

Under the influence of the technology transfer paradigm, grassroots extensionist-clientele interaction is mainly featured by the training and visit (T&V) system (see Figure 3.9). Obviously, participatory agricultural extension (PAE) and community-based organisation (CBO) development as local engagement for change are largely neglected.

[45] Evers, Gerke, and Menkhoff (2006, 246) elucidate that the knowledge trap "lies in the fact that data, information and knowledge are often taken over without any understanding of the corresponding unknowns. This is particular so when the people acquiring such knowledge simply copy solutions. Failing to import an understanding of the unknown consequently leads to bad investment and stagnation."

Figure 3.9: Grassroots T&V network of farming interactions



Source: Own presentation

Demonstration models (*mo hinh trinh dien*) as discussed above are implemented with better-off and large-scale farmers to demonstrate a new farming technology on a crop-long basis. New technology can be introduced by government agencies, research organisations, or agricompanies in order to prove the pre-eminent quality of a new technology and persuade farmers to use it. Grassroots extension often assists with the farmer selection process and community participation mobilisation. They are not involved professionally and are thus less informed about the project processes; no local feedback and evaluation mechanisms are operationalised.

Training (*tap huan*) is used to provide farmers with specific farming knowledge and skills. However, the latter objective is rarely achieved because of the training's strong theoretical base. The design of a half- or one-day training session is only enough for a lecture-based introduction into the topic. Training in this way has long been criticised for its lack of practical implications and application, ironically leading to a dramatic funding reduction for training, instead of improving the design to meet the growing needs for practice-oriented training by farming communities. There are two main types of training: one is policy-implemented courses organised by provincial and district government agencies under a state development policy or program framework. It can comprise multiple or a single theme(s); a subsidy component might be included in these training programs. With around 30 to 50 participants, sometimes including commune organisations staff, a district agency or CPC hall is often chosen for the events. Training sessions are well-prepared with PowerPoint presentations and handouts. Nevertheless how much training participants are prepared to change both conceptually and practically seems to receive no attention from the training agencies involved:

> We participated in a morning training organised by a provincial sub-department of aquaculture at the district agriculture cluster's hall. At around 8:00 AM a car arrived with provincial staff and trainers rushing to the hall to prepare. Around 20 to 25 area aquaculture farmers swiftly left the coffeehouse opposite and entered the hall. Within approximately 2.5 hours, three different topics by three lecturers covering a new policy on aquaculture waste water treatment soon to be implemented, fish diseases as

a result of recent university research, and climate change on global and Mekong Delta scales were presented in lecture format. The knowledge transferred was, according to our assessment, overloaded for farmers who listened and took no notes. Some technical terms and untranslated English phrases were difficult even for us to understand, while slides kept on moving up under the pressure of the limited time allocation. Some farmers started to fall asleep by the third presentation. However, the open discussion session actually got lively, with farmer's questions mainly related to their farming under such a policy change or disease threats and treatment measures. In a sensational argument, a small-scale aquaculture farmer was questioning the future under the new model of aquaculture waste water treatment that required double or triple the land area, leading to a hot debate about the feasibility of the model in a region that featured small-scale farming. However, many unsolved issues raised by farmers were dealt with by trainers replying that they were beyond their scope of ability or authority. A quite lavish lunch was ready for all participants by the end of the training. In the merry cheers for the completion of the training session, officials and trainers were talking about the next training appointment in another locality. Farmers gathered at another dining table were eating a hurried meal in a less conversational atmosphere. Waving goodbye to the car of trainers driving the opposite way to the city, the farmers returned home with different levels of confused understanding and disturbing thoughts that the training had definitely provoked but not thoroughly solved.

In another over two-hour afternoon training we observed rural water supply and sanitation issues (RWSS) were presented by the provincial center of preventive health under the RWSS national program, with specific promotion of modern concrete toilet construction to replace hanging fishpond toilets[46]. Besides the PowerPoint presentation, participants could receive printed hand-outs carefully bound in hardcover and other materials transferred from central organisations in Hanoi. The session introduced concepts such as the role and sources of clean water and proposed modern types of toilets. We found that more than half the participants were staffs from commune organisations and associations and the rest were village representatives, who were expected to further disseminate these information to other villagers, but the manner and effectiveness of implementing this task is unknown and unrecognised by responsible government agencies. When only three to five households were partially funded as pilot constructions, those selected would no doubt be those with an advantageous situation or a strong link with the local government. Here, again, we see the questions of knowledge trap and elite bottleneck trap discussed earlier.

In fact, because of their negative environmental and health effects, the eradication of fishpond toileting or any forms of direct defecation in the local waterways or fields have long been subjects of programs and campaigns. The release of governmental Directive 200/TTg dated 29 April 1994 on rural environment and sanitation resulted in Mekong Delta provincial PC's guidance and implementation of dismantling fish-pond toilets, initially along main roads and highways, with reported impressive figures reaching 70 to 80 percent in several localities (Le Dai Tri, *Tuoi Tre Online* December 6, 2003). Such sinewy policy interventions without appropriate alternative options and roadmaps for change instead led to higher defecation in rice fields and the recent re-establishment of fishpond toilets in many households (Tuyet Nhu, *Dat Mui Online* March 1, 2010). To make RWSS more feasible and effective, micro-credit programs have been promoted to support poor rural communities. The program, however, has only a marginal impact on poverty reduction as it reaches only better-off households that already have access to clean water (Reis and Mollinga 2009). Our observations indicate that fishpond toilets are not only still in use in the rural areas, but even in better-off households with porcelain tile floors in the houses. Our short talks with these local people reveal that this habit continues because they do not see any direct visual threats of fishpond toilets to their health, while fish can provide an additional benefit. Thus, the program has to assure at least three components: a locally-appropriate range of toilet models[47], support of loans for populations in need, and crucially effective training that can create a comprehensible transformation inside the broader rural community about the relationship between fishpond toilets, health, and the environment. Thus, development-oriented governmental programs and projects, beyond technological and financial

[46] A fishpond toilet (*cau ao ca*) is a temporary unroofed structure built over the fishpond, canal, or river with four stakes, two planks and simple surrounding covers. It might be an inherited model of boat-based floating lifestyles of earlier Mekong Delta residents as they started to have a settled inland life. The increase of population and inhabitant density has showed the threats of this toilet use to human health and environment.

[47] The Ministry of Health listed 4 types of hygienic toilets as a replacement for fishpond toilets, but in practice only the septic tank latrine model, the most "modern" and expensive one, have been encouraged by the involved provincial agencies in the Mekong Delta and is the only model to be supported by governmental loan programs (Reis and Mollinga 2009).

support, should focus on the social aspects of the projects, including local need satisfaction, change demand creation, and knowledge-based behavioural change (cf. Carrard et al. 2012).

The cases reiterate the replication of a bureaucratised technology-transfer approach to extension and education for change, which is seriously out of tune with more sustainable agricultural and rural development orientations that need dogged efforts and reflective learning. When centralised design and top-down implementation of development projects have been widely and strongly criticised for their assumptions of homogeneity and intolerant and inflexible principles, monitoring and evaluation tasks are often specified in project planning and decisions as the highlighted role assigned to local implementers. In our cases, especially within centralised national development projects or programs, it is the delusions of grandeur and hoarding of knowledge communication practices by mid-level state officials and researchers involved as project implementers and trainers that cut off feedback possibilities from development beneficiaries. Consequently, this training is characterised by expeditious contacts with prominent one-way information flow talks to disseminate certain new regulations or messages that local communities have to learn, remember, and follow because they are approved and built on the best intentions to bring the most benefits for the local recipients.

Technical provision is the second main type of training, which is related to a variety of specific agricultural production techniques and technologies. Between 10 to 15 training courses on diverse topics are organised annually in an agriculture extensive commune in the Mekong Delta, while in peri-urban areas where agricultural production has shrunk, fewer classes, normally three to five, are available each year with contents largely responsive to urbanised conditions and city-supply needs and integrated with rural transformation vocational training programs (see Tables 3.6a&b). Classes comprising approximately 30 trainees are preferred to be hosted in spacious farmers' houses because of its travel convenience for participants from neighbouring villages. Trainers are provincial and district extensionists for general courses and academic researchers in more specific knowledge and theory-based lessons. Cooperation with agribusinesses in training is an increasing trend now that agri-chemical companies have developed wider sales and promotion networks; although such connections are locally built and maintained, they mainly originate from the company side. The majority of agricultural training sessions are still arranged and provided by provincial and district extensionists despite recent expressed expectations to transfer this task to the grassroots colleagues as an additional source of income and opportunity for professional development; so far, however, no compatible capacity-building attempts have ever officially been discussed or achieved. Our discussions with grassroots extensionists have revealed that the role they play is of information brokers in organising such training, though many of them are confident that they would be able to take over some courses relevant to their qualifications. Although training is said to be largely rescheduled based on local need submission instead of top-down planning and provision, it is still very much dependent on the upper-level decisions of time and human resource allocation to organise each and every training session in villages. The waiting time for a training approval varies from weeks to months, according to the trainer's scheduling and funding, frequently causing a sudden onrush in the last months of the year

before the end of a fiscal period, and based on the enthusiasm for training realisation of grassroots extensionists. Further, local needs which are orally recognised and communicated between extensionists and local communities – through local farmers with whom extensionists often contact more than collective ideas collected from organised farming group meetings – might become biased methodologically and also difficult to be accurately and properly managed and monitored within the application process or in longer-term planning. The information in Tables 3.6a&b provides an overview of training priorities and organisation in an agriculture-intensive community and an urban area.

Table 3.6a: Training courses implemented in 2010 in an agriculture intensive commune

Month	Training	Trainer	Proposed by	Attending farmers	Venue	Hand-out
December	Rice Ragged Stunt Virus (Reoviridae) and Rice Yellow Stunt (Nucleorhabdovirus)	District Agriculture Office	Farmers	30	Farmer's house	Yes
	Rice Ragged Stunt Virus (Reoviridae) and Rice Yellow Stunt (Nucleorhabdovirus)	District Agriculture Office	Farmers	30	Farmer's house	Yes
November	Aquaculture feeding	Company	Company	60	CPC hall	Yes
	Watermelon planting techniques	Provincial Agriculture Office, CTU researchers	CPC	40	Farmer's house	Yes
	Swine disease prevention and protection	District Veterinary Station	CPC	40	Farmer's house	Yes
October	Watermelon planting techniques	Provincial Agriculture Office, CTU researchers	CPC	30	Farmer's house	Yes
September	Fish hatchery techniques (Anabas testudineus)	District Aquaculture Station	Farmers	30	Farmer's house	Yes
August	Fish hatchery techniques (Osphronemus goramy)	District Aquaculture Station	Farmers	30	Farmer's house	Yes
July	Orchid planting techniques (Mango flower induction)	District Agriculture Office	CPC	25	Farmer's house	Yes
June	Star apple (Chrysophyllum cainito) caring techniques	District Agriculture Office	CPC	40	Farmer's house	Yes
April	Vegetable planting techniques	District Agriculture Office	CPC	50	Farmer's house	Yes

Source: Compiled from Interview 258, male, senior commune official, Phong Dien district, 22.11.2010

Table 3.6b: Training courses implemented in 2010 in an urban community

Month	Training	Trainer	Proposed by	Attending farmers	Venue	Hand-out
October	Fish husbandry techniques	Quarter Economic Office	Ward People's Committee (WPC)	45	WPC hall	Yes
June	Swine husbandry techniques	Quarter Economic Office	WPC	72	WPC hall	Yes
March	Bonsai techniques	Quarter Economic Office	WPC	25	WPC hall	Yes

Source: Compiled from Interview 258, male, senior commune official, Phong Dien district, 22.11.2010

The poor responsiveness of technical training in both time and content dimensions resulted from the bureaucratic working style of the extension management system, combined with the inability to uphold the grassroots extensionist's role of local need identification, reflection, and monitoring are the main reasons for the existing paradox: increasing local needs for training and progressively frozen participation by farmers. Extensionists tend to interpret the farmers indifference towards training to their laziness and lack of awareness of the importance of training rather than a careful evaluation of the knowledge service design and delivery quality:

> Farmers often complain about the lack of training and express their multiple agricultural extension needs, but when invited many of them do not show up. For example, when we have a rice-seeding support program, farmers seek us out for registration and collection, but in the subsequent training they make excuses for being absent. They do not want to participate in training, because they think they can manage their crops with their own efficient knowledge unless they experience constant failures (Interview 273, extensionist, male, Cai Rang, 3.12.2010). Several farmers now attend training courses just to get single allowance envelopes or gifts, instead of knowledge acquisition to change their lives (Interview 237, ward FA senior, male, O Mon district, 9.11.2010; Interview 196, ward PC senior, male, Thot Not district, 23.10.2010; Interview 194, male, farmer and head of shallot group, Thot Not district, 23.10.2010). They become selective about the training they join in based on their assessment of the economic benefit potential and content relevance (Interview 223, commune PC official, male, Thoi Lai district, 3.11.2010). Farmers' collecting handouts without proper understanding and use becomes only a waste (Interview 312, DARD senior, male, Vinh Long, 9.3.2011).

It becomes clear that a cosmetic and superficial participation of farmers can be explained as a response to the formalistic and bureaucratic organisation of training provided by extension officials and trainers. Such technology-transfer and training turn out to be obviously extravagant uses of already poor resource allocation when decisions are made by district and upper level managers, so local needs are only satisfied if they are adjusted to the government's programs and planning and grassroots extensions run on errands.

Study tours have recently been promoted as a formal form of knowledge sharing among farmers. Previously, study tours, even trips abroad, were mainly organised for extension managers and workers under a capacity development framework. However, with the explosive growth of agriculture production models self-developed by farmers or supported by relevant state agencies, the increasing need of farmer-to-farmer learning has encouraged a more sophisticated arrangement. A well-organised

study tour can function as a forum for theory and practice discussion, and the interaction of professional knowledge and farming experience. As shown in our field data, the models to be observed and studied are proposed by farmer groups and submitted to the district by grassroots extensionists, but again it is the district extension who decides whether, when, and how study tours are conducted based on their own budget reference and preference. A grassroots extensionist explained:

> Thanh My commune is well-known for its extensive and large-scale shrimp farming. Farmers there are very skilful. They can provide proper treatment to their water source, which is increasingly becoming polluted. Farmers in our commune with only several hectares of shrimp farms are facing water pollution problems and wish to learn shrimp-raising and water treatment techniques. I suggested a study tour because seeing is believing, direct experience sharing among farmers is more effective than if only I go there to learn and retransmit such knowledge to farmers in my commune. Organising study tours needs funding that is beyond my authority. What I can do is thus inform the district about our farmers' needs and the number of participants. The district extension has to do budgetary and time planning and a tour is only possible with the participation of at least 20 to 30 farmers. Our farmers are informed about their involvement (Interview 170, extensionist, female, Vinh Thanh, 15.10.2010).

Study tours have become preferred within multi-area projects where farmers within a project are well-grouped and planned for knowledge sharing tours. For example, at a Hau Giang PAE project site, farmers are technically and financially assisted to propose and implement self-determined mushroom farming and chicken raising plans. Based on their requests, several carefully-designed tours have been organised as knowledge-based connection and sharing among farmers with similar interests, which is considered to be a main determinant to the success of agriculture development schemes (Farmer focus group 10, Hau Giang Province, 07.03.2011):

> Before any farmer's study tour, I prepare with farmers the questions to be asked in advance. Questions with the same content are integrated. Questions are also allocated to individual farmers to ask, not limited to those prepared inquires. Farmers are encouraged to take notes. If a visit is unsatisfactory or insufficient, farmers can propose another study tour at a different site (Interview 306, extensionist, male, Hau Giang, 07.03.2011).

Within agricultural extension literature, there are detailed sections on training and study-tour design over different phases from tour planning, implementation, and evaluation. What should be added here is the involvement of local community and grassroots extension into rural education and extension planning. The PAE project that included study tours, despite its success according to the project evaluation, left post-project learning issues unanswered when project funding became terminated and grassroots extensionists were left unengaged as the project only includes the participation of provincial extension staff at present.

Unlike demonstration models, training or study tours are planned and conducted by national, provincial, and district extension managers, despite frequently being described as primary tasks of local extension workers; our data showed that grassroots extensionists only maintain their "real" knowledge communication with local communities through three main channels: farmers' meetings, on-farm workshops (*hoi thao dau bo*) and (farm or home) visits.

Farmers' meetings are diverse in type and purpose. They can be regular meetings of members of the farmer's association. Meeting activities of smaller farmers' groups of similar interest, either self-formed

or project-based and initiated, become of greater practicality and interactivity when agreement on common action is the target, so that experience and idea sharing is practiced to a large extent. Within these meetings, grassroots extensionists can integrate their sessions to inform farmers about a new rural development policy, technical topics, or community opinions. However, these meetings are characterised by administrative function as a semi-annual review of an association's activities or campaign achievement evaluation of a registered individual. Farmers are losing their motivation to attend such meetings because a farmer's membership itself can hardly produce an atmosphere of cooperation and exchange among farmers without effective and concrete agriculture production programs, despite the enthusiasm from a few leadership positions with low salary incentives.

On-farm workshops are used in a broad context referred as to a formal seminar emphasising new technology presentation and application demonstration. It can be an on-farm applied research result, reporting results of a demonstration model, or a new product for agricultural activities. The on-farm workshop as discussed here has a narrower meaning. It is related to thematically technical talks organised by grassroots extensionists with small groups of between five and 15 farmers that occur right on the field. Such on-farm workshops deal with mainly paddy rice crops throughout early, middle, and late phases of a season. On-farm workshop intensification depends on the significance of crops (e.g. the Winter-Spring is the most important crop for Mekong Delta farmers) and the pest situation forecast. Unless organised by a well-trained and motivated extensionist, on-farm workshops become innocuous talks when repeated without a new knowledge foundation.

3.4. "Walk the tightrope": Grassroots embedded extension in a crisis context

Following Benor and Baxter's (1984) training and visit (T&V) extension system to build professional extension service, a center-to-village five-level extension system has been developed in Vietnam. However, the base extension, which is referred to as grassroots extension, is taken over by commune or district staff depending on the model (see Figure 3.2), because village networks are not widely formed and many of them have been disbanded due to lack of funding. Village extensions are contracted as collaborators to inform the district about village production situation in main crop seasons. The role of grassroots extension is highlighted in early documents about construction of T&V system:

> "The Village Extension Worker (VEW) is the only extension worker who teaches production recommendations to farmers. He [sic] is just as specialized and professional as other extension workers. The responsibility of all other extension staff is ultimately to make the VEW more effective in his work. The task of teaching farmers suitable technical practices and convincing farmers to try them is not easy. Hence, the VEW must receive intense support and guidance, and must not be burdened with nonextension functions. Moreover, the nature of his work and his achievements must be recognized personally and in terms of opportunities for professional growth and technical upgrading" (Benor and Baxter 1984, 13).

Nevertheless, to what extent this idea of can be realised is greatly dependent on the degree to which extension system is embedded in either the state management bureaucratic structures or local demands.

In a broad sense, embeddedness is used to describe the relationship of economy vis-à-vis society. The first use of the metaphor of "embeddedness" is often credited to Polanyi (1957) to refer to the dependence of market behavior upon "the relationship between functionally differentiated institutional complexes within an overall social system" (Dale 2011). In his influential but narrower conceptualisation, Granovetter (1985) restricts embeddedness to social structures, especially social networks (Beckert 2007). Significant meanings have now been added to the concept, encompassing several structural, cultural, cognitive, and political forms (Loubaresse 2007). Wells-Dang (2012) uses "embedded advocacy" to denote the advocacy work of civil society networks based on reciprocal relationships with authorities.

As discussed earlier, the rapid development of local extension services in the early decollectivisation years was largely a response to growing local production demands. However, the unified extension system constructed over the last two decades has persisted through embeddedness with state administrative apparatus for consolidated central power and, accordingly, top-down technocratic extension approaches have been implausibly applied as an automatic start-up of built-in software of a bureaucratic system. Therefore extension delivery has become unconcerned about diverse local needs in ever-changing contexts. State bureaucracy embedded extension as so far discussed is evident at all levels of the public extension system. In a different situation, grassroots extension might be embedded upwards with the state bureaucracy as a sub-system but also downwards with farming communities. The dichotomy of its embeddedness has put grassroots extension into a challenging dilemma: a government liaison seconded from above versus an agricultural knowledge professional.

Our interviews with communal extensions show a manifestation of the two kinds of missions they have to fulfil: "from-above" and "on-the-spot" missions:

> In identification of their extension missions, the responses are inclined to provide what they are expected to do by their extension managers from above. These include transfer of advanced farming models to local farmers, provision of on-farm workshops at the beginning of major crops, field and household visits regularly paid and particularly during pest and disease outbreaks, and submission of reports, orally or in writing, about the current agricultural development situations of the region in their charge and about local needs to help higher-level extension agencies with more demand-driven planning (Interviews 189 and 195). Nevertheless, what is important to notice later is an attempt to explain that there are missions and tasks, related to broader rural development issues, they have to take responsibility, involvement or cooperation. Because of their diverse engaged jobs, as agriculture relates to almost everything in the Mekong Delta, grassroots extensions often refer to themselves as commandos. Such "on-spot" work allocation or assignments are very much dependent on the leadership board of the commune where they are based. Two cases below illustrate such diverse situations.
>
> Like other commune extensions of this district, she is responsible for around 3000 hectares. It becomes impossible for her to visit every household and field in such a large area. Besides regular extension work that she undertakes mainly in advance of the annual rice crops, she works with local associations and organisations in several area activities and campaigns such as family planning, vaccination, or plant and animal disease control (Interview 137).
>
> In the case of another female commune extensionist, she signed a working contract with the district extension station. Her task as described in the contract was to provide agriculture-related consultations to the Commune People's Committee for its comprehensive agricultural development. Unlike other communes that have a permanent position responsible for agricultural development over the whole commune, she works there alone. She has to report to the commune

> vice-chairman, who is also the head of the commune's agriculture management board. Unfortunately, according to her experience, he has little knowledge of and concern for local agriculture. In reality, her work involves everything of a commune agricultural manager rather than a consultant, as formally assigned at the beginning (Interview 170).

Local extension workers who are directly working with farming communities on a daily basis have to thus fulfil three types of different work:

1. Vertically, mandates assigned by the higher extension level (as in Table 3.3);
2. Horizontally, professional, organisational and community work allocated in cooperation with commune's units, organisations, and staff;
3. From the community perspective, working with local communities and their expectations that extensionists assist them with solutions to any problems and issues they might encounter in agricultural production.

While grassroots extension has been organised and developed based on the pre-designed vertical mandate, the real tasks and activities of local direct extensionists have to include on-spot duties and most importantly, unlike any other state management and administration responsibilities, knowledge-based work with and for local communities, the key task which unfortunately is often neglected in system development strategies. The success or failure of an extension event, project, or program brings immediate impacts on local confidence and the working effectiveness of local direct extensionists, not their higher managers.

Grassroots extension in crisis

Extensionists appointed to work at the communal level deal with many difficulties to fulfil their tasks in poor working conditions. The working space of a commune extensionist is a desk and a chair placed either in the communal people's committee lobby or within the commune's agricultural development or mass organisation section. They work, plan, and report primarily with pen and (template) paper, with a calculator and mobile phone as their only electronic aids. They can use a common computer at the commune's people's committee; however, this computer is not always available. The lack of owning their computer prevents commune extensionists from updating information that serves their own work and managing documents:

> Commune extensionists responsible for transferring scientific and technical advances have confronted a lot of challenges in updating information to complete their roles as knowledge transferors. When many local households access information faster than extension workers due to their ability to afford to computer and internet services, in some cases, they suppose that information provided by extensionists is out-of-date. (Interview 195, extensionist, female, Can Tho, 23.10.2010). The need to have their own computers with internet access has become more important to commune extensionists than ever to help them access a diversified source of knowledge and information related to their work and specialisation, administer knowledge, and connect with other agricultural agencies and universities/institutes for working purposes. Under such circumstances, they have to use a common computer at the commune's people's committee for report preparation, while others have to manage documents and information through taking notes in their notebooks; however, such an information management method is not effective due to a large amount of information and time pressure at work (Interview 170, extensionist, female, Can Tho, 15.10.2010 and Interview 263, extensionist, male, Can Tho, 29.11.2010).

Given their daily working mobility and knowledge translation and diffusion, such poor equipment provision can hardly promote the working efficiency and effectiveness of grassroots extension staff (see Figure 3.10).

Figure 3.10: (a, left) A real working space of a commune extensionist, (b, right) An ideal portrait of a local extensionist with knowledge, skill, and dignity.

Source: Author 2011

Source: SNV et al. 2003

Another issue that discourages grassroots extensionists from fulfilling their tasks is related to their standard working contract. According to regulations of the extension system, extensionists working at the commune level have to sign a contract with their managing agency – the district extension station. Their salary level is regulated according to their qualification and the salary scale. However, in our interviewed cases, most of the commune and ward extensionists argue that their contracts are actually "dead" contracts. Without taking into consideration a salary increase for grassroots extensionists, the current salary level that grassroots extensionists receive hardly covers their living expenses, never mind their working motivation when the cost of daily basic necessities is increasing:

> Grassroots extensionists receive their salary according to their "dead" contract. It means that they only get the same salary level despite their number of working years. Based on contract terms, extensionists are paid according to a salary scale and their salary will be increased every three years. However, in reality, some extensionists working for four years have not received their increased salary level. In such cases, they hardly make any complaint about this issue to anyone when it is explained that the extension system budget has to cover several activities. Once the state has a decision about salary increase, salary of grassroots extension will be increased. (Interview 110, extensionist, female, Can Tho, 23.8.2010; Interview 170, extensionist, female, Can Tho, 15.10.2010; and Interview 273, extensionist, male, Can Tho, 3.12.2010)

> Working as extensionists requires us to travel a lot and often use mobile phones to collect, exchange, and update information; however, I always struggle with phone fees and petrol costs on my limited salary of VND 1.5 million per month (Interview 170, extensionist, female, Can Tho, 15.10.2010). As such a limited amount of money is enough for their two-week individual expenses, they find it difficult to concentrate completely on their extension work unless their family's economic condition is ensured. (Interview 204, extensionist, male, Can Tho, 27.10.2010). Such a salary mechanism fails to encourage those who have specialised in extension duties to work at the commune level, as most of them prefer working for extension agencies from the district level upwards (Interview 297, researcher, male, Can Tho, 15.12.2011).

> There is nothing except salary; however, they hardly live well with their current salary (Interview 195, extensionist, female, Can Tho, 23.10.2010). They might be reproved for not completing their tasks but there is nothing to motivate them to work. They only receive their salary from district extension stations while the commune's people's committee supports them very little financially. The commune's people's committee allow extensionists to get refunds of expenses for their training; however, they seldom request reimbursement because of complicated administration procedures (Interview 189, extensionist, female, Can Tho, 22.10.2010).

Once working motivation has dropped and the employment mechanism fails to support them to fulfil their tasks and ensure their living, many grassroots extensionists give up their careers:

> Duties of extensionists are knowledge generation and diffusion; however, they cannot complete their assigned tasks due to the employment mechanism (Interview 195, extensionist, female, Can Tho, 23.10.2010). Many have to give up their work as extensionists despite the fact that they have worked enthusiastically and regularly visited farmers. They have a working place at the People's Committee office but for what, when they even write reports with pen and paper and have no facility to update information, while the salary for extensionists with university degrees is very low, just over VND 1 million/month (Interview 189, extensionist, female, Can Tho, 22.10.2010 and Interview 195, extensionist, female, Can Tho, 23.10.2010). With such a salary level, obviously they hardly concentrate on their work when their family living is not ensured (Interview 182, FA official, male, Can Tho, 19.10.2010).

It is worth noting that the loss of human resources at the grassroots level might become more serious when extension work at such level cannot be resumed quickly. However, in our interviews, many respondents argue that vacancies for extensionists at the grassroots level seem unlikely to be filled unless there are positive changes in the operational policies of the extension system:

> As an extensionist working at the district level, she was temporarily assigned to undertake extension work at the commune level due to the vacancy for an extensionist in that commune. This position cannot be vacant when a winter-spring crop has started, so she has been in charge of this work for nearly two months. However, she argues that recruiting someone to take this position is difficult when no one has registered for it since the old extensionist gave up working four months ago (Interview 195, extensionist, female, Can Tho, 23.10.2010). New graduates tend to be not too eager to work as extensionists, even when they are prioritised to receive 100% of salary, instead of only 80% of the full salary. However, the actual money they finally receive is very little, as they have to pay insurance and labour union fees. (Interview 195, extensionist, female, Can Tho, 23.10.2010).

An increasing number of extensionist resignations have created a significant and alarming brain drain situation in the local extension system. Those who give up their extension work tend to find new jobs in agricultural companies, due to its high relevance to their qualifications and much more attractive salary:

> With the current low salary level, it is very difficult to encourage extensionists to work. Good extensionists are attracted by agricultural companies and they quit their extension work. Training a new university graduate to obtain enough knowledge and skills to work as an extensionist is a long process, but in the end they leave to work for agricultural companies. We cannot hold them responsible when the current salary regime fails to motivate them to work. A newly-graduated agricultural engineer working for a company is paid about VND 3.5 million per month with extra allowances for business trips and provided with a motorbike while the one who works for the extension system receives VND 1.5 millions. We have to accept the situation of how hard it is to keep them working for the extension system. The idea that our qualified extensionists wherever they work serve local Vietnamese development can console us. A trained extensionist quitting that job is a big knowledge loss for us; however, we cannot do anything to support them if they work for the extension system. (Interview 318, extensionist, male, An Giang, 10.3.2011)

> We have over the last few years let ten cases leave our system to work for agricultural companies, because they are paid ten times higher[48]. Very recently, we had to approve a resignation letter by a

[48] The figures between extension and corporate workers are confusing here. One says a new engineer makes 2.5 times as much in industry, the other says "ten times" and then uses a figure that is actually fifteen times. I decided

> young, competent staffer who is in leadership planning and who has just graduated with a Master's degree from a European university. He came to work as a representative of an animal feed company with a salary of 25 million dongs per month. (Interview 312, DARD senior, male, Vinh Long, 9.3.2011)

The grassroots extension crisis extends over both motivational and professional dimensions, and it is also true that the situation has been warned about, especially in recent related studies. However, a response at this level actually demands a structural change, making it a known but still unsolved problem:

> If only the salary policy for grassroots extension could be changed to encourage more high quality human resources. But our Vietnamese system is very hard to change in that direction. The predicament is well understood but not at all heard. We have written and published quite a lot about this problem. (Interview 297, researcher, male, Can Tho, 15.12.2011)

"Silent" grassroots efforts: Towards salient knowledge work?

Within the crisis, instead of a lack of motivation, several cases can still be observed that grassroots extensions keep on heading in their chosen knowledge diffusion path or their career. Our statistical data of 30 interviews with local extensionists in the Mekong Delta show the ratio of career-led extension is approximately 1/5. One common yet striking feature is that all share the major intrinsic motivators of using of what they have learnt, working with farmers, and learning from farmers:

> In implementing training, I receive VND 30,000 per course and have to pay motorbike petrol from my pocket money. I think that extensionists have to love their career, love the knowledge they have learnt, so their utmost objective of working with farmers is to ensure successful transfer of knowledge and further their learning experience and knowledge from farmers. Only when they are interested in the job do they get inspired to think of and design the most applicable models for farmers. This is true in my case. My conversations with farmers are always well-prepared and demonstrated with real examples (Interview 154, communal official, male, Vinh Thanh, 11.10.2010).

These extensionists have different strategies to earn extra income, such as distribution of seeds, fish breeding, growing rice on family land, or even helping with spouse's work or business, to keep them with a somewhat balanced material life. The argument would be that they would thus become less concentrated on their professional work. To some extent where the supplementary income generation activities are connected with local agricultural production, it might be however a useful contact with farmers in terms of potential knowledge exchange through commercial transactions. Others, especially young extensionists, have maintained their workplace loyalty through further education pursuit either supported by the state's human resources development program or self-funding. Their practical experience, now guided with broader contemporary theories, has reaffirmed their extension work commitment and generated new ideas for community development:

> I am following an undergraduate program at the Ho Chi Minh University of Agriculture and Forestry under the state's funding. During the study, I have worked part-time only, with very limited hours, focusing on work directed by my manager; for instance, I had to implement a plan to organize five training sessions at the beginning of this rice season. I am completing my graduation thesis on high-quality rice seed research. I have many plans that aim at serving local people. I am looking for something to serve local needs. Upon completion of my studies, I plan to found a cooperative to sell

---

to present here these differences based on different knowledge and experience of the interviewees. In all cases however the figures imply a huge salary difference between working for a governmental organisation and for a private sector company.

> fertiliser and pesticides with cheap prices. I cannot do this on my own but have to cooperate with the authority, the local people's committee, to do this. I have many initiatives but cannot carry them out yet, such as storing sesames: 30,000kg at the beginning of the season, 25,000kg at mid-season and 27,000-30,000 at the end of the season. If people can store sesames for one or two weeks, they will get a lot of income. People do not have favourable conditions for storing. If they store sesames in the hot weather, they will suffer from growth and become spoiled. I also find the chicken program very interesting, but it needs a large investment. If doing this way can make benefits, we could mobilise people to form a group of 10 to 20 people to do it. Generally, many ideas come to me when I am doing my job. And if these ideas could be executed, that would be great (Interview 234, extensionist, male, O Mon, 8.11.2010).

Talking with intrinsically motivated extensionists who are less supported under the bureaucratised system are among the longest interview conversations we recorded. They were so delighted to share with us their first-hand experiences and skilled practices that are far different from what the university taught them, challenges in engaging with rural adult education, brain drain, their thoughts about extension system transformation, farmer's innovation stories, and their appreciation of farmer's experience and knowledge. Many former extensionists who take a higher position in the extension or state system suggest extension work should be customer-driven and locally embedded:

> Young trainers often start their job with what they have been taught at university. If extensionists do not have practical experience, they may not answer questions from farmers. For instance, they are theoretically trained as to how and on which day to fertilize the summer rice, but the field is not as flat as this table. Farmers fertilize differently according to the ground contours. At present, there are many farmers who have retired, resigned, or are now teachers at primary and secondary schools. The excellent farmers in this province are mostly teachers. It is difficult to work with these people if the staff does not have considerable experience, is lazy at reading books, and cannot answer their questions (Interview 318, extensionist, male, An Giang, 10.3.2011).

> Conducting a training session is a hard job because it requires training skills. The knowledge you transmit in the training is absorbed differently by attendees; there are people who are smart and who are not, people who are conversational and who are not; sometimes there are people who don't do things that well but are very talkative and people who do things well but do not talk at all. Therefore, the trainer has to know the strengths and weaknesses of attendees to inspire them. There are people who talk big when they go to the local areas. They really want to show off. There are people who are smart and do things well, but they will not talk against these swaggerers. But there should be some solutions or methods to oblige these people to talk less, leaving room for the other attendees, but still keeping them happy. This is also a trainer's skill.
>
> During training, farmers also provide a lot of interesting information, yet there is both correct and false information. For example, the combine harvester: farmers initially said that this machine could only work in the spring-winter season; and could not work in the second and third seasons because when the second season crop is harvested, straws are released in the field, then when the rains come if straws are not burnt quickly, they pile up in the field and when there are continuing rains, it prevents work for the next season. So there is a problem that how to clear the straw appropriately. We are also talking about this matter. And this matter is also asked of people in other provinces. A man suggested we can hang a bag on the machine for the straws to be blown into and clear the bag when we finish. By this method we save time in gathering straw. I think that idea is good and actually when we apply it, we see it is very true and helpful. It helps to have straw piled up at the corners of the field, not filling up the field surface. There are a number of bright farmers from Thanh Hoa Collective who crossbreed their own rice breeds, but they are testing these breeds. The farmers do this themselves and this is very good. Also, there are some farmers that do research to invent pesticide-spraying machines to help farmers save labour costs. It shows that farmers do have many inventions.
>
> When we meet farmers, we learn many things from them. We learn that information we transfer to them is sometimes not correct. After providing them with knowledge and information, we have to follow them to the field to check if they are applicable or not, and if not we have to correct them (Interview 92, extensionist, male, Co Do, 19.8.2010).

Learning from farmers means not only needing to understand more about local situations or conditions to transfer success knowledge. For locally-embedded extension, this kind of interactive knowledge

practice is a mode of extension communication that sustains both extensionists' careers and the development of communities that they are working with. Further, better-trained human resources can open new opportunities for collaboration, even in knowledge production with academia (see Section 3.2) and better serve the communities:

> We have got an advantage that the Cuu Long Delta Rice Research Institute and Can Tho University are located here, within the city. So, we have had a very close cooperation with these two institutions to implement many agriculture development projects. Besides, we have cooperated with the Agriculture and Forestry University (Nong Lam University) at Ho Chi Minh City to provide undergraduate programs, especially the agronomy major, for us. Our center had cooperated with the Economics and Technology College here to open three classes for 100 agricultural extensionists from communes. At present, we are planning to open undergraduate courses in agronomy and each class will have 30 agricultural extensionists from communes and wards (Interview 9, senior extensionist, male, Aquaculture extension center of Can Tho city, DARD, Can Tho, 25.5.2010).

One might claim that it is not helpful that community-responsive and knowledge-based extensionists, who are not powerful enough in terms of both quantity and voice, and whose numbers have shrunk in the context of the grassroots crisis, cannot create a force of change against the present structural bureaucratisation. This claim seems to be half-true. What we try to highlight here is the local versus structural embeddedness of extension work, facilitating the negotiation process of a more knowledge-based approach ignited at the grassroots level regardless of difficulties imposed by the centralised system. The term "silent" used in this process refers not only to the little-recognised contributions of extensionists to agricultural and rural development as the agriculture journalist and poet Nghiem Thi Hang implies, but also to the underappreciated bottom-up energy that keeps the system moving and capable of being transformed.

I love my agricultural extension career
Coming to villages and working with farmers
In the beloved sentiments of friends
We start our co-journeys
*
In the spring hymns
Is the waft of sweet grass and flower fragrance
And in open love of humans and the earth
Is the silent scent of agricultural extension workers.

(by Nghiem Thi Hang, translated by author, Source: *Vietnam Agriculture Newspaper*)

3.5. Another system is possible: The contribution of new institutionalism

Examining the role of institutions and actors on social actions, new institutionalism constitutes at least four different bodies of thought or analytical approaches across the social sciences: rational choice institutionalism, historical institutionalism, organisational/sociological institutionalism, and ecological institutionalism (DiMaggio and Powell 1991; Immergut 1998; Hall and Taylor 1996; March and Olsen 2005). As an institution is a web of interrelated norms governing social relationships, group performance is produced by social interaction structuring (Nee and Ingram 1998). Rational choice institutionalism argues that actors behave strategically to maximise their preferences while historical institutionalists emphasise a calculus-based approach which claims that behaviour of actors are determined by where they think their life is embedded (Subramanian 2009). Ecological institutionalism

focuses more on diverse arenas and an adaptive cycle of decision-making (Gunderson, Holling, and Light 1995). Rational choice institutionalism helps to understand the strategic reinforcement of centralised power and resource allocation and the brain drain and professional crisis at the local levels of the public extension system in Vietnam, while seeing agent of change as preferences of individuals. Historical institutionalism explains the stratification of extensionists under state-functioned or knowledge-served groups and sub-groups notwithstanding their presumed hierarchical positions. Ecological institutionalism represents a cyclical process of complex, uncertain, and messy interactions in application of top-down versus bottom-up extension approaches and how local demands are processed under state-governed mechanisms (see Section 4.2). An ecological institutionalist analysis needs further time-sequencing data over longer periods of extension system development, which is out of the scope of this research.

Sociological institutionalists focus on norms that comprise informal constraints and acknowledge that informal norms are crucial factors in enforcing the rules of the game (Nee and Ingram 1998). This section, therefore, will discuss a possible transformation from bureaucratic extension system into a learning system through local extensionist interaction and negotiation of the identity of a reflective knowledge worker.

Two types of extensionists

As normally conceptualised, extensionists are typologised by the administrative order from central to communal extensionists and village collaborators. This way of categorising has the bias of positioning grassroots extension system as staff in the lowest and weakest status as analysed above. I would propose a non-hierarchy classification including state-functioned and career-based extensionists; the former with four sub-groups is greatly outnumbered by the latter.

The state-functioned group comprises extensionists who perform the duties of a state cadre (*can bo*). This group consists firstly of leaders and managers who attend meetings, write reports, and make state management decisions without an appropriate impact monitoring mechanism. Extensionists who are present during office hours and simply undertake their administration tasks as assigned by managers are also subsumed in this group. Extensionists who are not motivated to work or are forced to take the position without any desire for it to are listed in this group. The fourth sub-group includes part-time information providers at the village level functioning as support workers. They can take multiple state-governed duties apart from extension at villages and have no technical responsibilities.

The career-based group involves individuals who make extension their career. As such, knowledge work is core to their performance and evaluation. This group is small in size, emerging from highly-qualified staff with advanced degrees; they can even hold leadership positions. They have crossed the extension boundary to join the research community through studies that they have initiated or collaborated on with partners. The second sub-group encompasses employees who frequently and directly work with farming communities in dealing with their problems. A distinctive feature of this

group is that extensionists express their love to learn with and from farmers. They always want to be better equipped with facilities and further education to work more efficiently. The current crisis has shrunk the size of this group.

This conceptualisation of extensionist groups illustrates a biased human resource arrangement for state government purposes in the public sector system, making its farmer-serving goals difficult to achieve. The career-based extensionist group, though small-sized, is the key to maintaining the work of knowledge-based extension that benefits both community development and feedback loops of the system. These extensionists are able to relate the situations of other people and induce practice-driven cooperation, and can possibly engage in reproducing identity for themselves and rearranging the structural situation.

Sociological institutionalist construction of a learning system

From a sociological institutionalist perspective, an alternative learning system can be sketched out (see Figure 3.11). At the organisational level, this system is based on cultivation of a farmer-extensionist mutual learning culture and competent career-oriented staff at all levels. On this foundation, extension work can create a mutual learning environment, better resource and knowledge governance, and sustainable agricultural and rural community development benefits.

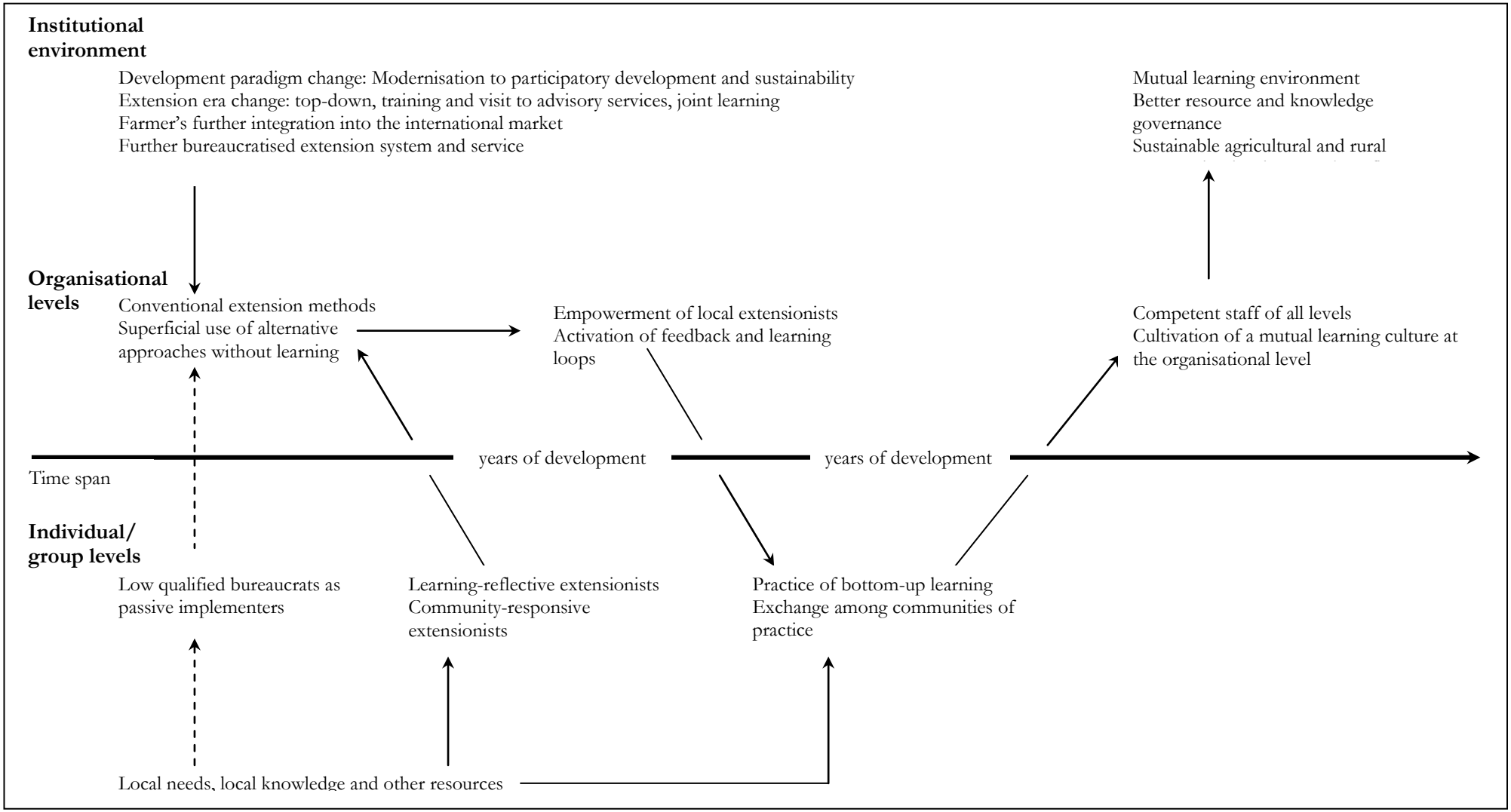
As analysed above, the current institutional environment is categorised by the development paradigm change from modernisation to participatory development and sustainability, opening a new extension era that advocates advisory services and joint learning. In addition, farmers in the Mekong Delta have been further integrated into the international market and face new production process regulations and products standards, which leads to massive demand for high technology and relevant knowledge, whereas further bureaucratised extension system and service have constrained the application of alternative extension methods. The extension landscape prominently features with top-down training and visit approaches. Adopting sustainable and participatory principles has gone no further than a superficial tool-form use. Local needs have not informed extension plans, while a large number of extensionists have worked passively and bureaucratically. Local knowledge is undermined.

I argued in the previous section that learning-reflective and community-responsive extensionists are the agents of change. Assuming that behaviours are derived from "nonrational action oriented to cultural beliefs constitutive of the institutional environment", for sociological institutionalism, professionals are agents of institutionalization through macro-level state regulation and normative isomorphism and micro-level actions oriented to conformity or decoupling (Nee 2005, 63). While this institutionalism emphasises human agency, the capacity to doing things (Giddens 1984) of all actors, only a few with discursive power more concentrated with stocks of knowledge and resource form social actors (Long 1992; 2001). Through interaction, these agents can activate feedback and learning loops with rural communities, manoeuvre other extensionists into change processes, and create empowerment of local extensionists. This reorganisation stems from extension career identity

reproduction and in-reality knowledge practice, and interaction between agricultural extension and production communities. The career-based high-qualification extensionists play the role of global and scientific knowledge brokers. The career-based, highly-localised extensionists keep local knowledge transmitted and local needs informed. The process of change has to undergo zigzag and multi-directional courses over years of development. Social skills of agents and change counterforce determine the direction of such development. A real change can be possible only when local knowledge is appreciated and knowledge-based work is the core of cross-hierarchical communities of extensionists, and a reflective learning culture is nurtured and cherished.

My findings are compatible with research by Anderson and Feder (2004): in developing economies, public extension organisations are often inadequately funded and poorly designed, leading to weak links between knowledge extension and generation and "frequent encumbrance of extension agents with public duties beyond those related to knowledge transfer" (Anderson and Feder 2004, 55). However, I would not recommend either socialisation or commercialisation of the system, which is not supportive to rural community development. A learning system transformation can solve immediate problems as well as longer-term ones because knowledge, not anything else, is the core element of extension conceptualisation, practice, education, and planning. Mulder and Pachuau (2011) are correct in commenting that the "agricultural" element in agricultural extension and education is getting smaller and smaller in the context of general development and society in both Western countries and "developing" contexts. Extension itself has evolved into a new fourth paradigm that is called facilitation extension, in which extensionists work as knowledge brokers who facilitate the learning process among all types of farmers and rural people (Swanson and Rajalahti 2010).

Figure 3.11: A model of bureaucratic extension transformation into a learning system



Source: Own presentation

Summing up

This chapter has explored knowledge work under the public extension system. A number of orthodoxies have been highlighted within the bureaucratised agricultural extension system and practices. Extension policies renewed with alternative development principles, become business as usual within the bureaucratic structures and mechanisms in organisation, budgeting, human resource management, and local networking. The indispensable and increasingly important role of grassroots extension workers in formulating plural local need-reflective planning, platforms, and linkages is largely neglected in the formation of grassroots extension levels as the systems administratively organisational perfection with the poorest qualified staff and least knowledgeable information providers. Extension clienteles more diversified and with increasing needs for knowledge lose their important implications for knowledge interaction transformation before the prominent top-down knowledge transfer and training with reduced quality, due to financial and professional constraints that lead to the farmer's repudiation of the system.

Within such a bureaucratic extension system, the success of extension projects that managers and professionals frantically pursue ends up with resource concentration among model farmers with better socio-economic conditions, while benefits for the majority of "normal" farmers are ignored, sacrificed, or dependent on vulnerable knowledge-sharing from such model farming. One of the most desperate consequences is the current motivational and professional crisis that grassroots extensionists are experiencing.

Yet, amidst such difficulties, several grassroots extensionists have, though less recognised, managed to work as the knowledge professional that local communities expect them to be (local embeddedness) beyond the basic local information provision assignment by their managers (structural embeddedness). To propose a change, the chapter, from a sociological new institutionalism perspective, discussed the development path of the current extension system into a learning organisation can possibly be relied on to persevere in the promotion of local knowledge practices of groups of learning-reflective extensionists and community-responsive extensionists, rather than administratively top-down technology transfer and monitoring or institutionalisation of a certain change idea wholly borrowed and foreign.

CHAPTER FOUR

ACADEMIC KNOWLEDGE IN BOUNDARY TRANSGRESSION: AGRICULTURAL RESEARCH, POLICY AND SOCIAL DEVELOPMENT INTERACTIONS

> In our scientific research work, we make every attempt to have good quality products. Such products must be of high applicability for farmers. It is also a failure that our scientific products become commercialised and costly, only affordable to better-off people. It deviates from our ultimate research goal (Interview 152, Agriculture and Applied Biology senior researcher, female, Can Tho, 6.10.2010).

The positioning of science as "the premier knowledge institution throughout the world" (Knorr-Cetina 1999, 1) and the universities' monopoly of basic knowledge production are thus challenged. Evers (2005, 11) holds the view that science is "increasingly intermingled if not determined by the organisations that govern the knowledge-based world market". A growing body of literature, under the umbrella of triple helix research, points out that the science, industry, and university in their polycentric relations interact and take "the role of the other", which is conducive for knowledge production and regional innovation (Etzkowitz 2008; Evers 2005; Zhou 2008). The rise of corporate universities illustrates a new educational role that corporations take when traditional higher education cannot yet provide a model that blends learning and work (Nixon and Helms 2002). Universities are making internal transformations as well, such as increasing their entrepreneurial activities and social development goals in teaching, research, and technology development, which provides spaces for producing polyvalent knowledge with theoretical, technological, and commercial potential[49]. Several universities extend a new entrepreneurial (Etzkowitz 2008) or developmental (Brundenius and Göransson 2011) identity.

Knowledge brokering for agricultural development is not new; for example, since 1906, an agricultural extension liaison division has been established at the University of Wisconsin to link local farmers and university researchers[50] (Lomas 2007, 131). In Germany, Friedrich Wilhelm Raiffeisen, born in Hamm near Bonn in 1818, created self-help, credit, and seed distribution organisations for poor farmers in the 1860s. Knowledge brokering has recently gained growing importance in development conceptualisation and practice, particularly now that development itself is being redefined as "the ability to generate, acquire, disseminate and employ knowledge, both modern and traditional" (Oldham and McLean 1997). Acting either as knowledge managers, linkage agents, or capacity builders, knowledge brokers make knowledge accessible, understandable, and usable for their audiences, as well as create positive social outcomes by enhancing access to brokered knowledge within a society or community (Oldham and McLean 1997; Ward, House, and Hamer 2009, 2).

---

[49] Etzkowitz (2008, 30) describes this as the second academic revolution in which universities undertake an economic and social development mission. The first academic revolution occurred from the mid-19th century with transformation from a teaching to a research institution.

[50] It is also noted that all land-grant universities in the United States have this kind of work as part of their original charters and the financial and land support of the federal government during the Civil War.

In developing and transitional countries such as Vietnam, where the private sector is emerging and the development of the triple helix is rudimentary, the third role[51] of academic institutions, including universities and research institutes, largely state-governed, maintains the inclination to attach themselves to developmental missions and tasks of the sector and local communities. An analysis by Tran Ngoc Ca and Nguyen Vo Hung (2011) indicates that the majority of academic organisations in Vietnam are not capable of providing sophisticated services to industry, and thus, firms tend to rely on their own or other firms regarding technology innovation. Yet the authors notice that particularly in traditional sectors, such as agriculture, and in some dynamic parts of the country, for example southern Vietnam including the Mekong Delta, academic institutions perform a vital role in diffusing technical solutions to farmers. Indeed, academic institutions can perform a number of knowledge-related functions that connect and translate global knowledge and scientific research into applied technology that informs locally specified conditions.

Against this background, this chapter in the first section examines the internal transformation of academic institutes in the Mekong Delta in terms of performing the third role. Continuing the discussion from the previous chapter with an expansion of researcher-extensionist-farmer interaction, Section 4.2 analyses the hard realities of participatory development approaches designed and applied in the delta. To explore interactions between academics and farmers metaphorically conceived as a "water and fish" relationship, knowledge diffusion practices and developmental impacts are scrutinised from both "formal" and "informal" modes and spheres and through cases of farmers as knowledge brokers and generators in Sections 4.3 and 4.4. Section 4.5 revisits the "water and fish" metaphor in the light of partnership development, leading to the concluding section highlighting a transformation that the practice of interaction between academics and farmers with interchanging roles of knowledge producers, brokers, and users is turned into a dimension of the alternative epistemic culture of development in the Mekong Delta.

4.1. The third mission: The internal transformation of academic institutes in the Mekong Delta

The second academic revolution has taken place over recent decades in Vietnam's education system with the focus on an increased research proportion in the university strategy and individual researcher workload. However, transformational results are still far from expectations. It is beyond doubt that the transformation is of high priority for the decades to come. A large number of research institutes and centers have even been founded under the influence of this second conversion wave; however, an appropriate human resource mechanism must be reinforced in order to achieve research volume and capacity change:

[51] In the wake of the second academic revolution, the third mission of universities is identifies as economic and social development, apart from the two traditional roles of education (teaching) and research.

> Our institute consists of 70 researchers but only 20 of them are listed as lecturers and entitled to the salary from the state budget under the public employee scale. We have to pay the rest, creating a huge pressure on research project attainment (Interview 122, senior researcher, male, Can Tho, 2.9.2010).

The third role of agriculture development-focused academic organisations in Vietnam and the Mekong Delta has always been accentuated in their founding blueprint, proclaimed missions, and development plans; provision of training and education services for local agricultural staff and farmers, extension of new breeding varieties, and transfer of advanced technology to rural communities. These are also the main criteria of an institute's performance evaluation by state managers and the broader society. A very common evaluation of the role of agricultural institutes states:

> "The contract 10 mechanism began the unleashing of productive forces in agriculture that was followed by other steps in technological reform. Agricultural scientists (agriculture, forestry, fishery and water management) worked in closed association with farmers, resulting in noticeable achievements in technological application and development: high-quality and high-yield strains of crops and animals, advanced cultivating techniques with a relatively developed irrigation system, new advances in post-harvest and processing technologies, etc. Researches on some advanced technology, gene recombination technology, etc. started to be applied to practice and bid achievements have been made. From a food importing country, Vietnam has become the second biggest rice exported in the world (Vietnam exported more than 4.5 million tons of rice in 2005 and 5 million in 2006). A relatively high yield is recorded: 4.86 tons per ha. In 2004, the total food output reached 39.3 billion tons, close to the food security level (500 kilogram/person/per year). The report to the National Assembly by the Government emphasized, "the application of new sciences and technologies to agricultural production makes noted contribution to the growth". It was also praise to our farmers for their creativity. Noteworthy is the fact that 15 research works in agriculture won the Ho Chi Minh awards in 1996, 2000 and 2005. They have contributed to the cause of hunger eradication" (Vu Dinh Cu 2007, 318-319).

It is now worthwhile to review how research and development roles have transformed to meet new societal needs in a globalisation era when Vietnam and the delta will be further integrated internationally.

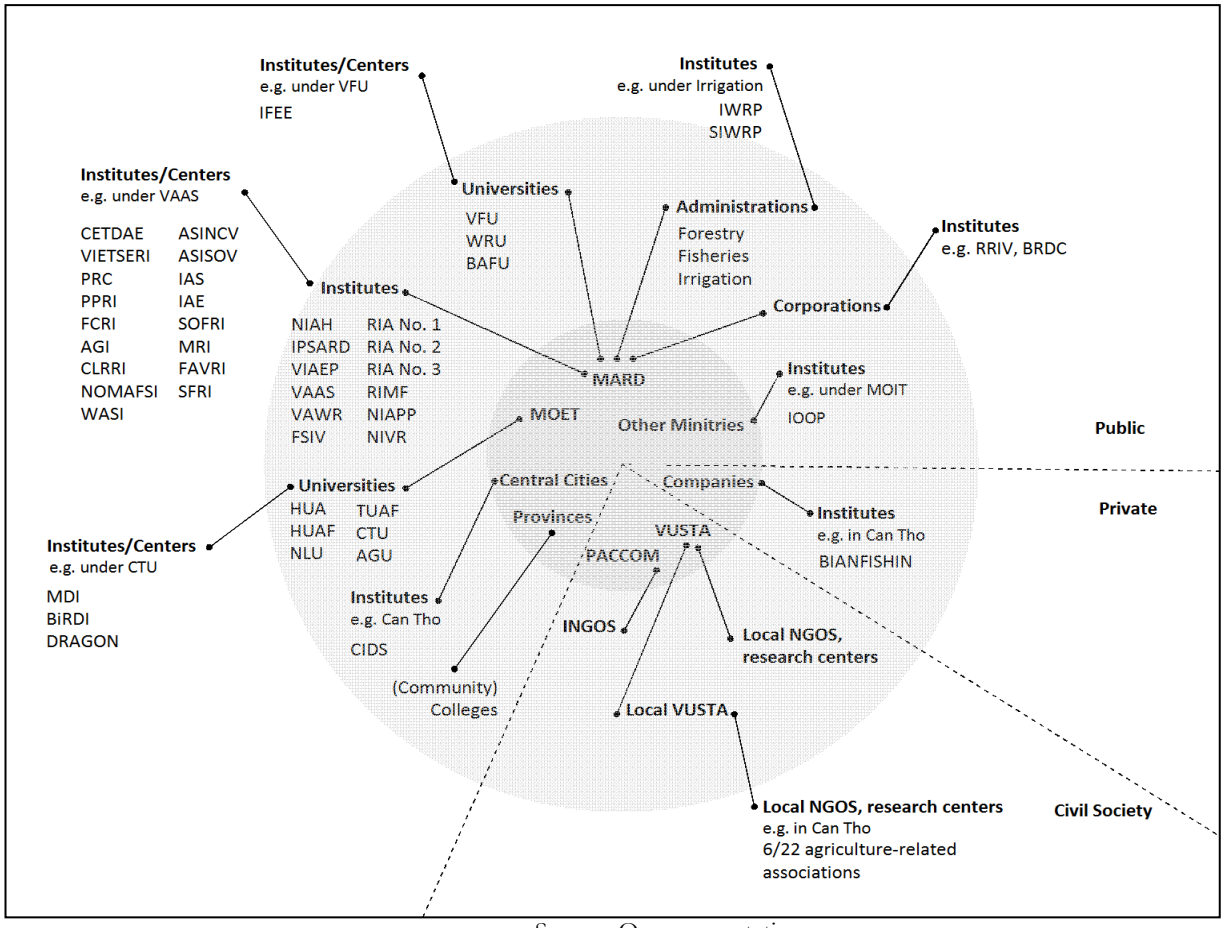
Main actors: Lost and regained positions

State decisions on research organisation establishment and distribution, apart from those dependent on historical contexts, are often made in compliance with the national agricultural development grant design over local comparative advantages, not to mention individual leaders' preferences and favour. Nevertheless, the research landscape is biased toward "big" cities, for example Hanoi and Ho Chi Minh nationwide, and Can Tho in the Mekong Delta region (see Appendix 4.1). This distribution pattern is similar to the epistemic landscape of knowledge-producing organisations in Ho Chi Minh City and the Mekong Delta described by Evers and Bauer (2009).

Research organisations involved in agricultural and rural development in the Mekong Delta have significantly developed in diverse forms in three arenas: public, private, and civil society (see Figure 4.1). Besides international non-governmental organisations and professional associations, research and development centers have been established by high-qualification professionals or researchers under the umbrella of the Union of Science and Technology (see Nguyen Quy Hanh and Nguyen Ngoc Khanh Van

2012 for cases in Hue City). Private seed and technology centers of companies are growing in parallel with increased registered enterprises. Binh An Fisheries Research Institute, Vietnam's first private research institute, is in the Mekong Delta (see Chapter 5).

Figure 4.1: The knowledge production system for agricultural and rural development in Vietnam (in reference to the Mekong Delta)



Source: Own presentation

Public organisations are predominant actors in the knowledge production system for agricultural and rural development in Vietnam and the Mekong Delta, despite emerging research organisations in the private and civil society arenas. This analysis will focus on public research institutes and universities and colleges.

The two main research institutes in the Mekong Delta are: Cuu Long Delta Rice Research Institute (CLRRI), established in 1977 in Co Do district, Can Tho city, and the Southern Horticultural Research Institute (SOFRI), established in 1994 in Chau Thanh district, Tien Giang province. Currently, under the management of Vietnam Academic of Agricultural Science (VAAS), these are nationally-leading institutes in their fields. They provide masters and PhD courses, training courses for officials and farmers, and technology transfer for the farming community via science and technology transfer centers.

Can Tho University (CTU) is a regional-level university. It has various faculties and institutes with a long history and reputation in agricultural and rural development all around the delta:

- The College of Agriculture and Applied Biology (CAAB), established in 1968, and the College of Rural Development, recently founded in mid-2011 as a demand of research beyond agriculture;
- The Mekong Delta Development Research Institute (MDI) grew out of a sub-department of CAAB in 1976 to emphasise strategic research on farming system development, plant resources, and socio-economic policies. The two other institutes are the Biotechnology Research and Development Institute (BiRDI) established in the 1960s and the Research Institute for Climate Change (DRAGON), founded in 2008 to focus on climate change, sea level rise, and community resilience. Under-CTU institutes' missions concentrate on research, technology transfer, and the provision of advanced undergraduate programs.

Local universities and colleges often build up their education and research activities to meet the needs of the provinces where they are based. Significantly, the model of community colleges is widely and rapidly developing in the Mekong Delta. These institutions highlight community ownership at the provincial level and community-based scientific and technological research (see further Epperson 2010).

Since 2005, key institutes in the Mekong Delta formerly under the management of the Ministry of Agriculture have been put under the administration of an academy or university. This means that these institutes have more space for research and decision-making. However, the state budget allocated to them has been heavily reduced. This poses the most apparent difficulty to institutes, which used to rely heavily on the state budget and are now less innovative because of this organisational change. However, such management system revision and financial pressure have provided opportunities for research institutes to develop their own research strategies and projects that satisfy both international standards and local needs, while strengthening their research interests and resources.

The establishment of research institutes and universities and colleges has opened up and maintained constant interactions between academics and farmers in the Mekong Delta, which is often described with a "fish and water" metaphor (see Section 4.5 below). Professor Vo Tong Xuan, who is a notable agronomist in the national academic community and often called Dr. Rice by farmers in the Mekong Delta, has amply described the close cooperation between the university and rural communities based on participatory development and knowledge integration knowledge practices, which had been advanced even before the liberation of the whole country had been achieved. Mass dissemination of high yield varieties (HYV) is not only a success for an approach of agricultural knowledge transfer but also a convincing contribution to the food and agricultural invigoration of post-war Vietnam.

> "For nearly 20 years, many Vietnamese scientists, particularly at the University of Can Tho, have practiced the participatory rural appraisal approach to determine constraints in farmers' fields. From this basis, they have tried to solve the farmers' problems by cooperating with the local administrators and with other scientists in the country. Generally, the constraints causing low rice production were analyzed systematically on the basis of soils, insect populations, disease occurrence, and varietal improvement. Once the constraints have been categorized into issues that can be tackled, the issues

> are assigned to different students as a research topic for graduation. These students put into practice the knowledge that they have gained in the first 3 years in school in trying to solve the problem, They learn both from the issue assigned to them and by going to the districts or villages where the problem occurs, which is also where they carry out their research. Thus, their research plot also serves as a demonstration field for the local farmers and administrators, who can see the solutions that can be applied to their local condition. We started this integration of research–instruction–extension into our education and training of the students in Can Tho in 1973. Thanks to this approach, appropriate technology — particularly new rice varieties — can be spread quickly among the farmers by themselves, especially originating from the cooperating farmers" (Vo-Tong Xuan 1994, 27-28).

Since national unification in 1975, the intensity of interactions allows us to distinguish three major periods of time with lost and regained academics' roles in agricultural and rural community development, as outlined below.

1975–1990. This period is characterised by centralised agricultural production and collectivisation. The impact of the Green Revolution provided new opportunities for HYV. Local farmers relied mainly on floating rice crops with very low productivity, suggesting a need for crop model changes. Research organisations carried out research through central budgets and transferred new technology to farmers via Science and Technology Transfer Centers (STTCs). They played the role of the monopoly knowledge source for the rural community.

1990–2005. This period witnessed agricultural privatisation as well as the emergence of agribusinesses. Farmers became more comfortable with HYV rice intensification and multiple sources of information from agricultural extension system, agro-companies, and mass media. Research institutes were undergoing internal structural changes, with more organisational autonomy and a lower state budget allocation. Their research and knowledge diffusion activities focused on agricultural diversification models and sustainable development, which had not yet attracted the interest and attention of the local farmers busy with income generation and economic development activities. Academics were losing their development positions and roles.

2005–present. This period marks the regained importance of scientific knowledge and academic cooperation. Farmers have faced new diseases and pest outbreaks due to intensive farming and pesticide dependence. Confused by multiple sources of information with fragmented and conflicting knowledge, farmers returned to scientists for legitimatisation. Commercial farmers and export-driven knowledge-intensive farming need updating and high-technology transfers that cannot be provided by normal public channels. Last but not least, the development of 'intellectual' farmers has required new methods and approaches for academic-farmer interactions and partnering.

New research approaches, new development roles taken

This section delves into research practices under the environmental and internal changes of academic institutes. The changing nature and quality of international cooperation, involvement of multiple

disciplines, and demands of policy consultations have shaped local research implementation and management. Shifting human resources dynamics also require the appropriate tacit knowledge management mechanisms.

International cooperation

International cooperation plays an increasing role in education and research institutions, especially in a more globalised world. For some, international research institute cooperation is a must because of a number of advantages:

- Problems can be resolved more easily and in relatively less time;
- Feed-forward and feedback to researchers is better;
- Expertise and other scarce resources can be shared;
- New rice information, technologies, and research methods can be disseminated faster;
- Scientific cooperation across political borders and economic barriers is facilitated.

(Lampe 1994, 15)

International cooperation for research purposes has been prioritised and strengthened throughout the formation and development course of institutions in Vietnam and the Mekong Delta. This is a channel for human resource training. It is also a gateway for global knowledge transmission and localisation. A long historical cooperation between the International Rice Research Institute (IRRI) and Vietnam's Mekong Delta provides a well-known example:

> "Researchers from Vietnam and IRRI have worked in partnership since 1968 to provide the scientific base for this transformation of the rice economy. Since the introduction of IR8, a total of 63 breeding lines from IRRI have been released in Vietnam. Adoption of these varieties now extends to 70% of the rice-growing area. Supporting the introduction, testing, and evaluation of modern rice varieties and related technologies was a strong network of national research institutions from the Ministry of Agriculture and Food Industry and agricultural universities under the Ministry of Education and Training. Since 1964, 362 Vietnamese scientists have been trained at IRRI in degree and nondegree programs (90% of them since 1981)" (Denning and Vo-Tong Xuan 1994, xiii).

The significant feature of this partnership is the strong academic linkage and exchange between IRRI and various institutes and agricultural universities in Vietnam:

> "For example, Dr. Vu Tuyen Hoang, Director of the Food Crops Research Institute and on the staff of MAFI, coordinates the Vietnam-IRRI Rice Research and Training Project. Professor Vo-Tong Xuan, Vice Rector and Director of the Farming Systems Research and Development Center of the University of Can Tho, has served as an IRRI Trustee since 1990. Dr. Mai Van Quyen, Vice Director of the Institute of Agricultural Sciences of South Vietnam, was an IRRI visiting scientist in 1989 Dr. To Phuc Tuong, who chaired the Department of Water Management at the University of Agriculture and Forestry in Ho Chi Minh City, joined IRRI as a staff member in 1991" (Lampe 1994,17).

Rice research is of the highest priority for Vietnam, so the partnership of IRRI and Vietnamese institutes might be less representative in other agricultural sectors. More generally, there are three main international cooperation modules: one-way, two-way, and partnership.

In one-way cooperation, local researchers implement part or whole research projects already designed by foreign partners. The simplest task is to conduct field interviews and complete questionnaires. The more

complex work consists of doing research on request or by order. They are paid for this work. Another type of one-way collaboration is foreign investment in infrastructure and facilities and capacity-building for Vietnamese research institutes. For example, Japanese assistance via Japan International Research Center for Agricultural Sciences (JIRCAS) was directed to the construction of the Faculty of Agriculture and Applied Biology, Can Tho University, one of the most modern agricultural research facilities in Vietnam (Interview 115, senior researcher, male, Can Tho, 27.08.2010). The final one-way mode is foreign researchers who carry out their research in Vietnam independently. Very often, Vietnamese researchers assist them only in administrative duties.

Two-way cooperation is usually executed under an umbrella of agreements signed between countries or ministries. SANSED (Closing Nutrient Cycles in Decentralised Water Treatment Systems in the Mekong Delta, Vietnam) and WISDOM projects are examples of academic mutual cooperation between Vietnamese and German scientists and researchers from multiple disciplines like water science, environment, hydrology, sociology, information technology, and earth observation. Research cooperation activities stretch over joint implementation of cooperative research programs, academic exchange, joint use of facilities, knowledge-sharing, and co-authorship of reports or papers. Two-way cooperation is currently the most prominent mode of scientific cooperation with international partners at the Mekong Delta institutes (Interview 112, senior researcher, male, Can Tho, 24.8.2010). It is crucial for multidirectional cooperation that effective research coordination and knowledge-sharing among disciplines, institutes, and researchers is maintained. Also, how cooperation can produce more strategic research-based recommendations and locally developed applications beyond co-authored articles is a paramount challenge (Interview 113, senior researcher, male, Can Tho, 24.8.2010).

Proactive participation of collaborative parties in all research stages athwart projects is delivered through strategic partnership. This is the situation with IRRI and Vietnamese institutes. A more subtle form is project partnership. Partners jointly write project proposals, appeal for sponsorship, and implement project objectives. Each party is responsible for undertaking its assigned tasks. This is a new trend that Mekong Delta academic institutes have been actively pursuing (Interview 122, senior researcher, male, Can Tho, 2.9.2010). By and large, cooperation and even partnership is built on mutual interest, commitment, and resources availability of partners.

Strategic partnership building in agriculture research with international partners has a long history in the development of academic institutes in the Mekong Delta, especially in rice science. "Traditional" partners include IRRI, Food and Agriculture Organisation of the United Nations (FAO), and universities from the Philippines, India, and Japan. Mutual efforts and partnership cooperation have become prominent in the international cooperation landscape. International partners have been diversified to include Australian, American, and European institutes. Research projects have increasingly engaged in complicated and hot-

spot research problems that local communities are dealing with, both trans-province and cross-border (see also Appendix 2).

Research coordination

On a regular basis, researchers in Vietnam and Mekong Delta exercise research at three different scales: international cooperation, ministry-governed, and province-governed projects. National research procedures are administratively complicated, which very often dissuades talented pure research participants (see Bauer 2011). Further, in order to increase research application acceptance, it is wise to invite a minister-managed research institute or center or pay for several working visits to Hanoi-based organisations (Interview 5, senior official, male, Can Tho, 19.5.2010). This practice, however, is hardly easy for researchers far away in the Mekong Delta:

> How can I manage to go to Hanoi several times while our institute has to cover all expenses ourselves. The expense for me just to cover the flight fare, accommodation for a couple of days. and local transportation in Hanoi is already very much. This cost is as much as the salaries of our several staff (Interview 144, senior researcher, male, Can Tho, 21.9.2010).

For research quality control, it is strictly speaking good that a counterargument mechanism is regulated in written policies. In practice, such regulations become challenging and costly for researchers from a peripheral research hub like the Mekong Delta:

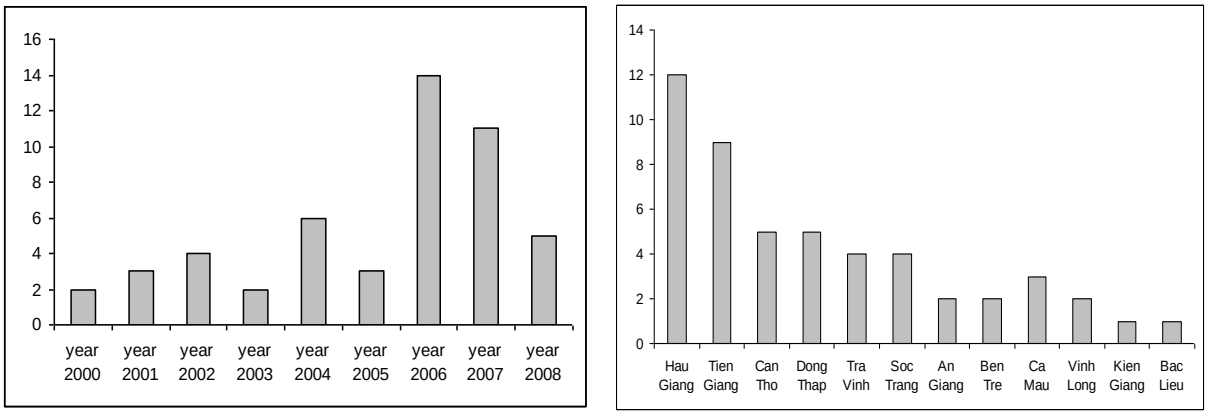
> Sometimes we have to invite scientists from Ho Chi Minh City to sit on a counterargument board. We have to pay all expenses for at least two days. We understand that high-quality counterargument might open up new ideas and research initiatives, but it needs the right invited opponent and a sufficient budget. Therefore, counter-argument is perfunctorily conducted; everything remains the same with or without a counter-argument session. Opponents say sketchy and diplomatic words and give the maximum score; participants all clap thunderously and go home (Interview 122, senior research, male, Can Tho, 2.9.2010).

At the provincial level, research plans are promoted to be locally contextualised and oriented to applied knowledge. Lately, there has been a rising trend of researcher involvement in provincial research projects (see Figure 4.2). Hau Giang, Tien Giang, and Can Tho are among the top provinces for hosting CTU research over the last decade.

When research cooperation between provincial authorities and research institutes has not been institutionalised, it seems that the interest of experienced researchers in provincial projects is determined by geographic distance and the appreciation they receive from the local project coordinator:

> Researchers have a tendency to launch their work in favourable areas, not in difficult ones. For areas where scientists are not respected, they do not carry out their cooperation research, or they work just to finish their duty. For localities where they are invited and well-respected, they would try their best to fulfil their jobs (Interview 123, senior researcher, male, Can Tho, 3.9.2010).

Figure 4.2: Number of provincial applied research conducted by CTU in 2000-2008, by year (a, left) & by province (b, right)



Source: Own presentation, data collected from CTU reports

In the context of increasing research cooperation and prosecution of multidisciplinary research, coordination is imperative to the achievement of common goals. Real life complex problems require multidisciplinary efforts for practical and comprehensive solutions (see also Section 4.3):

> In a recent effort on water hyacinth (*Eichhornia crassipes*) in Hau Giang, three are three groups of scientists joining in the project: agronomy, fishery, and technology. Agronomists research the use of water hyacinth for feed to animals or as organic materials for mushroom cultivation. Technology researchers take care of exploiting water hyacinth as input for biodigesters, while fishery scientists' focus on using biogas sludge water in fish breeding. Related research activities among disciplines are coordinated. Otherwise, experience-sharing in project management is also useful (Interview 147, senior researcher, male, Can Tho, 30.9.2010).

It is important to note that interdisciplinary research has also received growing attention of Mekong Delta academia. International cooperation is one of the primary motives for local endeavours in interdisciplinary science.

> In many university schools and institutes, researchers often do it the same way: they set up common goals and draft a general plan in which objectives are stated. Participating groups of researchers formulate their detailed activities to realise the relevant objectives. And then discussions of all group members are arranged to finalise the general plan. Based on the approved plan, groups will work together and each member is proactive in executing their work. If there is a problem during the implementation, it will be raised among the groups. They form groups that can work professionally. or else they cannot keep their standing with international partners (Interview 148, senior researcher, male, Can Tho, 1.10.2010).

Multi- and interdisciplinary studies are not only of great benefit to academia but also to practical problem-solving of rural communities. It is widely claimed that the knowledge of local people provides a strong source of argument for intensified interdisciplinary and transdisciplinary research (Tahmasebi, Ehlers, and Schetter 2013; Nguyen Quy Hanh, Vo Dinh Anh Tuan, and Nguyen Ngoc Khanh Van 2013). In many cases, disciplinary solutions become unproductive for real life decision-making by farmers. This is clearly evident in dealing with complex problems like climate change or basin water management:

> "… coordination among the scientists in Vietnam is not good enough to tackle each of the constraints in different agroecosystems to the degree needed. What we have has come about sporadically, piece by piece, while farmers have to face the whole range of problems in their farms. In other words, we scientists are trying to find the pieces and leave it to the farmer to put them together. The farmers cannot do this because they find it very confusing when a soil scientist tells them to do one thing, an agronomist to do another, and an entomologist or a pathologist to do a third - sometimes in the same locality three or four different groups are working without coordination. I think this kind of uncoordinated practice would be eliminated if the scientists worked within a unified program, where each looked at one aspect of a total picture and considered how he or she would affect that picture. The farming systems approach seems logical to me" (Vo-Tong Xuan 1994, 28).

Policy consultation

Policy consultation by researchers is done in two primary ways. Research in Vietnam, especially applied research, always includes an intensive element of policy recommendation. This is the prominent method of policy consultation. However, if the research is circulated only among academics or kept on bookshelves, the policy-informed objective cannot be achieved. In applied projects, before their conclusion, a workshop is organised to extend the results to wider audiences. However, to what extent the suggestions made in these workshops are recognised and realised in largely unknown. The second method involves policy research that academics are invited to take part in or design. Again, how much their proposed consultation is acted on depends on the position and power influence of state partners or policymakers working with them.

The participation of research institutes in policy consultation has been enhanced recently in the context of diversified law-making and enforcement. Good consultation must be evidence-based and critical thinking assured. However, expressing criticism or disapproval against approved grand policies, even with a constructive purpose, seems to be rare in Vietnamese social science circles. This paradox leads to the *illustrative research* (*nghien cuu minh hoa*) phenomenon, as it was called by a Mekong Delta senior researcher:

> It can be considered as the common shortcoming of the social science of Vietnam in general, not only of the Mekong Delta in particular. Many social science studies only do illustrative research. When reading articles, we can see photos for illustrative purposes amid the content of articles. We call them 'illustrative research' because researchers also do the same thing. Even research done by many professors in many workshops we attended aims to spell out existing policies. For example, when a state policy is introduced, the research will seek to prove that this policy is appropriate. But this is unhelpful, because the research is often biased and lacks a critical tone (Interview 144, senior research, male, Can Tho, 21.9.2010).

At the same time, reading scientific work does not seem to be the comfort zone of state decision makers, at least at the local level. Such reading requires a discovery of researched issues and speculation on the possibilities for the application of the research results:

> Several state leaders and managers seem to be very lazy in reading scientific materials and attending workshops. For workshops that are totally scientific, they only attend if their name is stated on the invitation. Also, they often attend only a part of the workshops. They are also lazy in listening because they get used to their management job. The number of officers who spend time reading research papers and seeking opportunities for possible application of research results is very limited. This is a big limitation. The research results can be very good. It is expected that they will think deeply to implement the research results (Interview 144, senior researcher, male, Can Tho, 21.9.2010).

The Socio-Economic Institute of Can Tho City is an intriguing case of a research-based policy consultation model. It was established in mid-2008 under the direct management of the City People's Committee. It operates to conduct research and provide consultations to the City Party Committee and People's Committee in the fields of development strategies and policies, state management, socio-economic issues, international integration, and urbanisation. This is a hybrid organisation of a state agency and a research institute. It has the typical difficulties of a newly-established institute including funding and competence deficiencies. The policy consultation function is intensely emphasised:

> Our institute is invited to participate in meetings held by the People's Committee on diverse topics of planning, construction, education, employment, or even civilised lifestyle. I am responsible for attending meetings as other staff of the institute are not enough qualified to contribute opinions at city-level meetings. We are expected to give opinions in meetings rather than passively sit and listen. It is a real pressure for me (Interview 144, senior researcher, male, Can Tho, 21.9.2010).

The institute's leadership representatives have to accompany city leaders on their working trips with central and local organisations. They also have to provide comments on sub-provincial socio-economic development plans, sometimes under working contracts. The institute is often invited to contribute opinions for strategic plans in the province and delta as well. Consultations are sent via written reports to higher level agencies; it is the institute's responsibility. However, to what extent their ideas are considered or integrated into the proposed plan is never reported; unfortunately, this is beyond the institute's responsibility (Interview 144, senior researcher, male, Can Tho, 21.9.2010).

Tacit knowledge on moving

There are two waves of human resource movement in the agricultural sector in the Mekong Delta. The prominent wave is "toward the private company". This is precisely the case of public extensionists leaving their posts to work for agribusiness under the current motivational and professional crisis of local extension system (Chapter Three). Young researchers leaving their institutes after higher education pursuit abroad tell another story with a similar narrative. The two main reasons cited are a much higher salary and a better working environment. Foreign companies or large enterprises are ideal for satisfying these conditions.

> In general, my institute satisfies training needs and gives opportunities for researchers to study abroad. However, many qualified staff members are either appointed by ministries to posts in other institutes or resign to find better working opportunities. In reality, my institute's facilitate many young researchers to do postgraduate study abroad. However, upon their return to the home country, they quit research job and work for foreign companies (Interview 113, senior staff, male, Can Tho, 24.8.2010).

It is true that research institutes have developed their human resource development strategy, in the long term as well as in immediate response to this unfortunate exodus of young researchers. However, such responses are mainly administrative regulations. In some institutes, there is a gap between researcher

generations. Leadership succession has become one of the biggest preoccupations of many research institutes:

> One of the main challenges in research is human resources. In the market economy, young researchers, after being trained at research institutes, continue to work for these institutes. However, most of them then decide to work for agribusinesses because of economic benefits. It can be said that human resources for research is seriously deficient. In the interviewer's institute, there is a distinctive gap between leading researchers and young researchers. While leading researchers are at the age of 50 to 60 and soon going to be retired, younger researchers are not enough qualified to take over research tasks (Interview 112, senior researcher, male, Can Tho, 24.8.2010).

The second wave, which is quieter and more subtle, is the appointment of senior researchers to leading posts of state institutes or organisations. This human resource reallocation is done within under 'party leads, state manages' principles. These senior researchers bring all their research culture and professional and social relations to their new organisations, in which research may or may not be the main task. It would be fortunate if policy consultations by researchers were more appreciated when senior researchers take leadership positions in ministerial agencies.

From an organisational management perspective, there is a loss of tacit knowledge and skills when researchers relinquish their academic work. A researcher or professional extensionist has undergone a lengthy apprenticeship to acquire the skills to formulate research problems and solution strategies beyond the systematic transfer of knowledge (cf. Senker 1995). Furthermore, expert networks and social skills as important components of tacit knowledge of agronomists and extensionists need long tenures to succeed (see Puusa and Eerikäinen 2010). Therefore, creating a favourable environment for the interaction between strategic thinkers and young researchers can be a good strategy for tacit knowledge exchange and creation of professional motivation and connection with newcomers (cf. Foos, Schum, and Rothenberg 2006). Occupational and social communities should also be encouraged beyond formal organisational learning (cf. Lam 2000).

Resignation of researchers (and extensionists) in these cases does not mean a withdrawal from their research career. The fact that the role of private sector in innovation is increasing means that working for companies can also provide other opportunities for research and development involvement. Therefore, sector-level knowledge management should focus on supporting social communities and multidisciplinary research.

Alternative epistemic practices: To what extent?

This section is a complement to the research efforts and coordination discussed above, focusing on larger development projects on climate change and water management. The following dialogue transcribed from a post-research seminar talk between a Vietnamese senior researcher at a Hanoi-based science and technology strategic planning institute and a group of approximately 15 international PhD students doing their field research in the Mekong Delta. The talk includes two parts in which the senior researcher first

shares research and development projects designed to include the engagement of different actors and knowledge world. The second section turns its focus to students' PhD projects and more locally-designed possibility discussions.

The talk covers interesting experience sharing on research coordination, information supply, roles of actors, climate change, tourism planning, and basin water management. What is significant is the alternative epistemic practice where scientific and local knowledge is accommodated. Therefore, community participation and public consultation have been carefully implemented. As such local 'living with floods' conceptualisation and practices are newly-framed in a regional strategic resilience plan. This research approach is demanding and challenging to PhD students who want to make their research actionable for local communities.

Part 1: Doing our project in an innovative way

Senior research: In Can Tho, we have a Climate Change Coordination Office (CCCO) coordinating all related activities of climate change in the city. It is one of the institutional innovations within a pilot project in three cities in Vietnam (Da Nang, Quy Nhon, and Can Tho) under the funding of international donors. A CCCO has a one-door policy and its mandate is to provide public information related to climate change. So you can really get support if you need information. Of course, in Vietnam sometimes the informal relationship is more important than the formal one, but at least you know when you get introduced to someone you are more likely to get it. I can help you if there is really a need […] In Vietnam, we have at least four or five river basins, and many provinces share the same watershed. We established several river basin organisations (RBOs) such as the Dong Nai RBO, but they are not really functioning very well. It is difficult to coordinate among provinces.

PhD student: There is no real coordination among provinces, not only regarding climate change, but…

SR: It's about all aspects of resource management; there are still a lot of problems. But at least when they are established they have mandates. But at the operational level, it is still not effective due to the problems of communicating among provinces.

PS: Where are RBOs located?

SR: It depends; for example, Dong Nai RBO is located in Ho Chi Minh City.

PS: How about the RBO for the Mekong River?

SR: An RBO is for a river within one country. Do you wish to know about Mekong River Commission (MRC)?

PS: No. Because I read from 1998 reports that there were some World Bank projects and they established an RBO for the Mekong River. But I am wondering in the Hau River or Tien River.

SR: World Bank projects? You know, along the Mekong River, there are a lot of attributes and I am not sure which one.

PS: Related to these governance and coordination aspects, what is the link between an RBO and the MRC or other international projects somehow doing things that are related to floods?

SR: The Asian City Climate Change Resilience Network (ACCCRN) was initiated by the Rockefeller Foundation to support four countries including Indonesia, Thailand, Vietnam and India. In Vietnam, it began in 2008 and we are now in the third phase, helping the three selected cities to develop their climate change resilience action plans. Now they have their own resilience strategies and have certain priority interventions. The funding organisations share a mechanism like an open competition for the member cities of the four countries so they can submit their plans with priorities to attract the funding organisations' appraisal and approval. Later on, the city can mobilise other resources and donors to deal with climate change in the city. So what you mention is very much relied on by CCCO; they should be more proactive and come up with their proposal and go out for funding. They can also receive funding from the Vietnamese government and they are supposed to coordinate and try to make this more effective by obtaining funding from both Vietnam and abroad. We implement pilot projects and after three years give recommendations on how effective the mechanism is, and we try to share this approach

with other cities in Vietnam and scale up and give feedback to the central government, because in Hanoi the central government is also facing how to coordinate climate change among line ministries. They really need some kinds of models of how to best coordinate climate change tasks, because climate change is very complicated and requires a lot of coordination among concerned agencies. We promote engagement not only from the government but also civil society. But so far we have not obtained much involvement from the business sector. Once you have the business sector involved, the project is more sustained. Investors are investing in certain risky areas but it is challenging to convince them because they need to see it as very attractive in the first ten years. If you think it is a long-term perspective, say 50 years, then you have to consider it carefully. How to involve in insurance companies is also challenging.

PS: How do local communities get involved in the project?

SR: The communities get involved in the way they come up with their own vulnerability assessment to identify what kinds of issues they have to face in the long-term perspective. All of this information has to take into account when a city develops its climate change resilience plan.

PS: How does it happen in the community when they do the vulnerability assessment?

SR: At this level, we involve local NGOs and they work closely with the community. They first introduce the concepts and knowledge about vulnerability and work with the community to come up with their vulnerability assessment. We try to use knowledge produced by Vietnamese institutions and universities and also link with the international institutes. So, we try to maximise using knowledge sources from both academia and the local community.

PS: How many people actually participate in assessment?

SR: We have participation of representatives from Farmer's Association, Women's Union, and Youth's Association. The way we operationalise it is that we set up where they can work continuously with the same people, in what we call shared dialogue. First we introduce all concepts and afterwards we sometimes come back and get their feedback and work with them, and they come out and carry out the assessment themselves. By doing this, we first raise their awareness but also build their capacity and now they are very confident in expressing their concerns and we see that as important. Until now, the decisions come from the central government and we go out to implement it. We work in different way, we can say that. We should discuss what problems we are facing and come up with priorities, bottom-up. We then organise a national workshop in Hanoi and invite people to Hanoi to tell the central government agency what happened over last two to three years. That's what we know is very innovative but it really requires time. We cannot work quickly, we really need time to work with the communities. But it is challenging because it is not always affordable for many projects. Our project donor is committed to give the time for us to go out and pilot documents and share them, so it has already taken four years. We are now in the third phase.

PS: So you're working with the representatives of the unions and associations?

SR: Yes, and then they express their concerns to the NGOs. But the concepts about the climate change, for example "living with floods" and so on are introduced already to them. Actually all such knowledge is there, what we try to do is to put the knowledge into a kind of framework. Their knowledge is already there, they exercise it all the time, because "living with floods" is part of their life.

PS: But the terminology and the concepts are introduced from outside?

SR: Sometimes you make it more explicit, so that they know what they are doing.

PS: How do you communicate with different users?

SR: We have a website to share our reports and papers. We produce video clips and documentary films. We distribute written and recorded materials to the workshops and meetings that we organise. We work with the community to develop the appropriate communication channels.

Part 2: Your PhD research projects

SR: And now with your research project, sometimes it is good that we meet and share and it is good for you guys to know at what kinds of needs you should aim your research. We see it as a match of research and development. We can organise some workshops that invite other stakeholders with potential needs; then, we not only have feedbacks from the academic supervisors, you can see also whether someone is interested in your results. So that you can be sure that at the end your research can be used; otherwise your research is put on the shelf and nobody cares about your findings. Except you and your supervisors, nobody reads your thesis.

PSs: [laughing]

SR: It is something in my heart. But you know my motivation when talking with people coming to Vietnam to do anything like you guys is that I am motivated to make sure the resources are used more

effectively […] I work at a research institution so my motivation is to publish articles. Look, how many people read your articles? The way you unpack your results is very important. If you just limit yourself in publication, this is a loss because of many ways of unpacking your results and communication to the right audiences and end users. You guys have sacrificed four years to do your PhD, you want to see something meaningful about what you recommend and somebody says yes they want to pilot your recommendations. That's very good; otherwise, it is a loss of resources so I encourage to be more proactive to talk with the climate change coordination office CCCO, tell them what you are doing and say that or anything that you can design in your research. Maybe you start your research with curiosity but make sure your curiosity is relevant to other people's needs, to make sure your results are used by somebody else later on. Knowledge management is very important, knowledge is there but it is how you use it. Maybe we do not need more information but we need to use it effectively. I will help you by playing the role of making sure you meet the right people, talk with the right individuals and assistants. If I am not the expert, I will introduce you to the others.

PS: I will write to you.

SR: But do not expect me to write back to you right after I receive your email.

These two discussions about two different scales of knowledge production indicate the potentials of alternative epistemic practices with systematic and future-oriented problem solving by harnessing various knowledge sources and stakeholders, including local knowledge systems. Yet such new ways and methods of knowledge production for both the senior strategic expert and PhD candidates are greatly determined by the learning-supported agendas and generous resource distribution of the funding agencies, making these cases different from the vast majority of project designs. What is unchanged is the project-limited-constraints, challenging the project and learning the culture of sustainability. Active reflection at the project scale can at least then be a mitigation measure of knowledge mis-management (cf. Allan 2012).

4.2. Participatory agricultural extension: Good intention, hard realities

Under the influence of shifting development paradigms, agricultural and rural development in many countries including Vietnam has undergone critical transformations, particularly in the areas of participation and sustainability. Within grassroots development, participatory approaches and methods have under various labels and names been applied across disciplines and sectors with the intention of advancing local knowledge, local diversity, and learning processes. Sustainable development has been promoted with the argument that economic growth, environmental protection, and social change can be harmonised.

Participatory agricultural extension (PAE) is an alternative approach introduced principally to promote the participation and agency of farmers in agricultural extension and education, enhance learning and practices in the local fields, and encourage learning among and between farmers and extension workers (SNV et al. 2003). Using two cases of adopting alternative extension approaches, farmer field schools and participatory technology development, this section investigates whether and how new approaches create change within the inherently top-down technical extension of a bureaucratic extension system.

Case study: Farmer field schools

In 1990, integrated pest management (IPM)[52] was introduced to Vietnam and the Mekong Delta as a solution to the problem of pesticide abuse habits of local farmers and to better protect environmental and farmer's health. The first IPM program launched in Vietnam and its Mekong Delta started with ecosystem studies in rice fields under the FAO's Southeast Asia Inter-country Program (ICP) on IPM in 1990. Unlike the previous lecture-oriented approach, a participatory training approach of farmer field schools (FFS) was enforced to empower farmers in making pest management decisions (Escalada et al. 2009; Huynh Q. Tin et al. 2010). Forming the core of FFS is a group of farmers with a common interest, who are assisted by a technically competent facilitator with the field as a teacher and a curriculum designed to demonstrate the natural cycle of its subject to experience season-long field-based courses for bottom-up change (Braun and Duveskog 2008).

By 2000, thousands of IPM trainers completed their IPM training courses via six IPM training centers nationwide and hundreds of thousand of farmers had participated in IPM-FFS (Nguyen Huu Huan 2001). Several IPM programs have been consolidated and applied to other crops like vegetables and groundnut with the assistance of Australia, the Netherlands, Switzerland, and Denmark, combined with international non-governmental organisations and local financial resources (Nguyen Huu Huan 2001). Moreover, within the IPM frameworks, IPM rice-fish models, IPM clubs, IPM communities, golden snail management, rat management, rice disease management, and seed rehabilitation have been promoted. It is estimated that approximately eighteen percent of farmers in the Mekong Delta were FFS-trained, assuming that an annual attendance of thirty thousand farmers was obtained (Escalada et al. 2009, 453). Yet, these programs are costly and foreign-funding dependent, so are hardly prolonged on the national and local extension agenda (Escalada et al. 2009, 448).

In parallel, IRRI-initiated IPM has focused on "no early spray" (NES) campaigns and made use of cost-effective, well-developed multimedia (Escalada, Heong, and Ho Van Chien 2009; Heong et al. 1998). The main local research partners are CLRRI and the Southern Plant Protection Center. The campaigns suggesting that insecticide application in the first 30 days after transplanting or 40 days after sowing is unnecessary were instigated in two remote districts in 1994 and, three years later, eighteen provinces in the South of Vietnam had applied this model from local funding, leading to the adoption by 550,000 farmers covering millions of hectares of rice, while the media campaign was estimated to reach ninety percent of farmer households in the Mekong Delta (Heong et al. 1998; Nguyen Huu Huan 2001).

[52] According to Kogan (1998), IPM connotes multiple meanings: "(a) the appropriate selection of pest control methods, used singly or in combination, (b) the economic benefits to growers and to society, (c) the benefits to the environment, (d) the decision rules that guide the selection of the control action; and (e) the need to consider impacts of multiple pests".

Previous research revealed that farmers who had accessed IPM-FFS or media campaigns largely reduced their insecticide use, especially those in campaign-launched areas and the years right after the campaigns (Nguyen Huu Huan et al. 1999; Matteson 2000). What should be noted from a 1992-2007 monitoring survey data analysis by Escalada et al. (2009) is that from 2005 onward, there is however an increasing trend in farmers' insecticide use and by 2007 farmers' insecticide sprays had returned to the levels of pre-campaign years. The authors highlight the need for repeated training and campaigns as reminders to reinforce farmer's judgments and spray decisions, particularly in the circumstances of pest outbreaks and conflicting messages by pesticide advertisements (Escalada et al. 2009, 454). Our focus group discussions (FGD) carried out with farmers from different backgrounds and locations in Can Tho City agree that IPM discontinuation may bring local farmers back to old pesticide-reliant habits:

> We did participate in IPM courses, more than 10 years ago or so. We now almost forget about it. There is no longer IPM training in our area. We occasionally watch IPM programmes on television, but they are just to watch (Farmer FGD, Phong Dien, 20.11.2010).

However, we noticed that the farmer's conceptual acquisition of IPM is a crucial determinant of their practice.

> Application of IPM is very useful for farmers. We can reduce production costs and increase our income. IPM also helps protect the environment and the health of farmers. IPM appliers are persuaded to plant healthy rice, protect predators, and visit their fields frequently. However, IPM has not been widely adopted in our areas because our fields are small-sized and unevenly distributed (Farmer FGD, Binh Thuy, 20.11.2010).

These remarks show the farmer's mental struggles between applying new methods and technologies over their traditional ways of doing farming. Learning new things merely as methods and without understanding the underlying assumptions and philosophy, can hardy persuade farmers, rationally and practically, to apply what they have learnt. Research by Rejesus et al. (2009) indicates a significant reduction of insecticide use by FFS farmers, but not NES farmers, compared to non-FFS or non-NES control farmers. Thus, a local funding deficiency should not be seen as culpable for the premature termination of FFS, but the extension system's ignorance of cultivating farmer-extensionist co-learning is the real culprit. In the Mekong Delta, we talked with several FFS farmers who unobtrusively continue to share their IPM knowledge and experience with other farmers in the community without being under any project or receiving any allowance, because their love for learning feeds on experiential co-reflections (e.g. Interview 140, female, farmer, Can Tho, 11.10.2011). Ultimately, a transformational extensionist's attitude and actions to facilitate joint learning for bottom-up change can only change the bureaucratic extension service, not the entire system:

> "A big constraint for FFS is variation in quality among extension staff. Most existing extension staff in developing countries were hired and trained under the training & visit era, where extension was considered a process of technology transfer from the expert to the farmer, with very little room for joint reflection. After many years of involvement in this rather top-down type of extension practice a large amount of re-training is required among staff to allow for a mentality change towards client service

orientation and appreciation for local and indigenous knowledge. Variation in quality of extension staff, just as in any teaching environment, results in variations of FFS quality" (Braun and Duveskog 2008, 20).

Case study: Participatory technology development

Since approximately 2000, PAE has been enunciated and developed in Vietnam under PAEM (Participatory Agricultural Extension Methodology) projects in selective northern and central provinces under a participatory curriculum development (PCD) approach (Taylor 2000) and PAEX (Participative Extension) program, with the adoption of Participatory Technology Development (PTD) in the southern and Mekong Delta areas. Aiming to build up an extension system that satisfies demands and is based on the assessment that extension workers are quite well-trained in terms of technical agricultural knowledge, but lacking competent extension skills, PAEX focuses on solidifying participatory extension methods (VVOB, IAS, and MDI 2008). PAEX projects have been implemented since 2001 in Southern Vietnam by the Flemish Association for Development Cooperation and Technical Assistance (VVOB) in collaboration with the Institute of Agricultural Scientific Technology for the South, the Mekong Delta Development Research Institute (MDI), the College of Rural Development (CRD), and provincial agricultural extension centers. PAEX's participants include provincial and district extension staff who learn and practise four main participatory technology development processes with farmers from extension clubs: identification of local problems and needs, proposal of solutions, implementation of experiments, and dissemination of positive results, and possibly a fifth phase of model up-scaling (Huynh Tran Quoc 2010). At best, via PTD, locally-tailored knowledge and technology are generated and diffused by local farmer's experiments, with the assistance of extensionists and researchers. By end of 2009, 57 extension clubs were founded with more than 1400 participating farmers and 60 experiments funded (VVOB, IAS, and MDI 2009).

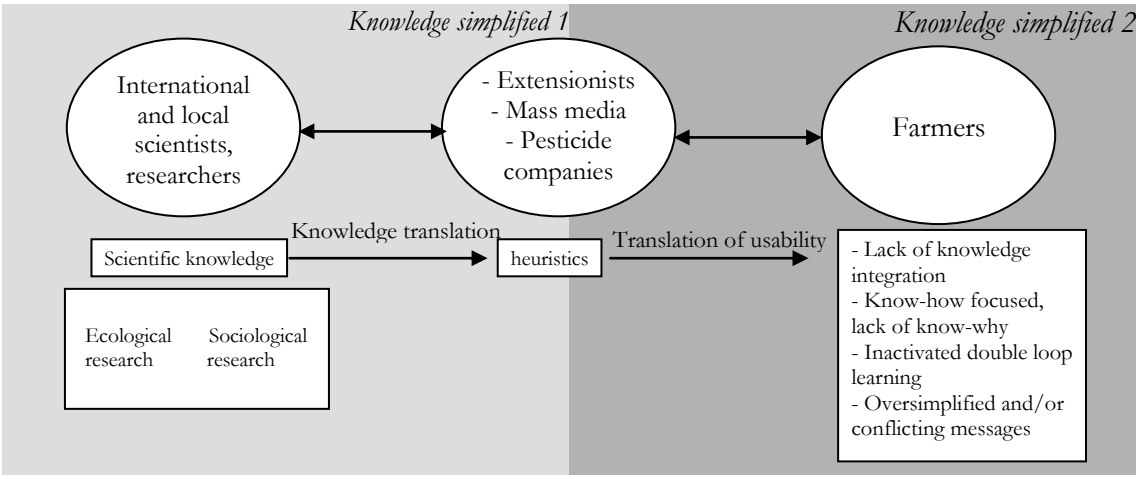
In evaluating PAEX, extensionists tend to agree that participatory extension is an effectively interactive method with farmers, but can hardly be operationalised without sufficient time and financial allocation (Interview 306, male, provincial extensionist, Hau Giang, 07.03.2011), whereas many extension club members are unable to tell what participatory steps are needed, or participatory experiments are only conducted in sizable farms and with better-off farmers (Le V. G. N. 2010; Pham Cong Huu 2006). Thus to improve PAEX, it is widely suggested that "more project resources should be allocated and attempts made to form many more extension clubs. These clubs should include more industrious and learning-motivated farmers" (Interview 308, male, district extensionist, Hau Giang, 07.03.2011).

We would argue that even though further external financial and human resources are genuinely needed for the success of PAEX application and institutionalisation, it is important to enhance local knowledge use and break the "dead" learning space between professional experts and farmers in doing PAEX together; otherwise it would just renew bureaucratisation and the outsider's top-down decision-making under the guise of participation. The practice of participatory agricultural extension needs a change at the core of the

extension organisational culture that extension agents learn from farmers, because of the fact that farmers are agents who generate and develop new knowledge. Such a change is not always accepted or known to be accepted by extension agents (cf. Van Den Ban 2010). For this reason, local extensionists are stuck in understanding and practising participatory agricultural extension as no more than a means or a method to get to know more about farmers.

The hard realities in the two cases are an ongoing issue that demand further efforts. Three main reasons, however, are important to point out here. The first is the complex nature of how IMP and PAEX brokered knowledge is broken down, simplified, and detached into unconnected pieces of technology, intentionally or unconsciously, throughout a double process of translation (see Figure 4.2). It should be noted that technology is developed based on heuristics framed from various phases, ranging from extensive ecological and sociological research to farmer's evaluation and communication strategy development (Heong et al. 2010). However, the distillation of only new heuristics that are perceived to be actionable for farmers means that knowledge is distorted from the beginning. Until it reaches farmers, such knowledge is once again reduced in meaning and philosophical foundation when technological aspects are introduced and sometimes misinterpreted by public extension, mass media, and pesticide companies (see Chapter Five).

Figure 4.3: Brokered knowledge broken over a double translation process



Source: Own presentation

Second, as discussed in Chapter Three, bureaucratisation has extended from the system structure to extension practices. The externally-oriented introduction of participatory approaches like IPM or PAEX into an extension system with its staff's adherence of an "elephant's head, mouse's tail" system and "we build and farmers will follow our models" extension practices requires accelerated time and efforts. The essence of bottom-up learning for change that alternative approaches embrace fails to get serious local attention unless it is based on reflective and effective co-learning. Knowledge is diffused and co-produced

over local application processes. Mutual learning values are not only reported to higher levels but also inform succeeding extension endeavours.

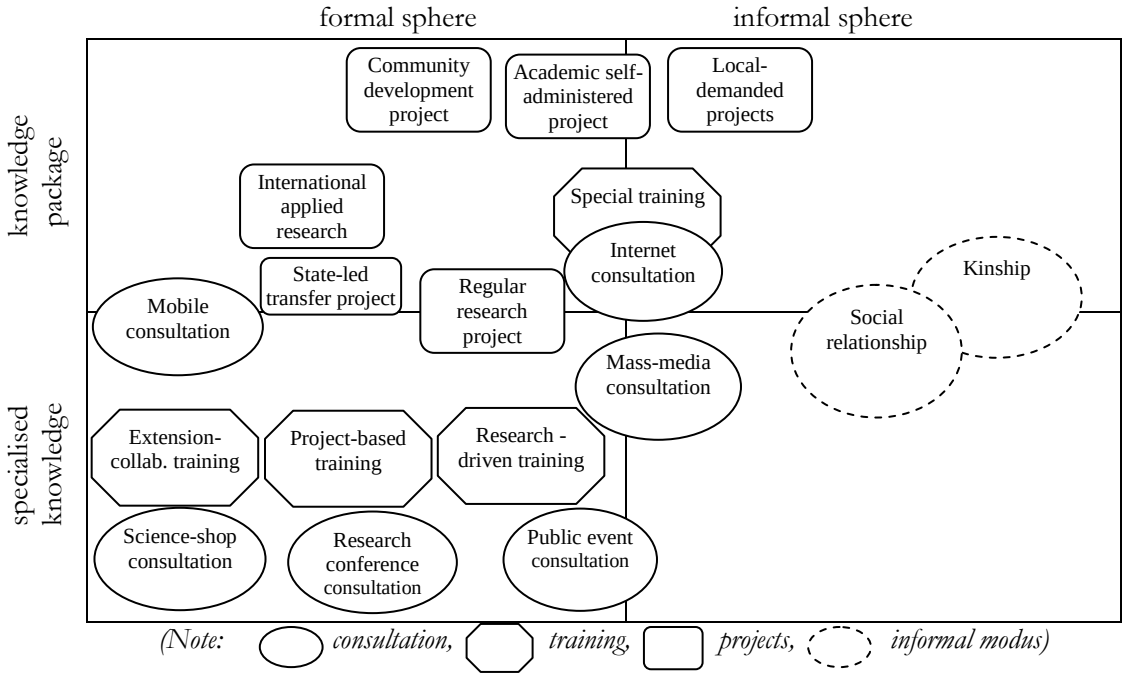
Third, agricultural sustainable and participatory initiatives with foreign origin may restrain the acquisition and learning capacity of farming communities through limiting their imagination and linkage with local knowledge stocks and practices (cf. Zink 2013). An exploration of more Vietnamese concepts with all meanings of IPM is discussed in Chapter Seven.

4.3. Academic-farmer interactions: Formal and informal modes

The interactions between academics and farmers can be captured through an investigation into formal and informal modes. By distinguishing formal and informal, we wish to emphasise that besides formal interaction structures such as institutionalised organisations, planned projects, or organised classes that are prominently promoted in literature and practice, informal channels through kinship and social relations that are dynamic in reality should not be taken for granted. This differentiation is central to the purpose of this analysis. The formal and informal boundary, within a farmers' thinking system, can be far more blurred or indistinct.

Interaction modes which will be discussed in detail below are illustrated over formal and informal spheres and knowledge specialisations and packages (Figure 4.3). We define three overarching formal modes including consultations, workshop and training courses, and projects (including knowledge transfer and community development). In the informal sphere, interactions motivated by kinship and social relations significantly translate scientific knowledge into local agricultural activities. It is important to note that an interaction mode can become rather plastic in spanning its inherited sphere when academics and farmers relations are not limited to one form of interaction. For example, academics and farmers maintain their "informal" knowledge and information sharing beyond the end of a "formal" research project.

Figure 4.4: Academic-farmer interaction typologies



Source: Own presentation

Interactions that are under discussion in this section mainly refer to knowledge flows from academics to farming communities, whether via uni-directional or communicative methods. Knowledge in diffusion can be specific within a subject aiming at an aspect or dimension of a problem or more comprehensive under a technical package towards complex and long-term issues.

Formal interactions

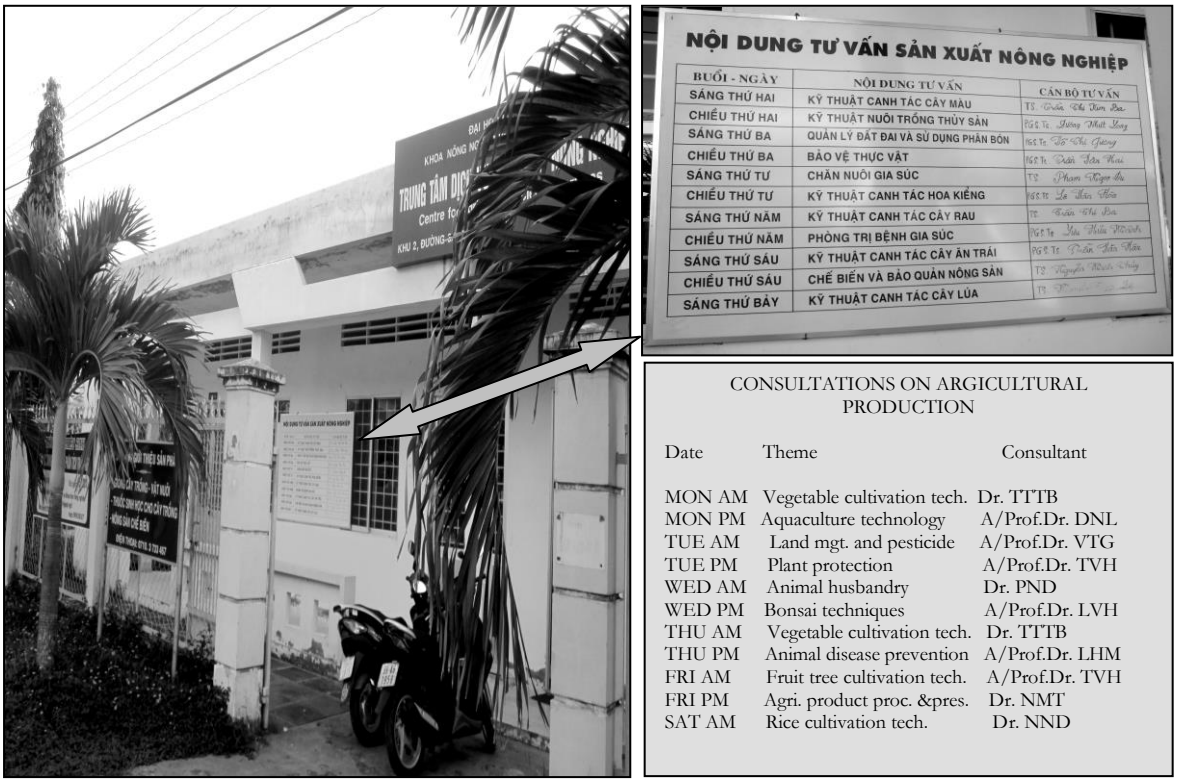
Consultation. Consultation sessions are a widely-applied knowledge transfer mode between academics and farmers in the Mekong Delta. They are increasingly diversified with the vast outreach of mass media and high-tech devices into the rural life.

Science-shop consultation. STTCs are established as the main and resource-concentrated gateway for transferring knowledge to wider rural communities under the old-styled education and research system. This model has become less effective in processes of autonomy achievement of educational organisations with the state funding reduction and the growth and diffusion of knowledge. Newly-structured organisations that are more discipline-focused have been formed under colleges or faculties, such as SOFRI, apart from its STTC, forming a fruit clinic focused on plant pathology. Under CTU, besides Center for Agricultural Science Services under CAAB, a veterinary clinic is operated under the Animal Health Department, CAAB. Sub-CTU institutes such as MDI or CTU Biotechnology Research and Development Institute (BiRDI) organise centers, showrooms, or seed supply points. Such multi-purpose science shops sell agricultural input or technical products produced by local researchers as well as

providing consultation, at a charge or gratis, for farmers and all types of customers. Farmers can bring their plant or animal samples to the centers for high-tech equipment-supported examination needs, and collect leaflets and brochures after the consultation for home reference. Consultation sessions can take place in person on fixed-schedule themes and consultants (see Figure 4.5) or via telephone in the case of the SOFI Fruit Clinic.

One advantage of science-shop consultation is prompt answers to simple problems that farmers are encountering. However, its access is more favourable for affordable households with telephone connections or residents in cities or district centers where most of the science shops are located. For academics, such consultation sessions are useful to be informed about the local current situation and over time provide directions for further research to more complicated issues.

Figure 4.5: Agricultural consultation provided for free at Center for Agricultural Science Services, CTU



CONSULTATIONS ON ARGICULTURAL PRODUCTION

Date	Theme	Consultant
MON AM	Vegetable cultivation tech.	Dr. TTTB
MON PM	Aquaculture technology	A/Prof.Dr. DNL
TUE AM	Land mgt. and pesticide	A/Prof.Dr. VTG
TUE PM	Plant protection	A/Prof.Dr. TVH
WED AM	Animal husbandry	Dr. PND
WED PM	Bonsai techniques	A/Prof.Dr. LVH
THU AM	Vegetable cultivation tech.	Dr. TTTB
THU PM	Animal disease prevention	A/Prof.Dr. LHM
FRI AM	Fruit tree cultivation tech.	A/Prof.Dr. TVH
FRI PM	Agri. product proc. &pres.	Dr. NMT
SAT AM	Rice cultivation tech.	Dr. NND

Source: Author 2011

Mobile consultation. Institute research groups organise regular or urgent mobile trips to communities confronting plant or animal disease epidemics. A vivid example is the SOFRI mobile plant clinic. Community selection is based on epidemic assessments by researchers or demands submitted by local authorities. While Mekong Delta communities are the focus, the team also operates trips to disadvantaged localities nationwide, such as the ethnic minorities in Lam Dong province, where they help with gardening improvements.

A trip usually includes 7-10 plant "doctors" with different specialisations (see Box 4.1). Information of local planting and disease situations has been collected via community representatives and relevant suggestions printed in advance. Farmers are asked to bring plant samples collected from both healthy and diseased trees to the consultation session. Most importantly, plant disease books are delivered and kept by individual farmers. With registered household information details and recorded disease symptoms, disease causes, symptom expression, and preventive methods, plant health can be monitored over a meaningful timeline. Mobile consultation sessions take place in a farmer's garden or in a community house with the participation of 100–150 local farmers.

Researchers and farmers show interest in mobile trips because of the on-farm interactive contacts. Previously-trained farmers from SOFRI are encouraged to join, learn, and share experiences on these trips. One major challenge for arranging more regular mobile clinics in the face of mounting need applications is limited funding allocation, while researchers still have to fulfil their primary teaching and research tasks.

Figure 4.6: The schedule of a mobile trip by SOFRI Fruit Clinic

Epidemic outbreaks on longan trees are currently widespread and seriously affect longan-planting areas especially in Cai Be, Tien Giang. In addition, diseases are causing damage on citrus plants in many other localities. Therefore, the Mekong Delta Fruit C of SOFRI has planned mobile trips to help local farmers check and treat diseases on fruit trees. The scheduled timetable is as below:

- 24 August 2011: to Dong Hoa Hiep and Hau Thanh communes, Cai Be district, Tien Giang province (issues on longan trees)
- 25 August 2011: to Ngai Tu commune, Tam Binh district, Vinh Long province (issues on citrus plants)

Participating plant "doctors" include:

- Dr. Philip Neil Tayloran, expert from U.K.
- Dr. Nguyen Van Hoa , director of the Mekong Delta Fruit Hospital, plant pathologist
- MSc. Le Quoc Dien, entomologist
- MSc. Huynh Thanh Loc, entomologist
- MSc. Dang Thuy Linh, plant pathologist
- MSc. Nguyen Van Son, bonsai expert
- Eng. Nguyen Thi Kim Thoa, entomologist

Source: SOFRI website www.sofri.org.vn, translation by the author

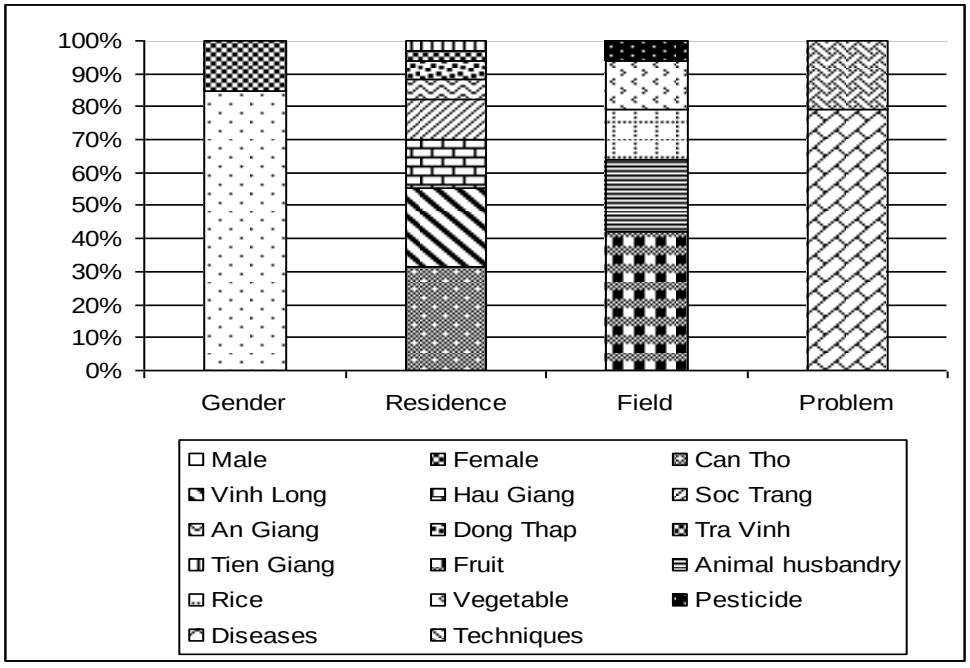
Scientific-conference consultation. Universities conduct annual or biennial research conferences to inform academics and the public of their recent research results and innovations. At such scientific conferences organised by CTU CAAB, 'advanced' or project-involved farmers from all over the Mekong Delta are also invited.

In attendance at plenary and thematic sessions, they have a valued chance to understand, from both the scientific and practical perspectives, the significance, processes, results, and impacts of projects in which they participated. In an advanced scientific environment, they can share information and experience with agro-scientists, businesspeople, and other farmers. Due to attendance requirements, this consultation service is mainly restricted to leading farmers who are well off and are large-scale producers; however, their role in brokering new knowledge and technology to their wider communities is still questionable.

Public-event consultation. There are increasing periodical international- and national-level agricultural fairs organised in rotation among Mekong Delta provinces with various rice, fruit, fish, aquaculture, and rural handicraft themes. These fairs usually combine exhibition sessions for the public and more closed thematic seminars and conferences as a scientific forum between researchers and policy makers. Farmers who visit institute or university stalls can be brought up to date about research activities and advancements and engage in consultation sessions provided free of charge. This kind of consultation shares similar features to the science-shop consultation, though the former typically has a more diverse audience.

Our one-day observation of CTU consultation provision at an international agriculture fair held in Can Tho in 2010 indicated 35 visits by farmers (including five women) from eight Mekong Delta provinces (see Figure 4.7). Farmers' questions focused prominently on disease treatment and technical solutions for their fruit, rice, and vegetable crops and on animal husbandry.

Figure 4.7: Consultation for farmers by CTU academics at the Viet Nam International Agriculture Fair 2010 in Can Tho City (Date: 8 December 2010, N=35)



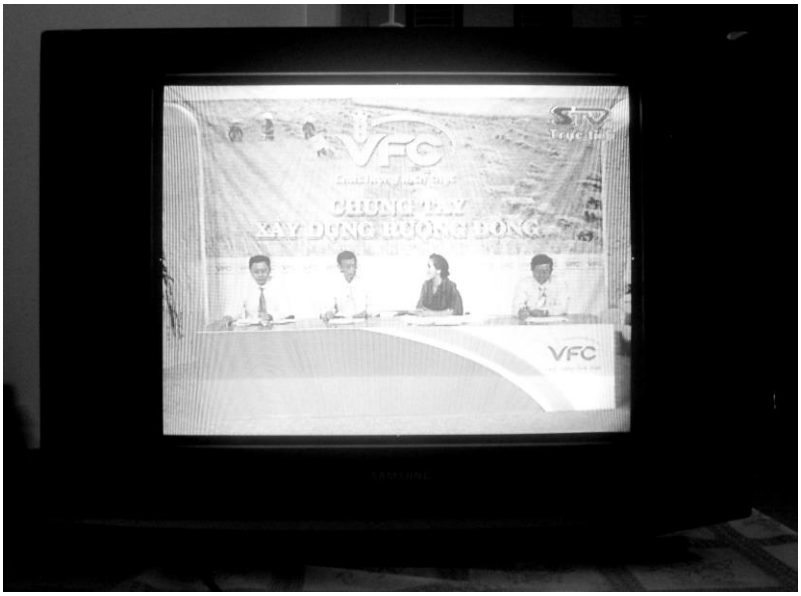
Source: Own presentation

Mass media-based consultation. Consultation sessions led by academics are transmitted by printed newspapers or via radio and television programs. Most agricultural newspapers at the national and local levels have a column where farmers ask and experts answer, such as the "Extension Bridge-Span" in the Vietnam Agriculture Newspaper. Radio programs on agriculture and rural development allot a certain amount of time to respond to farmers' inquires. In a general sense, this kind of communication is characterised by a selection of representative questions and a concise amount of information in response, mainly related to

pesticide use, particular agricultural practices, or market information. As such, at the end of several replies, "direct expert consultation" is widely recommended.

Our farmer focus group discussions confirm that television is one of the most popular and important knowledge sources for farmers in the Mekong Delta. With their longer history, agricultural extension programs concentrate on technical procedures of specific agricultural activities and good models of production. The recent boom of agricultural and rural development television series with regular live programs offers viewers a more communicative channel to interact with an agriculture expert trio including an academic, government official, and agribusiness representative (see Figure 4.8). Themes of the programs are determined based on the purpose of implementing a governmental program or policy, evaluation of the significance by the television staff, and in accordance with the farming seasonal calendar (a Mekong Delta local television survey in 2011 by the author). Around 20 farmers are purposely selected by the television station and invited to the studio to pose direct questions to the experts while other viewers can send their questions via a hotline system. Unanswered questions from a live broadcast will be collected and sent to experts for answers when possible.

Figure 4.8: A highly-presented expert trio on a live agricultural television program



Source: Author 2010

Many of our interviewed farmers agree that television programs provide them with updated, comprehensive, and visualised information and knowledge. However, effective knowledge acquisition requires an uninterrupted and attentive (with note-taking) viewing, which is practiced by few of the farmers (Interview 199, farmer, male, Can Tho, 25.10.2010). Others become critical of the objectivity of suggestions made by experts in agribusiness-sponsored programs (Interview 333, senior plant protection expert, male, Tien Giang, 14.03.2011). Also, the generic nature of agricultural programs that place an

emphasis on technical presentation or general situation description without evidence-based analysis discourages farmers whose technical knowledge has been strengthened over time or those who need more comprehensive knowledge for their intensive farming (Interview 294, senior researcher, male, Can Tho, 14.12.2010).

Based on the entertainment-education soap opera or drama formats, several radio and television programs have been also designed to promote farmers' perceptions and practices of integrated pest management and sustainable agriculture (Heong et al. 1998; Heong et al. 2008). In the recently-developed series *Ke hay nong nghiep* (New Agricultural Ideas) broadcast over Vinh Long Television once a week, each 15-minute episode comprises a dramatized conversation in which farmers meet and discuss an agricultural issue or concept in the confusion of negative, transitional, and positive values, and then a scientific consultation that legitimises and clarifies the issue or concept discussed in the drama segment (Ho Van Chien and Escalada 2011).

Internet-based consultation. E-consultation is often used in the recent agricultural extension, via either website or email. Some university faculties and institute centers also set up websites through development projects that provide farmers with technical and market information and e-consultation. Although there have been a number of commune-level projects of computer and internet infrastructure improvement for farmers, only a small group of progressive farmers take advantage of internet-based knowledge for agricultural production. Such progressive farmers include:

- Advanced large-scale farmers who have to invest in high technology because of their intensive large-area farming. Examples include aquaculture or fruit commercial farmers.
- Advanced collective farmers: They are head of agriculture cooperatives, clubs, or groups. Concentrated resource allocation from government and non-government organisations on farmer grouping greatly benefits group elites, including access to new technologies (Nguyen Quy Hanh and Nguyen Ngoc Khanh Van 2011).
- Advanced small-scale farmers: They cultivate on their limited land area with rigorous scientific knowledge application. They are supported to learn from and work with academics. Case 2 in the section below is an illustration (see Nguyen Quy Hanh and Evers 2011, Section 6.5 for detailed analysis).
- Intellectuals as farmers: They are elementary and secondary school teachers who are engaging in agriculture activities for extra income generation. Statistics show that emails for research institute consultations are mainly sent by these teacher-farmers (Interview 332, researcher, female, Tien Giang, 14.3.2011).
- "Pseudo" farmers: They are officers or workers in urban areas who at the same time own and work on their farming land in rural areas, either as an income-generation activity or for leisure purposes (hobby farmers). Taking advantage of their internet competence, they become active participants in internet-based consultations and other services.

Workshops and training courses. Organised in class form with separated or combined theoretical and practical components, workshops and training courses (or training in general) provided by academics aims

to diffuse new research results and achievements or new applied technologies and knowledge throughout the agriculture sector. Interactions between academics and farmers are observed in the types of training described below.

Extension-collaborated training. Multi-level extension agencies relied on their schedule and budget to organise regular extension activities. University and institute researchers are invited to report new research outcomes, deliver lectures, or instruct on new technologies. In case of epidemic outbreaks, extensionists cooperate with academics to conduct on-field investigation and provide disease prevention and control measures:

> Our organisation has several plans on technology transfer for agricultural groups and cooperatives annually. Demanded types of technology are determined by members of groups and cooperatives, such as fish farming in the paddy, high-quality seed production, etc. Then, we will work out a plan based on their needs and invite lecturers from Can Tho University to teach new technology. We are responsible for training aids and facilities while the cooperative or group has to arrange time and place for the meeting (Interview 17 & 18, senior staff, res. female & male, Can Tho, 31.5.2010).

Research-driven training. Providing involved farmers with research results is very much dependent on the research's ethical practices or the research project design. For research implemented by individual or group researchers, local farmers are hired to conduct activities without being sufficiently informed of research processes, potential findings, and applications. There are two corollaries of this deficiency: first, the loss of opportunity for new technology improvement and application with trained farmers and on pre-piloted sites and second, the misapplication of immature technology by involved farmers who want to take risks. In well-designed research projects, training is always a component. Workshops with various stakeholders are held to inform research objective and disseminate findings.

These training courses and workshops take place in a commune's hall, community house, or farmer's land. Presenters usually use PowerPoint presentations and handouts (see Figure 4.9). Some scientific terms and illustrations and foreign language expressions lead to a very confused message delivery. Our observation is that farmers are passive listeners and do not take notes. What makes the training sometimes irrelevant is the open discussion section at the end of the course is that farmers pose questions about agriculture policy, market information, or financial support, which is beyond the authority and capacity of trainers to answer.

Figure 4.9: A half-day training course on new aquaculture regulations, fish diseases and climate change provided by provincial aquaculture officials and CTU researchers for Can Tho City farmers

Source: Author 2010

Project-based training. Training is part of technology transfer and community development projects. As such projects aim at farmers' capacity building, training focuses on know-how and practice-based transfers. Accordingly, academics work with farmers in more intensive and long-term interactions.

Special training. Education organisations offer special courses for farmers to take up a new profession or position. For example, when the CTU School of Aquaculture and Fisheries (SAF) successfully developed artificial breeding of Pangasius (*Pangasianodon hypophthalmus and Pangasianodon bocourti*) or giant freshwater prawn (*Macrobrachium rosenbergii*) in the 1990s, intensive courses were opened to transfer the technologies mainly to extension workers. Shrewd and large-scale farmers who wished to grasp and apply the new technologies to their commercially-oriented farming registered without delay for such courses. The course fee was paid by farmers themselves or funded by local governments. Each course lasts a few months with theoretical and practical parts over the biological cycles of studied objects.

Another example is half-month certificate courses given by SOFRI to selected fruit farmers in the Mekong Delta and other parts of Southern Vietnam. The training is currently free of charge, as it is covered by an international cooperation project. To achieve the goal of training fruit farmers as expert farmers (*chuyen gia nong dan*), participants are equipped with (1) technical and specialised knowledge and skills, and (2) computer, PowerPoint presentation, and public speaking skills. During the course, they also work in a laboratory to diagnose diseases in plants and are asked to integrate their practical knowledge and experience into the lecture they are supposed to prepare and deliver in front of the entire class. Graduated farmers are expected to maintain an active role in vertical and horizontal knowledge diffusion upon their return to their communities:

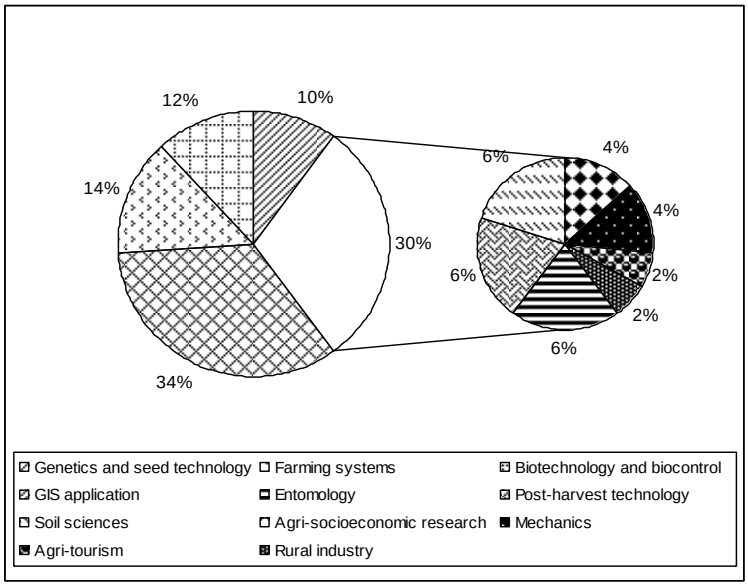
> In our first course, only 8 out of 13 participants were granted certificates. Those who fail have to re-sit in the following course. Our expert farmers should make efforts to share knowledge and learn from other farmers, a task that cannot successfully be done if they are not professionally trained (Interview 332, researcher, female, Tien Giang, 14.3.2011).

Science and technology transfer projects. These projects provide a wider space for academic-farmer interaction. Conventionally, science and technology transfer projects conducted by research institutes and universities target extension workers and local officials who continue to transfer new knowledge and technology to farmers. However, academics very often perform dual roles of knowledge producers and knowledge brokers, which is vividly illustrated through project design and implementation.

State-led transfer projects. These transfer projects are state-funded and thus have to meet prescribed administration and reporting procedures. Projects can be allocated by higher levels or from successful applications submitted under the extension system. Based on the log-frame design, such projects adopt technology-focused and model farmer-based approaches, which ultimately are most beneficial to better-off, large-scale, and powerful farmers and local elites (Nguyen Quy Hanh and Evers 2011).

Regular (applied) research projects. Researchers individually or in groups carry out their regular research projects at state, ministry, institute, and department levels. More localised applied research can be submitted and implemented through the provincial department of science and technology scheme (see Bauer 2011). CTU CAAB has taken the lead in province-level agricultural research projects in terms of coverage and quantity. The four focus areas of provincial cooperation are genetics and seed technology, farming systems, biotechnology, and GIS application (Figure 4.10). However, provincial research projects might attract more attention and priority from academics if the related administrative processes were simplified and researchers had more roles in their research and budget decision-making. Because scientists are highly self-respecting and liberal in disposition, they would easily lose interest in research constrained by multi-level management and interlacing administrative cobwebs (Interview 114, senior researcher, male, Can Tho, 03.09.2010).

Figure 4.10: Areas focused by CTU CAAB provincial applied research in 2000-2008



Source: Own presentation

International cooperation research projects. International cooperation in agricultural research in the Mekong Delta has evolved from "hard" investment in education and research infrastructure to "soft" capacity building through exchanges and more recently towards research partnerships based on mutual trust and common goals, in which research is co-designed, submitted for funding, and implemented (Interview 115, senior researcher, male, Can Tho, 27.08.2010). Agricultural research cooperation in which local researchers alone carry out the survey and input the data (Bauer 2011, 129) has given way to better-established knowledge collaboration, potentially challenging the success of old-styled collaboration (Interview 112, researcher, male, Can Tho, 24.08.2010). The long-recognised rice-research partnerships between IRRI and Vietnamese research organisations over the past five decades best illustrate such cooperation in essence.

It is important, in designing local or international research projects, to include beyond scientific activities funding and effort allocation for research information and dissemination activities to local stakeholders, not only for ethical reasons but also for the sake of interactive knowledge processes (cf. Wall 2008):

> In any of our research projects, local or international, we incorporate workshops and training courses to which local technical staff and farmers are invited, which is all the time approved. The language used in such training and leaflets should be simple, short and comprehensible for every farmer. These activities help farmers understand our research and provide a way to create research impacts on farming changes. Research ending with published journal articles does for me not live a full life (Interview 152, senior researcher, female, Can Tho, 06.10.2010).

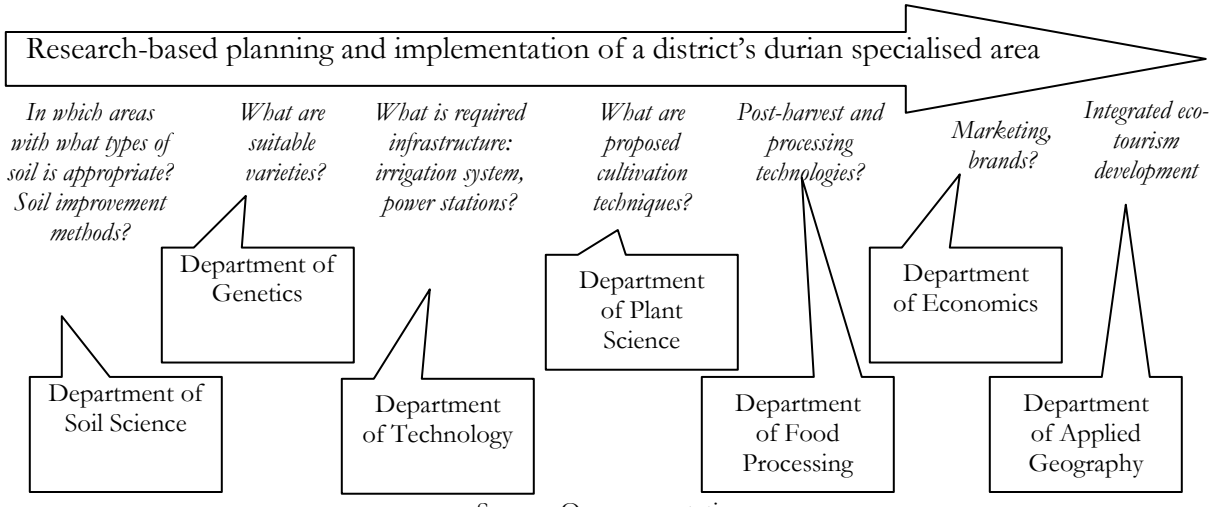
Academic self-administered projects. Several veteran senior academics, through their long-established networks of colleagues and international cooperation, receive funding that allows them to design a combined interdisciplinary research and community development project on their own assessment and prioritisation. A project management team formed with different disciplinary experts in the university select project sites

and beneficiaries in cooperation with, not subject to the decision of, local authorities. Duplication of integrated farming systems in Case 2 of the next section or technology transfer projects for the development of around-campus communities are some illustrative examples. It is on the periphery of a research and community development project, of the role as researchers and development practitioners that formal and informal interactions are intermingled, encouraging beyond-project communications and learning between academics and farming communities.

Local-demanded transfer projects. To what extent this kind of academic-farmer interaction is made possible is greatly dependent on the local leadership and endeavours in connecting science with local agricultural planning and development. Leaders from district governments have recently contracted with CTU academics for an all-inclusive agricultural development program with a knowledge package transfer. For example, in Hong Dan, Bac Lieu province, researchers from multiple disciplines have worked to develop a new rice variety and propose appropriate types of fruits and vegetables that tolerate the acid sulphate and salinised soil of the district. Integrated models of mushroom farming, poultry, animal husbandry, and aquaculture are introduced with practical training. Fish-source and rice wine, traditional products of local people, are improved in quality with new technological applications and are now well-known with registered brands. Participating farmers have to pay 35 percent of the total contract cost.

Another example of local authority and academic contract is through-the-value-chain research and development projects on a certain agricultural product as a local comparative advantage. In the development of a 100-hectare durian (*Durio zibethinus*) zone for Cai Lay district, Tien Giang province, for instance, experts from at least seven departments from four CTU schools and colleges (agriculture and applied biology, technology, economics, and education) have been involved in research and planning of planting areas, inputs, outputs, and marketing issues, as well as eco-tourism development (Figure 4.11).

Figure 4.11: An applied research over the value chain



Source: Own presentation

Community development projects. This is a special mode of interaction between academics and farmers in the Mekong Delta. The motive is that academics should do something to help poor-infrastructure, low-income, and loose-network communities around campuses that are located in rural areas. Unlike other interactions, community work is emphasised and underprivileged households are therefore prioritised despite indispensable technology and knowledge transfer.

CTU has a 100-hectare campus in rural Hau Giang Province. It in fact serves as an agricultural experimental zone where the Hoa An Bio-Diversity Experimental Research Center and the recently-established College of Rural Development are based. To help poor neighbouring communities, CTU researchers implemented a number of continuous projects on local livelihood and education development from different funding sources. CTU researchers' first interactions with local poor were though an Oxfam-funded women's empowerment project. Women formed saving groups of 15–25 neighbours and were trained on different agriculture-based income-generation models. Based on local demand, researchers from Hoa An Center in their next project established a veterinary store to provide veterinary medicine, animal food supply, and husbandry techniques. Women's groups are still in operation with an enhanced role for women role in the community.

Upon recognising that there was a high rate of illiteracy amongst local children, CTU researchers decided to use a store-house to set up classrooms of what they called "classes of compassion," where children were enrolled their first grades with free provision of books and pens. At the present time, the school has been integrated into the formal education system of the province and four students from these classes have been accepted for university education. More importantly, the local farmers' awareness about education is improved. Many other planting and animal husbandry programs have been implemented to help improve the lives of community residents. Among many elements to the success of community development managed by academics, as a senior official of Hoa An center commented, is trust-building, a process that demands a high investment of time, knowledge, and enthusiasm (Interview 145, senior researcher, male, Hau Giang, 29.09.2010).

The long-term and day-to-day interactivity of researchers in assisting local community development step-by-step goes far beyond the traditional community research and development model. In this case, where the communities have low stocks of social capital, success was achieved because the researchers first adopted a mutual interest approach to solve the social problems the community was facing (cf. Jagannathan et al. 2011).

Informal interactions

The academic-farmer interaction modes analysed above are fundamentally connected within formal contexts. As researchers are not only members of universities or institutes but also part of their families

and rural communities, knowledge diffusion between researchers and farmers can occur in less organised but possibly more interactive forms through kinship and social networks.

Kinship. Despite recently rapid urbanisation, the Mekong Delta's landscape and lifescape retain prominent rural features and lifestyles. There are a number of city-dwellers, including academics whose families and relatives live in the rural areas and perform daily agricultural activities. Through this connection, new knowledge and technologies are transferred to rural communities, with academics' kin as the first recipients.

A CTU senior researcher commented that before the finalised formulation of artificial breeding techniques of pangasius or giant freshwater prawn for mass education and dissemination, some researchers set up their own experimental facilities at home as a field test as well as a source of extra income. From these home trials and kinship knowledge sharing and learning, those first fingerling supply houses have been developed, becoming the core of burgeoning suppliers in the following years. The head of the fish seed supplier in Can Tho recalled his business's beginning:

> In the mid-1990, my brother was a well-known fish seed supplier in this quarter. In fact, my brother was a university lecturer who specialised in education. He had a sworn brother, also his colleague, who worked at the department of aquaculture. It is this sworn brother that provided training and instructions for my brother's business establishment. I worked with my brother until 1996 and then moved up here to start my own operation. We did not have enough pangasius seed to meet the demand for intensive farming for high "movement" years. Now that pangasius farming is uncertain and risky and thus farmers are trying various breeding stocks, I have to diversify my fish varieties supply as well. (Interview 289, farmer, male, Can Tho, 11.12.2011)

In the last two to three years when the pangasius and aquaculture sector in general have been confronting export difficulties, many fish seed suppliers have failed, though businesses buttressed with knowledge inputs from academic kin have been better operated because of confidence in their quality.

Social relationship and learning for change. Social relationships further diversify interactions between academics and farmers and challenge any attempts to create a typology. We emphasise as below the four main trends as processes of learning change in which formal and informal modes interact:

- Formalisation: Social contacts and introduction ignite formal learning;
- Informalisation: Formal interactions provide an environment for social learning;
- Relativisation: Social contacts change into long-term communication and relationship with relatives;
- Partnerisation: Formal interactions are the foundation for long-term partnership;

Formalisation and informalisation are the two main processes of bridging the formal and informal spheres. By formalisation we mean the process by which social or informal forms of interactions are used to connect farmers into more formal learning spaces. Social contacts or informal talks with academics turn out to be a key moment of change of farmers by opening up new learning and working opportunities and

environments. Without a doubt, such moments of change in order to create real transformation needs process-focused efforts by farmers themselves (see Case 1 Section 4.4).

As opposed to the process of formalisation, informalisation describes the continuation of academic-farmer formal interactions into less formal forms or contexts of knowledge application. Obviously, farmers frequently keep contact details of and maintain contact with academics with whom they have worked, met or know through training, consultation, or even radio/television programs. By informalising their interaction modes with academics, farmers wish to have more prompt and effective answers to their questions, increasing their possibility and intensity of adopting new knowledge for their agricultural production development. Other farmers through their engagement in academics' work, i.e. experiments or research, learn novel technologies as well as more scientific methods, which are then applied to their production activities (see Case 1 Section 4.4).

Relativisation is a special form of informalisation, with an emphasised affective relation. As mentioned above, farmers tend to keep academics' contact information and increase their informal interactions through telephone calls, visits, or other social activities. Seeing academics as universal experts, farmers often not only ask questions related to technical fields but also discuss problems they face in everyday life. Such frequent contacts in both direct and indirect manners, besides leading to knowledge flows from academics to farmers, enhance close relationships as if they were relatives. When such a relationship is established, academics are often invited to these farmers' intra-family anniversary celebrations and parties. Similar cases can be observed with local extension workers. Though further evidence is needed, our observation is that this relativisation practice is more popular in the Mekong Delta than other regions in Vietnam. From a cultural and personality perspective, this practice can be explained by the two main characters of Mekong Delta inhabitants: tolerance and respect for righteousness (see Chapter Two).

> Tolerance is developed from Vietnamese culture-based synthesis and Yin inclinations situated in ecologically-favourable conditions of the Mekong Delta where various cross cultures and peoples meet. Tolerance is manifested by acceptance and respect for other cultural habits and customs, co-existence of different religions and religious beliefs, and admission of personalities of either extreme with high amplitudes. Respect for righteousness is another distinctive feature. Resulting personal traits include generosity, chivalry, and frankness. Community bonds are not notably built on mutual assistance among those who are well acquainted with each other within stable, closed, and well-structured villages in rural northern Vietnam, rather on a willingness to protect and help others in need regardless or their origins or relations and generous hospitality to any home visitors and guests are clearly observed. Sworn brotherhoods or friendships are important linkages of members in open peasant communities in the Mekong Delta (Ideas mainly extracted and translated by author from Tran Ngoc Them 2008).

In the context of such cultural practices, relativisation is consolidated by the esteem and gratitude that farmers accord to academics, whose provision of solutions and new knowledge can improve life for their households and communities. From the academics' side, they also form and maintain, during their long

engagement with farming communities, a network of "*ruot*"[53] farmers as key informants for their community-based activities. They are the closest group of academics' satellite farmers:

> Experienced researchers have their "*ruot*" farmers. Their relationships are built on mutual trust and time-testing (Interview 331, senior researcher, male, Tien Giang, 14.3.2011).

Based on established trust, the farmers are invited to join different research and development projects carried out by academics. In agricultural development cooperation projects between Vietnam and some African countries, these farmers, among other well-trained ones, are sent abroad to work by side with local farmers on fields for direct knowledge exchanges.

Partnerisation is the most sophisticated process of academic-farmer interaction in conceptual, practical, and affective aspects. Its product is the partnership, which is often viewed as what is most needed and should be achieved in interactions and relations between academics and farmers. When two knowledge worlds meet, partnering should be based on mutual respect and objectives. It means that in knowledge work, flows are two-dimensional and knowledge is co-produced. It needs a replacement of the one unified universe ontology in development by a new design of human practices that includes plural worlds and knowledges (Escobar 2011).

4.4. Across formal and informal: Academics-farmer interactions and knowledge flows

The above section discussed multi-directional webs of academic-farmer interaction over both formal and informal spheres. In most cases, however, academics are knowledge generators and transferors while farmers are the recipients of knowledge and development, a relationship on which partnership can hardly be achieved. This section delves into cases of farmers who, through their interaction with academics, have performed as knowledge brokers and generators. They are called "barefoot" experts by the mass media, advanced farmers by praising communities, or just "normal" farmers who work every day in the field but are willing to share their accumulated experience and knowledge with others. We present three cases as groupings of individual stories.

Case 1: Farmers as first adopters

Our farmers' interviews reveal a number of cases in which farmers through their informal and formal interactions with academics have learned and applied new technical knowledge and farming models. Such applications have brought about higher productivity and higher income and lifted them out of previous economic difficulties. Of course, new technology adoption is not always a simple straight line from scientific knowledge inputs leading to improved production outputs and better income for farmer households. Inside the black box between those points is the struggle of old and new knowledge,

[53] "Ruot" literally means intestine. In Vietnamese language, usually it is collocated with nouns such as father, mother, brother, aunt, etc. to assert a blood relation. The term becomes difficult to be translated here, but can be understood as very closed or very familiar.

amplification of sources of knowledge and experience, including input from family members, and constant learning by doing. The stories above of frog and seed rice farmers both describe similar knowledge-localising efforts.

The following example illustrates how ideas and suggestions from informal talks with an academic led to training participation and new work for a farmer form Can Tho who made use of the opportunity and created a change for her life and her community.

> Mrs. T.D.H. from Yen Hoa village, Can Tho used to be a local secondary school teacher. She left her job after ten years of teaching due to a low salary. She then stayed at home and helped her husband with a home-scale business. In 2005, she started raising frogs. In the following years she became well-known as one of the first froglet suppliers in the Mekong Delta where frog raising has been promoted as an income generation model for farmers all over the delta. Her business ideas arose during polite conversation with a university lecturer who shared a hospital room with her father. The lecturer was working at the Agro-Forestry University and mentioned their new Thai frog breeding experiments and recommended that she learn to raise this kind of frogs, as their research suggested frog culture had high development potential for Mekong Delta farmers. Taking the academic's suggestions seriously, she, thanks to introductions by the lecturer, visited the university many times to observe and learn how frogs and other animals were bred and reared. Armed with new technical knowledge and equipped with materials and leaflets, she decided to invest in frog culture, bought new frog broodstock from the university, and started to apply what she had learnt into the real situation of her farm and water source. Her husband, who had graduated with an aquaculture university degree but had hardly worked in his chosen field, now had a chance to use his knowledge in frog artificial breeding. With these combined knowledge sources, they without great difficulty produced a brood of 1,000 froglets from ten male and female frogs, making profits in excess of 900% from froglet sales. For many years, she has been an exclusive froglet supplier with customers from Can Tho, Hau Giang, Soc Trang, and elsewhere in the delta (Narrative generated from Interview 269, farmer, female, Can Tho, 01.12.2010).

The next vignette is about how a farmer has employed that which he learnt from working as a rice experimental assistant for CLRRI on their farms and farming planning.

> Compared with many others with working experience of ten years and over, Mr. N.V.D. is one of the newly-recruited workers to help with CLRRI's rice experiments. By contract, their working period is office hour-based all year long, except in September when the water is rising. His duties as a rice experimental assistant related to the life cycle of rice plants include rice transplanting, caretaking, harvesting, grain counting, and storing under the close guidance and directions of researchers. Over time, he has learnt new rice cultivation techniques and became familiar with old methods, all of which are done with tremendous care and written monitoring. He had better knowledge about varieties under prioritised experiments, policy recommendations, and high or low demand by the market. He and his wife have a one-hectare field where normal rice has been replaced and updated with new varieties developed and recommended by CLRRI researchers and new technologies he acquired. He has sold his certified[54] seeds to farmers and seed centers. He often shares new knowledge and technology with interested farmers. (Narrative generated from Interview 197, farmer, male, Can Tho, 24.08.2010)

[54] The hierarchical system of rice seeds include breeder seed, pre-basic seed, basic seed, and certified seed. Farmers in the Mekong Delta and in Vietnam in general are still largely dependent on "uncertified" seeds that they randomly selected and saved from their previous crops. It has been promoted a wider use of certified seeds by training certified seed farmers and clubs. Pre-basic and basic seeds are produced and provided by universities, research institutes and seed centers to certified seed producers.

It is noteworthy that these first adopters are highly committed to share their acquired knowledge and technology with their communities. This is not always the case in terms of the elite bottleneck, in the model farmer transfer system (as discussed in Chapters Three and Six).

> "Descended from a peasant family I thoroughly understand difficulties farmers are facing. I am willing to assist those who are in need. I transferred frog breeding techniques to many farmers from other provinces; some stayed at our house for days to learn it. I instructed them with my best knowledge, though I know I might lose my customers and this job one day. I can find other work then." (Interview 269, farmer, female, Can Tho, 01.12.2010)

Case 2: Farmers as innovators

The main characteristic of this group of farmers is their untiring passion, love, and zealousness for homemade agricultural experiments and developments. They are effective producers on their farms, but their innovative power is actually kindled and flourished through the contact with academics via knowledge interactions. Their accumulated knowledge is gained from long-term self-practice and learning process supported by external learning and exchanges with local and international scientists, experts, and local farmers. Their inventions include new varieties of plants such as pest-resistant, salt-tolerant, indigenous rice seeds, novel technical procedures, production tools and machines, or innovative ways of thinking and practice in agricultural production:

> Before national reunification in 1975, Mr. V.V.C. from Tien Giang was a rice grower in the region well-known for consistently higher productivity. He was invited by CTU to deliver regular talks with students about his in-field practical experience. On such visits, he learnt rice multiplication techniques from academics. One day, a CTU agronomist gave him an envelope with eight grains of IR36 rice seeds, the last seeds of this type because amounts distributed to localities in the delta could not be kept after a high flood. Not much time later, new rice plants were bred and filled up his three-hectare field. This year, brown planthopper (*Nilaparvata lugens Stål*, BPH) outbreaks spread over the delta, which seriously damaged fields with contemporary varieties and endangered crop yield and food security. Surprisingly, BPHs landed in his field for a while but flew away without causing any damage. In three years (1977–79), he produced and provided more than sixty tons of pest-resistant rice seeds, helping the delta escape from a food crisis by a narrow margin. Since then, agro-academics and officials, even state leaders and managers, have visited his home more and more often to exchange information and knowledge and promote his experimental work, just as he travelled to talk about his experience (Data taken from Tien Trinh 2011a, *Thanh Nien Online* August 17, 2011).
>
> The works of Mr. N.V.L from Bac Lieu or Mr. T.T.H. from An Giang provide other examples of farmers who are devoted to rice selection and breeding. Their achievements are gained again from patient and steady on-farm experiments, backed up by knowledge and skills previously supplied by formal breeding technology training courses delivered by CTU, MDI, or CLRRI. Among hundreds of their new-developed rice lines, many varieties have been recommended for wide application, and some are even nationally recognised. Rice-breeding successes have pushed and pulled farmers to work closer with academics. Through this partnership have they learnt to work with more scientific methods and expert thinking and had chances to go abroad and share experience with farmers in the world (Data taken from Tran Thanh Phong, *Thanh Nien Online* August 19, 2011; Bao Van, *Thanh Nien Online* August 19, 2011).
>
> Besides rice breeding, Mr. D.V.C. from Tra Vinh is famous for providing consultations to farmers to rescue challenged rice fields. He pursues and practices the method that he calls "positive therapy" which heightens the concept of the "existence will" of rice plants. Before any chemical treatment action is chosen, he examines very carefully the diseased sample and encourages other farmers to follow the same methods (Data taken from Tien Trinh 2011b, *Thanh Nien Online* August 21, 2011).

> Farmer D.V.C. is taking consultation work with the knowledge and skills of an expert and his "positive therapy" practice is quite close to the idea of integrated pest management (IPM) discussed at length in academic books. His success does not rely on words or written arguments other than practice-based concepts and actions. Careful and caring principles (see Chapter Seven) suggested as a lodestar in localised conceptualisation of IPM and sustainable agriculture development are nicely realised and promoted in reality by farmers like Mr. D.V.C

The above are selected examples of innovative rice farmers in the Mekong Delta. Innovations and inventions can widely be found in fruit planting, aquaculture, and agricultural mechanics. Applications and impacts of farmer's innovations sometimes go far beyond specifically-originated conditions and locations when they are further developed in cooperation with scientists or adoption of scientific methods and manner through farmer experimentation.

Case 3: VACB farmers as knowledge brokers

The narratives of three VACB[55] farmers X, Y & Z

In 2009, Farmer X was accepted onto a VACB "clean environment" project administered by CTU scientists and researchers. The project focused on pig raising technologies in response to the spread of blue ear disease. His house, easily accessible for local villagers from all sides, was selected as the project communication post and permanent classroom for the project training courses. Partially financed by the project, his temporary house was upgraded by extending the eaves and capable of housing 60-70 seats. A plastic biodigester was installed to connect waste from a newly-built toilet and animal raising facilities, facilitating farming using a complete VACB system. More than 10 courses have been conducted by CTU

[55] VAC, an intensive household-scale symbiotic farming system of horticulture (V), pisciculture (A) and animal husbandry (C), was the first model of its kind, and was initiated and launched by the National Association of Vietnamese Gardeners (NAVG) in 1986. It is based on traditional gardening methods used by Red River Delta farmers, and it has rapidly gained farmers' interest because it promises to combat rural hunger and malnutrition by providing diversified vegetables, fruits and animal proteins, helping to reduce economic risks that stem from their dependence on a single product, and instead increase their self-reliance and household income through saved capital input from the output-input recycling mechanism between subsystems. Additionally, the VAC itself is ecologically desirable and sometimes called the "VAC ecosystem", as it helps to vitalise and make green fallow and uncultivated land while sustaining local resources (Ikeguchi, Lam My Lan, and Duong Nhut Long 2008, 12; NAVG 1995, 4f; Wieneke 2005, 23f). In the course of development, the model has been modified to be more appropriate for the climate and typology specifications of application areas. For example, it is observed in the Mekong Delta that an internal alum-washing drainage system is dug around and between a garden, where prominent citrus species and coconut palms are intercropped with mango, guava, pineapple, cacao and pepper plants (NAVG 1995, 4f). The system can also be extended by adding more possible subsystems; for example, VACRRR (R: rice, R: cash crops and R: forestation) is well developed as a typical farming model in Song Hau Farm areas. VAC and its modified versions, however, do not provide an apposite treatment of animal waste, particularly within the C component where swine raising is prominent. In order to make it a more sophisticated and practical appliance, a combined biogas module was supplemented, which created the VACB system (B: biogas). Biogas technology has long been adopted in livestock-based farming in Vietnam. Biogas construction design is principally distinguished by two models: (1) brick and concrete biogas plants designed by NAVG and (2) lower-cost and easier-to-operate plastic (tubular polyethylene film) biodigesters introduced by Ho Chi Minh City University of Agriculture and Forestry in 1992. Biodigesters produce properly treated by-products within the system, clean domestic energy and better rural sanitation from an ecological perspective (especially where both animal waste and human faeces are connected to and treated in biodigesters). Farmers in the Mekong Delta widely use the latter model, as it suits their small-scale farming, initial construction investment and technical maintenance.

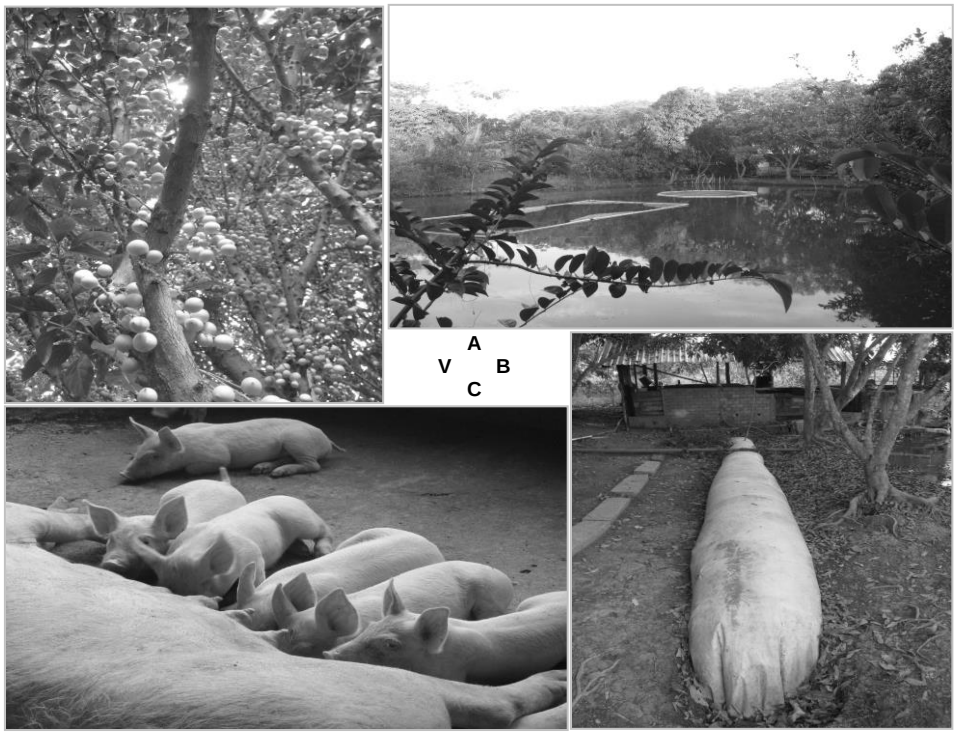
experts on different VACB-related topics, from horticultural diversification, swine farming techniques, swine disease prevention and treatment, fish hatching and fish stock management, to biogas plant construction and maintenance. In each thematic course, 60-70 local farmers are invited and CTU trainee students participate as observers. The training, which is structured around a theoretical component followed by practical sessions, lasts normally from one to three days and sometimes longer. To date, Farmer X has actively attended all classes and intensively worked with experts in solving local emerging issues, as he plays the role of intermediary between scientists and locals applying for new technologies. He often communicates with other advanced farmers such as Farmers Y and Z to exchange practical experiences and lessons. Problems that cannot be solved within the group are presented to external researchers/experts, who either advise the farmers in a phone call or visit directly for sample collection and laboratory testing. Farmer X and his wife are willing to share their experience with local people, explain to them any issues they do not thoroughly understand and distribute the project's training materials. At the time when this interview was conducted, an older villager was waiting for Farmer X to check his new biogas plant operation. Farmer X also helps CTU trainee students implement their experiments in his field. It is through such formal and informal learning and practice that he can acquire essential knowledge of the VACB system. For him, passion, knowledge and practice are the key elements to his present success. In the expansion phase of the project, he was selected to follow the project's researchers in assisting new VACB households to set up the model, a testament to his persistent thirst for learning. This recruitment drive also provided him with a second job as a knowledge broker.

Farmer Y participated in the VACB implemented by CTU researchers in 1996 (see Figure 4.10 for his VACB system). He was carefully instructed how to handle and release *Trichogaster pectoralis regan* (TPR) fish into the lake, feed and take care of them. His fishery mentor maintained weekly visits to his farm. He shared that he followed all the instructions strictly and tried to understand thoroughly every procedure to induce spawning, from hormone preparation, dosage calculation and injection techniques to egg collection and larvae feeding. His first crop was a great success, with an average weight of 100 grams per six-month old fish, which surprised even provincial agriculture leaders. He became the first Mekong Delta farmer to succeed in TPR breeding and fertilised fish egg production and was well-known in local and national mass media. Finding new technology and knowledge for him was as important as localising such knowledge by proposing modifications, advancements or improvements gleaned from local practical application. He realised that apart from a strong educational background, local understanding, good communication skills and continuous learning create a high-profile knowledge broker. Besides collaboratively implementing applied research provided by the university on his farm, he has been employed as a lecture assistant and technical advisor in CTU's VACB training projects, as well as a number of other provincial and international development projects. Farmer Y is also energetically involved in local development activities.

In 1998, he was appointed the head of his commune's extension club of 22 members, which went on to become the 21-participant agriculture cooperative that he has chaired since 2003. For him, farmer groups are useful for VACB technology and knowledge diffusion among members.

Recently, he has delivered on the spot training sessions to farmers from various provinces in the Mekong Delta, based on their invitations and contracts. Some initial efforts are being made to establish a VACB technology transfer association comprising state managers, scientists and knowledge brokering farmers. Throughout his knowledge brokering, new knowledge is generated through improvements, modifications and practical implications; however, little is discussed and added to VACB training materials. When asked about training material preparation, he pointed to his head: "Here, it is all inside here".

Figure 4.12: Farmer Y's VACB system



Source: Author 2011

In 2000, Farmer Z learnt about Farmer Y's VACB model from a local television programme and went to see him and learnt from his experiences. Back home, he decided to chop down more than 60 longan trees to create a pond, and applied for a bank loan of VND 10 million to invest in TPR and pig-raising. However, the first crop failed because of poor TPR eggs. Not discouraged, he kept on the second TPR crop, but still quite a number of fish were dying after the first 20-30 days. In fact, after his first crop failure he started participating in a project run by CTU researchers on native fish conservation through protection zoning and local livelihood improvement. One day, while transporting a CTU scientist around the village to select suitable households for biodigester construction, he was so worried and impatient about his fish

conditions that he recounted his futile attempts at fish rearing to the scientist, a fishery mentor who also helped Farmer Y in another VACB project: "If I fail this time again, I guess I will have to leave my house. I have little hope now that the fish are dying". Without delay, the scientist visited his pond. Sample testing revealed the disease was related to brachial parasites. After two days of treatment under scientific instructions the health of his fish recovered significantly. Under the continued supervision of the scientist, ten months later he had more than 10 tons of mature fish that he continued to culture, in order to satisfy market demand, into brook fish. He earned a profit of VND 30 million for this crop. In the next crop in 2003 he mastered TPR spawning and produced nearly one ton of TPR fish eggs, but still could not meet demand. He then became the direct technology transferor for nearby interested farmers and the quality checker of fish eggs for selling to out-grow farmers. He developed and led a group of 30 local farmers to specialise in TPR egg production. After learning biodigester construction techniques, under other projects or within his own schemes he instructed on and built an array of biogas plants for others in the Mekong Delta. He also helped to spread *Trichanthera gigantae* plant as a feedstuff for livestock and fish after successful experiments carried out by CTU agro-scientists. Similar to Farmer Y, Farmer Z first worked as a knowledge broker within CTU projects, before being introduced and connected with provincial and international development partners. His experience taught him the importance of on-farm, throughout-the-process training for farmers whereby, accompanied by his colleagues, he would stay the whole week with farmers to transfer fish breeding techniques. Essentially, he ruminated on the applicability of what he presented to farmers during his theoretical and practical courses. One of the most difficult questions that many farmers asked him during his courses was: "Thanks to your technology we can make good production, for sure, but we are now worried about the market, so can you help us with our product sales?" After a few years of VACB knowledge brokering, he formed a wide network of application farmers from his own region and all over the Mekong Delta, who agreed to collaborate in a VAC fish egg supply group that was able to satisfy any immediate order for one to two tons of TPR eggs. This networking initiative helped to develop Farmer Z's knowledge brokering over the production chain, from TPR breeding to marketing.

Academic-farmer partnership construction

It is important to note that the transfer of integrated farming technology and knowledge is mainly designed as part of a project's framework with the participation of (inter) national project managers, universities and/or development agencies as technology developers, technical advisors and local governments and communities as beneficiaries. Following mainstream technology transfer[56], the "from

[56] By this we mean the prominent approach of agricultural and rural extension in Vietnam. Since 1993, a professional extension system has been created nationwide over four levels of administration (national, provincial, district and commune). However, service performance is confronting insufficient funding and staff and a lack of up-to-date extension principles and practices (Poussard 1999). Influenced by the top-down and hierarchical structure, in order to

model farms to extensive fields" approach is adopted as the major dissemination strategy (cf. NAVG 1995, 5). The diffusion process is chronologically implemented as follows: eligible pilot households are selected by the project and local government, models are established with subsidised inputs and technical support by project technicians and development practitioners and finally dissemination seminars and meetings are organised for broader communities in order to inform them about the model and share experiences when initial results are achieved (cf. NAVG 1995, 5). It is expected that new practices be multiplied when the model's principles and outcomes are obtained and proven through this process.

Since the VACB system is complicated in terms of effective adoption and operation in the long run, rather than technological understanding and acceptance, on the spot and post-project consultations and support are required, as this need is hardly satisfied by a centralised project and its resource constraints. Besides "hard" technological issues related to subsystem installation and arrangement, production activities require further multidisciplinary and multi-stakeholder efforts. It is always challenging for both scientists and farmers to address the basic question: Which kinds of plants, animals and fish need to be grown within the integrated system, taking into account the dynamics of local conditions, needs, pest and disease outbreaks, as well as market demand. Furthermore, even when intensive dissemination is needed, it is crucial to keep in mind that the system is under investigation, theoretically and practically, for optimisation over the time-space axis (cf. Wieneke 2005, 24).

Taking a different approach, local academics, particularly from Can Tho University (CTU), have diffused VACB technologies through their development-induced action-research interventions. Funded by governmental programmes or via individual research networks, these projects are planned and implemented directly by groups of university researchers from relevant disciplines. Due to their research-driven features, such research/development projects frequently provide better access, constant contacts, relation maintenance beyond project boundaries and learning spaces between the knowledge source and the recipient. In addition, by working closely with farmers, scientists can provide short, instantaneous problem-solving advice and extensive, well-prepared lessons to farmers as well as conduct experiments and tests and make modifications corresponding to farmer's experiences, local conditions and practical trials. Throughout this process, localised knowledge and new values are generated and added, and trained farmers have emerged as a new category of VACB knowledge brokers working across the delta.

---

obtain central funding local extension divisions have to "adopt themselves to meet the criteria without consideration of local needs and ecosystem suitability" (Nguyen Ngoc De 2005, 85).

4.5. "Water and fish" metaphor reinvented: Transformation of the epistemic culture of development

In Vietnam's Mekong Delta, "water and fish" is often used as a metaphor to describe the symbiosis and collaborative relationship and interactions between academics and farmers. The metaphor's connotations have been expanded with transformative academic-farmer relations and interactions.

The expanded metaphor, nevertheless, would very often be: "fish needs water more than water need fish". That is, farmers need academics that provide them with new knowledge and technology for agriculture and rural development more than academics need them. Accordingly, following the metaphor's spirit, universities and research institutes have been encouraged to take responsibility for transferring their new knowledge and technology, as well as helping disadvantaged communities to develop. These tasks become more obvious when campuses are surrounded by poorly-resourced populations. Even when concentrated transfers through STTCs have been replaced by bottom-up approaches and communicative methods, for many academics the superiority of expert knowledge remains unchanged in their thinking and practice. This is the first version of "water and fish" relationship between academics and farmers.

The second "water and fish" version promotes farmer's participation and knowledge into research work. For senior researchers who have long experience working with rural communities, it is unwise to keep "insipid water" or non-interactive knowledge exchange and learning with farmers who have rich understandings about environments and changes. At the CTU, for example, for generations of researchers have developed a research culture that respects local knowledge and resources. It is explained that:

> "For more than 300 years, the inhabitants of the Mekong Delta have been making the best uses of the biological resources for subsistence. They have managed to overcome all the adversities in climatic, soil and water conditions to produce enough food, fifibrend shelters for themselves, generations after generations. Through their rich practical experiences, by trial and errors, they have invented ways to take advantages of the annual floodwater, which at time reached more than 1.5 meters in the fields. They conquered the toxicities of acid sulphate soils and saline soils in order to produce valuable crops and animals to share with the whole societies. And they made much more for their communities to survive and to thrive on. But these popular inventions were usually localized within the original communities; they were not spreading widely due to natural barriers, poor communications and transportations.
>
> More recently, when formal education and training coupled with scientific research in the agricultural sciences to contribute toward rural development of the Mekong Delta, scientists started to experiment ways to improve the Delta. The wise scientists usually tried to learn the experiences from the local farmers who had lived there for generations, and whose practical experiences were still localized only in the communities. These experiences were precious because they had been well tested. The scientists' job at that time was to understand the process and the conditions (particularly soil and water conditions) and then tried to make some improvements using the latest technologies that the farmers did not know. The resulting improved technologies were then extrapolated to other communities having similar soil and water conditions" (Vo-Tong Xuan cited in Nguyen Ngoc De 2006, v).

Even so, farmer's knowledge is exploited for the purpose of accumulated scientific knowledge while farmers are pure information providers or low-cost hired workers. They are employed to carry out

experiments about which they are less minimally informed. As a consequence, farmers remain dependent on outsider experts' knowledge. The community's knowledge autonomy for development cannot be achieved. The dynamics of local innovation in the more uncertain context of and pressure from basin water resource management, climate change, and food security cannot be fully understood and harnessed.

This chapter attempts, via the analysis of the dynamics of local farmers' knowledge brokering and generation, to provide a reconstruction of the third "water and fish" generation that emphasises that academics and farmers are partners in creating and diffusing new knowledge for agriculture and rural development. "Partnership" does not mean inviting farmers for innocuous participation in a pre-designed project; rather, it is a process of development co-planning, implementation, and evaluation. Rural communities have also undergone changes that facilitate a real partnership construction:

> Currently, a number of farmers get ahead of scientists in developing and preserving new plant varieties. In the past, only experience guided farmer's breeding activities. Several recent participatory breeding courses organised by universities and research institutes have provided farmers with scientific methods and techniques. The amalgamation of experiential and scientific knowledge in farmers' experiments promises an increase of quantity and quality of creative outputs and innovative farmers (Interview 153, senior researcher, male, Can Tho, 6.10.2010).

> We highly respect farmers who manage to do experimental research and many of them deserve praise for their great achievements. Despite low formal educational attainment, they are wise and experienced: They prove their capacities not only in plant breeding but many other areas. What is more appreciated is that these farmers are effective knowledge brokers educating other farmers inside and outside their community. There are several initiatives and innovations that farmers pioneer and which are still unknown to scientists (Interview with CLRRI Director, data taken from Tien Trinh 2011c, *Thanh Nien Online* August 24, 2011).

To avoid local romanticism or romantic localism, it is crucial that academics should take the lead in creating the foundation of partnership. Participatory rice variety selection and breeding projects by CTU or CLRRI are good examples of how to start up a network of innovative farmers. The question of maintaining a network that is growing increasingly complex requires academic-farmer cooperative mechanisms, in both formal and informal modes, that take into account the farming community as a whole despite the supposed priority of advanced farmers. The culture of interaction between academics and farmers with interchanging roles (of knowledge producers, brokers, and users) is turned into an epistemic culture of agricultural and rural development. Only when this culture is nourished could the extended metaphor be re-written: "vivid water and lively fish".

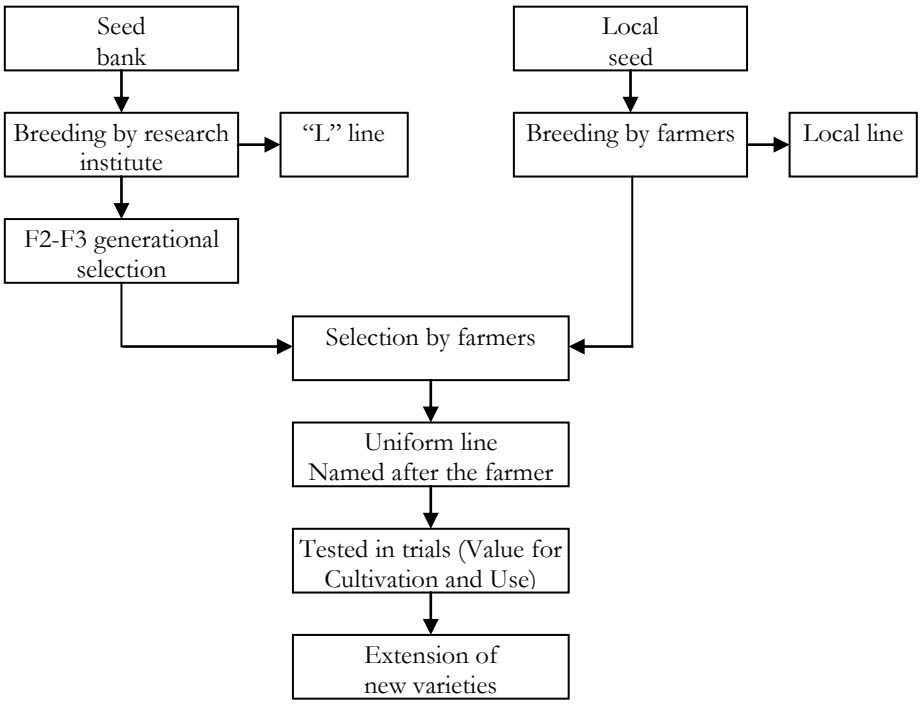
The approach toward the third layer of "water and fish" partnership also assures that knowledge-based interactions between academics and farmers involve on three kinds of actions: technical, pragmatic, and ethical as described by Immanuel Kant (see the elaborate discussion by Müller-Merbach 2006). The interactions are not technically to fulfil research or knowledge transfer activities or solve farmers' practical problems, but pragmatically they are related to rural community development, especially the development of the poor and disadvantaged, the hidden rural population obstructed from knowledge and resource-rich

projects. Ethical action includes the compliance of ethical requirements in research as well as determination of science-based justifications in knowledge diffusion impacted by different interests and policies. As such, the success of an individual knowledge diffusion transaction or a more sophisticated project should include a trisection of knowledge for technical, pragmatic, and ethical action. This is both motive and foundation for partnership to be built up between scholars and farming communities.

Two examples below are aimed at illustrating knowledge production and the use of partnership between academics and farmers. A project scale academic-farmer partnership can be observed in many rice breeding efforts. Participating farmers have bred rice lines on their own from local seed and selected new rice varieties with forte features in comparison with varieties bred by institutes. Uniform lines are named after the farmers and widely disseminated after being tested in trials (see Figure 4.13). Farmer-bred varieties have proven to be of stable yield, pest resistant, and highly tolerant:

> "In recent years, there is a bridge linked into rice breeder and farmers in the rice selection processing for selecting new rice varieties in the Mekong Delta. […] Some farmer rice varieties having good characteristics such as: tolerance to acid sulphate soil, short duration, high yielding could be expansion in the Mekong Delta were HĐ1, HĐ4, NV1, NV2" (Le Xuan Thai, Huynh Quang Tin, and Huynh Nguyet Anh 2011).

Figure 4.13: Research and farmer participatory rice breeding procedure

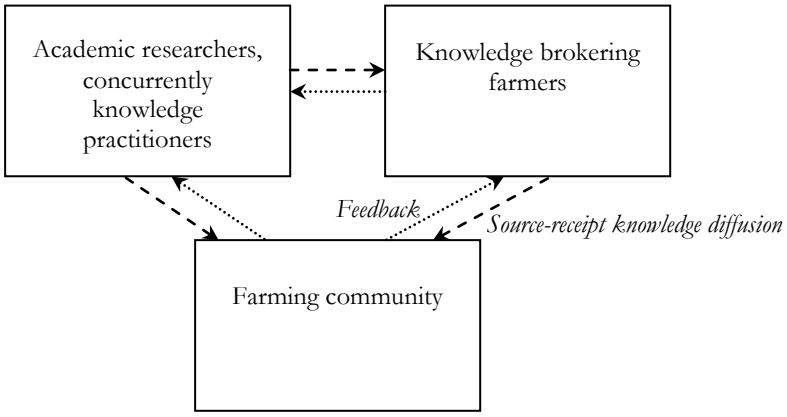


Source: Le Xuan Thai, Huynh Quang Tin, and Huynh Nguyet Anh (2011)

The stories of VACB farmers provide us with an example of long-term partnership cross the standalone project. Our analysis of knowledge exchange and the interaction between CTU academic researchers and

farmers suggests an emerging approach in which knowledge brokering farmers continue to spread knowledge to the farming community (see Figure 4.14).

Figure 4.14: Brokering farmer-based knowledge diffusion



Source: Own presentation

It is evident from our case analysis that farmer-led knowledge brokering functions as a key link in connecting the complete knowledge diffusion cycle of the VACB farming system to the broader farming community. Farmer knowledge brokers can best perform their task on account of their position between experts and farmers, knowledge users and knowledge generators, producers and consumers. To start their brokerage work, Farmers X, Y and Z voluntarily helped neighbours to set up VACB systems through regular contact. Now paid to carry out this task, mainly in the form of travel and working day allowances, in neighbouring provinces, Farmers Y and Z stay and work with local people for days until related theory and practical processes are completed. System monitoring visits are also planned. Expressions in local language, the development of locally appropriate options for innovation adoption and exemplification of their own lessons learnt are effective ways and methods of brokering farmers that external experts rarely have:

> Living the same life other farmers are experiencing, Farmer Y finds it easier to explain, illustrate and clarify any hitches or problems farmers encounter. He uses more dialects and simplified expressions, for example 10 "tắc" instead of 10 centimetres, or "fish can live in different places" instead of "fish can be adaptive to different water environments" (Extract from Farmer Y's narrative).
>
> The options were what Farmer Z tried to develop his trainees, as he understood the heterogeneous nature of the other farmers. In fish classes, he provided three fish density-based structures including natural, landscape and industrial models relevant for poor, average and better-off farmer groups. This method facilitated the decision-making of his colleagues based on their own socio-economic situations. However, not all trainee farmers followed his guidance because of their strongly perceived high density, high productivity correlation unless some of their crops failed. He said he had to pay a lot so that his fellows could avoid these mistakes; otherwise, they themselves would have to pay, which sometimes cost too much and led to rumours of a model's dismal failure (Extract from Farmer Z's narrative).
>
> From a farmer's error, Farmer X recognised and used it as an example in other classes that the biogas tube should not be fixed in the ground (for aesthetic reasons), as methane liquidises in a cool environment (Extract from Farmer Y's narrative).

Understanding local natural conditions, power structures and cultural values helps broker farmers accomplish their brokering jobs in a more sustainable manner:

> The construction of biogas plants was very much dependent on the type of local soil in deciding suitable size and construction types for the digester's main ditches. Farmer Z suggested a simple construction for biodigester ditches in one province, while in more sandy areas he insisted on a cement-solidified construction, which did not please farmers from the outset because of the higher costs. However, his one month later the very same farmers were offering high praise for the good operation of their biodigesters (Extract from Farmer Z's narrative).

> In one of CTU project, in which he participated as a technical consultant, some days before the course was officially started with community participation, Farmer Y managed to talk to and present all the tactics of fish spawning to the village head. Convinced of the viability of the scheme, and armed with the necessary knowledge, the village head agreed to be a knowledge transfer facilitator for the community's households. In another project, he recalled, each project beneficiary was provided with two cows, 20 kilograms of fish eggs and a biodigester construction, as well as training courses. Many householders who were relatives of commune leaders, and even better off in some cases, were selected, which threatened the success of the model transfer. He discovered this when he made a field tour around the project area, but he could not change the situation because the list was approved by the local government. What he could do, though, was to persuade the project management board to accept one more local "real" poor farmer whom he met during the field investigation and who was passionately looking for a development model to change his life. This man, upon the completion of the project, provided the best sample of the project's values. In a biodigester construction project, he called a halt to the local practice of fish toilets by diverting both animal waste and human faeces into the new biogas plants. As project beneficiaries explained that they could not afford a concrete toilet, he proposed a very simple design with an expenditure of approximately VND 100,000, which was accepted by local people. Ultimately, beyond his expectation, only one household constructed a toilet according to his design, whereas the rest invested in nicely constructed ones through their own funding (Extract from Farmer Y's narrative).

Moreover, other factors beyond knowledge acquisition contribute to farmers' determination to run VACB units. Together with technology and knowledge, the financial investment, production input demand and output supply of the new farming system motivates or demotivates its duplication. The way Farmer Z promoted various household resource-based models of TPR raising and organised TPR farmers to control a massive and qualified product supply operation has provided practical solutions throughout the VACB production chain, a task most rural extensionists claim is not their responsibility.

Our interpretation of three versions of "water and fish" is greatly compatible with Callon's (1999) three models of participation of lay people in the production and dissemination of scientific knowledge. The public education model (Ml) focuses on the education of a scientifically illiterate whereas the public debate model (M2) prioritises non-specialist's discussion because their knowledge and competencies can enhance and complete those of specialists. The co-production of knowledge model (M3) supports active involvement of lay people in the creation of knowledge concerning them. It is a challenge for Science, Technology and Society Studies "to understand more fully the functioning of Model 3 and to highlight the conditions of its diffusion" (Callon 1999, 94). Our case studies provide some insights into Callon's Model 3 engagement. With the help of constant scientific consultation with academic researchers, a high commitment to sharing knowledge with other farmers and learning in practice, a farmer's brokering can

better handle locally specified situations and issues, knowledge tacitness, knowledge traps and matters beyond the knowledge transfer boundary, such as production options or marketing issues. Thus, knowledge brokering farmers work across the traditional divide of institutionalised and non-institutionalised diffusion.

Summing up

Apart from training and education as the primary function, academic organisations in the Mekong Delta have undergone major transformations and changes in terms of research and social development as their second and third missions. Regarding global-local knowledge flows, Vietnamese researchers have been provided with more autonomous and self-determined options in international cooperation initiation and implementation, making much wider international partner networks and fundamental changes of cooperation partnership. Research projects are also more multidisciplinary. Within the internal knowledge production system, epistemic interactions and cooperation between academics and knowledge professionals from governmental agencies and private companies have been increasingly reinforced. Apart from the pursuit of consultation positions of academics in private and non-governmental organisations, inter-epistemic cultural communication and rearrangement are fostered by the brain drain with the movement of professionals from academic and government agencies towards the private sector and centralised human resource reallocation decisions across sectors.

For the third mission analysis, this chapter has analysed different modes of farmer-academic interactions in Vietnam's Mekong Delta. While formal and informal modes are distinguished by their more closed or open boundaries, fluid knowledge blurs the distinction between formal and informal spheres. Indeed, academics and farmers interact in a space of integrated forms of interaction, multiple roles and relations, and uninterrupted chains of questions and answers stimulated by academics' theoretical research and the practical daily production activities of farmers. The four processes of formal and informal knowledge interweavement and interplay have been described. The expert knowledge receiving processes by farmers can be the formalisation of informal contacts and conversations, or informalisation of formal communication modes in everyday life and situations, even relativisation of interactions by the development of a closer relationship. Partnerisation is a process that brings the academic-farmer interactions to a new level. Where local knowledge is valued and partnership cultivated, farmers are taking new roles in knowledge brokering and generation and new knowledge is co-produced.

The research highlights fluid and multidirectional processes of knowledge generation and diffusion for the agricultural and rural development in which agricultural scholars and producers are involved. It challenges the culture of knowledge creation for rural development rooted in the dichotomy between academics as knowledge producers and development experts and farmers as passive knowledge receivers. Instead, the

culture in which knowledge-based procedures, processes, and practices are inter-exchanged, transmitted, hybridised, and adopted among actors and knowledge worlds is turned into an emergent epistemic culture of agricultural and rural research and development in the Mekong Delta.

This scenario of two-way communication in many cases remains far from being achieved; both sets of actors remain confined to their own life worlds, reading from their own scripts. This means the "triple helix" of communication between university researchers, government agencies, and private sector companies (like fertiliser suppliers) does not always include the farmers (see Chapter Five). Farmers learn more from their neighbours than from various government agencies (see Chapter Six). There are exceptions, as our case studies show, but the appropriate use of knowledge for development is still limited.

CHAPTER FIVE
AGRIBUSINESSES: CONTESTED KNOWLEDGES AND HYBRIDISED ENTERPRISES

> It is time for us to assign tasks for agencies and companies related to agricultural production and development. Agrichemical companies should not be allowed carry out agricultural extension work as they only give priority to profit generation. Extensionists should take all responsibility to directly direct farmers to implement production models. Large-scale production management should be undertaken by professional organisations such as the Southern Plant Protection Department. University and institute researchers should perform their core role of conducting research (Interview 333, Plant Protection senior, male, Tien Giang, 14.3.2011).

This statement is a core message I received while conducting a one-hour long interview with a renowned senior plant protection government manager and researcher, who, for a long time, has been earnestly working with farmers in the Mekong Delta in the field BPH management. He said that he would again proclaim these ideas to higher leaders in an upcoming Hanoi conference of which the agenda includes a session for recognition of his professional contribution to pest-control rice productivity stabilisation and growth. What he suggested is a the return to the traditional roles of each social actor involved in the rural development sector, which implies the state management impuissance towards uncontrolled expansion of the agrichemical industry in the delta's agricultural productionism. Yet his call for a boundary close of each system definitely neglects the increasing trend of interaction and knowledge co-production practice among development stakeholders as discussed in the previous chapters. The recent implementation of the quadruple association of the state, scientists, agribusinesses, and farmers has been largely evaluated as an in-reality impasse (see below Section 5.2). Its failure is caused by its administration-established foundation of a governmental decision encouraging production cooperation by economic contracts instead of knowledge-involved exchange throughout agricultural production and development processes.

The agricultural innovation system in Vietnam has however prominently been conceptualised and realised surrounding the core of the science system and/or the extension system. Thus, innovation capacity of other actors across the agricultural sector, including agribusinesses, is very often neglected. This chapter focuses on the role and interaction between agribusiness and other actors in knowledge diffusion and reproduction in the agricultural sector. Agribusinesses encompass a broad range of agricultural production, processing and distribution, seed supply, agrichemicals and farm machinery and the various forms of enterprises, farms or retail stores reaching deep into rural areas. The chapter first examines the changing environments of global market integration and enterprise development policies that have provided new conditions and requirements toward agribusiness in the Mekong Delta. In the context of post-equitisation and entrepreneurship detachment of community development, it continues to scrutinise the formation of new roles and interactions among private agribusiness in agricultural technology and knowledge development and diffusion with a focus on farming communities. The engagement of the agribusiness

sector in knowledge diffusion is further explored through discussion of "conflicting" knowledge situations because very often their business activities are driven only by economic goals if social development is not supplemented. The chapter finally investigates hybridised business organisations and suggests that development of new agricultural entrepreneurship with learning and development at its heart is fundamental to the sector and rural development transformation.

5.1. From the village pond to global market: Agribusiness changes and challenges

In the heyday of Vietnamese feudal dynasties such as the Le and Nguyen, agricultural promotion policies were valued (see Chapter Three), which elevated land reclamation, agricultural growth and trade expansion. In the Mekong Delta, a number of busy commercial centers were formed by the end of the 18th century (see Chapter Two). A commodity economy was highly developed in many regions in the delta due to the increase of abundant agricultural products, especially rice production, enlargement of merchants, and transportation development. In the convergence of the above conditions, My Tho, well known as the Great City (*Dai pho*) in Tien Giang Province, provided an excellent example of a commercial center formation:

> The economy of My Tho was prominently characterised by an agricultural economy. With natural and social favourable conditions, the commodity economy was developed very early in the combination of both domestic and international trade. Commodities from My Tho were shipped throughout the Southern Vietnam's market, to the capital of Phu Xuan, Cao Mien (former Cambodia) and even China, Japan, and Europe. The activeness of the My Tho's commodity economy significantly contributed to the vigorous shift of the Dang Trong's (present-time South Vietnam) economy from self-sufficient to market oriented, and integration into the zealous East-West trade currency of the 16th and 17th centuries. The development of the commodity economy in My Tho provided local people with improved living standards and supportive access to national and international technologies and civilisations. This East-West economic and cultural interaction is the foundation for the development of My Tho and the Mekong Delta in the following centuries (Tran Thuan 2010, author's selective extract and translation).

Under the French colonialism (1861-1954) and American war (1965-1975) periods, agricultural and rural development was penetratingly influenced by profit-driven exploitation and economic dependency policies of the rulers. Through the so called civilising mission, whatever economic growth and transformation were made in Vietnam and its Mekong Delta, during colonial rule, only benefited the French colonists and their supporters (Burlette 2007; Nguyen Van Khanh and Nguyen Lan Dung 2006; Pham Cao Duong 1985). The huge and increasing American economic assistance, frequently under strict control and conditions, for Southern Vietnam with a boom during the period 1965-1975, was a feature of neo-colonialism (Pham Thi Hong Ha 2012). What is considered "positive" of economic change under the Vietnam Democratic Republic regime is that a relatively dynamic market economy was formed (Pham Thi Hong Ha 2012).

After national reunification in 1975, agricultural and economic production policy of the North was adopted by the South and the Mekong Delta region, through two main instruments of the New Economic Zones (NEZs) and State farms (Le Meur and Leurent 2006). While NEZs had successfully reallocated

nearly 1.4 million households in 1961-1987 within and inter provinces (Trinh Huy Quach and Hoang Thi Tay Ninh 2004), efforts of collectivisation were not always welcomed, even resisted by farmers in the Mekong Delta provinces[57] (Pingali and Vo-Tong Xuan 1992). It is through locally broken "fences" towards agricultural collectivisation and centrally planned economic policies in the delta that contributes to the country's history of transition to economic reforms and development renovation since the late 1980s. Kerkvliet (2005) precisely describes counterproductive contracting with collective cooperatives:

> After a few years of the product contract arrangement, many villagers in the [Mekong] delta were frustrated. They had their own fields, which they had long sought, but they did not *really* have them. They wanted to farm those fields as their own, but they could not *really* do so. They and their fields were in an organization that they should have run but did not, an organization that was meant to help them farm but usually did not or could not. That organization, the collective cooperative, was not only often useless but cost them a significant proportion of what they produced. To some extent this quandary was their own making. Few did their collective work well, thereby contributing to the organization's problems and thwarting leaders who tried to make the product contract arrangement effective. But, people wondered, how could they work diligently when they could not rely on everyone else – including their own leaders – to do the same, when they received but a small fraction of the increases they produced, and when the cooperative and state agencies took sizable amounts but gave them little in return? (Kerkvliet 2005, 208; italics in original)

After *doi moi* (renovation) was announced in 1986, Resolution 10 and 2003 Land Law promoted agricultural restructuring and diversification by permitting land transactions and granting households long-term land use rights and greater production freedom (Nguyen Thanh Binh 2008; Ravallion and van de Walle 2001). Further, the last two decades, with Vietnam's expansion of international economic relations (see Sepehri and Akram-Lodhi 2005) and privatisation policies (Pingali and Vo Tong Xuan 1992; Truong Dang Loc, Lanjouw, and Lensink 2006) (see Table 5.1), there has been a boom of private sector in both enterprise and capital registration (Phan Dinh Khoi, Truong Dong Loc, and Vo Thanh Danh 2008). Over the past 20 years, the agro-economic development in the Mekong Delta has made a huge contribution to poverty reduction and improved local living standards (Benedikter et al. 2013).

Table 5.1: Critical momentum of agribusiness development in Vietnam

Year	Critical events	Main descriptions/impacts
1981	Directive 100CT/TW ("Contract 100")	Farmers had more rights to decide what to produce and where to sell their products
1981-1987	Decollectivisation	Transitional period from high centralisation and collectivisation to decollectivisation
1986	Doi moi (Renovation) launched by the Sixth Party Congress	Transformation from central planning to a market oriented economy with state management
1987	Enactment of Foreign Investment Law	Allowing 100 percent foreign ownership, tax holidays, and other incentives for foreign investment
1988	Resolution 10	Farm household as the main unit of agricultural production
1992	Equitisation process (*co phan hoa*)	- Started in 1992 as part of State-owned Enterprise

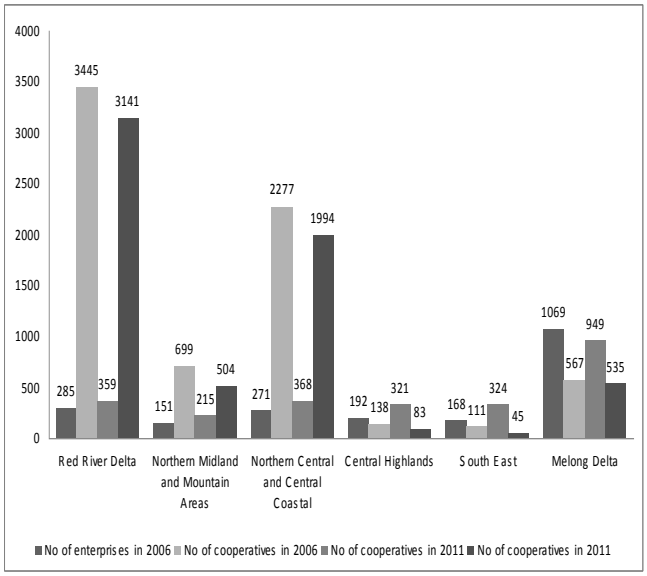
[57] Even in 1986, less than 6% of farmers from the Mekong Delta belonged to an agricultural cooperative (Pingali and Vo-Tong Xuan 1992, 107).

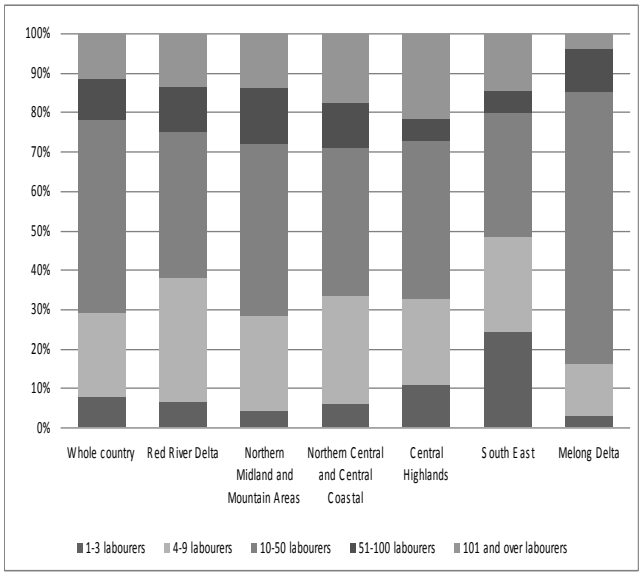
		Reform Programme - 1992-1996: Pilot stage -1996-present: Expansion stage
1993	Enactment of Land Law	Land use rights can be transferred, leased, inherited and mortgaged → agricultural restructuring and diversification
1997	Enactment of Cooperatives Law	Promotion of 'new-style' cooperatives based on voluntary membership, competitive factor markets, and no government financial support
1995 - 2000	Open to international trade	1995: Vietnam-US relation normalisation 1995: Member of the Association of Southeast Asian Nations (ASEAN) 1998: Member of the Asia-Pacific Economic Cooperation (APEC) 2007: Member of the World Trade Organisation (WTO)

Source: Input from Cuyvers and Tran Van Binh (2008); Marks (2010); Nguyen Thanh Binh (2008, 3); Truong Dong Loc, Lajouw, and Lensink (2006)

The development of agricultural enterprises in the delta has far outnumbered other regions in the country in terms of quantity and size (see Figure 5.1a). Yet (even micro,) small and medium enterprises (SMEs) are still prominent (see Figure 5.1b; Benedikter et al. 2013). Currently, the industrial sector which generates around 30% of the delta's GDP, includes important agriculture related industries such as the processing of food (e.g. rice, fruit or aquaculture), the production of agricultural and aquaculture inputs (e.g. fertilisers, pesticides, animal feed, seeds, or fingerlings) and machinery (Garschagen et al. 2012, 110).

Figure 5.1: (a, left) Number of agricultural enterprises and cooperatives by regions in 2006 and 2011, (b, right) Percentage of agricultural enterprises by labour numbers by regions in 2011





Source: Data from GSO 2012

The most challenge for each enterprise and the sector's sustainability within the intensive economic internationalisation (see Section 2.3) is internal transformation integrated with smallholder farmer developments. Sector's internal transformation should aim to expand diversified global markets.

> The majority of Vietnamese enterprises lack global market information and WTO strategised business planning. Our survey of small and medium enterprises in the Mekong Delta has shown that more than 50% of enterprise directors did not attend a business administration course. Many of them do not even have a high school graduation certificate. Their IT and English communication is extremely poor. The enterprise liquidation rate is quite high, over 10%/year. (Vo Thanh Thu and Cao Thi Viet Huong 2008)

It is evident from our field research that rural smallholder farmers are the main consumer of agricultural input sector and the main input supplier for food related processing industry, even large scale agri or aqua-cultural companies have developed their own specialised areas. What should be noted is that among 2.3 million households, including more than 6200 farms involved in agricultural production in the Mekong Delta, over 70% of them have less than 2 hectares of land and more than 98% have no formal training (GSO 2012). This insufficiency of qualified and trained work force largely hampers the progress of productivity, international trade and sustainable development of the region. If business development policies and plans focus only on "keeping the big, ignoring the small", increasing inequality within the sector and in the societal level will become irredeemable. Hoang Ba Thinh (2008) suggests promotion of social responsibilities of business in protecting the local environment, employing local workers and contributing to the local social security fund. While this suggestion is important, engaging smallholder farmers into inclusive markets throughout value chain development is the core of sustainable commercialised livelihoods transformation in the Mekong Delta.

5.2. The entrepreneurship detachment from community development

In the Mekong Delta, the entrepreneurship detachment from community development has substantially taken place over the past two decades under the influence of the two processes of equitisation and ex facto decollectivisation. In both pre and post doi moi periods, agricultural knowledge diffusion organised by extension actors in farming communities has been done through formal cooperative types and State owned enterprises (SOEs) (see Chapter Three). SOEs are expected to take crucial political and social development positions in influencing development orientations and creating change impetuses for the entire agricultural and rural sector.

The equitisation process in Vietnam has undergone two phases: pilot stage (1992-1996) and expansion stage (1996-present). Yet only non-strategic SOEs were included in the equitisation program (Truong Dong Loc, Lajouw, and Lensink 2006). As a result, despite small numbers, tarrying SOEs are "strategic" and "influential"; however their social development link has been greatly lost.

.

> In recent years the state owned enterprise sector has declined rapidly in the number of enterprises and employees by policies of equitization, innovation and restructuring. As of 31 December 2011, the number of state owned enterprises (including the 100% state-owned enterprises and equitized enterprises) is only 3,265 (accounting for 1.01% of total enterprises, in 2006 accounted for approximately 3%) and use of 1.66 million employees (accounting for 15.3%). However, the proportion of indicators on business and production performance of the state owned enterprise sector remains high, particularly capital mobilization accounts for 32.3%, turnover 26.5%, pre-tax profit 43.3% and contribution to the State budget 35% (GSO 2012).

The cooperation between joint stock companies and local authorities can no longer be implemented through administration orders. Doan Tue (*Vietnamweek* July 06, 2011) told a story that he called "atypical" about a provincial leader working as a partner with an enterprise in order to "please" ask them to help the province with construction of large-scale rice field models.

Researching the association of farmers into agricultural cooperatives, clubs, and groups[58], it is affirmed that farmers have less cooperative interests because of unachieved cooperative forces to overcome new challenges they face (cf. Benedikter and Waibel 2013).

> "Agricultural cooperatives functioned largely as a legal formality in the Mekong River Delta region, leaving household farms as the ex facto productive unit earlier. There appeared to have been greater willingness among Mekong farmers to apply ex officio land tenure arrangements in deference to tradition. As a result, the effect of Resolution 10 in that region was less than in other regions of Viet Nam. The Delta had long represented one of the most important agricultural regions in the country, and farms in the region tended to be larger and relatively more commercial (as opposed to subsistent) in production orientation" (Edmonds 2004, 59).

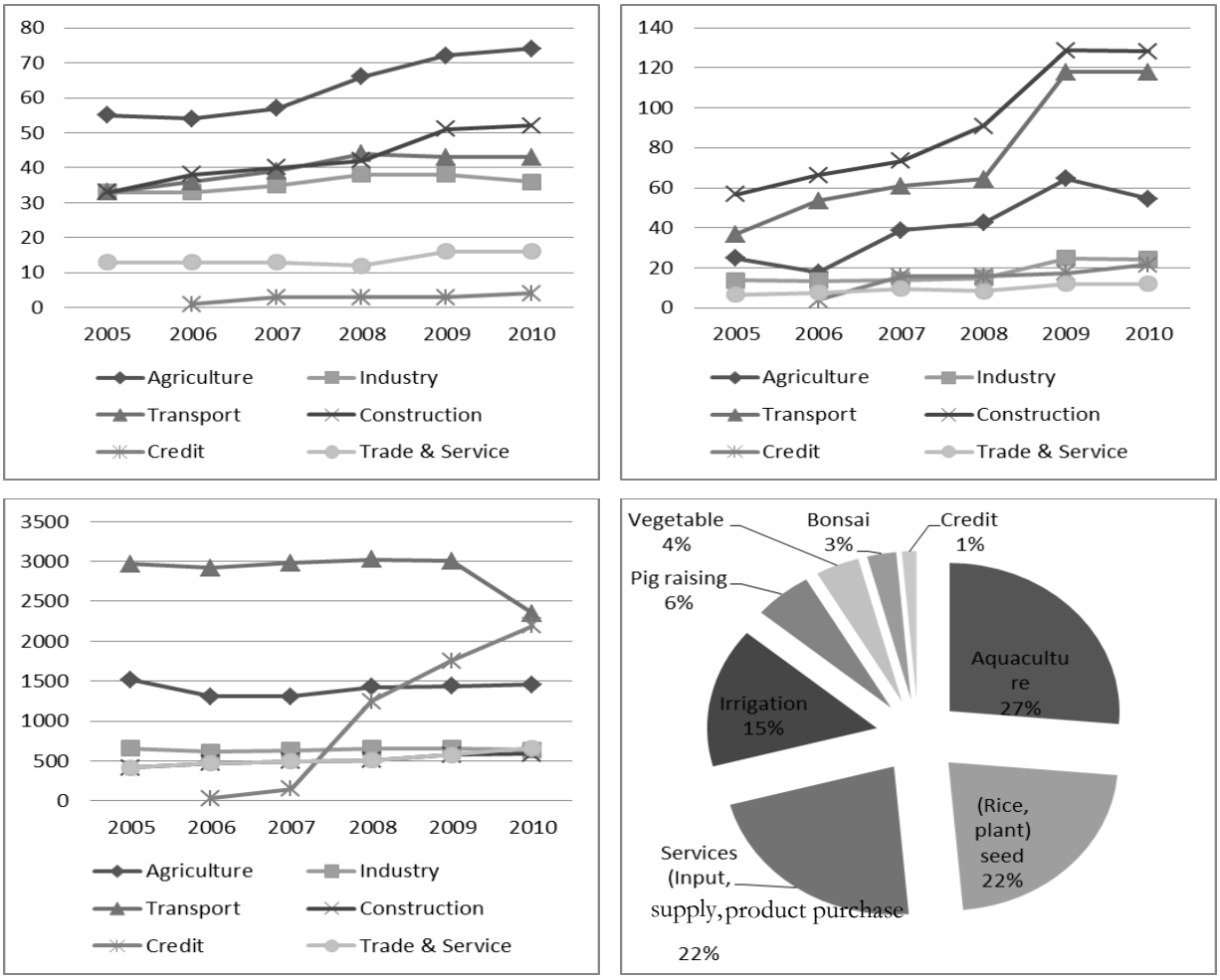
Our data of agricultural cooperative in Can Tho (Figure 5.2) shows that despite an increasing number of cooperatives the last five years, the membership and registered capital size seems to be of little change. Based on the information sheet supplied by Can Tho Department of Rural Development, many cooperatives are already marked "under dissolution". My direct visits and interviews with all listed cooperatives in one district have further divulged that nearly half of them had not been in operation for long. Other cooperatives are also facing many resource mobilisation difficulties as in the case of Thoi Thanh.

> The Thoi Thanh Cooperative in Giai Xuan, Can Tho, is specialised in aquaculture. Its precursor was an agricultural extension club established on the basis of the voluntarism of some local farmers. The club was then promoted into a cooperative, and its operation was based on farmers' contribution. Catfish raising is the main business activity of the cooperative; however, its business is currently no longer effective as the catfish price has decreased. Meanwhile, the cooperative finds it difficult to

[58] Our interview with a provincial Rural Development Department in the Mekong Delta (Interview 17, senior official, male, 31.05.2010) pointed out that there are 55/72 agricultural cooperatives (until mid-2010) currently operating in the province, with main services such as irrigation, science and technology transfer, seed tree supply, internal credit, agriculture production. The competence of cooperative heads is limited; 80.6 percent of cooperatives' accountants are not officially trained. Cooperatives do not have a clear operation plan and remain passive in searching market for the output. For a general picture, cooperatives are mainly operating seasonally on irrigation and science and technology transfer. The province has 2,680 agricultural groups, of which 21 have recently established. These groups aim to speed up the processes of economic structural transfer, industrialization, and modernisation in rural areas and support members in daily life and production, such as experiences exchange, support of new seed varieties, new technology, application of advanced science and technology in aquaculture, and so on.

invest in raising other kinds of fish due to the instability of aquaculture. For example, to start up aquaculture, some farmers need 100-200 million, even 700-800 million for infrastructure construction and fertilised fish purchases. However, their investment success is poorly ensured in the ceaselessly changing market. In case their production fails, they cannot afford a bank loan repayment; therefore, they are unlikely to apply for another loan to invest in their business. In such contexts, a modest number of cooperative members continues to maintain their aquaculture while most of them have given up (Interview 229, communal officer, female, Can Tho, 4.11.2010).

Figure 5.2: (a, left, upper) Number of cooperatives by types in Can Tho 2005-2010; (b, right, upper) Registered capital (billion dongs) of cooperatives in Can Tho 2005-2010; (c, left, lower) Number of cooperative members in Can Tho 2005-2010; (d, right, lower) Types of agricultural cooperatives in Can Tho on 2010 (n=72)



Source: Data supplied by the Can Tho Department of Rural Development 2010

5.3. The expansion of agribusiness in agricultural knowledge diffusion in the Mekong Delta

Our findings from farmer's focus group discussions have revealed that television programs and agribusiness are the two most popular source of agricultural knowledge to Mekong Delta farmers (see Chapter Six). The expansion of agribusiness in agricultural knowledge diffusion has been boosted, based on the sector's attraction policies of high-qualified human resource, including the state's brain drain in

recent years while up-to-date technology localisation has been fostered through intensive cooperation with research and state management agencies.

> For rice plants, we collaborate with Cuu Long Delta Rice Research Institute in O Mon for experiments and tests. As for testing fruit – important farm products in the southern region, we have the Southern Fruit Research Institution locating in Tien Giang. Our company is in frequent collaboration with these institutions. Recently we had a cooperation project to produce biological products to treat *Bactrocera dorsalis* (flies in fruit). Fruit affected by these flies will not be able to be sold both domestically and internationally. As we learn from news, the green dragon fruit for exportation must be undergone a strict procedure of preventing flies and treated with biological methods. Besides, we also cooperate with agencies like sub-departments at provincial level since they do have technical specialists in order to bring more and better services to our farmers (Interview 298, agribusiness, Can Tho, 16.12.2010).

Furthermore, apart from maintenance of various forms of interactions with farmers, private enterprises' knowledge communications approaches are designed to facilitate dialogical exchange with farmers. Our observations of typical knowledge sharing sessions with farmers organised by a state extension agency and an agricultural enterprise have proved that the former maintained a one-way teaching approach while experts from the company encouraged group discussion and farmer's knowledge sharing (see Figure 2 for a comparison of space arrangement).

Figure 5.3: (a, left) A good farming model sharing conference organised by a commune extension agency, (b, right) A workshop on new pesticides delivered by an agro-chemical company

Source: Author 2011

Agri-businesses have developed a number of knowledge transfer channels with rural communities in the Mekong Delta. First agricultural enterprises use their broad networks of wholesalers and retailers, who are frequently invited to enterprises' training and information sessions, to increase their production sale and knowledge connection with farmers. Active participation in agricultural fairs and campaigns also provides opportunities to introduce their new products and technologies to farmers. Many companies set up hot lines with specialised technical staffs for farmers to discuss their concerns with. The telephone numbers

are also written in the product's label. Moreover, agri-business actors have for many years sponsored and developed radio and television programs, several of which are live and education-oriented. These programs are effective in not only the transfer of new agricultural innovation but also farmer's thinking and practice transform into sustainable agriculture.

Agri-businesses have created direct channels with farmers through training. They send technicians to check and help farmers to follow product use instructions. Demonstration activities are initiated to help farmers see, hear and debate new technologies. Some companies develop "working in the field with farmers" programs in which their experts are sent to eat, live and work together with farmers throughout a crop cycle. For example, since 2006, An Giang Plant Protection Joint Stock Company (AGPPS) 1.005 young and enthusiastic engineers have been sent to and have worked closely with farmers on 11,960 points, 30 models and 98 technical consulting locations in the Mekong Delta region and several provinces in the Southeast, Central and Northern Vietnam (www.agpps.com.vn) (see Figure 5.4).

Figure 5.4: "Working in the field with farmers" program by AGPPS

To eat, live and work together with farmers…

…is a link between farmers and scientists.

Purpose & Meaning:

- Eat, live and work together with farmers, we can understand their thoughts, aspiration and requirements in production along with the Government, scientists help farmers to achieve the target of "bumper crops – high prices".

- Work together with farmers in the fields, we can learn valuable experience and share experience in production with farmers.

- This is the program reallocating profits to farmers through people and specific works.

The total number of FF (Farmers' Friends): 1.005 FFs in 9 areas: An Giang – Dong Thap, Kien Giang, Can Tho, Can Tho – North Hau River, Can Tho – South Hau River, Dong Thap Muoi, Ho Chi Minh City, Southeast Vietnam – Western Highlands, Central Vietnam and Northern Vietnam.

Source: http://www.agpps.com.vn

5.4. The hard reality: Contested motivation and innovation?

The delta is confronting chronic post-Green Revolution and emerging problems and challenges in order to develop more sustainable agriculture and rural life. Agriculture in the Mekong Delta over the past decades has shifted in the directions of advanced technology development, higher product standard requirements posed by (inter)national markets, environmental sustainability and inclusive development. However change is only possible when greater cooperation among actors in innovation development and adoption is achieved.

The practice of quadruple association (*lien ket 4 nha*) of the state, scientists, agribusinesses, and farmers provides a good example of contested knowledge. The quadruple association has been promoted under the Decision 80/2002/QD-TTg by the agricultural product consumption through cooperative contracts. Immediately after the policy's issuance, a number of campaigns and models were built, and large companies were invited to participate. For some reason, however, this good-intention policy has reached an in-reality impasse.

> It is very difficult for farmers to join hands with companies. In theory, the relationship between farmers and companies should involve cooperation, but in reality, they are opponents (Pham Cong and Quoc Dung, *Nguoi Lao dong* January 11, 2009).
>
> As the market price increases, the farmers void the contact and sell products in the market. On the other hand, as the market price decreases, the businesses cancel the contact by many ways, like not recognising and underestimating the quality of products. At this time, there are no sanctions for this problem. Meanwhile the cooperation of scientists with farmers and business is good (Interview 10, extensionist, male, Can Tho, 25.5.2010).
>
> Quadruple cooperation is loose. Private traders buy rice and then re-sell it to small businesses that transfer the product to large businesses. A company signed a contract with 20-30 households to cultivate rice in an area of 100 hectares. Upon harvesting, farmers normally sell rice to private traders who then sell it to companies. If they wanted to sell rice to companies, they would have to pay the expenses of hiring boats to transport the rice to the company. Last July and August, the company did not buy rice from farmers under contract. Farmers had to sell their rice at low price to traders to make the payment of agricultural materials. When the rice price was higher, farmers no longer had rice for sale. Although the State supported the company to get loans to buy rice, the company did not collect rice from farmers (Interview 154, commune official, male, Vinh Thanh, 11.10.2010).

To solve this difficult problem, economical benefit instruments are suggested. For example, Tran Van Hieu (2004) concludes in his research that we have to do something so that everyone can be benefit from economic cooperation.

Other examples include conflicting messages against sustainable crop management efforts by pesticide companies (see Section 4.2) or pesticide retailers (see Section 6.2) Due to the expansion of agribusinesses in agricultural knowledge work while their knowledge brokerage is often broken because of oversimplification or even conflicting information, the role of agribusinesses in agricultural extension is questionable, or even proposed to be eliminated.

The current discussion and practice of association and cooperation among main actors in the field of agriculture and rural development in Vietnam, despite its specific focus on the production and consumption phases, can be reflected upon the growing literature of the state-university-industry triple helix in knowledge production for development, which is mainly contextualised in the transitional knowledge economies. In both mainstreams of thoughts, however, interactions are largely discussed on and for the sake of the development and transformation of the sub-systems, whereas society development becomes a resultant outcome. How rural communities can be integral as an agent for the knowledge for development cooperation and interaction among helices is thought-provoking for further research. For a

more practical approach, relations between smallholder farmers and the private sector need to be built on a new foundation of strengthened commercial farmers' associations and increased inclusiveness of modern value chains regarding smallholder farmers (see Vredeseilanden/VECO 2013 for specific examples; cf. Figure 5.2d).

5.5. The emergence of hybrid agribusiness: Agricultural entrepreneurship?

The call, atop this chapter, for a closed boundary of the systems definitely neglects the increasing trend of interaction and knowledge co-production practice among development actors as discussed in earlier passages. The increasingly important role of agribusinesses in agricultural and rural development in the Mekong Delta is further proved in terms of development and democratisation of knowledge. Old and new challenges the delta is facing goes beyond doing things better, or productionism led development. Doing new things is needed. There is a greater demand for localised and instrumental knowledge and innovation from novel seed varieties, farming techniques to systemic management of natural resources and pro-poor rural development (see Chapter Two). Agricultural entrepreneurship is no longer defined only within an increase of business size, but more importantly as Lans, Seuneke, and Klerkx (2013) argue, by competence in exploit entrepreneurial development opportunity in the broader working environment the entrepreneur engages in:

> 1. It does not limit the study of agricultural entrepreneurship to specific situations such as new venture creation (e.g., most of the agricultural businesses are already in existence for decades).
>
> 2. Learning and development are the heart of entrepreneurship: The fact that some farmers exploit entrepreneurial opportunities and others do not is not due to lack of certain personality traits, but due to (the lack) of specific competence, and experience.
>
> 3. It recognizes the importance of the broader working environment the entrepreneur engages in. Interpretation, understanding and creativity, core processes in opportunity development process, all do not happen in isolation, but are influenced by, for instance, the farmer's wife, employees, competitors, network, and chain partners or extension services. (Lans, Seuneke, and Klerkx 2013)

Development of agricultural entrepreneurship in such an orientation encourages interaction between agricultural enterprises and other actors in knowledge diffusion, generation and legitimisation. Shifting from the production-driven association of the quadruple of the state, scientists, agribusinesses, and farmers to knowledge-based networking and partnership building is both a challenge and an opportunity when the *tam nong* program has recently been promoted to construct new rural development. Knowledge coproduction and learning spaces can be cultivated through participatory and transdisciplinary research. Creation of dialogical channels engaging actors from different knowledge worlds should facilitate public discussion on complex issues where contested knowledge is communicated[59]. Such public debate can help

[59] In our FGDs, we showed the farmers different concepts related to agricultural sustainable practices and asked for their definition and experience sharing. A wide range of concepts was discussed including row seeding, integrated farming systems, four spray principles, no early spray, three reductions and three gains (3R3G), one must and five reductions (1M5R), ecological engineering to good agricultural practices (GAP), VietGAP, and sustainable

farmers to make decisions that are greater dependent on new knowledge acquisition as well as nourish knowledge management that includes the exploration of both the known and unknown in the more complex and uncertain context of rural development of the contemporary delta.

New agricultural entrepreneurship should emphasise the inclusive development of agricultural cooperatives and households businesses. Models like farmers' friends developed by AGPPS should be further replicated. Locally-tailored knowledge development throughout this cooperation needs to be integrated in the knowledge diffusion management in both project and sector levels.

What is important to be highlighted here is that there is an emergence of hybrid agribusiness in the Mekong Delta. For example, large companies, such as Bianfishco, have established research institutes and centers that attract experts from different disciplines to joint problem solving of sustainable production and development[60]. Other examples include agri-chemical stores opened by those who have worked in the agricultural extension and management sector or seed farms and organic fertiliser enterprises managed by well-trained young agronomists who maintain a close connection with academics. Farmers also formulate

---

development. Such practices have developed and evolved from both external knowledge imposition and locally adapted and generated knowledge. Local farmers are basically aware of the concepts although the understanding and application are partially restricted. We continued with consolidation of the common understanding of each concept within the FGD and drew lines of connection between such concepts. By so doing, a network of concepts and practices appeared clearly to the farmers that they had never discovered. The network has in turn asserted a significant role of adopting a single technique or practice. Also, knowledge that used to be applied in rice crops now could be usefully linked to fruit, vegetable and aquaculture production. After the session, many participants approached us with happiness and expressed a wish to have further "training sessions" like this in the future. Such exercise demonstrates the significance of knowledge colligation in the context of rich diverse and even conflicting knowledge diffused. This task has been ignored by agricultural extension and education professionals who mainly work on a specialised technology project. Colligated knowledge produced with farmers can help them not only overcome learning for action barriers but also generate prerequisite-critical knowledge when researching "the conditions for and limitations of knowledge". It is highlighted that in the course of concentrated introduction and diffusion of new knowledge and technologies to rural communities in the Mekong Delta, even with novel approaches, it is equally important that agricultural extension and education professionals frequently "step back" and tackle, with farmers, conflicts and unassociated abundance of knowledge that farmers encounter. Such criticism and reconstruction of farmer's present understanding and practice of "old" knowledge can help solve learning stuckness, consolidate practical application and create new knowledge as well. As a knowledge management implication, conflicted and colligated knowledge should be managed within cycles of new knowledge generation.

[60] Binh An Fisheries Research Institute (Bianfishin) is the first fisheries private research institute in Vietnam. It is founded in end July 2010 from the single budget contribution from Binh An Seafood Company (Bianfishco). Its scientific council includes 22 members who are former (deputy) ministers of fisheries, science and technology, and agriculture and rural development and top scientists and experts in related fields from all over the country. With such a convergence of high-level human resource plus a flexible financial mechanism and production-oriented research, the institute is aimed to bring about a new science and technology driving force of sustainable aquaculture development in the Mekong Delta and Vietnam.

> "The institute enjoyed more advantages in comparison with the public institutes, because it is closely linked with production. Bianfishin should speed up research and services for Bianfishin itself and other companies as a way to develop itself in a sustainable manner. Especially, the institute should carry out researches of extraction and refinery technologies for high-value substances from Pangasius by products." (Phuong Chi 2010)

It is also the intention of the institute council that a Fisheries Academy can be established in cooperation with Can Tho University. The academy can provide interdisciplinary applied research and advanced programs for lecturers and practitioners in the field.

groups and cultivate networks/communities of practice involving experts in the fields and farmers across the delta (see Chapter Six). These forms of hybrid agribusiness should be cultivated and harnessed as agents for change toward inclusive markets and agricultural entrepreneurship development.

Summing up

Analysing multiple cases of knowledge transfer by agribusinesses, especially "farmer's friend" forces, this chapter reaffirms that the private sector through its advantages of most up-to-date technology localisation, wide networks and effective communications with farmers affords one of the most crucial knowledge sources of farming communities. More significantly, our findings reveal contested knowledge areas where agribusinesses in the name of agricultural extension have extended messages which are sales-supported, oversimplified and contradictory to recently-introduced sustainable development principles and efforts in the region. Project-bounded models and farming contract breaches have also challenged farmers' new knowledge adoption and their trust in public-private partnership for alternative agricultural development.

The chapter suggests that knowledge-based interaction among actors is crucial not only to successful knowledge diffusion but also conflicting knowledge communication and management. Hybridised organisations such as private company's research centers or transdisciplinary research should be supported and promoted as a new foundation for agricultural entrepreneurship development. A long-term pursuit of sustainable agricultural development in the Mekong Delta needs to be grounded on another epistemic culture that enhances interactive learning between the state-university-industry triple helix and rural communities.

CHAPTER SIX

BEYOND THE RECIPIENT'S MODUS OPERANDI: FARMERS AS KNOWLEDGE BROKERS AND GENERATORS

> When farmer's interests are strengthened, people might be self-motivated to be a farmer and pursue formal education to obtain a "farmer practitioner certificate". Things would be completely different from the current situation where any real estate or agricultural materials agents can hold farmers in the lowest regard; everyone is entitled to and can easily become a farmer (Dang Kim Son 2012 cited in Huynh Phan 2012, *TuanVietnam.net* April 12, 2012).

This extract is part of a vivid image of Vietnam's agricultural and rural development future held by the head of the national agricultural strategic policy institute. Whether or not it is merely the dream of the director or the beginning of new agricultural strategies, its profound understanding of development lies at the advocated change in the farming profession per se. Farmers have been recently recognised as the subject (*chu the*) of rural development in Vietnam, as for example under the *tam nong* policies. Yet the failed definition of the subject's capacity, function, and support mechanism has rendered this bold policy ambiguous in this time of economic crisis because of its rural infrastructure development bigotry. When the role and how to achieve the development goals of the *subject* cannot be identified and realised, farmers are both the indispensable and indecipherable agents of agricultural and rural development.

In Vietnam and the Mekong Delta, the demand of the development process that focuses on poverty reduction and rural development has encouraged the involvement of various knowledge brokering actors: international non-governmental organisations (under development projects and consultation services), government agencies (mainly through agricultural extension systems and governmental programmes), universities and research agencies (via their technology transfer centers or practical research implementation), mass organisations, and mass media. Relied on for their visions and resources, such knowledge brokers, who are trained experts in certain fields, transfer "proven" technology and knowledge to "targeted" communities that are believed capable of acquiring and using the knowledge to solve their "underdeveloped" problems. Within the rural development context, it is evident that the synthesis of the knowledge triangle of education, research, and extension services has been practiced to ensure positive development impacts. Yet, under the umbrella of mainstream development based on expert knowledge, technocratic agendas, and "for the common good" goals (cf. Ziai 2011), farmers and rural communities are seen in most cases as passive recipients of knowledge for development.

The previous chapters have discussed multi-directional interaction webs among knowledge and development professionals and rural communities over both formal and informal spheres. In most cases, however, professionals are knowledge generators and transferors while farmers are recipients of knowledge for development. The increased knowledge application of recipient communities is one of the most

accurate indicators for the success or failure of diffusion efforts. The first sections of the chapter will explore farmer's knowledge receiving, sharing, and adoption practices. This chapter continues to delve into cases of farmers who through their interaction with knowledge professionals have acted as knowledge brokers and generators. It explores the alternative development path, new identity and undertakings and knowledge brokerage and networking undertaken by knowledge brokering farmers. The chapter concludes with implications for cultivating farmer-based knowledge work and communities as an alternative force for sustainable development in the Mekong Delta.

6.1. Actionable knowledge in the ocean of information: From farmers' perspectives

It is a truism that with the development of communications technologies and networks, farmers can without an easily hitch access immense amounts of information for their production, social interaction, and entertainment purposes from diverse channels. It is also a platitude that pragmatic and actionable knowledge for farmers is becoming more and more important from both the economic and sustainable development perspectives in a world that is "flattening". Farmers have abundant information but they have serious knowledge gaps from basic system production thinking to environmental sustainable approaches, as well as collective organisations and international market integration (results from Delphi Survey and Local Television Survey). Agricultural sector leaders often assert that our science and technology are abundantly available and accessible to all farmers. This is only true in view of on-paper scientific knowledge stocks, not in-reality for farming production (Short conservation at a workshop, farmer, male, Phong Dien, 30.11.2010)

Previous discussions have clearly demonstrated that multiple forms of knowledge are translated and diffused as external sources of knowledge from extension, research, and private sector systems to the farming community in the Mekong Delta. This section, from the perspective of knowledge users, will explore which knowledge channels are most used by farmers and how farmers exploit such sources of knowledge for their development decision-making. This section also discusses difficulties farmers face when adopting knowledge that is counterintuitive and alien to them.

Farmer's popular channels of knowledge: Results from focus group discussions

This section primarily presents the results from farmer's focus group discussions (FGD) (see Appendix 1.2). Eight FGDs were organised in three of Can Tho City's districts (Binh Thuy, Phong Dien, Cai Rang) and two sessions held in Hau Giang Province. The researcher, with the support of local agricultural officials, selected participants for focus groups based on pre-determined criteria. Each FGD consisted of five to seven farmers who shared similar social, economic and cultural backgrounds, experiences, and concerns in agricultural production activities. FGDs also included geography, state support, and farming system cohort differentiations. Each approximately two-hour FGD consisted of two sessions where

farmers were invited first to identify and rank the channels of knowledge that are important to their agricultural and rural development activities. In the second session, they were encouraged to discuss the sustainable agriculture concepts and practices in which they were engaged (see results in Chapter Five).

The findings demonstrate that agricultural television programs are in most cases highly-rated. Still, there are varied priorities of knowledge sources, that ranged from integrated formalised and social learning structures, devices, and spaces, and involved actors from different knowledge-worlds (see Table 6.1).

Table 6.1: Channels of knowledge communications prioritised by different farmer groups

Farmer's group	**Rankings**		
	1st ranking	**2nd ranking**	**3rd ranking**
Urbanised area	- TV agricultural programs;	- Agricultural supply agents/companies	
Semi-urban area	- TV agricultural programs; - Workshops and training (by universities, extensionists, supply companies)	- "Good" farmers; - Training + materials; - Study tours	- Café; - Neighbours; - Books; - Cooperation teams
Rural area	- TV agricultural programs	- District extension; - Personal experience; - "Good" farmers; - Research institutes, universities	- Café; - Farmers' unit; - Workshops and training (commune extensionists; - Agricultural supply agents/companies)
Intensive support by the government	- Provincial extension (with the commune agriculture technical group, training, study tours)	- TV agricultural programs	- Company extension; - Other clubs; - Materials at the club; - Loudspeaker system
Standard support	- TV agricultural programs; - Workshops	- Training; - Study tours; - Café; - Radio	- Farmers' unit; - Agricultural supply agents/companies; - Loudspeaker system; - Materials; - Family, relatives, neighbours
Low support	- TV agricultural programs	-Leaflets, training materials, newspapers	- Family, relatives, neighbours
Vegetable and aquaculture	- On-farm meeting	- Internet; - On-farm workshops; - Agricultural supply agents/companies; - Training materials	- Friend groups; - Home visits to similar models - Café; - Training by district extension and fishery staff
Fruit	- TV agricultural programs; - Training by research institutes, universities + training materials	- On-farm workshop; - "Good" farmers; - Books	- Clubs and cooperation teams; - Newspapers

Sugar-cane	- Company extension	- Workshops; - Experience sharing (by word of mouth among club members); - CTU, provincial departments.	- model study tours

Source: Own data

The diversity of knowledge channels can be observed in intensive agricultural production areas and inter-crop farming models. In the semi-urban and rural areas, for example, informal interactions with other farmers such as neighbours and progressive farmers are emphasised, besides formal training organised by extension and educational organisations and agricultural companies. Semi-urban farming communities appear to benefit more from agricultural extension and development projects due to physical and social accessibility preferences. In urbanised areas where agricultural activities are characterised by subsistence cultivation or sporadic crops in regions with suspended urbanisation projects, farmer's new sources of information are largely television programs and agricultural companies.

For communities with intensive support by the government, for example, model villages, agricultural cooperatives, or farmer's clubs, their main channels of knowledge include extension projects directly managed by and connected with higher-level managers and among group members assembled and strengthened by such projects. Meanwhile low-supported communities in mainly rural areas tend to be marginalised within their relative and neighbour networks.

Unlike rice monoculture farmers, fruit, aquaculture, or sugarcane producers are likely to be more actively engaged in different channels of knowledge in order to satisfy their large-scale and commercialised farming. Training sessions or workshops with consultations of academics and scientists are preferred. Besides traditional methods, books and the internet are used to explore new technologies not yet supplied by current educational programs. Knowledge produced from such specialised individuals or groups of farmers very often can be harnessed to provide models or recommendations in television or direct contact training programs (FGD, Hau Giang, 05.03.2011).

Our results are compatible with the research by the Vietnam's Institute of Policy and Strategy for Agriculture and Rural Development (Pham Hoang Ngan et al. 2009) conducted in three provinces nationwide (Can Tho in the Mekong Delta, Lao Cai in mountainous northern Vietnam and Hanoi in the Red River Delta) that the four most popular knowledge channels of farmers were television (100% of respondents), agribusinesses (51.3%), extension (51.3%), and associations (48.4%). It should be noted that only in Can Tho is agribusiness identified as a highly influential knowledge channel (Can Tho: 48.4% of respondents, Lao Cai: 7.4%, Hanoi: 4.9%) (Pham Hoang Ngan et al. 2009, 45). In general, the findings indicate that external sources of knowledge are prominent accumulated knowledge stocks of farming communities in Vietnam and the Mekong Delta. What should be emphasised from our FGD analysis is

that farmers-to-farmer interaction remains indispensable to the application and generation of new agricultural knowledge and technology of farming communities in the Mekong Delta. Important channels of farmer's horizontal knowledge exchange consist of on-farm meetings, morning coffee get-togethers, and experience sharing among club members or with experienced farmers. More than a condition, farmer's prior knowledge is also regarded as a source for further knowledge acquisition.

It is not hard to understand why agriculture-related programs on television are the top preferred channel for information and knowledge obtainment by farmers in the Mekong Delta. The last decade's evolution of the television industry that has created broad reach, around-the-clock broadcasts, and diverse programs is one source of change, but the main cause is that knowledge and development professionals have progressively made use of television to transfer and exchange knowledge to and with farmers. Each provincial television station often has four to five periodical television programs and roughly the same number of radio programs on agriculture and rural development from pest forecasts to intensive technique programs and live expert-farmer exchange forums (see Appendix 6.1). A farmer in Can Tho can watch several programs from other provinces from both the Mekong Delta and nationwide, which largely satisfy differentiated tastes and the types of knowledge being sought:

> Television is an important source of knowledge for me. I can see and hear at the same time about technological description and explanation. Sometimes, I call live programs and my question is answered (Interview 174, farmer, male, Thot Not, 18.10.2010).

However, experienced farmers and high-technology audiences have started to complain about the repetition of the same inept motif programs with less trend analysis and strategic projection (Interview 294, senior researcher, male, Can Tho, 14.12.2010). Further, farmers are becoming more critical about expert consultation in programs funded by agribusinesses (see Chapter Five).

There is an obvious stagnation of newspapers in providing information and knowledge for the farming communities. Farmers in agricultural clubs or cooperatives still see newspapers as an important source of knowledge, due to the free distribution of local and agriculture newspapers to these organisations. Our content analysis of Can Tho daily newspapers over 01.04.2010 to 31.03.2011 volumes shows that despite its sector's updated, "hot" issue seizure such as water management, aquaculture development, rice cultivation, and rural strategies, the majority of information is transferred under the news and policy analysis forms, making it a good source of reference for government officials rather then giving voice to the people of Can Tho City (see Appendix 6.2).

Knowledge for action: Three types of knowledge

Our FGDs have also demonstrated that farmers rarely use one sole channel of knowledge in their actual actions or decision-making in their daily production activities. Instead, an integration of multiple sources of knowledge is constantly practiced (see Figure 6.2). Many local extensionists consider that this "solidity

first" trait of farmers largely hinders their new technology application. Adoption of sustainable agricultural knowledge by farmers in fact relates a number of factors including capital deficiency, old thinking and habits in agricultural production, poor risk calculation, and small size of farmers' lands (FGD result, see also Figure 6.1).

Figure 6.1: Farmer's clustering of their ranked knowledge channels as knowledge sources for action

Source: Author 2010

Farmers' employment of integrated knowledge sources originates from their need for multiple types of knowledge for decision-making. Three types of action-oriented knowledge that associate with and guide farmers' adoption of new innovation include directional knowledge, assertive knowledge and practicable knowledge. Directional knowledge comprises first-contact information to a basic understanding of the agricultural innovation, which galvanise farmers to learn further to adopt such innovation. Directional knowledge can be obtained in social contexts, such as the case of the frog-raising woman (Chapter Four) or through organised training. Mass media and the Internet are gaining popularity in providing farmers with directional knowledge. Even intensive half-hour technology transfer programs just provide farmers with new ideas and directions for further theoretical and practical efforts because it is almost impossible for them to take notes and watch the television at the same time or remember all the detailed information needed (Interview 199, farmer, male, Co Do, 25.10.2010). Assertive knowledge relates and inputs the persuasion process over cognitive, epistemic, and socio-economic considerations. Assertive knowledge for our FGD farmers refers to model visits or study tours where they themselves can see the innovation. Seeing is more important than hearing, and doing is better than seeing. Practicable knowledge consists of both technological operation and tacit knowledge of the innovation. Acquisition of practicable knowledge needs technical training and apprenticeship. Extension of sustainable development innovation demands accelerated assertive knowledge while in the transfer of new agricultural technology, practicable knowledge that assures that production observes market rules and standards requirements is required (see cases in

Section 7.3). IPM farmers' field schools with a meticulously-designed practicable-knowledge emphasis in the curriculum have turned out to create little impact on farmers' cognitive change of pesticide application in the long run, mainly because of assertive knowledge (see Chapter Four).

In his *Diffusion of Innovations,* Rogers (2003) describes a phased adoption process across five stages: knowledge, persuasion, decision, implementation, and confirmation. This is the extended model of his earlier version that proposed individual adoption of innovation, encompassing awareness, interest, evaluation, trial, and adoption steps (Rogers 1962). What is important from Rogers's model is the recognition of farmers' complex innovation adoption process, throughout multiple uncomfortable times of acceptance and rejection decisions, even in the post-adoption phase. However, Rogers has failed to acknowledge and explain types and roles of knowledge over the adoption process. In this model, knowledge is weakened by meaning only information that happens in the early stage of farmers' getting to know about the innovation. Our cases of the Mekong Delta farmers show their innovation adoption process embraces multiple use of channels of communications, external and internal sources of knowledge, and types of action-oriented knowledge.

Alien knowledge in adoption

Farmers in their adoption of sustainable agricultural innovations need assertive knowledge for their cognitive persuasion and acceptance. Yet farmers' learning processes might be challenged by troublesome knowledge, which appears counterintuitive, alien, or incoherent to them (see Meyer and Land 2003, Chapter Seven for further illustration). Alien or foreign knowledge is a kind of troublesome knowledge that comes from a perspective that conflicts with the farmer's knowledge and cultural mindset (cf. Perkins 1999). From a learning point of view, Perkins (1999) suggests constructivist responses to alien knowledge that emphasise the learner's recognition and evaluation of different perspectives such as through facilitation of their engagement to compare and contrast discussions. Farmers through their intensive working over multiple crops in their fields and with generational expertise have developed their own cultivation techniques and thinking. Heong et al. (1998) claim that farmers' decision-making about pest control is based on visualised effects, quick responses to uncertainty, and economic rationale detachment. Therefore, it is always insufficient that new knowledge of sustainable agriculture is disseminated based only on technological pre-eminence confirmation, especially when innovation's effects towards each individual farm can only be seen over the longer term and requires collective actions in the entire pest management setting.

Case 1: Row seeding

In the promotion of rice intensification in the Mekong Delta, besides generation and application of high-yielding and short-duration varieties, cultivation technologies have attracted academic and professional

attention and investment. Row seeding technology was introduced first in Tra Vinh Province in 1998. A few years later, Song Hau state's farm applied this technology to all of the fields of over its 6000-hectare area, exemplifying as a successful story to spread the model widely in the entire Mekong Delta despite its strong dependence on top-down management mechanisms. The technique became more applicable than ever thanks to the local design and material adjustment and modification of a row seeder, especially when plastic equipment was developed in Can Tho City (see Figure 6.2).

Figure 6.2: Use of plastic row seeders in the Mekong Delta

Source: nhuahoangthang.com

Using this technology has brought benefits beyond the reduction of seed rate and thus production cost:

> In the Mekong Delta, with the adoption of row seeding technology, farmers can save 100-150kg of rice seeds/hectare, nearly 50kg of urea fertilisers and 1-3 times of pesticide spraying. Damage caused by rats has been reduced and the quality of grains improved. Fields with row seeding become supportive to manual work of caring and use of combine harvesters (Nguyen Van Luat 2008).

However, the application of row seeding technology is not simply the introduction and use of row seeding equipment with scientific evidence for better crop management, both economically and environmentally. Rather it is connected closely with an acceptance that struggles over old cultivation thinking and practices. Two main oppositions to the new technology are the long-time experience-constructed practices that "anything you stick in the ground will grow" and "better a dense crop failure than a successful thin crop" (*that day hon trung thua*). Thus, science-based conditions for a success of row seeding crops such as careful land preparation are hard to satisfy in their large areas and uneven land surfaces, as often explained by the farmers we interviewed. In the same manner, many farmers had to admit that they provided additional sowing when observing their thin seed-rate fields, even though they understood such density was scientifically proved to be the optimal rate of rice plant growth and productivity (Interview 203,

agricultural official, male, Can Tho, 26.10.2010). Consistent with Paris and Truong Thi Ngoc Chi's (2005) findings, our research indicates gender inequality in new technology learning leads to spousal disputes over seedling density, which usually end up with seed supplementation either as the wife's sole determination or by mutual agreements (Interview 315, farmer, male, An Giang, 10.03.2011).

Our recent interviews with farmers from Song Hau state's farm area, which is under the organisational restructuring to give more production decision-making freedom to farmers, have revealed them reverting old sowing habits, especially small-scale and senior households. Such cases suggest the need for dialogical connection and communication between scientific knowledge and farmer's experiential knowledge. Provision of more explicit practical descriptions and instructions besides technical solutions can equip farmers with understanding to help overcome possible conflicts. A little note such as below when added into row seeding training materials and courses can enhance positive effects on farmer's preparedness to accept new technology on their crops, which in most cases of smallholder farmers are the unique source of their household's food and income for several months:

> In the first days after sowing until tilling, fields look very thin. In the fourth week, rice plants grow exuberantly with strong stems and then can produce long spikes with plump seeds, etc. This growth process allows higher productivity than dense sowing (Can Tho Agricultural Extension Center, n.d.).

Case 2: The legendary light trap and seeding calendar breaking

The attack of Brown Planthoppers (BPH), an invasive insect, caused serious rice loss by widespread transmission of two virus diseases, grassy stunt and ragged stunt from 2006 to 2008 in the Mekong Delta (Tran Thai Le, *Lao Dong* June 15, 2010). In mid-2007, Vietnam had to suspend rice exports because of BPH outbreaks. The MARD Plant Protection Department initiated a large-scale BPH Escape Strategy (*Chien luoc ne ray*):

> The concepts underlining this approach were the light trap trends from many years of light trap data and that most virus infection result from migrating hoppers. Thus, if crops were sown after the migration peaks, the chances of virus infections can be markedly reduced and BPH populations can also be reduced if farmers were practicing "three reductions, three gains". This practice includes "no early spray" in the first 40 days. Rice cropping can also be synchronised thus further reducing available host sources for BPH reproduction since BPH is monophagous and can not survive in any other plant" (Ho Van Chien, Nguyen Huu Huan, and Le Quoc Cuong 2012).

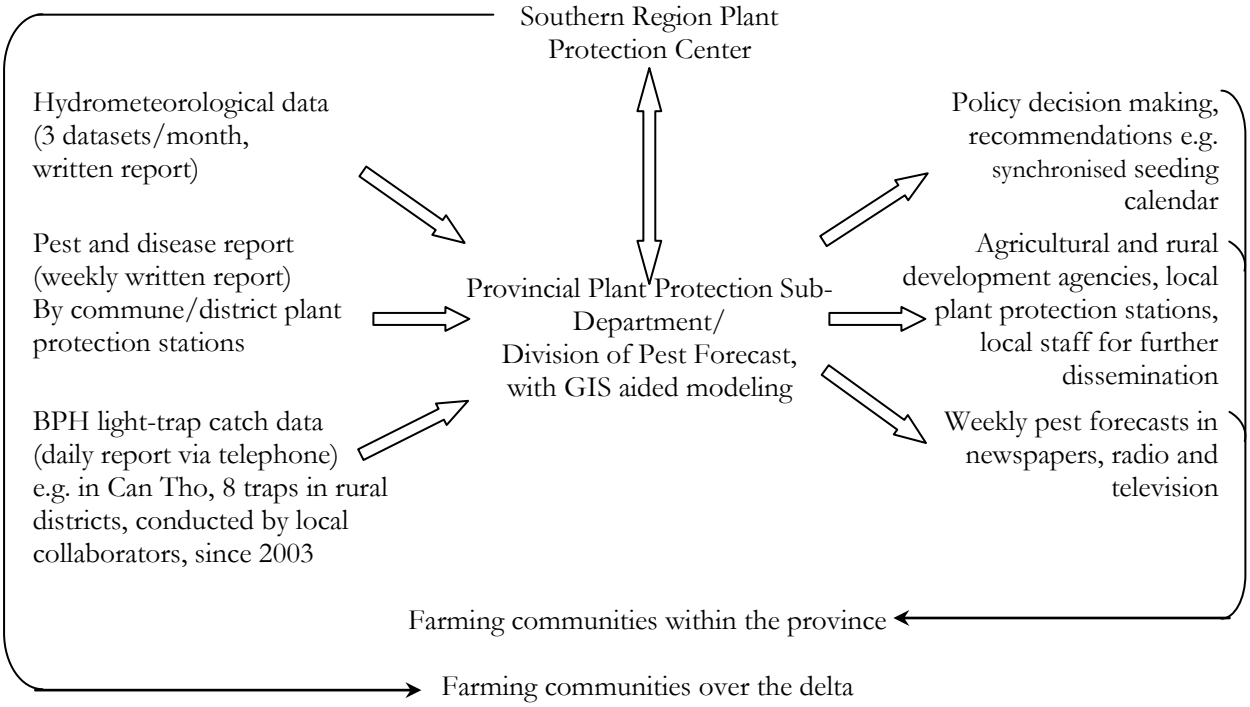
The strategy has brought about extraordinary success. In the later crops, Vietnam's rice export volume has resumed and even grown higher. What is amazing is that farmers have synchronously started their rice cropping on over one million hectares nationwide within one day of the state's suggested calendar (Tran Thai Le, *Lao Dong* June 15, 2010). The story of the legendary light trap that assisted the BPH trend monitoring on which the BPH-escape synchronous seeding calendar was made appeared widely on the news.

A light trap is simply manufactured with four 0.6 metre neon lights surrounded by glass panes and covered by a rain-resistant conical lid and a funnel connected with an oil or pesticide-contained nylon bag or a tray to collect pests. This light system is hung over an iron or wooden pole that can undertake the pest calculation and prediction for a field area of thousands of hectares (see Figure 6.3). Since 2005, a network of more than 340 light traps has been set up and been in operation all over the Mekong Delta. These traps are used to catch adult insects at night.

Figure 6.3: A BPH light trap in use in the Mekong Delta

Source: Nong nghiep Viet Nam (nongnghiep.vn)

Figure 6.4: Pest forecast knowledge input-output flows in the Mekong Delta



Source: Author's presentation

BPH light-trap catch data are collected by a commune plant protection collaborator and reported daily via telephone to the provincial Division of Pest Forecast. This center uses GIS-aided modelling to analyse BPH daily light-trap data, weekly pest and disease reports by communes, and hydrometeorological datasets to develop pest forecasts every week and a synchronised seeding calendar for each crop and disseminate them through means of mass communications (see Figure 6.4). The provincial rice pest and disease control steering committee are responsible for announcement of the seeding calendar of each crop. For example, the Summer-Autumn seeding calendar of An Giang province in 2012 notes:

> Based on the real situation of BPH population in rice fields and light-trap recorded BPH trends, the provincial rice pest and disease control steering committee hereby inform commune's steering committees and all farmers of the Summer-Autumn crop calendar is from 01/4 – 15/5 (solar calendar) (except for Phu Tan, 10/4 – 10/5 is applicable). The BPH-escape seeding should be scheduled in two periods. Period 1: seeding should be made from 10 – 20/4/2012 (20-30/3 lunar calendar) for regions with early and normal Winter-Spring crop harvest. Period 2: seeding should be made from 01 – 10/5/2012 (11-10/4 lunar calendar) for regions with late Winter-Spring crop harvest such as Phu Tan.

However, our recent interviews with farmers have revealed the accelerated seeding calendar is being violated (*xe lich*). There are a number of reasons, both cognitive and economic:

> Recommendations of crop calendar made by scientists and authorities are for reference purposes only. For example, BPH is predicted to migrate on November 25; however, this is only a forecast and it may be wrong. Those who do not follow the calendar may be subject to much more risks in productivity and expenses (Interview 161, farmer, male, Vinh Thanh 13.10.2010)
>
> Rice price is increasing so we take risks to sow rice seeds sooner than the calendar (Trung Chanh, *Kinh te sai Gon* 20.10.2011)

I talked with a young farmer who had enjoyed several high-yield crops. He said that he determined his crop calendar by the method that his father had taught him. For one year, his own crop was very successful while his neighbours' fields, following the provincial schedule, completely failed. From that time on, local extensionists did not urge him to follow the collective sowing timetable. The local extensionist who accompanied me confirmed this information. He however did not answer me when I asked him why he did not explain to the farmer the importance of virus disease control through the synchronised seeding calendar, beyond one individual's immediate economic benefits. He also did not reply when asked why he did not encourage the farmer to share his experience of pest prediction and control to see if his experience was appropriate and could be shared for his entire area. Recently, it has made the news:

> As reported by the Vinh Long Department of Plant Protection, over 2,300 hectares of winter-spring rice suffered from harmful BPH attacks because of the disregard of the collective crop calendar (Trung Chanh, *Kinh te Sai Gon* October 20, 2011).
>
> Dong Thap province has about 700 hectares of rice infected by grassy stunt and ragged stunt viruses, approximately 20ha of which are under severe infection. Scientists point out that seeding calendar breaking is the main cause of virus spread. The earlier seeding areas are "caught" BPH immigration wave after the harvest of the last Winter-Spring crop (Hoang Mai, *Dan Viet* April 16, 2012).

The two cases have demonstrated separate sub-societies that provide different knowledge about the application of row seeding and the NES strategy. Scientific evidence has attempted to offer optimal

options with less consideration about local cultivation, technical, and social conditions. Farmers still strongly rely on their experiential knowledge combined with short-term income generation. Extension professionals and agribusinesses have worked on utilitarian knowledge while performance achievements or economic profits are prioritised.

Can one form of knowledge become legitimate knowledge towards an issue of common concern? Actors within their closed knowledge worlds endeavour to legitimate their knowledge. A more helpful approach would be the recognition of plural forms of knowledge and creation of interactive public domains among them. Rigid administrative orders or pure scientific arguments seem to be less effective in a plural knowledge world context. The investigation and promotion of everyday threshold concepts provide a good vignette of interactive and generative global-local and science-everyday knowledge (see Chapter Seven).

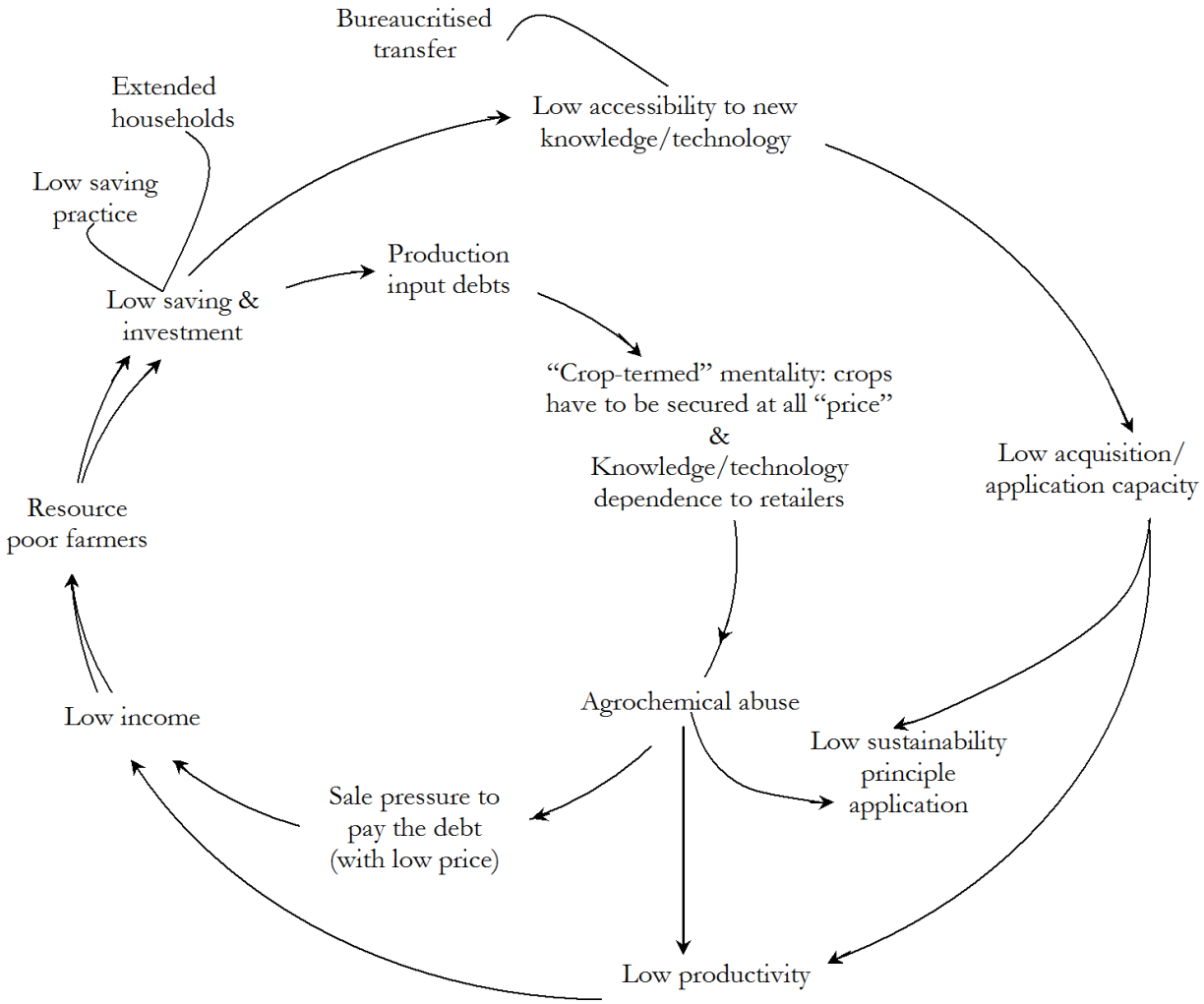
6.2. Double exposure: Uniform knowledge diffusion in heterogeneous rural communities

The very well known argument in community development that communities are not homogenous seems to be a difficult principle to realise in practice. The Mekong Delta has recently seen widened development gaps within the rural community across several socio-economic and ethnic dimensions. The ignorance of knowledge and development practitioners of such gaps often leads to the failure of sustainable knowledge diffusion. What is worse is that the local structural power inequity is bolstered, leaving underprivileged farmers to be double losers in both development and knowledge of development processes.

The coupling vicious cycle

Disadvantaged and resource poor farmers in the Mekong Delta or anywhere else are the least benefited from model farmer based extension system. They are this way because of insufficient resource contribution and "knowledge stock" to ensure the success of the model, either for technical demonstration or research purposes. The well known classical developmentalist model of low saving, low investment, and low income decently illustrates the poverty vicious cycle of resource-poor farmers in the Mekong Delta. In the context of increasing knowledge diffusion for agricultural production more regulated by good quality, environmental change adaptation, and sustainability principles, poor resource farmers are once again "left out". They are trapped in a twin economic and knowledge poverty vicious cycle (see Figure 6.5).

Figure 6.5: Small-holder farmer's coupling economic and knowledge poverty vicious cycle



Source: Own presentation

Crops are seen as the subsistence means for poor farmers; however, they cannot afford production inputs. To start crops, they have to go into debt to buy agricultural materials from rural traders. They have to pay higher prices plus an extra interest payment once the crop is harvested:

> Farmers have to pay 2-3% of the total amount for interest. For example, retailers sell one box of fertilizer costing 550.000VND to those who are able to make instant payments. However, for those who are in debt to retailers to get the box of fertilizer, they have to pay an extra amount of 10.000 VND (560.000VND for the product) and incur an interest of 3% of total price for each month (Interview 174, farmer, male, Thot Not, 18.10.2010).

> Owners of agricultural material stores decide the prices of paid and unpaid products and farmers have no right to ask about product prices. This year, farmers sell rice at a good price. The rice price is higher, which makes prices of other products increase. Agricultural material stores also increase prices of agrochemical products. One bottle of pesticide originally costing 20.000VND is increased by 21.000VND. However, farmers resign themselves to buy it. (Interview 253, Farmer Association senior, male, Binh Thuy, 17.11.2010).

In-debt farmers also become dependent on retailers in terms of cultivation and pest management technology application. In several cases where agrochemical traders cannot even provide them with the pesticide as timely and accurately as requested, farmers have to accept alternatives recommended by retailers which are usually new products with attractive promotions. However, those recommended products are found to be ineffective at disease control. Farmers have to use more pesticides for disease treatment. Overusing agrichemical products causes crop damages and increased costs for farmers:

> Farmers want to buy a certain pesticide (*co vit*) but retailers introduce them to another pesticide that is newer and cheaper. Farmers unhesistantly agree with the retailer's recommendation as they are unable to make the payment for pesticide. Retailers sell farmers new poor-quality products instead of the products requested by farmers to receive commission from wholesalers. Poor-quality products are ineffective and not resilient to diseases (Interview 221, senior official & extensionist, male, Thoi Lai, 2.11.2010).

Upon harvesting crops, farmers hastily sell rice regardless of its price due to their debt pressure. Normally, the price of rice sold after the completion of crop is low. Better-off farmers store rice, monitor the market fluctuation, and sell rice when its price is good. Thus, better-off farmers earn more profits while poor farmers are unable to escape from this vicious financial trap. (Interview 245, farmer, male, O Mon, 12.11.2010):

> Rice has to be sold regardless of its price. Upon harvesting, farmers gain little profit, they pay off debts to retailers. The rest is very small and only enough for a half-year of living expenses. Thus, they are always in financial difficulty (Interview 161, farmer, male, Vinh Thanh, 13.10.2010).

I would call this kind of debt environmentally "bad debt" because it strengthens the farmer's "crop-termed" mentality that crops have to be secured at all "prices". New sustainable agriculture technologies clearly have no ground in which to develop in this cycle.

The vicious knowledge cycle presents an eloquent argument. The resource-poor farmer clearly has low accessibility to new knowledge and technology. On one hand, it is because of farmer's poor resource availability. Further, many poor farmers cannot manage to interrupt their daily hired work to attend classes of which the results are equivocal. On the other hand, their participation is restricted in the model-based knowledge diffusion system. Their limited prior knowledge and participation in training courses lead to their low acquisition and application capacity of new knowledge and technology to enhance their productivity. As a result, they earn low income from crops. With low income, they can hardly make a good investment for the next crop.

Double marginalisation: Model-based extension transfer in ethnic communities

Two cases of ethnic minority communities who live in marginal situations[61] in Tra Vinh and An Giang are presented at two levels of analysis: intra-community and inter-community, respectively. I argue that the benefits of minority development and extension projects, in the name of the common good, are reaped by just a few powerful elites, either Kinh, ethnic minorities, or mixed groups. Poorly designed and monitored extension projects that ignore power relations and are biased in their beneficiary selection vigorously back up and strengthen the local-level structural power inequity. This pushes ethnic minorities to the second layer of marginalisation.

Case study: Rum Soc's agricultural club: "It is our club, where is our voice?"

Rum Soc village in Cau Ke district of Tra Vinh province is demographically dominated by Khmer people, and is one of the province's most disadvantaged villages. In May 2002, Rum Soc village's agricultural extension club was established with the approval of the local authority. The club functions as an organised and recognised group of local farmers, with a mandate to receive, apply, and further diffuse new technology and knowledge in rice and agricultural production among members and towards the wider minority community. The club comprises 71 members, with 32 Khmer farmers registered. At all levels the government and its professional agencies, such as the provincial plant protection department, have provided intensive agricultural development projects to local ethnic farmers via the club. The club has also become a reliable demonstration site of up-scaling experiments by research institutes and universities, such as the transformation from triple rice to double rice plus one corn crop or the introduction of bio-insecticides. Several club members were funded by the local authorities to participate in long-term training courses and study tours organised by researchers. Now most of the club members can produce verified rice seed to meet local demand and provide other localities with filled orders. New technical adoption leads to better savings from input reduction, higher productivity, and accumulative income for club farmers.

Frequently mentioned as minority-based, the village club however actually comprises a group of high-productivity farmers coalesced around and led by a Kinh farmer. As a result, the club's growth has consolidated the inherent leadership position of the Kinh and their premier role in making decisions related to the club's collective issues. No Khmer members have taken any positions in the management

[61] Vietnam comprises 54 ethnic groups, of which the ethnic majority Kinh makes up approximately 87% with the remaining 13% divided into 53 other ethnic minorities. The minority groups are notably characterised by remoteness, language barriers, degraded infrastructure, high poverty rate, poor education, low social status, and limited access to employment, public services and political power (van de Walle and Gunewardena 2001). Since doi moi (renovation) in 1986, an array of policies, programmes and projects have been implemented to empower people, in particular ethnic minorities. One of the most applausive achievements is a reduced poverty rate from over 60% in 1990 to less than 10% in 2010. Nevertheless, ethnic minorities remain poorer and more disadvantaged than the majority Kinh community, elucidated by their lack/lower return of endowments and/or community characteristics (Baulch et al. 2007).

board. This absence was blamed by Kinh managers on the limited communication abilities and low education of Khmer farmers. From the club leaders' perception, it has already been a success of the club to encourage the simple membership of Khmer farmers. Selected farmers who participate in long-term training courses, learning tours, and higher-level conferences are thus only individuals from the management board. Ultimately, it is Kinh managers who prominently represent and make decisions for the majority of Khmer farmers. Khmer members are only passive participants within a club intended to make their collective voices to be raised and heard.

Case study: An Loi: model village versus normal village

An Loi in An Giang province is characterised by the typically unfavourable conditions of a remote ethnic minority village. The determinants that have made this Khmer community attract the attention and support of upper authorities and agricultural extension workers include its easily-accessed geographical location, high concentration of skilful farmers, and wide network of retired higher-level cadres. Agricultural technology projects have thus prioritised farmers from the village to participate in building farming models. The village has been recently designated as one implementation site of a national project promoting an alternative approach in agriculture extension. With the support of the commune, an agriculture extension club was established on the same principles as in the Rum Soc case. Our interviews indicated that local farmers, especially the club members, have acquired and adopted the latest farming technologies promoted in the delta. A village farmer proudly explained "This village is taking the lead in high productivity agriculture in the district thanks to numerous training courses and support by the governments" (Interview 321, farmer, male, An Giang, 11.03.2011). The village became widely known after several local farmers were commended as nationally "good" farmers. The village has therefore received disproportionately large amount of knowledge, technology, and financial transfers from minority-mainstreamed projects in the region. An Loi has been labelled a model village, an example of minority development success within the administrative area where local authorities and agricultural officials have concentrated their efforts.

Ta On is an adjacent minority village. By contrast with An Loi, households in Ta On are economically poor and socially marginalised. Their main source of livelihood, agricultural production such as rice and vegetable cultivation and fish rearing, is dependent upon natural conditions and traditional farming techniques inherited from their parents and developed through their own experiences. A young local farmer expressed his satisfaction with his current rice productivity during our interview; however such a yield seems a failure in comparison to many An Loi appliers of advanced cultivation technologies. Ta On villagers have obtained few chances to join in agricultural extension and research activities. Despite our few observations that new farming techniques are diffused from the model village to other farmers in neighbouring fields, new knowledge seems to stay within the model village's boundary.

The Rum Soc's agricultural club case reveals that the outcome of substantial technology transfer projects that ignore the Kinh-driven formation history and power structure of the club seems to detract from the overall objectives and priorities of minority-centerd development. Indeed, such projects have further internalised the long-standing, hierarchical positions (cf. Schad et al. 2011, 95) and "knowledge as power" practices of the Kinh managers into the Khmer-focused group. In An Loi, there is an unequal distribution of development project sources between model and typical minority communities. The practices have been embraced by the bureaucratic structure and decision-making of local governments and unconnected extension projects whose managers look only for successful outcomes. It is neither the intention of this discussion to debase positive outcomes of ethnic development efforts in practice nor to debate ambitious contributions to the literature of local elites and community development that power elites as a strategic group appropriate development resources to bolster their wealth and power. What is significantly important from our findings is that social polarisation in ethnic communities is seemingly reinforced and obscured by tokenism practices of many actors, thus making it hardly visible to minority development policy-makers. Multiple separate development interventions are managed within their sole log frames, "hard issues" focuses, and consequentialist orientations. Local authorities based on the hierarchical power structure maintain their performances of formalism and "exaggerated achievements" by strenuously constructing local development models; accordingly, beneficiary selection becomes biased and local participation becomes merely lip service.

In short, at whatever interventional levels, the participation of local groups, considering their heterogeneity and complexity of living conditions, power relations and needs, should be an integral part of planning, implementation, and evaluation processes. Such projects should aim, besides concrete materialised objectives, towards local empowerment and ownership and create dialogical and learning spaces for those who are involved to promote holistic reflection and representation of local development as well as develop lessons learnt and alternatives that are ethnically informed.

6.3. Farmer to farmer: Knowledge sharing patterns and processes

This section also discusses effective farmer's learning contexts or knowledge interaction environments that are effective under farmer's evaluation, which is often taken for granted by external development and knowledge professionals in their knowledge exchange undertakings.

Farmer-to-farmer knowledge sharing patterns

Our farmers' interviews reveal a number of cases in which farmers through their informal and formal interactions with academics have learned and applied new technical knowledge and farming models. Such applications have brought higher productivity and income and lifted them out of previous economic difficulties.

Residing desultorily and working unconnectedly in rural communities, these first adopters often focus and become proficient through on-field practice in their one specific area of agricultural production, for example frog rearing, seed rice production, papaya planting, or watermelon farming. As their work is not always known by the local authorities and extension officials whose interests are greatly intended to project-based demonstration farmers under current promotions or campaigns, their expertise is likely to be mainly shared with within-community or same-farming-model farmers who get to know and visit them. It is often true that knowledge sharing of this kind is quite limited in terms of number of followers and area of knowledge transmission; for example in the above case of the seed rice farmer, he has exchanged new production techniques with five to six neighbouring households, while large apprentices from many provinces in the delta can however be observed in high-economic value models such as frog raising. There are four major farmer-to-farmer knowledge-sharing patterns from our analysis:

- Non-sharing: Non-sharing does not simply mean the absence of knowledge sharing, because the absence of knowledge can lead to the absence of knowledge sharing. Non-sharing includes but is not limited to knowledge hiding which is referred to attempts to withhold or conceal knowledge when requested, such as playing dumb, rationalised hiding and evasive hiding (Connelly et al. 2012). Non-sharing implies the absence of knowledge sharing action in spite of the availability of knowledge.

- Partial sharing: An incomplete amount of knowledge is shared because of the level of willingness to share, capacity to share, and the nature and complexity of knowledge itself (as discussed in Chapter Three).

- Conditional sharing: Knowledge is shared with or in certain conditions or contexts, for example within a friendship circle.

- Full sharing: Complete knowledge sharing is done through information provision and direct process-long training. This covers the cases when farmers do not see more producers as competitors, have alternative income sources, training is paid as per agreement, knowledge sharing is encouraged through training courses and teaching material preparation (e.g., SOFRI fruit farmers), or they feel a need to help other farmers (because they are also farmers or because they have been supported by academics and it is their turn now to help further their community), such as the frog-raising farmer in Chapter Four.

Table 6.2 below illustrates the types of knowledge sharing among farmers in the Mekong Delta. The quotes are extracted from longer interviews with farmers conducted in Can Tho and Vinh Long between October 2010 and March 2011.

In general, non-sharing among Mekong Delta farmers happens when knowledge becomes a trade secret or should be kept secret, as in the case of pesticide use. The main reason for non-sharing among farmers in the Mekong Delta is the menace of declining market share with the numerical growth of producers. For example, a papaya farmer from Can Tho in consideration of this threat does not want to tell or teach (even with the suggested payment of a high fee) anyone about his successful production. A local commune agricultural official commented:

> Farmers like him (the papaya farmer) are selfish in exchanging knowledge because they do not want others to have better results than they do and get better market access. Another factor is the community spirit. In a community where farmers are active and interactive in community work, they organise joint efforts for road construction and economic development activities. Knowledge is also better shared among farmers in such a community (Interview 203, commune agriculture official, male, Can Tho, 26.10.2010).

The main reason for partial knowledge sharing among farmers in the Mekong Delta is their unsophisticated capacity of knowledge integration and expression. Meanwhile full sharing is related with farmers intensively engaged in learning and training environments, making knowledge sharing a motivation and task of theirs.

The typical pattern is contextualised knowledge sharing. Farmers share knowledge within their kinship, neighbourhood and friendship circles. The size of a farmer's social network also determines his/her knowledge- sharing scope. Knowledge and development professionals should therefore promote and support farmer-to-farmer knowledge sharing and learning environments and networking activities (see next Section).

Table 6.2: Types of knowledge sharing among farmers in the Mekong Delta

Knowledge sharing pattern	Do you share agricultural technology and knowledge with other farmers?	Farmer's interview code
◉	➢ When I do not understand something, I frequently ask my neighbour. He knows quite a lot about the issues but always faces difficulties in enunciating his ideas. He only can tell us what he remembers. It does not mean that he is not enthusiastic in providing me with advice but he just cannot tell it out in a complete and corporeal manner, which makes my application less effective. I reckon similar cases are many.	161, Vinh Thanh, 13.10.2010
●	➢ Other farmers sometimes don't answer my questions. For example, my inquiries of food processing have been answered perfunctorily. I have asked an animal engineer who is working for Mr. Dung, he also told me very little about it. But finally I found my own way to do food processing and it helped my pigs gain weight.	164, Vinh Thanh, 13.10.2010
◉	➢ In general, farmers do share knowledge with each other. Usually, people in my village who are not as successful as me don't want to share knowledge with me. Although they may dislike me, I treat them as good as I can. Only my close friends and relatives have offered me with detailed instructions as needed, not the neighbours even though they're kind-hearted persons. Sometimes I have to go the agrichemical store to ask and they also provide me with good guidance. They also give me related booklets to learn. In training courses participants discuss enthusiastically. After that they visit each other to learn their models and go drinking together. We discover from this model to another.	167, Vinh Thanh, 14.10.2010
◉	➢ Knowledge sharing among farmers must rely on their practical experiences.	168, Vinh Thanh,

		14.10.2010
●○	➢ Many farmers hide their experience and knowledge. They don't tell which kind of effective pesticides they are using. Agrichemical companies and stores instruct me when I come to ask them. They give me leaflets to read at home too.	169, Vinh Thanh, 14.10.2010
●	➢ I've been in many cases that other farmers don't want to share. For example, they told me that they cannot tell anything about rice planting theoretically; learning must be done through doing. Some people tell me about some techniques but actually they are not like that. Rice growers like medical practitioners tend to hide knowledge. If someone is enthusiastic, s/he will instruct you carefully; if not s/he will hide it because s/he's afraid your crop is more productive than his/hers.	172, Vinh Thanh, 15.10.2010
○	➢ I don't hide anything. I share knowledge with anyone who are interested or in need. But I am not sure whether they follow my instructions. There are many farmers who are more skilful than me.	172, Vinh Thanh, 15.10.2010
○◉	➢ Farmers don't hide rice planting technique. However they hide knowledge about pesticides or techniques in cash crop cultivation because it is more difficult to do. Sometimes they share, but only partially. Until our outcomes are not good as expected that we know they didn't share all. Sesame is easier to cultivate. I am often instructed by Chinh, whose field is next to mine, about some kinds of pesticides every morning when we meet in the field or at a coffee shop.	173, Vinh Thanh, 15.10.2010
○	➢ Farmers don't hide their knowledge; maybe they don't express their knowledge completely. For farmers, it's really awkward to hide their knowledge with acquaintances. Farmers exchange experience and technique together, one uses this expensive pesticides, another may use different or cheaper ones; it depends on their affordability and personal choice. One may accept to spend more labour and time to spray twice by using cheaper pesticides; meanwhile others want to spray one time only by using expensive ones. Farmer doesn't hide anything. They are happy when having a bumper crop. Farmer competes fairly, not like merchants. If everybody has a bumper crop, we all still can sell our products. If someone can sell his products, it doesn't impact the other one's sale. Therefore, farmers have a fair and happy competition. For business, because there are hundreds of sellers while buyers are small in number, the competition is tougher. An example of competition in farmers is that farmers with more money can keep their rice in store while the ones with less money will sell it first.	174, Thot Not, 18.10.2010
●	➢ When seeing each other, we just exchange greetings rather than sharing information. Generally, everybody is busy working all day and we have little time talking to each other.	183, Thot Not, 21.10.2010
○◉	➢ Some share all information and knowledge with me; some share partially whereas others tend to keep knowledge for themselves only. We close friends share knowledge in all sincerity.	185, Thot Not, 21.10.2010
◉	➢ Throughout my working, I gain experience. I share knowledge with those I trust. With strangers, I dare not share or advise them because I could not take responsibilities if something goes wrong. For my friends, in case they get any diseases, we can share information on treatment methods. I will not share experience with strangers.	188, Thot Not, 22.10.2010
◉	➢ If someone has a successful rice crop, they share experience with me. However, they will not share fish farming information since they are afraid that we could not gain a similar success, for example, what if we apply their shared treatment method on our infected fishes and things still get worse. Every fish is different, every disease is different too.	190, Thot Not, 22.10.2010
○◉	➢ Farmers rarely ask information in a thorough way. I make careful guidance when being asked. Some farmers tend to hide their knowledge with peers, yet, they enthusiastically share it with extension workers.	197, Thot Not, 23.10.2010
○	➢ In agricultural production, they just share knowledge in an honest way with those they like and sometimes the vice versa is true. We work, gain information and share knowledge with friends in group meetings. Some people just share information when they want to. Some people are good at production skills, yet, they are not willing and enthusiastic to share. People tend to succeed if they make a good progress record of their crop. Sometimes, I could not recall the whole process to figure out why my last crop is not successful.	199, Co Do, 25.10.2010
○	➢ We usually motivate each other. When someone is successful, s/he encourages his/her friends and relatives to follow.	200, Co Do 25.10.2010
○	➢ Leaders of the co-operative and village often visit the fields and share knowledge with farmers. For example, once a leader came to my field and saw that my pesticides did not work, he told me to	205, Thoi Lai, 27.10.2010

	visit a neighbour's field which was more effective and tried using that type of pesticide. We support each other; leaders visit our fields frequently.	
○	➢ I feel uneasy when I succeed whereas my surrounding people do not. Thus, I share everything I find useful with other farmers.	215, Thoi Lai, 29.10.2010
◉	➢ If someone is interested in learning, I am willing to share. My sharing should be made upon request. I could not go around and share knowledge with everyone.	271, Cai Rang, 2.12.2010
○	➢ People do not hide; they are always willing to share. In this hamlet, we often have meetings. Actually, we have a club.	328, Tri Ton, 13.01.2011
◉	➢ In anniversaries or parties, I share all knowledge when being asked.	313, Tam Binh, 9.3.2011
◉	➢ We share knowledge among farmers during informal talks. Yet, I could not make presentation on production process to public. Maybe I am good at one stage or two. I have succeeded in one crop, yet failed in another one. I am not confident that I am good and right at every stages of my production process. Thus, I find it difficult to consult others.	342, Co Do, 17.3.2011

Notes: ● Non sharing ⭘ Partial sharing ◉ Conditional sharing ○ Full sharing

The sharp S curve

The ideas of new knowledge and technology diffusion in the agricultural and rural development sector in Vietnam in general and in the Mekong Delta are mainly built on Rogers's ([1962] 2003) innovation diffusion S curve model[62] in which an innovation is transmitted through certain channels over time (through knowledge, persuasion, decision, implementation, and confirmation processes) among the members of a social system in an adoption order of innovators, early adopters, early majority, late majority, and laggards:

> (1) Innovators who are characterised to be venturesome and risk tolerant are the first individuals to adopt an innovation. Despite their cosmopolite position, they play the gatekeeper role to import outside innovations into the system. (2) Early adopters are the second fastest group that adopts an innovation. More integrated to the local social system and respected by their peers for judicious decision-making, early adopters as role models reduce adoption uncertainty by adopting an innovation and trigger the critical mass through interpersonal connection. (3) Early majority comes next despite deliberating for some time but with the most numerous adopters. They are an important link between the very early and relatively late adopter categories in the diffusion process but seldom hold the position of opinion leadership within the system. (4) Late majority with the same member size as the early majority category adopts an innovation after the average member of the society. They approach an innovation with a high degree of scepticism under the pressure of relatively scare resources. (5) Laggards are the last to adopt an innovation because of their limited resources and limited network of traditional values. Many of them are isolated from the social networks of their system. (Rogers 2003, 282-285)

The model is indeed applicable to explain varied adoption of agricultural innovations that are motivated by productivity and income increase and facilitated through social learning. Innovations here are considered as perfected final product or a method ready to be applied, though they are not: knowledge localisation or innovation reinvention happens in most cases. Innovations in particular are the input of another production process determined by other resource and market factors. Driven by short-term observable

[62] Rogers (2003, 281) goes far to suggest the percentage of each innovation adopter category, making the adoption S-curve: innovators: 2.5%, early adopters: 13.5%, early majority: 34%, late majority: 34%, and laggard: 16%.

economic benefits, such kinds of adoption do not need much propaganda endeavours by public and private professional agencies. Still, such new technologies are dramatically widespread over time in the farming communities, reaching the critical mass and also including laggards. The role of innovators and early adopters is outstripped by highly extrinsically motivated mass to adopt the innovation:

> Before 1986, the majority of the Mekong Delta farmers grew flooding rice (*lua mua),* a kind of local rice grown during the rising water season with long strands of straw but low yield production. Therefore, farmers had to cultivate rice in a large area to meet their household food needs, whereas increasing pests and diseases drove many households into hunger. From 1988, high-yield rice varieties, e.g., *than nong,* were widely introduced with inception from state-farm areas. Only after two or three crops, such new varieties became prominent in Mekong Delta fields (Interview 134, male, farmer, Co Do, Can Tho, 8.9.2010; Interview 133, male, senior staff of Co Do Farm Company, 8.9.2010).
>
> Other examples can be turbulent production development of pangasius hypophthalmus (*ca tra*) and fruit trees. Cultivating pangasius from natural seeding has developed for long time in Mekong Delta household farms. Recent research-based innovations of pangasius hatching and large-scale farming have strongly impelled industrial pangasius farming. Besides training courses organised for farmers by fishery extension professionals, transmission and adoption of such innovations are implemented through informal networks. Many households get loans from banks and relatives to prepare ponds and cultivate fish. Many seed provision stores spring up like mushroom, and fishery food and chemical shops open. In only a few years, the pangasius cultivation industry has been dramatically magnified with the development of processing factories and Vietnam has become one of the biggest pangasius exporters in the world. However, with recent quality pressures by the international market and environmental problems, pangasius cultivation by good practices is promoted that makes many farmers *suspend* their pond (*treo ho*) and take on a debt burden. Such unplanned rapid development can be observed in fruit tree planting. At the beginning, a few households in a community plant some kinds of fruit trees such plum or longan and they sell their products at high prices. Later, other households in the community cut down their old trees in gardens and plant such fruit trees. Production techniques are based on personal experiences or sharing among local farmers. Very observable results after one or two crops is that pest and diseases break out and prices go down so many farmers are ordered to cut down their trees and find another kind of tree. The refrain "planting, cutting down, cutting down, and planting" (trong, chat, chat, trong) keeps repeating. Local farmers often remind each other: "The production of pangasius first fails, now followed by Hong Phuoc Malay apple (*Syzygium malaccense*)" (*ca tra di truoc, man Hong Phuoc theo sau*).

Distinguishing different innovation adopters is useful in suggesting that it is useless to convince the innovation adoption of the masses in a social system in a quick manner. However, it is dangerous to view innovation adoption processes out of knowledge and power inequity relations, leading to the naïve belief that opinion leadership can be created through resource concentration on early adopters to build models. In the context of insufficient human and financial allocation for agricultural knowledge diffusion in Vietnam, the model is misinterpreted and partly applied by diffusion professionals in the way that only model farmers are benefited. In cases where new innovation is expeditiously grasped and adopted under the economic motivation – creating the vertically sharp S curse, the knowledge professional's role of innovation orientation and knowledge supplementation and is significantly crucial to the farming community. It is high time that the extension system develops qualified consultation staff to meet the knowledge requirements of quickly commercialised and large-scale agricultural production in the Mekong Delta.

Creation of learning contexts

In a specific learning event, learners are engaged in activities involving content, both explicit and tacit knowledge and context, the set of circumstances relevant for learners to build knowledge (cf. Figueiredo 2005). Learning context is not restricted to the learner's environment with a clear-cut location and delimitation, such as a classroom. The constructivist view that context is the interaction's knowledge (Figueiredo 2005) allows inclusion of pervasive leaning environments such as communities of practice. In this sense, the concept comes close to Ikujiro Nonaka's conceptualisation of ba, the enabling context of knowledge creation:

> " […] knowledge does not just exist in one's cognition, rather, it's created in situated actions. Ba offer a context and is defined as a shared context in motion, in which knowledge is shared, created and utilised, ba is a place where information is given meaning through interpretation to become knowledge, and new knowledge is created out of existing knowledge through the change of meanings and contexts. […] ba can emerge in individuals, working groups, project teams, informal circles, temporary meetings, virtual space, such as e-mail groups, and at the front line contact with the customer" (Nonaka and Toyama 2002, 1001).

The default learning context between knowledge and development professionals and farming communities is the classroom format with the prominent teaching role of the trainers and one-way knowledge communication. The aggrandizement of content delivery has forced a number of contextualised training initiatives in agricultural extension, such as on-field workshops or farmer's field schools, to wither in accordance with professional's losing interests due to funding or project termination (as discussed in detail in Chapters Three and Four). At the same time, farmer-led networks and communities of practice are widely neglected from the formal development agendas (see Section 6.5 for detailed cases).

Our FGDs point out that there are two imperative knowledge communication contexts that may be culturally distinctive to the Mekong Delta farmers, but are often neglected by agricultural professionals: early morning coffee and family anniversary and festive parties (*dam tiec*). Coffee shops can be found easily almost everywhere in the Mekong Delta. It is a public meeting place of farmers during their early morning coffee. Early morning coffee takes place from 5:00 to 6:30 AM before farmers go back home to feed their fish or to work on their rice fields. The farmers automatically arrange themselves into clusters of specific agricultural topics or join together in a big group:

> Farmers usually gather at local coffee shops to discuss all problems related to agricultural production. They share useful farming information with each other (Interview 174, farmer, male, Thot Not, 18.10.2010).

> Local farmers enjoy coffee in specific clusters of agricultural activities every morning. Those who raise fish join in a group and talk about fish farming and the group of gardening farmers shares their stories together. Coffee shops have become the most popular and convenient place for knowledge dissemination. Market prices of agricultural products are quickly articulated here. For farmers, communicative learning at a coffee shop is much more effective than reading a newspaper or book (Interview 237, Farmer's Association senior, male, O Mon, 9.11.2010).

> When I wish to learn something new, I go to a coffee shop early in the morning to drink coffee and listen to other farmers' stories. We discuss new farming techniques. Talking with other farmers at the coffee shop helps me to decide my own suitable technological application. I also have a chance to meet with old farmers and share experience here (Interview 167, cooperative farmer, male, Vinh Thanh, 14.10.2010).

In An Giang, one agricultural extension coffee shop under the support of local extension agencies has recently been opened. Extensionists have supplied the coffee shop with newspapers, books, and other materials, which are accessible to all coffee drinking farmers. When I repeated this story of the An Giang coffee shop, a commune head in Can Tho also expressed his plan to establish a similar shop in his locality (Interview 207, commune senior, male, Truong Xuan, 28.10.2010). The effectiveness of farmers' morning coffee is very likely to be fostered if based on enhanced farmer and knowledge professional interactions.

Organising anniversary celebrations especially ancestors' death anniversaries is a prominent Vietnamese tradition. Such celebrations are always followed by a festive party. What is significant to note is that big parties are commonly celebrated by Mekong Delta families, despite their economic situation. I was invited by a hired labour-dependent village family whom I had earlier interviewed to attend a death anniversary celebration, along with approximately sixty other participants. The family told me that they had similar parties every two months throughout the year. Paying for frequent and sizeable anniversary celebrations is a genuine burden to poor families (Interview 221, district senior official, male, Thoi Lai, 2.11.2010).

In such a family's celebrations, knowledge sharing is done without barriers. It is because:

> My brother is an advanced and productive rice farmer. During our family's anniversary party, he shared with other participants in his table about the rice seed fortification technique and medicine he has bought from Cao Lanh. My son's father-in-law took his advice and harvested good crops and reduced production expenses. He is planning to apply this method all over his 100 *cong* fields (Interview 184, farmer, male, Thot Not, 21.10.2010).

> I always share new knowledge and technology with other relatives and friends in family parties. I found basic seed give high productivity and encouraged Hamlet 11 farmers to conduct a trial. At present, many farmers are using this basic seed base cultivation (Interview 313, farmer, male, Vinh Long, 9.3.2011).

> Extensionists who cannot drink wine face difficulty trying to start their conversation with farmers, especially in informal contexts such as party occasions. With the catalyst of only one to two cups of wine, farmers would become close to extensionists, boosting attentive listening and knowledge sharing (Interview 157, Farmer's Association senior, Vinh Thanh, 11.10.2010).

This is an effective knowledge sharing of Mekong Delta farmers. Extensionists and researchers with long-term experience of working with farmers often use this learning context as a knowledge nexus to disseminate an innovation to the rural community. However, taking advantage of these informal learning environments to enhance farmer-and-farmer and farmer-and-professional knowledge sharing requires further efforts and innovative ideas.

Farmer-led knowledge brokerage

Chapter 4 presented cases of farmers working as knowledge brokers as a result of researcher-farmer interaction and co-knowledge generation. This section further examines different stories of farmer-led knowledge-broker development.

Case 1: IPM-FFS farmers

Since 1990, integrated pest management (IPM) has been used in Vietnam and the Mekong Delta as a solution to change the pesticide abuse habits of local rice farmers and better protect environmental and farmer health via FAO's and IRRI's groups of projects. An FAO-led program has taken a participatory training approach called farmer field schools (FFS) to empower rice farmers in making decisions. So far, hundred of thousands of Mekong Delta farmers have attended this learner-centerd type of season-long on-field training and several of them completed training-of-trainer courses. IMP-FFS has been terminated due to insufficient government budgets when international projects ended.

However, IPM knowledge has continued to be transmitted by several farmers who were trained to be FFS trainers. They have unobtrusively shared their IPM knowledge and experience with other farmers in the community without any project initiative or allowance. Their love for learning developed from IPM-FFS needs to be nurtured though uninterrupted experiential co-reflections with other farmers. The biggest challenge of such informal IPM knowledge brokers is that they are not updated with new IPM knowledge and practice generated since their last training.

Case 2: SOFRI fruit farmers

Several special courses have been organised by the Southern Horticultural Research Institute (SOFRI) to train fruit farmers into expert farmers (*chuyen gia nong dan*). Participants are equipped with (1) technical and specialised knowledge and skills and (2) computer-based presentation and public speaking skills. Farmers have a chance to work in a laboratory to diagnose diseases on plants and are helped to integrate their practical knowledge and experience into the lecture they are supposed to prepare and deliver in front of the entire class. Graduated farmers, though the number is still modest, are supported to maintain an active role in vertical and horizontal knowledge diffusion upon their return to their communities, such as their engagement in SOFRI mobile clinic trips.

In analysed cases, farmer-led knowledge brokering functions as a key link to translate knowledge into the broader farming community. It is imperative to connect farmers from all corners of the village and work to assist the poor. In addition, new knowns and unknowns are increasingly framed and developed through farmer's experiments and testing in local conditions and knowledge brokering experiences, which need to be properly managed. Importantly, these farmers' networks and communities tend to be invisible to

agricultural and rural development managers. As such, local rural development agencies should identify these networks and communities to support the growth of their learning culture and inter-community learning.

Using the concept of "ba" as the enabling context of knowledge creation (Nonaka and Konno 1998), three important contexts should be created and developed: learning space, practice space, and knowledge (re)generation space. Where an interactive and generative knowledge partnership is established between knowledge professionals and brokering farmers, the gap between vertical and horizontal knowledge can be bridged.

6.4. New development paths, new identity discovered

This section uses VACB cases to identify another knowledge-based development path of a new group of farmers in the Mekong Delta. These farmers have shifted towards a new identity in which knowledge diffusion and production become their main work alongside agricultural production.

A new path of development: Knowledge engagement

The main theme that runs through Farmers X's story is his struggle with livelihood diversification, his engagement in applying VACB, and his duplication and transformation into a knowledge broker. Meanwhile, the main feature of Farmer Y and Z's stories is their brokerage development experiences through interactions with academic researchers and farmers with whom they have worked. These complementary stories convey that the farmers, in ways different from the universally-conceptualised agrarian change in Vietnam that is based on land and production accumulation (Akram-Lodhi 2001, 2004, 2005), have gone through a personal and professional change process driven by knowledge accretion from diffusion and learning. The process can be reflected in five stages: (a) nuclear household farmer, (b) active knowledge disseminator, (c) paid technical consultant, (d) advanced farmer, and (e) professional knowledge broker.

It has been highlighted that nuclear household formation is an important landmark in the farmers' life stories. The farmers stated that as the main bread winners of their newly-formed families they (and their wife, in case of Farmer X) have worked very hard for a better life. They, like many other farmers in the Mekong Delta, have painstakingly worked to escape deprivation, but not all of them during their lives can find a solution to "from where and how to get out of and not fall back into the poverty cycle" (Interview, Farmer Z, 08.12.2010). Under the increasing lack of access to cultivatable land[63], less effective traditional

[63] Although the formation of private large farms is observed, the main characteristic of agricultural land ownership in Vietnam and the Mekong Delta is small and distributed plots. The man-land ratio in the Mekong Delta declined from 0.6 ha/farmer in the mid-1980s to less than 0.45 ha/farmer in 2001 (Nguyen, T.K. 2009, 232). Nguyen Vinh Thanh and Le Sy Tho (2010,156-161) describe small-scale agricultural production and its "behind the village bamboo range"

production methods, and increasing needs for children's nutrition and education, farming intensification and diversification, as well as new technology adoption, have been commonly promoted and adopted[64]. However, unrecognisable and uncontrollable pest and disease outbreaks and negative market demand and supply externalities have greatly hindered or even bankrupted small-scale farmers. What makes Farmers X, Y, and Z different from other farmers is that, when selected as project beneficiaries, they made use of the opportunity to work with and learn from scientists and researchers in order to solve obstacles to farming and accumulate knowledge from both project courses and their own practice. Farmer Y, for example, was the only one out of 18 farmers who accepted the opportunity to rear TPR in his pond. Given that the technology was new, his decision was made based on a better educational background, confidence in scientific knowledge, and an appetite for risk-taking. Formal educational attainment defines the ability of farmers to learn, but the desire to learn determines their knowledge diffusion and reproduction achievements[65]. The farmers gradually manipulated new knowledge for the benefit of productivity and improved livelihoods.

The second development stage involves the farmers' knowledge sharing and diffusion with other project participants and neighbours. After a (sub) system has been successfully implemented on their farms, the farmers are then instructed by project researchers and technicians to set up the same model for other project participants. Through this process, new knowledge is transferred to other households, whilst the farmers' knowledge and capacity are also enhanced via the training-the-trainer mechanism. They most frequently start their diffusion work with close friends and neighbours through unofficial channels. The three farmers in our case studies expressed a strong commitment to continuing to assist other farmers in an attempt to build up a VACB (sub) system. Knowledge sharing willingness, sometimes coined the "responsibility" of the farmers, can be explained through their relationships with the university researchers who enthusiastically taught and instructed them. Farmer X pointed out that "I am deeply grateful to my

---

traditional practice and cultural habits as a trap (*bẫy tiểu nông*) that hampers the development of a large-farm economy and the application of ecologically sound technology.

[64] "In nuclear families, the phases of creation, expansion, accumulation, and consolidation confer to the household life cycle as well as to the livelihood strategies. The phenomenon of young couples living with the husbands' family may be explained differently by anthropologists; in our study we distinguish this as a phase of preparation towards establishing an independent household since the cohabitation only starts after marriage to allow the young couple to save money. Off-farm diversification was important for all households from preparation until expansion, but for the resource-poor, it was a necessity at all times. In the expansion phase the farmers increased the farm turnover by keeping more livestock, and in a later phase they accumulated their savings either in land, houses or the education of their children. The Mekong Delta farmers diversified on-farm activities to increase food production and maximise the cash income from their limited area. This on-farm diversification and the effective integration of components affected income positively, but needed know-how, and a minimum area of land in, or close to, the homestead". (Bosma et al. 2005, 64)

[65] Farmer X, who attained an elementary education, has to spend more time learning and practicing new knowledge delivered by researchers/experts. He does not have many initiatives or innovations compared to other farmers with higher standards of education. Yet, constant learning and practice have provided him with the knowledge and confidence to broker VACB knowledge to his wider community.

mentors – CTU scientists who passionately worked to transfer to us the necessary knowledge and skills to build up and develop the VACB system. Therefore, I promised myself to share willingly what I learned and successfully applied in my house with anyone who needs my help. Currently, I am working closely with my two neighbours on their systems" (Interview, Farmer X, 08.03.2011). Farmer Z explains that there seems to be a natural bond between CTU scientists, who are looking for advanced farmers to further disseminate the VACB model, and those in dire need of new knowledge to solve farming problems, and that the best testimony to his mentors is to study harder so that he can help even more people. As the farmers note, communication skills are very important for any farmers wishing to dispense VACB knowledge. Farmers X and Y mentioned some other farmers in the project who had achieved the same good results but were not able to systematically re-explain the process they undertook in front of a group of people.

The third stage appears to start when the farmers, following the termination of the project and based on their capacity and personal qualities, are selected from among other project beneficiaries to become collaborators with university faculties. They are paid to assist in running the more technical components of VACB training courses held by the university, and are responsible for on the spot practical training in a certain VACB subsystem, during which they try to link their instruction with the theoretical element taught by university researchers, by using their own language and experience to achieve the course objectives. At this stage, the farmers mainly focus on efficiently using and transferring already produced knowledge or knowledge exploitation (cf. Liu 2006).

In the fourth stage, through the continual process of situated learning in action in close consultation with the researchers, the farmers become what is viewed as advanced[66]. Acquiring knowledge can increase their productive ability to grow particular crops and in turn raise their human capital and capability (Howie 2011, 73). Very often, advanced farmers are related to big land owners with higher economic power, and they sometimes enjoy higher educational attainment compared to average farmers. According to Nguyen Ngoc De (2006, 110ff), advanced farmers are characterised as experienced, technologically progressive, economically well off, and socially prestigious. For this reason, they are usually selected by project leaders to be the models of new technology introduction. One common pathway to becoming an advanced farmer is through the accumulation of cultivated land, which leads to the demand and consequent application of new technology. However, an advanced farmer does not always mean someone who advances knowledge sharing. The cases of Farmers X, Y, and Z provide another development roadmap of advanced farmers,

[66] Different from "good" farmers, an officially certified category used by farmers' unions, the advanced farmer tag is used by local agricultural officials and extensionists to refer to de facto technologically progressive and socially respected farmers in a community, whether or not they are "good" farmers. The differentiation between the two categories remains possibly due to the fact that decisions on the certification process are made within the hierarchical structure of farmers' unions at all levels (as our interviews point out whereby agricultural officials and extension workers are frequently not informed about the "good" farmer list) and selection criteria are largely biased towards economic profit records.

with its departure based on advanced technology and knowledge acquisition and mastery. Their economic growth is generated from intensive farming on their current land, while proactive knowledge sharing and brokering bring them professional confidence and local trust and respect.

Reputation facilitates the farmers' expansion of their knowledge brokering services beyond the university network in which they started. Particularly in the cases of Farmers Y and Z, they have developed partnerships with international non-governmental organisations and local authorities and inter-provincial client groups. Their job has also become more professional through diversified farmer clients and new issues and problems they have faced. Besides technological transfer, they have to take care of the whole course of knowledge transfer and practical application of their clients while maintaining interest in their colleagues' motivations, investment capacity, and other traditional and cultural factors that influence the transfer process. To make VACB knowledge and technology locally useable and upscaleable, brokering farmers are involved in cycles of identification, rescaling, transformation, and distribution of knowledge. Through such processes, new values are added to farming initiatives, improvisations, and innovations, such as improved biodigester construction or TPRs spawning through the use of less modern equipment developed by Farmer Y or various TPR rearing scales suggested by Farmer Z. Their brokerage professionalism has triggered the movement from mere knowledge exploitation to knowledge exploration at this final stage.

In summary, the five stages of development towards a professional knowledge broker from a normal farmer have been described and analyzed. Such staging is relative, though, as the phases are not necessarily chronologically distinctive; for example, becoming an advanced farmer involves a continuous process of previous phases without clear borders. Furthermore, the knowledge brokerage career of a certain farmer, depending on his/her individual educational background and socio-economic situation, can flourish all the way to professional status or just to earlier stages. The path includes multi-directional learning processes between and among farmers and experts, challenging the single, project-based engagement and development consultation by short-time experts prominent in development cooperation practices (cf. Evers and Gerke 2005, 7). It involves a long-term process of selection, apprenticeship training, practice, capacity building, and knowledge exchange. Understanding the stages involved in the knowledge brokering development path of the farmers has implications for interventions aiming to develop the number and quality of a cohort in various fields. For example, recent efforts by a research institute in the Mekong Delta to educate fruit farmer experts, through intensive formal training and involvement in mobile fruit tree doctor teams, may be oriented to the formation of farmer-based brokerage networks. More potentially, recent research indicates a number of examples of farmers who work as local technicians, local innovators and community motivators (Nguyen Ngoc De 2006, 101-108), and who advance from growers to the

breeders of new varieties that are then widely adopted (Tran Thanh Be 2009, 251-256) in the Mekong Delta.

New identity discovered

A number of case studies in this research of VACB farmers, SOFRI fruit farmers, rice breeding farmers, and IPM brokering farmers have shown a variety of approaches by which the farmers have engaged in knowledge diffusion, brokering, and generation. They are forming a new faction of farmers shifting from agricultural production alone towards a new identity in which they function in the role of knowledge brokers and generators. Their activities highlight pro-poor knowledge diffusion and management and sustainable agriculture technology to disadvantaged communities. They work with researchers to localise new knowledge and technology. They also produce new knowledge based on their practice with their local fellows. They are called barefoot experts, advanced farmers, and local knowledge pioneers (see Figure 6.6 for an advanced farmer portrait).

In the rapid process of urbanisation, non-farming shifting and the movement of labour towards industrial zones have been dramatically occurring. Yet there is no small number of agriculture engineers returning to their farms to set up a seed farm as a laboratory, conduct experiments on fields, or try new ideas with cooperative establishment. They are part of farmers' groups with a knowledge-based identity.

The following story of Ba Liem suggests another sub-group of knowledge working farmers. They have different qualifications and jobs before becoming farmers. For example, high school teachers in An Giang or doctors and engineers in Can Tho turn their working focus to rice, fruit, or fish farming. They play an important role in knowledge sharing, at least within their communities:

> Ba Liem had a serious thought of creating something to decrease the burden for the farmers. Upon his visit to the fields during the vegetable planting season, especially green beans and sesames, he dropped by a friend's field where green beans were being planted. The job was not terribly demanding but required two people at the same time: one to dig the holes and the other to drop the beans into them. The idea of creating a seed-sowing stick was then triggered in his mind. In 2004, the first seed-sowing stick was made by Ba Liem and successfully tested. This stick includes a long tube and a box that contains seeds is attached in the upper part. When people make a hole on the ground with the stick, the seeds from the upper box will drop down to the newly dug hole. Notably, the stick also has a part for selecting the right seeds to be sown in case users want to sow different seeds such as green bean, soya bean, corn, or peanut. The advantages of this tool include preventing the seeds falling out of the holes, increasing the sowing speed up to three times in comparison with traditional sowing by hand. It is striking that the stick is only sold for VND 130,000, which is affordable for many farmers. In the following year, Ba Liem improved the stick into a moving sowing machine. The machine's wheels have holes positioned at the same distance, so that while moving the machine, users can fill the seeds in the holes at the same time, which helps create a very even distance for the seeds.
>
> In 2007, Ba Liem successfully invented a farm-product collecting machine. The machine looks like a trolley with a fan system at the front to rake the farm products into the machine's container. In this container, there is a vertical spiral spinner to bring the products up to a tube where they are dropped into a bag. The machine can collect many types of farm products from seeds, piled products, or spreading products. The users only have to move the machine around the yard where farm products are spread. If operators are tired, they can use the automatic mode and the machine will do the job.

> The machine's performance achieves 3-4 tons per hour, which is equivalent to two strong farmers working for half a day. The machine is powered by electricity, costing 1.5 Kw per hour and priced at VND 6 million. The introduction of the seed-sowing stick, seed-sowing machine, and farm-product collecting machine has been highly appreciated by the fellow farmers. Not only are they priced reasonably, these farming tools also have many convenient functions and high performance.

I read this story in the Can Tho newspaper and Ba Liem accepted an interview with me, one of my first interviews with farmers during my field trip in the Mekong Delta. I was strongly impressed with his inventions and knowledge network development:

> It will be good if you travel and talk directly to farmers. Sometimes, they offer an idea that at first we think is nonsense. But when we reconsider, it's totally possible. Thanks to this experience, I have got many initiatives. But if we just sit in the office all the time, how can we invent or produce? I read a newspaper and knew that in Thailand, a Master's or PhD has to do 1 or 2 studies each year. Some people encourage me to work for the government offices in district. I think it's also good because I can receive financial aid for working in governmental organizations. Now, my life and family condition is stable, but we aren't still able to establish a medium or bid enterprise. But here, if I were an officer, I would stop doing research. (Interview 2, Farmer & Mechanical Engineer, male, Can Tho, 01.05.2010)

In the end, his educational background indicated he was a mechanical engineer by training: "I was a student of Pedagogy University of Technology. In 1989, I graduated and had more than three years of working in different companies. I then determined to leave the city life, packed my belongings and returned to my village to take care of my parents".

The most important task therefore is promoting knowledge networks led by these barefoot experts. The networks should include connections with both knowledge professionals and with rural communities.

Figure 6.6: Farmers in a knowledge era

Source: Author photo (from a television program of Vinh Long Television) 2011

6.5. Farmer's networks/communities of practice: Implications for knowledge diffusion management

This section focuses on analysing farmer's knowledge flow networks to explore networks/communities of practice formed and operated with the support of knowledge brokering farmers. It uses VACB farmer cases. Based on the research findings, theoretical reflections on managing knowledge diffusion are framed.

Analysis of farmers' knowledge flow networks

This section analyses the interaction, significance and intensification of various actors and organisations, individually or in-group, over the knowledge transfer flow network centerd on Farmers X, Y and Z (see Figures 2a-c)[67]. Perceptibly, the main sources of knowledge of the three farmers are (1) the university scientific community, who has brought them new technologies and knowledge to solve current farming problems, as well as opportunities to learn and transfer new knowledge for their fellows in need and (2) the professional group of VACB farmers, in which three of them play core roles. Depending on the foci of a certain VACB project, the farmers tended to maintain close relations with scientists specialised in that particular VACB subsystem. The more intensively the farmers worked with scientists within or beyond one research/development project, the higher the importance of the scientist's roles was ranked by the farmers. In the case of Farmer Z, this role was more concentrated on one scientist, his pisciculture mentor. Farmer Z has widened his sources of knowledge by networking with groups of students[68] and farmers with whom he has had a chance to work, which is less observed in the other two cases. Within the group of brokering farmers, Farmers Y and Z maintain a stronger relationship compared to their connections with Farmer X, who is considered a new recruit and thus tends to learn and receive information/knowledge from the other two farmers. Only Farmer X retains a strong knowledge transfer tie with his wife because they both

[67] The VennMaker 0.9.6 VIP software was used to present the networks. Relevant by-default actor types (names and images) including female, male, actor or institutional actor were applied based on how the farmer (Ego) addressed these actors, or Alter(i). Alteri mainly included: (1) CTU academic researchers (abbreviated to "Res."), (2) CTU trainee students (Trainee), (3) farmers, who were further subcategorised as farmers within the village (Villager), farmers in a project (Proj.far.), either CTU, local government (Local) or international (Int.) projects, and farmers from the delta in general (Farmer). As not each and every actor in one group could be individually identified, for example, cohorts of trainee students or local farmers with whom Ego worked, they were representatively demonstrated with 1,2,3, …, n in the network. The size of Alter symbolised its importance determined by Ego. Alter attributes were illustrated via (1) three sectors: knowledge source, knowledge receipt and the buffer sector where Ego had indirect VACB knowledge diffusion relationship with Alteri, for example trainee students, and (2) three concentric circles signifying the spatial proximity (district, province and delta levels) of the Alteri to Ego. Strong, simple and weak ties were used to illustrate respective types of Ego-Alter and Alter-Alter relations. Further reading includes Manual VennMaker 0.9.5 VIP by Kronenwett (2009).

[68] He was fond of talking about VACB issues with trainee students and visitors, from whom he learned a lot. He was willing to let trainee students carry out their experiments on his high-value ponds, upon which he could only take any actions with the students' agreements. In return, they helped him with sample experiments, training document preparation and report drafting. It was through old trainee relations that he was able to work for some international development projects (Farmer Z, interview, 08.12.2010).

have joined in an animal husbandry development project, which is designed to promote the woman's role in household livestock activities.

In the knowledge receipt sector, we can observe a trend to broaden the audience over the spatial dimension as the farmers become more experienced in their knowledge brokering. The majority of Farmer X's knowledge brokerees are within his locality and were introduced through CTU development projects in which he is involved. In contrast, Farmers Y and Z have expanded their services across the delta, through invitations by local and international projects or private farmer groups. Very often, the farmers maintain a strong relationship with the heads of the group or the most progressive farmers of the cohort to which they make the transfer. Based on this network, Farmer Z has formed a fish egg club that enjoys delta-wide membership and high productivity.

A loose knowledge-related connection between the farmers and local extension workers and/or provincial agricultural officials in the networks was observed, although an exception was Farmer Y, who was recognised as a "good farmer" by the commune and was responsible for the local extension club and later the cooperative in his commune. Newly-applied knowledge and technology by CTU farmers should be prioritised by their local extensionists and agricultural officials to apply in localities with the sameness or similarity of physical and institutional landscapes. Such "dovetailed" knowledge could be widely transferred and wisely used within the locality, if more intensively linked.

Figure 6.7a: Farmer X's egocentric knowledge flow network

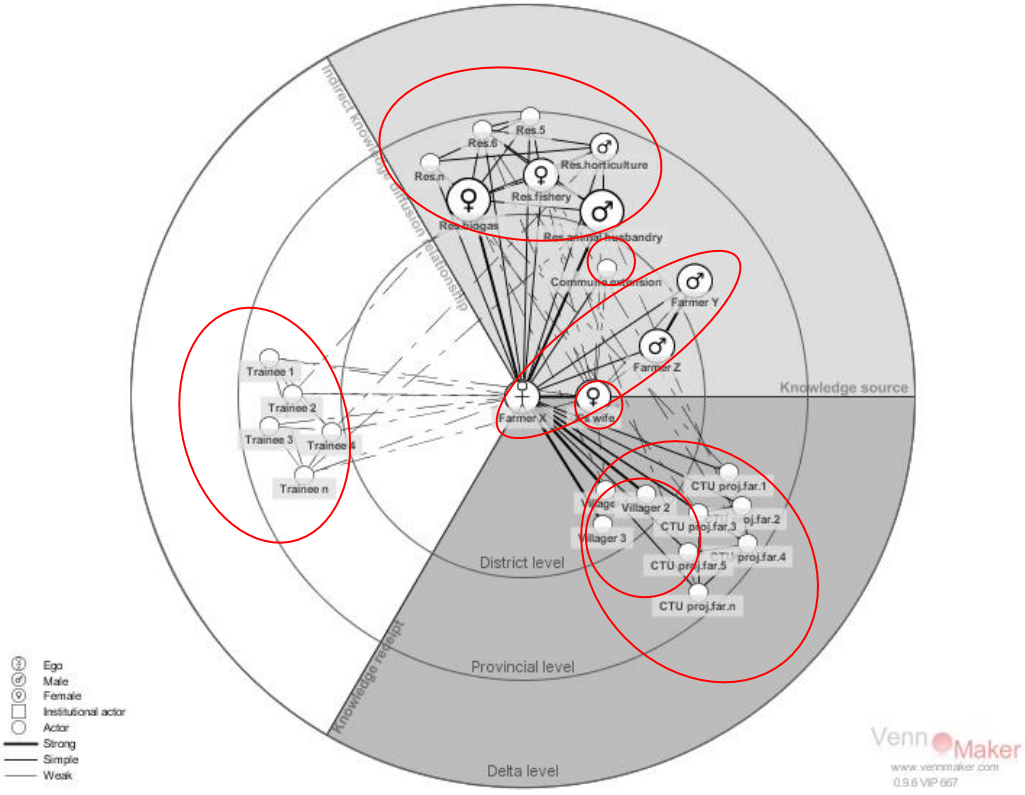


Figure 6.7b: Farmer Y's egocentric knowledge flow network

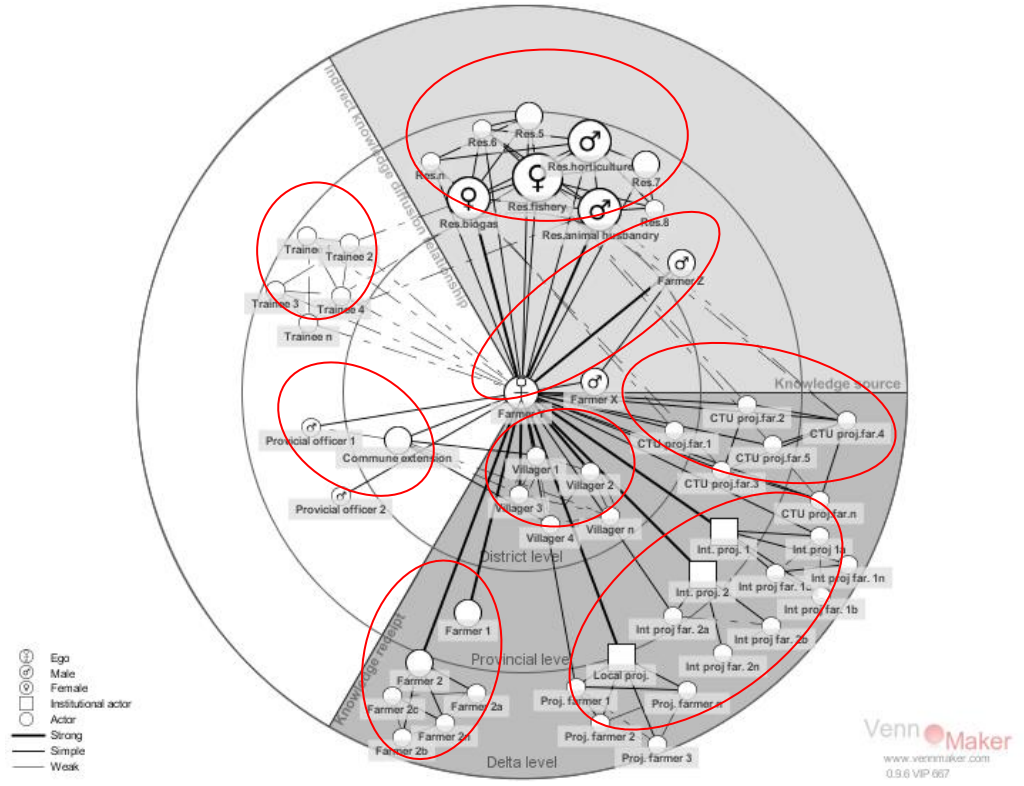
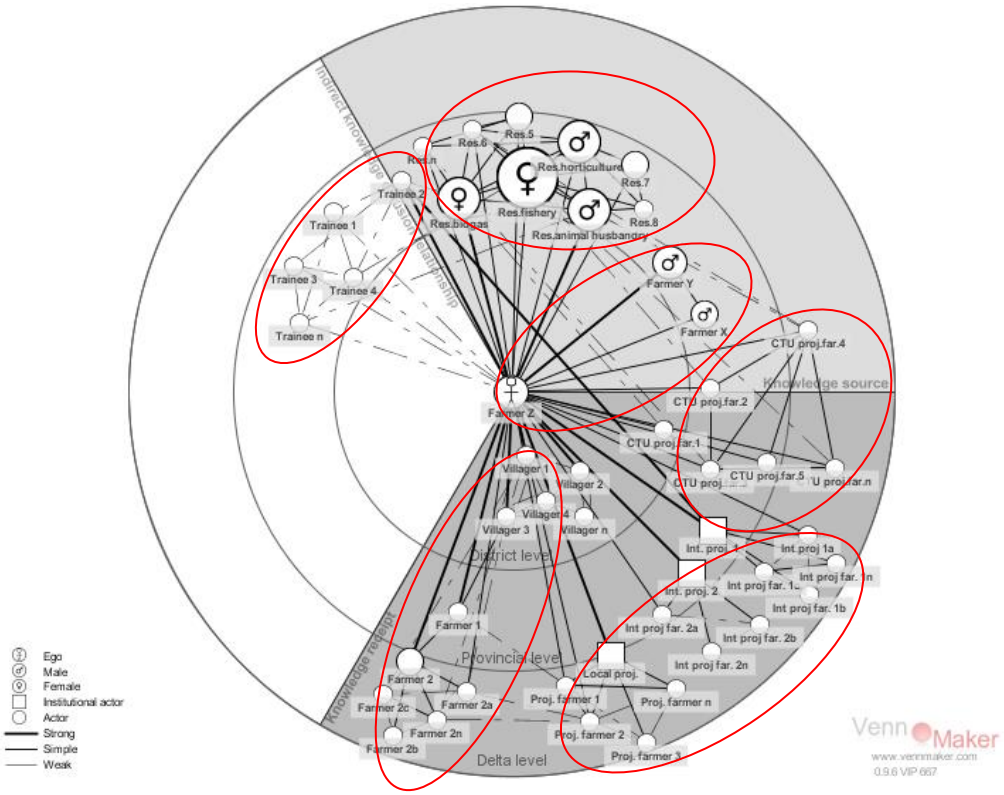


Figure 6.7c: Farmer Z's egocentric knowledge flow network



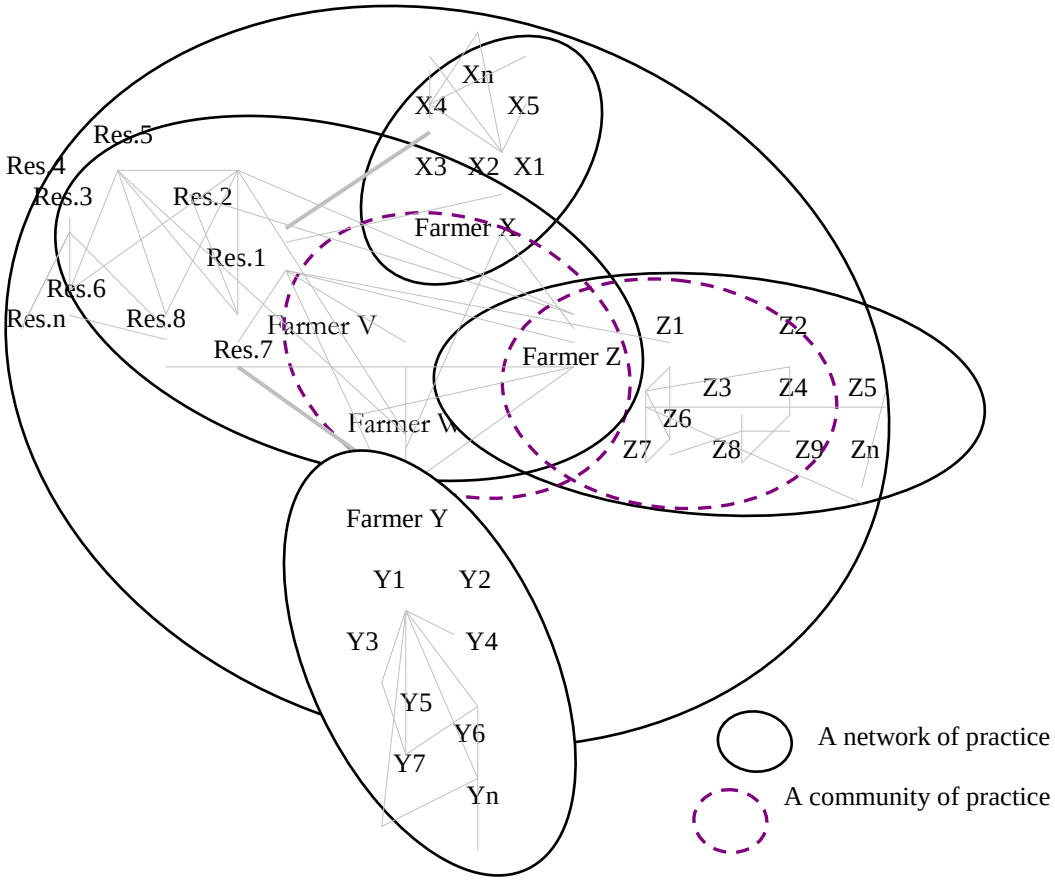
Networks/communities of practice: Coordinating knowledge and innovation flows

Tracing the farmers' stories and redrawing knowledge flows by connecting their egocentric networks elucidate networks and communities of practice[69] engaged in VACB system brokering/diffusion and its

[69] Wenger, McDermott, and Snyder (2002, 4) define communities of practice as "groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis". Collaboratively informal, independent, off-the-grid networks, a community of practice consists of practitioners who develop shared understandings, engage in work-relevant knowledge building and create norms of direct reciprocity (Hara 2009, 118 cited in Correia, Paulos, and Mesquita 2010, 12; McDermott and Archibald 2010). It is a tightly knit group of members who know each other and typically negotiate, communicate and coordinate with each other directly (Wasko and Faraj 2005, 37). Three distinctive features of communities of practice include the mutual engagement of participants, a joint enterprise as a process of negotiation and a shared repertoire combining both reificative and participative aspects (Wenger 1998, 72-85). Conversely, networks of practice connote larger and more geographically distributed groups of individuals engaged in a shared practice with weaker relationships than those among the members of a community as participants who may not know each other nor necessarily expect to meet face to face (Tagliaventi and Mattarelli 2006, 294; Wasko and Faraj 2005, 37). Despite their indirect contacts and unfamiliarity, participants in networks of practice can share and exchange a great deal of knowledge, as "networks often coordinate through third parties such as professional associations, or exchange knowledge through conferences and publications such as specialized newsletters" (Brown and Duguid 2000 cited in Wasko and Faraj 2005, 37). Communities and networks of practice are self-organising, open activity systems, which develop on their own depending on the voluntary engagement of their members and internal leadership, and flourish whether or not the organisation/sector recognises them (cf. Wenger, McDermott, and Snyder 2002, 12f).

adoption in the studied cases. The following diagram (Figure 6.8) shows these interwoven networks and communities.

Figure 6.8: A constellation of networks/communities of practice identified within VACB knowledge brokering/diffusion



Source: Own presentation, notes: Res.: academic researchers; X1-n, Y1-n, Z1-n: farmers 1-n within the egocentric knowledge networks of Farmers X, Y or Z)

As demonstrated in the diagram, three different levels of practice network overlap: VACB farmer networks under brokering farmers X, Y and Z, the network of academic VACB researchers and brokering farmers and the network of academic VACB researchers and farmers. During several years of VACB knowledge brokering, the three farmers and other local farmers working with the VACB system have developed and maintained their own networks of practice. The networks shrink from a wider network of VACB knowledge transfer by connecting only those farmers who follow farming and living development based on VACB, not all are VACB learners. While the networks develop on the active engagement of all members, brokering farmers play the principal roles in maintaining and coordinating the operation of the networks. Furthermore, the working experience and brokerage coverage of brokering farmers determine the network membership size. For example, the network of Farmer X consists of five to ten farmers in the commune, while Farmers Y and Z have fifty to sixty members from all regions of the Mekong Delta. The

domains of the networks are generally described as practical information and knowledge sharing and exchange for the sustainable development of VACB system at the participant's household. Depending on the expertise and the practice of each network, the practice of each network is negotiated and becomes specialised in one or two VACB system components while the whole system structure practice is continued. For instance, the VACB farmer network centerd on Farmer Y seems to balance the development of all subsystems, while Farmer X's network tends to focus on the animal husbandry component. More specialised, Farmer Z's network concentrate ostensibly on large-scale TPR egg production. Through experience sharing and practical idea exchanging, these networks are intended to help members to solve everyday problems related to the application of the VACB system. They flourish accordingly through the expansion of VACB knowledge transfer projects. Farmer X's network, which currently is at its coalescing stage, represents this tendency whereby the network is important in allowing members to exchange and acquire practical knowledge that they cannot find elsewhere. Thus, active interactions between members can be seen in this stage. Farmer Y's network, after nearly 20 years of operation, has now reached maturity, which is characterised by low communication levels among members, who have now mastered the necessary techniques. However, the network cannot help them with new problems such as product consumption or marketing.

In contrast, Farmer Z's network seems to maintain the relevance of the domain while finding cutting-edge practice. The operation of the network depends on the intellectual input of many if not all active members, especially the coordinator, as illustrated by Farmer Z's description of their activities:

> Our grouping is not an officially announced club, nor does it hold any certified establishment decision. We connect together in a so-called *équipe* (a French word synonymous with a team or organised group) to help each other in the production and distribution of our products. It has become a routine whereby members who live nearby meet on Saturday afternoons or Sundays to drink coffee or wine and chat at a member's house or at the coffee house. Such informal talks have no specific themes but go around the current production situation of farmers and the problems we face. Solutions are often gained from sharing experiences of members or new experiments they hear of. Our members who live 10-20 kilometres away communicate mainly through telephone. We also meet once a year to review the previous year's production and to come up with lessons learnt and evaluate market demand in order to plan our production focuses for the next season. We follow a 'slow but sure' approach. We concentrate our investment in our key product, TPR eggs, but allocate resources to other fish varieties and VACB system components. We build our network on mutual trust and quality control. I do not even meet in person some members of the network, but the quality of our product must be met (Interview, Farmer Z, 08.12.2010).

The second network of practice comprises academic VACB researchers from CTU and VACB knowledge brokers. This network originates from formal VACB knowledge transfer projects administrated by CTU agricultural scientists who, besides following knowledge transfer objectives, select and train potential farmers to be trainers for up and coming farmers. After project completion, the farmers continue to work closely with some experts in their training or scientific projects, and maintain uninterrupted communication channels with these experts for consultations when the farmers carry out their own brokering (see above

sections). Similar to farmer's networks of practice, this type of network is also a subset of the VACB knowledge transfer network. It connects approximately 10-15 members: half are agronomists, including some currently retired from CTU, and the rest are VACB knowledge brokering farmers, including Farmers X, Y, Z and a few new brokers from other provinces (as Farmers V and W in the above diagram). They meet and work directly with each other during their involvement in projects or when problems require them to do so; otherwise, they communicate via telephone. What makes this network different from farmers' networks of practice is that its domain, apart from helping farming members to share ideas and solve practical problems, focuses on innovation[70] (cf. Wenger, McDermott, and Snyder 2002, 74-77). Innovative ideas and initiatives offered by the farmers are the results of knowledge exchange and situated practices within the networks:

> In his second TPR breeding trial, Farmer Y came up with a method for injecting fish using a washing basin and without oxygen tools, which was afterward approved by his mentor and adopted by many farmers. In order to inject a hormone supplement into brook fish, he was instructed in the first trial that the needle should be inserted directly into the scaleless fin. He found this hard to properly manage, especially as he was an "all fingers and thumbs" farmer, which thus led to an inefficient amount of hormone injected into the fish. He instead suggested injecting the hormone into the most muscular part of the fish, and the result was accepted by CTU researchers. In addition, he proposed a number of modifications for biodigester construction. With concrete biodigesters, he recommended the replacement of PCV hooks with glazed terracotta ones because of their local availability, better durability and leakage prevention (Extract from Farmer Y's narrative).

The farmer's successful application of TPR fish several years previously, the current growing of *Trichanthera gigantae* as a feedstuff for livestock or using methane for lighting besides igniting it in the brokering farmers' fields and ponds are also the successes of beyond-the-lab experiments carried out by CTU agro-scientists. It is through their implementation of experiments and testing in local conditions that new ideas and improved products are realised. The energy of the network is fuelled by new research efforts by experts and innovative questions asked by brokering farmers in which they both actively engage to answer.

The third network of practice is the literal combination of all described networks. The domain and practice of the network are not clearly identified. In reality, the performance of the network relies on brokering farmers facilitating knowledge flows from experts to farmers and vice versa. Network analysis shows that knowledge-brokering farmers are situated in structural holes, as they bridge the two networks (see Andersson, Holm, and Johanson 2007, 33), so they have power over controlling the flow of knowledge among networks or actors. The development of this network provides more opportunities for new membership and direct communication between experts and farmers.

The network analysis has also revealed two communities of practice growing inside, and as the core of, networks of practice. One is the community connecting Farmer Z and VACB practitioners living within

[70] Innovation is much more than "new" technologies. It connotes "different ways of thinking and different ways of doing things". It relates to strategy, marketing, organisation, management and design (Knickel et al. 2009, 138).

the province. Their geographical proximity allows for more intensive face-to-face contact, thus the domain and practice of the entire network are frequently the upscaled agreement of what has been negotiated in the community. The other is the practice of VACB knowledge brokering farmers. The members are Farmers X, Y, Z and farmers recently trained to become VACB trainers. Again, they reside close to each other, within two neighbouring districts, which helps them easily meet face-to-face once or twice a week, without fixed schedules and agendas. However, different from the practice of the network, the community focuses on sharing technical VACB knowledge as well as knowledge transfer/brokerage methodologies. Besides its membership inclusion of different "generations", another advantage is that the community links with the expert group, who can provide consultations on issues that members are not able to solve by themselves. Therefore, the community's stock of knowledge is both locally and scientifically defined and embedded in epistemic cultures beyond a single practice (cf. Mørk et al. 2008).

Summing up, the analysis has presented a constellation of networks and communities of practice consisting of knowledge brokering farmers, local farmers and agronomists involved in applying and improving the VACB system in the Mekong Delta. Networks and communities of practice foster an enabling environment for knowledge sharing, and especially traverse the stickiness of tacit knowledge which resides in individual skills, understanding and collaborative social arrangements and can only be transferred through the mutual engagement of participants into practice (cf. Van Baalen, Bloemhof-Ruwaard, and Van Heck 2005). Not only ways of improving the effectiveness of knowledge sharing and use, they are critical sources of local innovation because of their constant improvisation and active reflection of interactions beyond formal project arrangements and canonical practices (cf. Swan, Scarbrough, and Robertson 2002, 479). Geographical locality is still a factor in maintaining members' close contacts and active engagement, as shown in the development of communities within networks. The geographical condition becomes significant when a large proportion of network members are connected through telephone communication and without any technological assistance, such as a website. However, physical proximity no longer determines the thriving of networks/communities of practice (cf. Amin and Roberts 2008, 335-336). For example, the lack of new ideas and approaches when new problems arise, as in the case of Farmer Y's network, delays the lively engagement and interactions of members who do not live far from each other. Rather, as stated by Wenger (1998, 131), "the relations that constitute practice are primarily defined by learning. As a result, the landscape of practice is an emergent structure in which learning constantly creates localities that configure the geography".

It has highlighted the crucial role of knowledge brokering farmers in coordinating knowledge flows within and between networks/communities of practice and innovation flows initiated by agronomists and experienced brokering farmers, while adding value for the entire networks/communities entails the active engagement of all members. However, as networks/communities of practice are embedded in broader

networks and epistemic cultures, inter-community knowledge communication (cf. Gherardi and Nicolini 2002, 420) remains challenging for the managers of agriculture and the rural development sector. Still harnessing the power of such informal and seemingly invisible networks and communities for formal organisational/sectoral development goals is a difficult undertaking (see Cross, Liedtka, and Weiss 2005) that needs further integrated governance efforts.

Managing knowledge diffusion

Our case analysis of knowledge brokering provides insights in re-conceptualising knowledge diffusion management[71]. Crystalising dynamics, complexity and the uncertainty of knowledge diffusion, and application in cases such as the VACB system, requires the integration of "successful" knowledge transfer objectives and new knowledge generation cycles. New or extended knowledge as the object of this "second order" of knowledge diffusion management comprises knowledge which is created through interactions of knowledge flows between source and receipt systems and through the management of both knowledge and non-knowledge[72] or ignorance.

Defined in reference to knowledge, non-knowledge, or ignorance, refers to a lack of knowledge or information. Different from false knowledge, ignorance as a fundamental part of social life attempts to circumscribe the unknown: "Whenever new knowledge arises, the perceived amount of non-knowledge increases at least proportionally" (Gross 2007, 743; cf. Evers and Wall 2011). For the purpose of this analysis, knowledge and ignorance are categorised and defined as follows:

i. Knowledge: a belief that was justified as true and is accepted by groups or individuals studied by sociologists*
ii. Relational ignorance (unknown knowledge): lack of knowledge in one knowledge system[73] in relation to another knowledge system
iii. Rational ignorance (known unknown): knowledge about the limits of knowledge and knowledge about what is not known, but taking it into account for future planning*
iv. Natural ignorance (unknown, nescience): lack of any knowledge, beyond anticipation*

(* entry borrowed from Gross 2007, 751)

[71] "Knowledge" when used in collocation with "transfer/diffusion" and/or "management" in the paper implies knowledge (*sensu lato*) composed of four subsystems within the epistemological pyramid: data, information, knowledge (*sensu stricto*) and wisdom. Senge (1990) clearly distinguishes between the two types of knowledge.
[72] The debate on non-knowledge goes back at least to "Socrates' insistence that his 'wisdom' lay in knowing what he did not know". Translated from the German word Nichtwissen, non-knowledge or ignorance is more commonly used than other versions as nescience, not knowing or unawareness (Gross 2007, 743).
[73] Ackoff (1971, 662) defines a system as "a set of interrelated elements". We see knowledge stocks and knowledge flows to, between and within social systems as the knowledge system (cf. Bell and Albu 1999, 1722). For example, Wall (2008) examined peasant, research project and post-Socialist knowledge systems to understand how agricultural knowledge is used differently in the Khorezm province of Uzbekistan.

Managing new knowledge generation from knowledge diffusion should consider interactive knowledge flows between the source and the recipient. The added element of relational ignorance is fundamental in widening the knowledge brokering/diffusion framework from its sole planned goal of the successful transfer of knowledge to the negotiated diffusion processes between the source and recipient's knowledge systems. Given the superficially prominent tendency from the source (experts) to the receiver (farmers), it would be a mistake to conclude that "knowledge can be transferred only from a person having a higher knowing level toward a person with a lower knowing level"[74] (Bratianu 2010, 198). Interactive knowledge flows occur at any time between the systems, and over time the direction seems to get reversed more from the receiver side when feedback and evaluations are invited. Relational ignorance implies a lack of knowledge of both the recipient and the source about the other. Even from the very start of the transfer, ineffective knowledge circulation between the systems can cause potential failure of the knowledge transfer project. A commonly observed shortcoming of many agricultural knowledge transfer projects, succinctly reviewed by Anderson and Feder (2003, 13), is that "research-extension linkages were generally weak, and neither research nor extension was sufficiently conscious of the need to understand the constraints and potentials of the different farming systems as a basis for determining relevant technology and technology development requirements". The farmers' stories and the above discussion on institutionalised VACB transfer are relevant to the argument made by Chambers (2010) whereby development fails to live up to its expectations when professionals provide solutions built on stereotypes contrasting with the complex realities of poor, marginalised and vulnerable people[75]. It is crucial that knowledge diffusion management should not be trapped in the predisposition that the source "knows better", which sustains a modernist and colonial approach to development (Westoby and Dowling 2009, 188). The authors (ibid) advocate an "elicitive" training approach that honours the receiver's knowledge and validates creation through

[74] In criticising Nonaka's knowledge creation model, among others, which ignores pressure difference in generating the flow of knowledge, Bratianu (2010) adopts another metaphor of "knowledge as energy". Although Bratianu's critical analysis is helpful in broadening our understanding of knowledge transformation processes by questioning the role of knowledge stickiness, reusable knowledge (multiple flows through the cycle) and emotional knowledge (generated by emotions and considered as states of our body and mind), his suggestion of uni-direction of source-receipt knowledge flow may misinform the attempt to present holistic knowledge dynamics.

[75] The full quote of the argument is: "Non-linearity, adaptive agents, and unpredictability are three concepts which resonate with, illuminate and confirm the realities of poor, marginalised and vulnerable people, and their lives, livelihoods and aspirations. The conditions of the lives and livelihoods of many of them are non-linear, as we have already seen, typically lcdduu – local, complex, dynamic, diverse, uncontrollable and unpredictable. The farming systems of many small farmers have been characterised as CDR – complex, diverse and risk-prone […] Farmers in these conditions complicate and diversify their farming systems in many ways to reduce risk as many poor people do in other conditions. A largely valid stereotype may be that to survive, to be more secure and less vulnerable, and to achieve a better livelihood and life depends for them on a committed and energetic search for opportunities, being aware of and sensitive to changing conditions, open to communication and learning, and adapting, improvising, diversifying, complicating and multiplying the activities and linkages in their livelihoods. And most critically, their future is unpredictable.

As we have seen, these realities of poor people contrast with the conditions which many professionals assume or seek to create and where they can exercise their expertise" (Chambers 2010, 34).

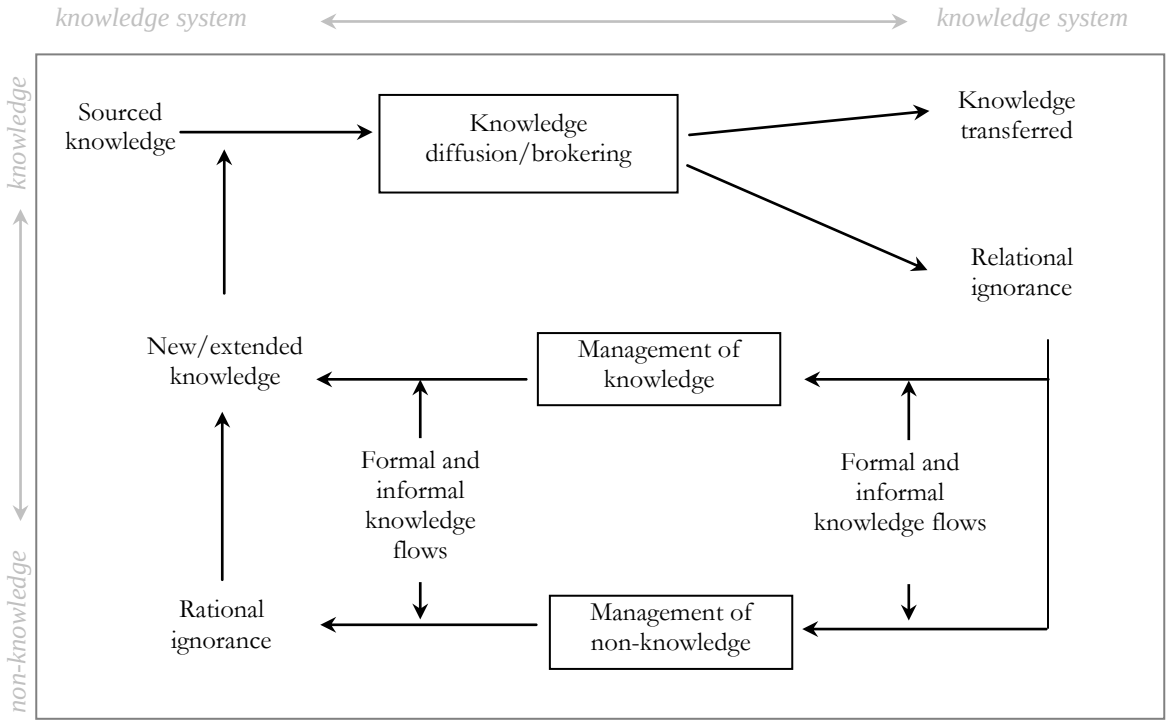
reflection and action over the co-discovery of knowledge transferors and recipients. The achievements and empowerment of VACB knowledge brokering farmers have demonstrated the intensive and long-term interactions and exchanges between academic experts' and farmers' knowledge systems. It is emphasised here that the adoption of a knowledge partnership mindset and relevant tools in knowledge brokering/diffusion management could provide a multidirectional approach to managing knowledge diffusion processes, as well as new knowledge generation and re-link knowledge management with broader learning and innovation systems.

In one respect, knowledge diffusion management deals with knowledge reproduction and innovations as the outcomes of the diffusion process, while managing VACB brokered knowledge illustrates what this involves. Managing knowledge also needs to take into account both formal and non-formal knowledge flows. The role of VACB farmer-centerd knowledge networks and communities of practice in promoting tacit knowledge diffusion and local innovations is well-developed in this paper. However, tacit knowledge, which is interacted with and learnt in such informal practices, is not always responsive in a formal system. "Informally" reproduced knowledge is therefore easily lost, unless it is recognised as properly managed (see Evers and Wall 2011; Wenger, McDermott, and Snyder 2002, 9).

The second relates to managing knowledge about the unknown or rational ignorance. The earlier discussion on the challenges of VACB transfer demonstrates a number of unknowns in terms of the optimalised development of the system's "contents" over the time-space axis. For example, the first TPR experiments on farms required new knowledge generation and application provided by interactive expert and farmer knowledge systems. Newly-developed incurable diseases in crops, such as citrus greening disease, or in fish and animals are more visible examples of the unknowns that need to be managed for further research and practical solutions. Consequently, scientists working in cooperation and coordination with knowledge brokering farmers can also frame and formulate problems, which can generate new values (Heiman, Nickenson, and Zenger 2009) and maintain the learning cycle in complex environments.

By and large, as a conceptual framework, "second order" knowledge diffusion management attempts to integrate knowledge and non-knowledge, and formal and informal knowledge, flows into interactions of knowledge systems when managing knowledge diffusion and new knowledge creation (see Figure 6.9). At the operational level, within an institutionalised social structure, for example research institutes or programmes/projects, the application of the model can be effected by implementing management strategies in its departments, sections or project teams in their organisational context. Nevertheless, it requires much more time and effort to maintain the success of integrated knowledge diffusion management in a social environment where actors are distributed in both spatial and temporal scales. Farmer-led and informal learning networks/communities in practice should be used as prime examples of managing knowledge.

Figure 6.9: "Second order" knowledge diffusion management



Source: Own presentation

Summing up

This chapter has attempted to comprehend the farming communities as a particular knowledge system from the perspectives of both the beneficiaries of knowledge for development and the agents of knowledge production. Knowledge diffusion myths were discussed in taking into account the differences in resource accessibility, capacity, and power relations within and among farming communities, which is often ignored in agricultural and rural development projects. Knowledge-sharing and adoption practices were also examined within the broader cultural, socio-economic, and power-relation contexts. The analysis allows insights into the creation of knowledge inequity and gaps that are increasingly widening and implications with more local life reflections.

The chapter emphasised the novel dimensions of agrarian change and of an agricultural knowledge-creation culture in Vietnam's Mekong Delta by examining cases of farmers engaged in knowledge brokering. Farmers empowered with knowledge, and through intensive engagement in networks and communities of practice, are taking an increasingly more important role in diffusing and (re)producing knowledge via brokering services. They have formed a group of farmers with a new identity towards knowledge-work involvement. The findings suggest an appreciation of farmer-constructed learning structures in managing knowledge diffusion and that farmer-based knowledge work and communities are

cultivated as an alternative force for sustainable development and strategic *tam nong* policies to be realised in the Mekong Delta.

CHAPTER SEVEN

ANOTHER EPISTEMIC CULTURE OF DEVELOPMENT IN VIETNAM'S MEKONG DELTA

> "The call for a critique of the position of total dominance held by modern science is not aimed to revert to a pure and innocent, premodern world. It is, rather, a plea to include the point of view of marginalized peoples and cultures that have less and less of a say in the "expert" decisions that shape their lives. Not infrequently, they have to resort to the language of esoterism, mysticism, and life denial to withstand the brainwashing that would have them applaud each insensitive attack against their dignity, autonomy, and survival as a magnificent achievement of modern science. The challenge facing science and technology in the future is to contribute responsibly to sustainable development" (Vessuri 2007, 171-172).
>
> "Building institutions that transmit or consume knowledge is difficult enough, but filling them with a culture of knowledge, a culture of academic debate, a culture of the pursuit of knowledge, is a vastly more difficult matter" (Evers 2005, 11-12).

Based on the evidence and discussion in the previous chapters, this chapter synthesises and dissertates upon the duality of knowledge diffusion for agriculture and rural development in the Mekong Delta. A duality standpoint is critical to dismantle the binarism fallacy and impasse and also to open up new space for the exploration of another epistemic culture of development that is emerging: the core argument of this research. This chapter continues to pore upon enabling conditions and main elements constituting the emerging epistemic culture. A field research exercise using expert knowledge to identify threshold concepts is used to portray the continuation of dimensions of another epistemic culture, even one unconsciously practiced. The chapter finally submits implications for knowledge management and governance, some final thoughts beyond the scholar-farmer divide argument raised from the beginning of this thesis, and suggestions for further research.

7.1. The duality of knowledge diffusion for agriculture and rural development

The Mekong Delta is well known for being the largest and most active agriculture region in Vietnam. It is the rice basket of the whole country, ensuring national food security while at the same time contributing a significantly large proportion of rice, fruit, and aquaculture exports. It is increasingly recognised as a modern hydraulic society in which waterways and networks have been steadily regulated and controlled by high dykes and new technology, blissfully leading to the triple rice crop revolution and aquaculture boom. Last decade progress endeavoured to foster the region to become urbanised and industrialised by 2020 have incubated industrial zones and clusters in which Can Tho takes the nucleus role. It is also well documented that the delta is projected as one of the regions most impacted by climate change, as well as ecological and local livelihood threats by upstream dam construction and water resource over-exploitation. Commercialised agricultural production is under pressure to be reorganised in the face of environmental protection and international market requirements.

It is little known that the river and water civilisation that developed over 300 years has been inherited by and upheld in Mekong Delta dwellers' perception of nature-human interactions, and the delta's cultural traits govern their behaviours in community and society. They "lean on" water bodies, not control them. Every year, the rising water usually mistaken as a flood by outsiders is welcomed as a symbol of prosperity and the return of an old friend with a meaningful message from nature. The delta society is structured in an open system with emergent properties of tolerance, affection and gratitude appreciation, dynamics, and practicality. Building a community house that can take the role of a Northern village's communal house becomes alien along the canal communities in the Mekong Delta, which requires a different development approach, rather than a simple imposition of an outside model. Even in cases where local people claim to be "victims of their habits" (Herbst et al. 2009), scientific proof, wide educational programs, and local participation are also needed.

This is not to argue against modern developments and achievements that the Mekong Delta residents have laboured and mastered. Our analysis of the delta's development landscape indeed establishes that there is a convergence of modernisation, sustainable development, and strategic governance. Thinking, behaviour, and practices of the river and water civilisation have been deliberately incorporated into recent sustainable and strategic development planning in the delta. Farmers' agricultural diversification practices, such as VACB, are invigorated. High dyke systems are modified to match the farmers' crop seasons. To more or less harmonise the development objectives of food security, economic growth, propoor development, and environmental sustainability, sets of both modernistic and sustainable (traditionally developed or externally introduced) concepts and practices have intertwined and interacted, facilitated and constrained. I find it difficult to convince local state officers or farmers in the Mekong Delta to willingly and firmly adopt environmentally friendly technology without economic benefit calculations. At the same time, good intention flood reallocation projects have faced failure because of culturally poor designs. Nature and humans, the river and water civilisation and a modern hydraulic society, modernism and sustainability, economic growth and inclusive development, short-term and long-term goals, external support and local resources, and scientific and local knowledge exist in a both-and relationship; in their duality; they cannot be separately analysed or promoted in development planning and implementation. Under a certain circumstance or time, one element becomes stronger than the other, and it is Mekong Delta people as the knowledgeable and reflexive agent who interactively (re) create resources and (re) construct changes. These characteristics illustrate the duality of development practice in the Mekong Delta.

The duality of development practice in the Mekong Delta is crucial for policy makers and planners with a modernistic and mechanistic mindset in times such as reform, "innovation," or national building oeuvres. Planning a shortcut and sustainable development is dubious and dicey in cases such as administrative urbanisation, foreordained statistics, urban-rural discontinuum, tightened coupling poverty cycle of the

rural poor, or ignored double marginalisation of underprivileged groups. The diffusion of new sustainable innovations has to overcome a number of epistemological, technical, and cultural barriers. Vast literature on a Vietnam in transition or debates regarding its continuity and transformation are time-framed in post-*doimoi*, making the discussion of development in Vietnam fall into the state-society, authoritarian topdownism-democratic everyday politics polarisation. The duality framework facilitates a holistic understanding of knowledge interaction in power and resource manipulation of multiple actors with different intentions and goal setting. Change and transformation in duality cannot be created from one single source of external interventions or within the non-stop transition of development in that the old is not yet completely cleared and the new not fully "activated." Structural change is made possible through interaction among sources, types, and processes of knowledge in creating local actions when, more than ever before, knowledge is needed to address new and upscale challenges the delta is facing.

Placed in such a developmental environment in the delta, knowledge diffusion for agriculture and rural development in the Mekong Delta is conceptualised in a complex interactionist system within systems. Systems of agricultural extension, research, and agribusiness are investigated in their knowledge diffusion toward the rural community in the Mekong Delta. The conventional model is still prominent in the knowledge diffusion landscape of the delta; researchers are knowledge producers, and extensionists are the main knowledge transfer agents of research results and technologies to rural residents. With their advantages in production-based knowledge and wide sales networks, agribusinesses are increasingly becoming important knowledge brokers to farmers in the Mekong Delta. The triple helix of state's extension, research, and business has been promoted in agricultural research and farmers' production and consumption, yet due to its economic contract foundation, the quadruple association of the state, scientists, agribusinesses, and farmers has reached an in-reality impasse. Sets of actors remain confined to their own life worlds, reading from their own scripts while farmers are perceived as passive knowledge and development receivers. The local knowledge system has, therefore, mainly reacted and responded to external changes by modifying its environment, such as using policy instruments to change production practices, instead of internal system change generation.

Veritably, each system has undergone its own internal transformation. For example, our policy analysis highlighted three patterns of in-transition change within the extension system since its formation in 1993: repositioning as a professional organisation within the state agency system, extension objective shift from hard technology and state policy dissemination towards more farmer-driven, diversity-appreciated and sustainable development-based extensions, and restructuring focuses on the development and expansion of local extension networks. In practice however, the system replicates the state bureaucratic system structure of "elephant's head, little mouse's tail"; physical, financial, and human resources are mainly concentrated and distributed by the upper level organisations. The serious consequence is that besides the

development of high-level bureaucrats as a strategic group, grassroots extension is a crisis in both motivational and professional dimensions. As such the system solidifies bureaucratisation of extension work characterised by "peel feet to fit shoes" or "one-size-fits-all" technology transfer. Public agricultural extension cannot lead but instead "chases after farmers." The agricultural research system in the Mekong Delta has also developed its focus on the second and third missions: research and social development. Recent research workers have intensively engaged in international cooperation, focusing more on regionally complicated and "hot spot" research problems, interdisciplinary exploration, and policy consultation. Researchers and farmers have fabricated a close relationship, metaphorically referred to as "water and fish" through various formal and informal channels of knowledge communication. Despite these efforts, knowledge interaction between researchers and extensionists, researchers, and farmers is essentially governed and limited in educational or applied research projects featured by bounded timeframes and good intentions but hard realities of going "beyond model" dissemination. The agribusiness system especially in the Mekong Delta is becoming an important source of farming-related technology and knowledge, especially agrochemicals, for the rural communities, yet, the partisan pursuits of profit and thus simplified, sometimes conflicting message transmission have blocked the potentially productive cooperation of agribusiness and other actors.

Our research has also explored a *restructuration* of knowledge diffusion from grassroots, informal, bottom-up efforts and networks. In the extension system, we can still observe a career-based extension group that takes extension as their profession or career. They are grassroots extensionists who directly work with farming communities and maintain their love to learn with/from farmers despite structural bureaucratisation. A small number of highly qualified staff members with leading positions who are intensively engaged in research activities are also subsumed in this group. They are the agents of change as a reflective learning culture is nurtured and cherished within the research system through their extension services. Our study has also revealed cases in which farmers have worked as knowledge brokers and generators through their diverse formal and informal interactions with academics. Through social relationships, many farmers have developed learning opportunities or even long-term partnerships with researchers. Researchers also work as development practitioners, especially in communities surrounding campuses. Some private companies have created research opportunities with the participation of scientists from different disciplines. Several farmers are invited to be university lecturer assistants or participate in breeding projects as a researcher's partner.

Knowledge diffusion for agricultural and rural development in the Mekong Delta is still prominently characterised by *teaching* thinking and practices. As such, despite its complexity and multi-actor engagement, knowledge diffusion is rightly represented as a one-way pipeline of knowledge flow from agricultural extensionists, academics, development practitioners, and agribusiness professionals as a

knowledge source to farmers as passive knowledge receivers. Knowledge is narrowed in an explicit form and technological solutions for problem solving. Artefact-oriented knowledge diffusion thus aims merely at knowledge transfer success based on adoption velocity and coverage. Nevertheless, streams of knowledge diffusion practices, which emphasise reflective learning and coproduction of knowledge among actors engaged in sustainable development, have been developed. Although such alternative knowledge practices are observed from below and in informal spheres, which makes them unrecognised if not ignored in mainstream development and formal policy making, they offer energy for knowledge generation and diffusion approaches for rural communities in the Mekong Delta. As previously discussed, the adoption of participatory or bottom-up methods without continuous learning and dialogical reflections easily becomes a fad instead of a fundamental change. Sustainable agricultural development cannot be achieved unless a co-learning culture between rural development and knowledge professionals and farming communities is cultivated. These epistemic practices challenge the traditional culture of knowledge creation for rural development rooted in the dichotomy between academics and development experts as knowledge producers and brokers and farmers as passive knowledge receivers for development. It is in this sense that I call the duality of knowledge diffusion for agriculture and rural development in the Mekong Delta.

Recognising different plural knowledge worlds with different forms of knowledge in interchanging roles of sources and recipients of knowledge, dialogical and interactive channels are the most important task to be taken in the contemporary Mekong Delta context. In addition to producing and presenting their research findings, scientists need to get involved in knowledge brokering activities. Besides their production and supply of agricultural inputs, agribusinesses also produce knowledge and engage in agricultural extension. Extension professionals are now increasingly participating in research activities. Farmers receive new knowledge and technology for development and create locally practiced knowledge as well. The mass media, especially television programs of high-quality agricultural extension and education, can be used to support public dialogical domains. Nourishing such interactions may bring about socio-economic rural sustainable development as well as the transformation of an epistemic culture of development.

7.2. Another epistemic culture of development

What is accentuated from my research is the manifestation of another epistemic culture of development in the Mekong Delta. Knowledge-based interaction among social actors in knowledge diffusion in the Mekong Delta is key to achieving multiple goals, such as successful knowledge transfer, actionable knowledge generation, use of new knowledge diffusion approaches, structural change of knowledge institutions, sustainable development of agriculture and rural communities, or even development of learning organisations or a learning society. The essence of interaction among actors is to create the structural transformation of knowledge practices, another epistemic culture of development that facilitates

and promotes the sustainability of the rural Mekong Delta. This section highlights the conditions, features, and development status of another epistemic culture of development in the Mekong Delta.

Three important conditions that extol interactions among actors across formal systems and organisations, on which another epistemic culture of development is nourished, include the following: interactive environment, new identity of actors, and hybridity of knowledge work organisations. The interactive environment is fomented by the need of collaborative and transboundary research and development efforts in a more complex, uncertain, and regionally integrated context. Further, the development of mass media and communication technology has aided dialogical forums, such as the Farmer's Bridge television program or e-consultations between researchers and farmers. And importantly, the river and water characteristics of Mekong Delta residents with wide networks of brotherhood and friendship often cause the expert-farmer distance to blur. Such spaces in which extensionists and researchers sit drinking wine with farmers in an open backyard turn out to be important knowledge exchange moments that can change the whole lives of participating farmers. Informalisation or relativisation of relationships between knowledge and development professionals is quite distinctive to the delta's culture, which increases knowledge interaction among groups from different professions (Chapter Four). Many professionals themselves even pursue a "water and fish" relationship with farmers.

The second condition is the growth of actors with a new identity through knowledge engagement with rural communities. For example, a group of grassroots extensionists who committed themselves to knowledge-based extension work has distinguished themselves from the large majority of staff who work as a State cadre. The expansion of farmer's friend forces with three co-principles, "Drs Rice" and citizen scholars (Hall 2003) epitomises a new group of community-attached knowledge professionals. Conspicuously, a number of case studies in this research have shown that barefoot experts, advanced farmers, and local knowledge pioneers are forming a new group that has shifted from agricultural production alone towards a new identity in which they function in the role of knowledge brokers and generators. They work with researchers to localise and diffuse new knowledge and technology, and at the same time they produce new knowledge based on their practice with their local fellows. Unquestionably, the new identity as discussed also represents hybridised forms of professions, in which actors take and add the new roles of the others.

Third, there is also another mode of hybridity that emerges from cross-boundary interaction among actors: hybridised organisations. Some examples include private company's research institutes or bio-fertiliser enterprises that are formed and managed by ex-academics. Agrochemical stores or seed farms of agronomists can provide agricultural inputs as well as knowledge exchange at the village level.

Under these conditions another epistemic culture of development has emerged in the contemporary development context of the Mekong Delta. Many of this culture's practices are not new; for example, before the national reunification in 1975, farmers such as Mr. V.V.C from Tien Giang worked with researchers to breed pest-resistant rice varieties (Chapter Four). Farmers have been inventing production tools since the early days of the delta exploration (Son Nam 2004). However, new dimensions have been constructed and reconstructed to form another epistemic culture of development characterised by three main elements: inclusionality, co-creation, and reflexivity.

Inclusionality[76] promotes the fluid boundary logic view of space as "openness," "infinite softness," and "cannot be cut," which are all dynamic relational influences and coevolutionary processes between nature and humans, structure and environment, community and neighbourhood, individuals and groups, and self and otherness (Rayner 1997; 2004; 2011). Inclusionality allows for the conceptualisation and practice of a duality instead of polarisation of development as well as knowledge development in the Mekong Delta. The Mekong Delta's river and water civilisation, which is expressive of its own knowing and behaviour to the nature and life organisation within the delta's distinctively energetic context, is not just a past experience, and it needs to be radically learnt and relearnt in any "modern" development engineering projects in the Mekong Delta. The "I know better" fence that divides actors into the binarism of development experts-beneficiaries, knowledge source-passive receivers, and agencies with interest and knowledge work clashes is eliminated because every actor has some "good" knowledge to share, and over time interactive knowledge flows occur at any moment between the systems. The farming community is adding a pillar to support the state-university-industry triple helix. Interactive and generative global-local, science-everyday and source-recipient knowledge(s) dualities are nourished. The "second order" knowledge diffusion management integrates knowledge and non-knowledge, and formal and informal knowledge flows into interactions of knowledge systems.

Co-creation relates to the active and creative participation of actors in development and knowledge development construction. Co-creation is the manifestation of the cogency and potency of inclusionality. Knowledge co-production can be formally performed in transdisciplinary research or everyday practice of collaborative informal grouping. It has to be built upon partnership. Co-creation needs a strategic approach in structuring and supervising complex change processes (Regeer and Bunders 2009) and

[76] In Rayner's (2004) definition, "'inclusionality' expresses the idea that space, far from passively surrounding and isolating discrete massy objects, is a vital, dynamic inclusion within, around and permeating natural form across all scales of organization, allowing diverse possibilities for movement and communication. This way of understanding natural form radically affects not only the way we interpret all kinds of irreversible dynamic processes, but also the fundamental meaning of 'self' as a complex identity comprising inner, outer and intermediary domains, rather than an independent, single-centerd entity" (Rayner 2004).

constructing suitable boundary concepts, workable boundary objects, and conducive boundary settings[77] (Mollinga 2010) posed by that inter- and trans-disciplinary research. In many researched cases, co-creation can be designed and embellished through resource reallocation or practice restructuring to explore and develop potentialities and to enable contexts of interaction. For example, appreciation of grassroots knowledge-based extensionists can foster a reflective learning culture as the core of structural change of the extension system. Radical innovation from within or Emergent Innovation is argued as a key in sustainable knowledge co-creation (Peschl and Fundneider 2008).

Reflexivity refers to reflexive management of mega-knowledge in creating new knowledge at various levels of learning. Reflexivity is a multifaceted concept involving questioning, reviewing, evaluating, debating, and adapting processes through which innovative behaviour outcomes are generated, which make it frequently discussed in organisational learning and innovation literature (MacCurtain et al. 2010). Reflexive self-regulation of organisations indicates the reproduction of the organisation is reflexively organised through meta-practices (Albrecht and Elisabeth 2003; Giddens 1984). At the individual level, reflexivity is defined as "the turning back of the experience of the individual upon himself [sic]"[78] (Mead 1934, 134). Reflexivity is widely used as an epistemological analytic standpoint in scientific practice, such as Bourdieu's conception of epistemic reflexivity (Maton 2003). Reflexivity requires a person to reflect on knowledge for development processes and to challenge pre-fixed assumptions and frameworks through double- and triple-loop learning. This research has presented a number of cases that grassroots extensionists, researchers, and farmers engage in reflective practice to complete their tasks and generate new knowledge. Reflective learning has helped to sustain the operation and effectiveness of networks and communities of practice. What becomes important now is the concept that reflective learning and "second order" knowledge diffusion management needs to be further advocated at the organisational and sector levels. Reflexivity creates opportunities for enhancement of conceptual readiness and effective implementation of innovation in more complicated and uncertain contexts of development as well as enrichment of local imaginings that potentially reshape and transform global issues and regimes. The next section offers a case study to illustrate how local researchers' reflections on their interaction with farming communities can

[77] "(1) The development of suitable boundary concepts to think multidimensionality; (2) The construction of workable boundary objects to make assessments and take decisions in conditions of incomplete knowledge, uncertainty, complexity and non-congruent interests; and (3) The crafting of conducive boundary settings, that is, shaping the internal and external institutional arrangements of research in such a way that the first two can be achieved effectively" (Mollinga 2010, 2-3).

[78] In Mead's (1934, 134) own words, "it is by means of reflexiveness - the turning-back of the experience of the individual upon himself—that the whole social process is thus brought into the experiences of the individuals involved in it; it is by such means, which enable the individual to take the attitude of the other toward himself, that the individual is consciously to adjust himself to that process, and to modify the resultant of that process in any given social act in terms of his adjustment to it. Reflexiveness, then, is the essential condition, within the social process, for the development of mind."

concoct local conceptualisations on which sustainable agriculture actions can implemented, instead of forming a dependence on imported ideas.

The three principles of inclusionality, co-creation, and reflexivity define the essential characteristics of another epistemic culture emerging in the development context of the Mekong Delta. Another epistemic culture of development is the core to structural and systematic change of the knowledge system and thus achievement of sustainable agriculture and rural development of the region. Since change energies are at the grassroots level and informal interface, promotion of knowledge interaction from within and mainstreaming of inclusional and reflexive knowledge practices bear a particular significance. If another development is people-centerd (Nerfin 1977; Duong Phu Hiep 2008), reflexive (Jakimow 2008) development, then another epistemic culture on which we are discussing can be called another-development epistemic culture.

7.3. Hybrid knowledge: Results of a survey

This section presents an empirical example of hybrid knowledge generation, using results of threshold concept identification, to demonstrate everyday reconstruction of knowledge. This concrete case suggests an alternative way of thinking to address the impasse of current agricultural innovation transfers (see Chapters Two, Three and Six). More importantly, the example explicates "hidden" dimensions of another epistemic culture and as such provides generalisable implications for knowledge management for development, which is further synthesised in the following section 7.4.

The ideas of threshold concepts have recently emerged from and are widely used in education and, more specifically, curriculum design. Threshold concepts are defined as akin to conceptual portals or gateways that open up a transformative internal view of the subject matter or part thereof, subject landscape, or even world view within and across disciplines (Meyer and Land 2003; 2005; 2006; Land and Meyer 2010)[79]. Since its inception, threshold concept research has attracted growing interest and discussion within specified disciplines as diverse as education, nursing, computing, economics, geology, and politics because of its explanatory and practical potentials from both cognitive and social learning perspectives (Cousin 2006; Davies 2003). It is reviewed that threshold concepts are often proposed within disciplinary settings as either differentiated concepts or overarching concepts within a hierarchy of concepts (Bradbeer 2006).

[79] Different from "core" or "key" concepts, Meyer and Land (2003) identify five characteristics of threshold concepts: (i) Transformative: Threshold concepts change the way learners think and practice in their disciplines. The conceptual shift in understanding a subject marks an initiation into any subject culture as "we are what we know" (Cousin 2006). (ii) Probably irreversible: Threshold concepts are unlikely for learners to be forgotten or unlearned. This does not however exclude the possibility of concept modification or rejection for a more refined mental model. (iii) Integrative: Threshold concepts allow learners make connections and see interrelatedness of phenomena that are previously hidden. (iv) Possibly often bounded: Threshold concepts indicate the boundaries of conceptual space or subject areas. (v) Troublesome: Threshold concepts are conceptually difficult, counter-intuitive, alien, or seemingly incoherent.

Based on the conceptual change theory and focusing on disciplinary knowledge transformation, Davies and Mangan (2005) offered a more fine-grained distinction of thresholds: basic thresholds (relating the transformation of everyday experience understanding through an integration of personal experience and discipline ideas), discipline thresholds (connecting the transformation of understanding of discipline ideas through the acquisition of theoretical perspectives), and modelling thresholds (relating the transformation of ability to construct discipline arguments through acquisition of organising ideas). A web of threshold concepts therefore helps to construct the overall structure of the discipline, which in turn can establish disciplinary continuity in punctuated learning (Kinchin 2010). The usefulness of threshold concepts is also discussed in the provision of a transformed way towards cross- and inter-disciplinary discourses (see Carmichael 2010; Royeen et al. 2010). Understanding threshold concepts involves learning and knowledge acquisition processes through overcoming misconceptions, troublesomeness or liminality, which lead to thinking and practising transformation in disciplines. The threshold concept theory is often criticised based upon the argument that concepts cannot be reducible to capacities (Rowbottom 2007). More constructively, Rowbottom (2007) emphasises that "it is that so-called 'threshold concepts' are not as easy to spot as anyone has previously thought, even if there are such things." Thus, helping learners to understand and grasp threshold concepts is no less important than identifying threshold concepts and including them in the curriculum design. The threshold concept framework provides an alternative approach towards learning difficulties that goes beyond normal phenomenographic research by strategising the social construction of disciplines (cf. Carmichael 2010). As such, adopting threshold concept research can facilitate the creation of partnership research between educational developers, learners, and subject specialists (Cousin 2010).

A two-round[80] internet-based Delphi survey was carried out to identify and rank threshold concepts in two selective discipline clusters: agricultural extension and pest management. Based on previous contacts with agricultural experts in the Mekong Delta for interviewing data collection within a broader research design, experts and researchers from academic, governmental, and industrial organisations were invited, with the final 16 respondents (13 males and 3 females) participating in the survey. Approximately two-thirds of the

[80] In the first round, the respondents were asked to propose threshold concepts relevant in their fields of agricultural extension and pest management. A threshold concept literature summary in English and its Vietnamese translation version were provided to all participants. To ensure the respondents' sufficient and accurate understanding of the threshold concept, examples were given and face-to-face discussions were encouraged and conducted. The first-round results were synthesised and presented as a list of identified threshold concepts with feature descriptions and illustrations. Respondents in the second round were requested to indicate their agreement or disagreement towards threshold concepts proposed in the first round and to rank their importance on a five-point Likert scale (1 = very unimportant, 5 = very important). Given the fact that Delphi technique enables the researcher to better understand issues of concern by consulting opinions of experts whose anonymity is maintained, it is highly appreciated for encouraging free and true opinions from experts based on their personal knowledge and experience and minimising influences and biases caused by dominant individuals (Hanafin 2004; Hsu and Sandford 2007). Survey respondents found threshold concepts both novel and provoking, thus some of them inspired direct conversations for hours with the researcher to further share their opinions and ideas about threshold concepts.

participants were over 40 years old and held a doctoral degree with working experience of more than 10 years. Participants' specialisations included agronomy, agriculture system, plant protection and biotechnology, aquaculture, and agricultural extension and rural development. Some of them had a leading position in their professional field. A striking feature was that most of the respondents maintained the dual-profession of knowledge creators (academic, governmental or corporate researchers) and knowledge disseminators (for the rural community development).

Identification of threshold concepts: Scientific and everyday knowledge

Within the two selective discipline clusters, there are a number of proposed concepts that meet the features of threshold concepts. The ranking exercise is aimed to prioritise and network those concepts. For the purpose of the analysis, I will focus on scientifically developed concepts in relation to proposed concepts, which are generated from the practical involvement and reflection of local experts into the field, that we call everyday threshold concepts.

Agricultural extension. The respondents agreed that *participatory agricultural extension* is a threshold concept. As previously discussed, in the common thinking of agricultural extension experts and practitioners, knowledge and technology are produced and transferred by scientists and agriculture educators to local communities in need to promote social and economic development. Such a practice has been consolidated by the hierarchical and bureaucratic system of extension services in Vietnam. Respondents agreed that the introduction and adoption of PAE could potentially satisfy local demands of knowledge from an integrated bottom-up and civic learning approach. The most difficulty in understanding and applying the concept, as respondents figured out, which is similar to the argument made in section 2, is the transformation of extensionists' thinking and doing so that farmers' needs and knowledge are responded to and used.

The survey also indicated that *farmers are experts* (*nong dan la chuyen gia*) is recognised as a threshold concept. It was explained that once farmers are regarded as experts, development professionals as outsiders will not only encourage farmers' participation but also will recognise farmers as partners in designing and implementing development projects. The following extractions from the survey further present respondents' recommendation:

> Upon grasping this concept, all fundamental concepts of PAE are present and connected. The concept helps me deeply understand why we implement these and those PAE methods. I now can explicate to myself why we need to obtain opinions and ideas from farmers in assessing and evaluating development projects. We do such phases not because we are required to, but because we need advice and knowledge from farmers who are real experts on their farms and in their farming communities.
>
> When thinking *farmers are experts*, separate pieces of PAE knowledge are linked into chains, which make me understand PAE in a quicker and deeper manner.

> At first, I found it challenging to understand, believe, and practice within the notion "farmers are experts." Normally, experts are those who transfer new knowledge and techniques to farmers. Whether farmers actually understand and can explain their work is very hard to say.

As such, *farmers are experts* shares several underlying participation and learning principles with PAE. In fact, *farmers are experts* in the definition of local experts inherits and sheds light on PAE contents and methods, without which the concept might lose its power in a vacuum. What makes *farmers are experts* compelling perhaps is that it is expressed in the local language that can explicitly convey meanings less expressed in foreign abbreviations, such as PAE, PAEX, PAEM, or PTD, which are more often used as a method. One of the leading experts in PAE in the Mekong Delta asserted the following:

> "We regard farmers as experts. With such an attitude towards farmers, we do respect farmers. Considering farmers as experts transforms the way we behave and communicate with them. Once our attitude, behaviour, and communication are changed, farmers grow close to us and become our fellow travellers in the learning journey. Farmers' opinions and ideas are listened to and respected, and thus they are actively engaged in agricultural extension projects that promote the effectiveness and efficiency of agricultural extension" (Interview 285, senior researcher, Can Tho, 10.12.2010).

Pest management. The survey reports a hierarchy of threshold concepts proposed. *Integrated pest management* (IPM) is identified as a discipline threshold. *Economic threshold*, which is defined as "the pest population density at which control measures should be adopted to prevent an increasing pest population reaching the economic injury level" (Davis and Tisdell 2001), is the antecedent to IPM. IPM in turn is claimed to be under the higher-order concept of *sustainable agriculture production*. This finding is relevant to what Davies and Mangan (2005) suggested as discipline and modelling threshold concepts.

A group of respondents supported the idea that *caring* is a threshold concept in pest management. They argued *caring* would transform the way farmers think about and treat their plants, animals, and the environment. Farmers very often do not care or lack basic knowledge to appropriately care for their crops over growing phases. Such taken-for-granted characteristics seem to be much truer with farmers from the Mekong Delta where land and weather conditions are more favourable than other regions in the country. However, *caring* is not restricted to hard-working or industrious attributes; instead, it is associated with smart crop management, individually and collectively. The following citations extracted from the survey further illustrate such views:

> "Normally, farmers here lack care about growth and development processes of plants and domestic animals. In temperate climate and fertile soil conditions, farmers sow their rice seeds and wait for harvesting. Rice seeds are often selected from their previous crops. Now that most farmers pursue intensive farming, farmers really have to care about verified seed selection, land preparation, crop growth over various phases, frequent field visits, and appropriate decisions of pest management. Farmers need to treat their crops with knowledge-based caring that goes beyond the customary perception that anything you stick in the ground will grow."
>
> "The rice growth cycle is similar to that of human beings. They both require the right interventions and care. Healthy rice first grows up from healthy seeds. Next, like children, seeds need to be placed in a favourable environment to develop well and strongly. This requires farmers to invest in deep ploughing and careful harrowing, which is quite absent in farmers' traditional thoughts but now becomes crucial to prevent organic toxicity in triple-crop and intensive-farming systems. Pests and diseases should be

> frequently observed and checked to provide proper treatment. Here come the principles of 'four right things' in using pesticides: no early spraying, 3R3G, 1M5R, and also ecological engineering. In the same way as human obesity, redundant nitrogenous fertilizer brings negative effects for rice."
>
> "Mekong Delta farmers need to acquire basic knowledge about their plants and animals in order to apply appropriate care."

Caring as a suggested threshold concept comprehends the above-cited connotation of IPM. More than a technical and moral call, *caring* paves a potential epistemological transition to change farmers' minds and practice in pest and crop management. Again, defining *caring* takes an IPM integrative approach. Though not bounded by IPM, *caring* might become nebulous with no reference to IPM-based methodological developments.

What has been discussed in this section illustrates the relationship and interactiveness of scientific and everyday worlds and knowledge. It is the local researcher's peripheral position between knowledge generators and knowledge practitioners that ignites the development of everyday threshold concepts based on their daily practical experience and reflections. Despite their foundation on everyday experience, everyday thresholds are essentially not basic thresholds as typologised by Davies and Mangan (2005). Everyday thresholds can be under basic, discipline (area of practice), or modelling categories largely dependent on the concept's connotation and connection with a stock of scientific knowledge. In this sense, everyday threshold concepts foster scientific evidence links as well as ignite local imagination for change.

Implications of everyday threshold concepts

The identification of scientific and everyday threshold concepts provides significant implications for sustainable agriculture education and practice in the Mekong Delta. It requires turning the focus to the essence of the learning process that breaks single-loop learning (cf. Peschl 2007). Understanding technical dimensions of concepts such as *PAE* and *farmers are experts* and their premises, assumptions, or frameworks of reference allow learners to perform active learning and knowledge construction, which may potentially help them overcome the "stuckness." "Innovation, as a result of human interaction, often fails because people do not understand each other because they belong to different worlds which have their own languages and cultures" (Klerkx, van Mierlo, and Leeuwis 2012, 469).

Everyday threshold concepts are more distinctive in providing implications related to hybrid knowledge (re)construction. First, everyday threshold concepts are consolidated and developed from expert's knowledge engaged in day-by-day local contexts, practices, and cultures. This localised knowledge is externalised in a dialectical form and tone. As such, local knowledge users can find it easier to learn, acquire, and interpret everyday thresholds in their practical activities. For example, our interview data with local farmers who make progress in IPM application largely back up the importance and comprehensibility of an everyday threshold concept like *caring* rather than science-reliant IPM, though the two are believed to

share and complement meanings that can create changes in farmers' pest management. Second, such scientific concepts as PAE and IPM themselves evolve and include new meanings over time once diffused to local communities. Localised threshold concepts thus can best capture and integrate these conceptual changes in practice. At best, learner's imaginative capacity and local learning spaces can be promoted when local learners interact and reconstruct the concepts. In such circumstances, interactions can lead to the construction of the sense of knowledge (generation) ownership, which is crucial to form beliefs and action taking by learners. As McDonell (1997) states, "individual human beings must rest their actions on judged beliefs rather than on warranted knowledge." As knowledge is continuously created and constructed, threshold concepts continue to be reinvented. Proposing threshold concepts, however, is only a commencement step on a learning passageway of no shortcut, as Cousin (2006) describes, "mastery of a threshold concept often involves messy journeys back, forth and across conceptual terrain." Learning threshold concepts by rote without reflections and re-imagination is in the end captive to ritualistic refrains.

The exercise of exploring threshold concepts has revealed the endurable presence and practice of another epistemic culture in all dimensions of inclusionality, co-creation, and reflexivity. Such knowledge production interactions are only made visible and measurable through innovative outcomes. Due to their intangible nature, everyday epistemic practices become invisible to knowledge and development managers, even unconsciously developed among actors. Therefore, knowledge management and governance should aim to foster new knowledge development from within and innovation upscaling.

7.4. Implications for knowledge management and governance

Another epistemic culture of development is emerging with an increasingly important role to play in constructing knowledge for sustainable rural development practices in the Mekong Delta, yet it is often "hidden" from the mainstream development and knowledge for development landscapes. While it is still important that strategic planning and governance is needed for the development of this alternative knowledge production culture and that the role of State and its policies contributes an important communication system in knowledge democratisation and bridge building, bottom-up and from within knowledge initiatives and practices provide the fundamental frame of reference for this epistemic culture to be further discovered, cultivated, and fostered. The sociological institutionalist construction of learning-based extension system delineating a grassroots instigated elusion from current bureaucratic knowledge transfer praxis (Chapter Three) well illustrates paths and approaches towards another epistemic culture. In other words, it is from internalist reconstruction and transformation within reflective communities (Williams 2010), such as farmer-led communities of practice, and hybrid knowledge developed from interaction and networking logic that the alternative epistemic culture of development is beginning to spring, and in this same orientation it should be boosted up.

> "For government to become a learning system, both the social system of agencies and the theory of policy implementation must change. Government cannot play the role of 'experimenter for the nation', seeking first to identify the correct solution, then to train society at large in its adaptation. The opportunity for learning is primarily in discovered systems at the periphery, not in the nexus of official policies at the center. Central's role is to detect significant shifts at the periphery, to pay explicit attention to the emergence of ideas in good currency, and to derive themes of policy by induction. The movement of learning is as much from periphery to periphery, or from periphery to center, as from center to periphery" (Schön 2010/1973, 16).

Farmers are no longer merely homogenous recipients of knowledge for development, as evidenced by those in our cases who have actively engaged in knowledge diffusion through brokerage practices and networking. They also play a crucial role in cultivating networks and communities of practice and connecting experts in the fields and farmers across the delta, from whom knowledge is shared, used, and re-produced, as well as the unknowns framed and formulated. Development and knowledge professionals are no longer staying within their disciplinary or work boundaries. New identities and hybridised organisations and communities have been created through knowledge (system) interactions. Thus, managing knowledge diffusion should involve managing knowledge transfer and creation processes encompassing knowledge from the source and receiving actors, the knowns and (relational and rational) unknowns. It should also appreciate farmer-led learning structures in practice and encourage the connection of frequently ignored informal knowledge flows with the common "knowledge for development" goals of responsible organisations and the agricultural and rural development sector. In other words, the agricultural extension system, knowledge system, and innovation system need to place significant emphasis on multi-agents, multidimensions, and interactive learning in agricultural and rural research and development. Further, enabling spaces should be generated, including learning space, practice space, and knowledge (re) generation space. Transdisciplinary research should also be encouraged, especially in the context of dynamic workforce movements. ICTs and mass media, particularly live television programs, should be designed to embrace thematic dialogues in which all voices are included and that contain situational analyses that provide useful information or trend understanding and decision making of rural communities.

Practical implications for knowledge diffusion project managers are as follows. First, ecologically sound agricultural systems should receive further research and development efforts for improvement and adoption and aim to promote sustainable development in the Mekong Delta and throughout Vietnam. Second, interventions should facilitate farmers' personal development and learning processes. It is evident from our study that "training the trainer" is appropriate for building the capacity of farmers, who potentially continue to diffuse and share technology and knowledge with their wider rural community. The training of trainers is a long-term process involving the careful selection of participants, communication design, and monitoring mechanisms. It is important to create opportunities for these trainers to get involved in training and in different environments. This task relates to a human resource development

strategy rather than immediate transfer quantity focus. Research/development projects should put forward the objective to train more farmers who will and can share knowledge rather than the better off and technology harboured ones. Third, the farmers' stories imply that the learning process is not well defined and newly explored knowledge is not codified or externalised. A learning cycle can be conducted by the construction of a feedback loop, which not only provides a participatory tool for a project's evaluation but also helps to manage new knowledge produced and lessons learnt.

For managers in the agricultural and rural development sector, firstly, research/development projects conducted by development and knowledge professionals with the participation of farmers should be encouraged and prioritised for funding. The study cases show that "professional" knowledge brokering farmers interact and work together with project scientists/researchers to generate new knowledge through problem solving or by framing and formulating problems to create new values and maintain the learning cycle in complex environments. Local extension workers should consider the imitation of a participatory research approach, though less elaborate, in their diffusion planning (cf. Ton 2005). Secondly, in addition to recognised formal farmers' groups and associations, farmers also connect via networks and communities of practice to help each other to develop, including sharing and exchanging knowledge. Despite their effective contributions to sector development, such networks and communities tend to be invisible to managers. As such, local rural development agencies should identify these networks and communities to cultivate their learning culture and/or inter-community learning. Some concrete interventions or measures could involve the following: participation directory compilation; training invitations to coordinators; experience, techniques, and stories selected and published; invitations to deliver presentations in seminars and conferences; and utilisation of lessons learnt in the community and network as well as other motivation and incentive mechanisms. Thirdly, the way farmers organise their communities or networks of practice calls for an alternative approach to managing knowledge flows beyond the traditional administrative boundaries. In the case of Farmer Z's network, management interventions and support can be more effectively implemented via the NAVG, as a national professional association, and provincial sectors rather than single, unconnected efforts only at the local level. The stereotypical understandings of the knowledge deficits in rural areas should be carefully applied in the Mekong Delta context or elsewhere despite the fact that far more conceptualised and institutionalised efforts are needed to democratise and promote local, non-standardised, non-universalised, everyday knowledge currently positioned at the bottom in status and power (cf. Bruckmeier and Tovey 2009). In this sense, development knowledge should not be managed somewhere by someone, but instead "it should, indeed, be debated - not only by academics [...] but more importantly by those who are supposed to be its 'beneficiaries'" (Broad 2007, 706).

7.5. Concluding remarks: An outlook beyond the farmer-scholar divide

Yes, farmers are increasingly becoming knowledge and innovation workers, for their sustainability-oriented development. How agrarian communities in the Mekong Delta of Vietnam talk, think, and apply knowledge for their everyday life and production has been shaped by and has shaped their knowledge work interaction and partnership building with agriculture scholars, extension and business communities. This research has illustrated and reaffirmed that development and knowledge principles proclaimed by the post-development theorists, the integration of the rural community as a pillar of the expanded triple helix and, the holistic theory of knowledge management, the orientation of the third generation of knowledge management, and epistemic culture as a culture of knowledge creation, diffusion, use and regeneration, which are well founded in contemporary global development and post-industrial societies, are compellingly informative on constructivist understanding of knowledge creation, diffusion, use and regeneration for agricultural and rural transformation in Vietnam. The approaches such as Beyond Farmer First (BFF), Farmer Participatory Research (FPR), transdisciplinary research, and Agricultural Innovation System (AIS) are significantly instructive and should be sufficiently promoted in knowledge for development practice. Significantly, another epistemic culture of development has emphasised epistemic culture pluralism and epistemic culture convergence. The construction of such another epistemic culture might contribute to the definition of new dimensions of a knowledge civilisation in its formation through the destruction of the industrial episteme that is based on the *reduction* principle.

Founded on constructivist perspectives of systems thinking and symbolic interactionism and placed in a broad analysis of the delta's river and water civilisation (*van minh song nuoc*), modern hydraulic society developments and recent natural and social change impacts, the present research has revealed the duality of knowledge diffusion for sustainable agriculture and rural development in the Mekong Delta. Despite the still prominent technocratic teaching-oriented paradigm in the knowledge landscape of the delta, as our findings have illuminated, a *restructuration* of knowledge generation and diffusion derives from grassroots, informal, bottom-up efforts and networks conditioned on interactive environment, new identity of actors, and hybridity of knowledge work organisations. Another epistemic culture of rural development characterised by knowledge inclusionality, co-creation and reflexivity is emerging.

Another epistemic culture of rural development in Vietnam's Mekong Delta underlines multi-form interactions and endless transitions of interfaces among and across knowledge production and utilisation communities and networks considering their embedded epistemic cultures over cycles of knowledge processes. Knowledge growth, transformation and transmission for development are no longer the unconnected work of individuals or groups of professionals who provide "treatment" to "problems" they identify in rural communities. A new epistemic paradigm nourishes and encourages cooperative and participatory knowledge circulation throughout infinite knowledge production, use and reproduction

spirals, and reciprocally among knowledge domains and worlds, while the subsystem's practices, pursuit of other interests, and interactions with its own larger influencing environment are also taken into account. Thus, only within a single knowledge transaction can a knowledge source and recipient be clearly distinguished, but they cannot in a knowledge system and process perspectives where knowledge role exchange takes place continuously as knowledge is constantly contextualised, used, and regenerated, in whatever scale of knowledge management and governance are used. As such, the fundamental of change stems from the promotion of learning organisation cultures in which learning within and between knowledge systems is maintained. To this extent, the question of who's first, farmers or scholars and professionals, as asked in the beginning of the thesis, becomes less important, disregarding issues linked with knowledge legitimacy and ownership. Instead, mechanisms of interaction and cooperation maintenance of epistemic communities and networks might gain more attention for new knowledge practice engineering.

The emerging epistemic culture as argued and demonstrated in this thesis is based on examples and stories of various dispersed arrangements and structures at interactive levels of epistemic communities and networks, rather than on organisational or sectoral scales. In this research, the "becoming" of another epistemic culture of development has been interpreted throughout interactive knowledge work practices, including informal, non-institutionalised and even hidden forms of interaction, as the change energy. It now raises the question of "making" the alternative epistemic culture on a regional and/or national scale engaged with mainstream institutions and formal relations. Though "fences were broken locally, but dismantled centrally" (Rama 2008, 27), as learnt from the country's history of transition into the economic reforms and development renovation since the late 1980s, innovation decision making in post-*doi moi* is indeed a difficult process of mediation and struggle between conservative-reformist thinking, old-young leaders and staff, and traditional-modern methods in finding a path that is not available elsewhere for a replication or is not easy to define from the beginning of the process but from continuous and joint learning in practice (cf. Duong Phu Hiep 2008) . Still, the traditional epistemology is largely in operation and use, if not prominent in the contemporary Vietnamese rural development context, and it is further supported by top-down planning and management mechanisms and expanded bureaucracy. Although it was implicitly admitted in this thesis that such a large and comprehensive development policy and program can hardly reach the grassroots and informal structures and practices, it is still crucially necessary that local initiatives are integrated and facilitated with enabling contexts into a long-term, strategic, and reflective planning by the state with a catalytic role in the current Vietnamese context.

Among others, I would argue that a mindset change about the role of agricultural and rural development is a fundamental determinant of the sector's policy change. If not linked with and beneficial for local rural development, high-tech agricultural zone development projects would become closed fiefs of experts and

technicians only. In the recently developed national *tam nong* (comprehensive agriculture, farmer, and rural development program), farmers are reaffirmed as the agents of agricultural and rural development processes, but how this concept is operationalised in community projects and everyday practices need much more joint effort of experts from related sectors in local knowledge mobilisation. The enculturation of the sector's decision makers and planners to a mindset change that agricultural and rural development is a fundamental foundation and a harmonious link to the long-term sustainable development process rather than functioning as an input supply source of or big leap into industrialisation and urbanisation through promotion of the biggest possible extraction of rural resources and ignorance of the fatality of rural civilization is essential (cf. Pham Xuan Nam, Dang Viet Be, and Hainsworth 2000). The pure quantitative increase of more experts and high-tech devices and infrastructure with the absence of mindset-transformative epistemic practice cannot lead to the sustainable transition to a more knowledge-based development form of society.

Systamic or strategic change now becomes first dependent on neither farmers nor scholars/professionals but on how knowledge management and governance mechanisms and strategic decisions on promoting interactions among actors and expanding the alternative epistemic culture of rural development can be developed on a larger scale based on local developments of interactive knowledge world practices depicted and discussed in this thesis, both on mindset change and action planning. Yes, in the vast ocean of knowledge and emerging islands of new epistemic practices, micro-to-macro knowledge governance (see Foss and Michailova 2009) has to bridge and breed knowledge-processes-based interaction and learning cultures among communities and networks. If not, distributed transformations of the described epistemic culture of development only fall into being marginalised, budding, and unstructured features of knowledge-based societal change projects and cannot effectively lead (to) rural development transformation. Such recommendations become most critical in the rapid changing context of and increasing development interventions on the Mekong Delta under the impact or even pressure of modernisation, economic international economic integration, construction of upstream dams, and climate change.

This research is one of the first to add a knowledge dimension to the systematic understanding of the rural development in Vietnam's Mekong Delta and can be part of a broad-researched area of Vietnam development in transition with a large interest in state-society relations under the lens of knowledge, power, and development. As such, the rural transformation in Vietnam needs to be incorporated with the analysis, which was not thoroughly investigated in this research, in the fields of agro-genetic technology, green agriculture, land reform, rural-urban migration, and urbanisation. Moreover, government agencies can be further investigated beyond the agricultural extension system to see their knowledge generation and use for policy making and implementation at different levels. How different sources of knowledge are used

to generate policy at the central and provincial levels can be of high interest. In the same manner, how knowledge is used and produced for development by civil society organisations that burst into operation also is worth being investigated and included for a full picture.

To understand knowledge for development practices that are locally specified and culturally contingent, further research will have to consider the dynamics of knowledge alliancing and networking between and among actors in the agricultural and rural development sectors. Knowledge diffusion and brokering can be researched within the epistemic cultures in which they are embedded and/or knowledge management and governance frameworks. Knowledge sharing between communities of practice could also be further investigated, while research on contemporary Vietnamese farmers could explore how technology and knowledge are adopted and how they impact production and the lives of different groups of farmers, or how knowledge is extended within formal arrangements set up by external interventions in comparison with informal networks built up by the rural community to promote knowledge and experience sharing for their own development.

For a more generalised Vietnam-wide understanding of epistemic culture change and policy suggestions, other studies should be conducted in other regions with elevated recommendations for those with a more closed peasant social system, such as the Red River Delta, or even in other major river deltas of the world. Most importantly, forms of interactions or hybridised organisations among knowledge worlds and epistemological communities have to be examined throughout their formation and operation processes. What factors determine the success or failure of such forms, and how these forms in turn nourish and enhance the new epistemic culture of development are some examples of this interesting area for further research. Capitalisation of knowledge and knowledge marginalisation and inequality may also be included.

The aforementioned topics invite further academic endeavours under the form of either pure research or action research. Establishment of community-based knowledge centers in rural areas, small-scale incubator-based agribusinesses, or farmer-professional agricultural research projects can be practical references for the latter orientations, as well as bringing them into operation and researching knowledge processes within such arrangements. I hope that this research forms an early phase for any future "double hermeneutic" (Giddens 1987) endeavours in the Mekong Delta of Vietnam and Southeast Asia as "a laboratory" of global developmentalist and ecological change (Antweiler and Hornidge 2012).

References

Ackoff, Russell L. 1971. Towards a System to Systems Concepts. *Management Science* 17 (11):661-671.

Aguirre, José Luis, Ramon Brena, and Francisco J. Cantu. 2001. Mutiagent-based Knowledge Networks. *Expert Systems with Applications* 20 (2001):65-75.

Akram-Lodhi, A. Haroon. 2001. Vietnam's Agriculture: Is there an Inverse Relationship? In *Institute of Social Studies Working Paper Series*, No. 348. The Hague.

Akram-Lodhi, A. Haroon. 2004. Are 'Landlords Taking Back the Land'? An Essay on the Agrarian Transition in Vietnam. *The European Journal of Development Research* 16 (4):757-789.

Akram-Lodhi, A. Haroon. 2005. Vietnam's Agriculture: Processes of Rich Peasant Accumulation and Mechanisms of Social Differentiation. *Journal of Agrarian Change* 4 (1&2):73-116.

Albrecht, Becker, and Brauner Elisabeth. 2003. Management as Reflexive Practice and the Role of Transactive Knowledge. Paper read at Organizational Learning & Knowledge 5th International Conference, at Lancaster.

Ali, A.K. 2005. Using the Delphi Technique to Search for Empirical Measures of Local Planning Agency Power. *The Qualitative Report* 10 (4):718-744.

Allan, Catherine. 2012. Rethinking the 'Project': Bridging the Polarized Discourses in IWRM. *Journal of Environmental Policy & Planning* 14 (3):231-241.

Amin, Ash, and Joanne Roberts. 2008. Knowing in Action: Beyond Communities of Practice. *Research Policy* 37 (2):353-369.

Anderson, Jock R., and Gershon Feder. 2003. Rural Extension Services. In *Policy Research Working Paper*. Washington, DC.

Anderson, Jock R., and Gershon Feder. 2004. Agricultural Extension: Good Intentions and Hard Realities. *The World Bank Research Observer* 19 (1):41-60.

Andersson, Ulf, Desiree Blankenburg Holm, and Martin Johanson. 2007. Moving or Doing? Knowledge Flow, Problem Solving and Change in Industrial Networks. *Journal of Business Research* 60 (1):32-40.

Antweiler, Christoph, and Anna-Katharina Hornidge. 2012. The Nexus of Agency, Knowledge, and Environmental Change in Southeast Asia. In *Environmental Uncertainty and Local Knowledge: Southeast Asia as a Laboratory of Global Ecological Change*, edited by Anna-Katharina Hornidge and Christoph Antweiler. Bielefeld: Transcript Verlag.

Baden, Sally, and Claire Harvey. 2011. Small Farmers, Big Change: Lessons from Oxfam's Agricultural Programmes - An Overview. In *Small Farmers, Big Change: Scaling Up Impact in Smallholder Agriculture*, edited by David Wilson, Kirsty Wilson, and Claire Harvey. Warwickshire, Oxford: Practical Action Publishing Ltd in association with Oxfam GB.

Bae, Jonghoon, and Jun Koo. 2008. Information Loss, Knowledge Transfer Cost and the Value of Social Relations. *Strategic Organization* 6 (3):227-258.

Bao Van. 2011. Nhung Chuyen Gia "Chan Dat" - Ky 4: Xuat Ngoai Trinh Dien Lai Tao Lua ("Barefoot" Experts – Series 4: Going Abroad for Rice Breeding Demonstration). *Thanh Nien Online* 19.08.2011. Available: http://www.thanhnien.com.vn/pages/20110819/nhung-chuyen-gia-chan-dat-xuat-ngoai-trinh-dien-lai-tao-lua.aspx [Accessed 04.04.2012].

Barbour, Rosaline S. 2008. *Introducing Qualitative Research: A Student's Guide to the Craft of Doing Qualitative Research*. Los Angeles, London, New Delhi, Singapore: Sage Publications.

Bauer, Tatjana. 2011. *The Challenge of Knowledge Sharing: Practices of the Vietnamese Science Community in Ho Chi Minh City and the Mekong Delta*. Berlin: Lit Velag.

Baulch, Bob, Truong Thi Kim Chuyen, Dominique Haughton, and Jonathan Haughton. 2007. Ethnic Minority Development in Viet Nam. *Journal of Development Studies* 43 (7):1151-1176.

Beckert, Jens. 2007. The Great Transformation of Embeddedness: Karl Polanyi and the New Economic Sociology. In *MPIfG Discussion Paper 07/1*. Max Planck Institute for the Study of Societies.

Bell, Martin, and Michael Albu. 1999. Knowledge Systems and Technological Dynamism in Industrial Clusters in Developing Countries. *World Development* 27 (9):1715-1734.

Benedikter, Simon, and Gabi Waibel. 2013. The Formation of Water User Groups in a Nexus of Central Directives and Local Administration in the Mekong Delta, Vietnam. In *ZEF Working Paper* Series, No. 112. Bonn.

Benedikter, Simon, Gabi Waibel, Serge Birtel, Bui The Cuong, and Tran Thanh Be. 2013. Local Entrepreneurship in Vietnam's Rural Transformation. A Case Study from the Mekong Delta. Bonn: Center for Development Research (ZEF), Can Tho City Institute for Socio-economic Development Studies (CIDS), Southern Institute of Social Sciences (SISS).

Benor, Daniel, and Michael Baxter. 1984. *Training and Visiting Extension*. Washington DC: World Bank.

Berends, Hans. 2005. Exploring Knowledge Sharing: Moves, Problem Solving and Justification. *Knowledge Management Research & Practice* 3:97-105

Berg, Bruce L. 2001. *Qualitative Research Methods for the Social Sciences (4th ed.)*. Boston, London, Toronto, Sydney, Tokyo and Singapore: Allyn and Bacon.

Berg, Håkan. 2001. Pesticide Use in Rice and Rice-Fish Farms in the Mekong Delta, Vietnam. *Crop Protection* 20 (2001):897-905.

Biggs, David, Fiona Miller, Chu Thai Hoanh, and François Molle. 2009. The Delta Machine: Water Management in the Vietnamese Mekong Delta in Historical and Contemporary Perspectives. In *Contested Waterscapes in the Mekong Region: Hydropower, Livelihoods and Governance*, edited by François Molle, Tira Foran, and Mira Käkönen. London: Earthscan.

Biggs, David. 2003. Problematic Progress: Reading Environmental and Social Change in the Mekong Delta. *Journal of Southeast Asian Studies* 34 (1):77-96.

Biggs, David. 2010. *Quagmire: Nation-Building and Nature in the Mekong Delta*. Seattle: Washington of University Press.

Blackman, Deborah, and Angela Maria Benson. 2010. Overcoming Knowledge Stickiness in Scientific Knowledge Transfer. *Public Understanding of Science* 21 (5):1-17.

Blankenship, Selena S. and Wendy E. A. Ruona. 2009. Exploring Knowledge Sharing in Social Structures: Potential Contributions to an Overall Knowledge Management Strategy. *Advances in Developing Human Resources* 11 (3):290-306.

Bloor, David. 2010. Sociology of Knowledge. In *A Companion to Epistemology*, edited by Jonathan Dancy, Ernest Sosa, and Matthias Steup. West Sussex: Blackwell Publishing.

Boisot, Max. 1998. *Knowledge Assets: Securing Competitive Advantage in the Information Economy*. Oxford, UK: Oxford University Press.

Bosma, Roel H., Henk M. J. Udo, Johan A. J. Verreth, Leontine E. Visser, and Cao Quoc Nam. 2005. Agriculture Diversification in the Mekong Delta: Farmers' Motives and Contributions to Livelihoods. *Asian Journal of Agriculture and Development* 2 (1&2):49-66.

Bradbeer, John. 2006. Threshold Concepts within the Disciplines. *Planet* 17:16-17.

Bratianu, Constantin. 2010. A Critical Analysis of Nonaka's Model of Knowledge Dynamics. *Electronic Journal of Knowledge Management* 8 (2):193-200.

Braun, Arnoud R., and Deborah Duveskog. 2008. The Farmer Field School Approach: History, Global Assessment and success stories. In *Background Paper for the IFAD Rural Poverty Report 2010*.

Broad, Robin. 2007. Knowledge Management: A Case Study of the World Bank's Research Development. *Development in Practice* 17 (4):700-708.

Bröchner, Jan, Sara Rosander, and Fredrik Waara. 2004. Cross-Border Post-Acquisition Knowledge Transfer Among Construction Consultants. *Construction Management and Economics* 22:421-427.

Brooks, Nick, Natasha Grist, and Katrina Brown. 2009. Development Futures in the Context of Climate Change: Challenging the Present and Learning from the Past. *Development Policy Review* 27 (6):741-765

Bruckmeier, Karl, and Hilary Tovey. 2009. Conclusion: Beyond the policy process: Conditions for Rural Sustainable Development in European countries. In *Rural Sustainable Development in the Knowledge Society*, edited by Karl Bruckmeier and Hilary Tovey. Surrey: Ashgate.

Brundenius, Claes, and Bo Göransson. 2011. The Role of the Three Missions of Universities - a synthesis of UniDev project findings. In *Universities in Transition: The Changing Role and Challenges for Academic Institutions*, edited by Bo Göransson and Claes Brundenius. New York: Springer.

Bui Trinh. 2013. GDP chay di dau? (Where does GDP run to?). *VnEconomy* 16.10.2013. Available http://vneconomy.vn/20140206031427536P0C9920/gdp-chay-di-dau.htm [Accessed 1.12.2013].

Burlette, Julia Alayne Grenier. 2007. French Influence Overseas: The Rise and Fall of Colonial Indochina. Department of History, Louisiana State University.

Byosiere, Philippe, and Denise J. Luethge. 2008. Knowledge Domains and Knowledge Conversion: An Empirical Investigation. *Journal of Knowledge Management*12 (2):67-78.

Callon, Michel. 1999. The Role of Lay People in the Production and Dissemination of Scientific Knowledge. *Science Technology Society* 4 (1):81-94

Can Tho Agricultural Extension Center. (nd). Ky Thuat Xa Lua Theo Hang (Row Seeding Technique). Available http://hoinongdan.cantho.gov.vn/DesktopModules/CMSP/DinhKem/43_TT.L.08_Ky-thuat-sa-lua-theo-hang.pdf [Accessed 01.05.2012].

Cao, Tu Thanh. 2008. Nong thon Nam Bo - Nhung van de cua hom nay (Southern Rural Area – Today's Issues). *Tia Sang* 16.06.2008. Available http://www.tiasang.com.vn/Default.aspx?tabid=76&News=33&CategoryID=3 [Accessed 31.10.2010].

Carmichael, Patrick. 2010. Threshold Concepts, Disciplinary Differences and Cross-Disciplinary Discourse. *Learning and Teaching in Higher Education: Gulf Perspectives* 7 (2):53-72.

Carrard, Naomi, Michael Paddon, Juliet Willetts, and Dustin Moore. 2012. Poverty Dimensions of Water and Sanitation Services and Climate Vulnerability in Can Tho City. Institute for Sustainable Futures, University of Technology Sydney.

Carrillo, Francisco Javier. 2008. Towards a Global Knowledge-based Development Agenda. *Journal of Knowledge Management* 12 (5):3-7.

Chambers, Robert, Arnold Pacey, and Lori Ann Thrupp, eds. 1989. *Farmer First: Farmer Innovation and* Agricultural Research. London: IT Publications.

Chambers, Robert. 1983. *Rural Development: Putting the Last First*. New York: Longman.

Chambers, Robert. 1997. *Whose Reality Counts? Putting the First Last*. London: Intermediate Technology Publications.

Chambers, Robert. 2010. Paradigms, Poverty and Adaptive Pluralism. In *Institute of Development Studies (IDS) Working Paper*. Brighton.

Chen, Chaomei, and Diana Hicks. 2004. Tracing Knowledge Diffusion. *Scientometrics* 59 (2):199-211.

Christensen, Karina Skovvang, and Per Nikolaj Bukh. 2012. Facts, Processes and Common Understandings: The Management of Knowledge in Project Based Organisations. In *New Research on Knowledge Management Applications and Lesson Learned*, edited by Huei-Tse Hou. Rijeka: InTech.

Conceicção,Pedro, Manuel V. Heitor, David V. Gibson, and Syed S. Shariq. 1998. The Emerging Importance of Knowledge for Development: Implications for Technology Policy and Innovation. *Technological Forecasting and Social Change* 58:181-202.

Connelly, Catherine E., David Zweig, Jane Webster, and John P. Trougakos. 2012. Knowledge Hiding in Organizations. *Journal of Organizational Behavior 33* (*1*):*64-88*.

Cook, Jack S. and Laura Cook. 2005. Promoting Organizational Knowledge Sharing. In *Innovations of Knowledge Management*, edited by Bonnie Montano. Hershey, London: IRM Press.

Corbridge, Stuart. 1998. Beneath the Pavement Only Soil: The Poverty of Post-Development. *Journal of Development Studies* 34 (6):138-49.

Cornwall, Andrea, and Karen Brock. 2005. What do Buzzwords do for Development Policy? A Critical Look at 'Participation', 'Empowerment' and 'Poverty Reduction'. *Third World Quarterly* 26 (7):1043-60.

Correia, Ana Maria R. and Anabela Sarmento. 2005. The European Challenge of KM and Innovation: A Skills and Competence Porfolio for the Knowledge Worker in SME's. In *Innovations of Knowledge Management*, edited by Bonnie Montano. Hershey, London: IRM Press.

Correia, Ana Maria Ramalho, Alice Paulos, and Anabela Mesquita. 2010. Virtual Communities of Practice: Investigating Motivations and Constraints in the Processes of Knowledge Creation and Transfer. *Electronic Journal of Knowledge Management* 8 (1):11-20.

Cortada, James W. 1998. Where Did Knowledge Workers Come From?. In *Rise of the knowledge worker*, editted by James W. Cortada. Boston, Oxford, Johannesburg, Melbourne, New Delhi, Singapore: Butterworth-Heinemann.

Cousin, Glynis. 2006. An Introduction to Threshold Concepts. *Planet* 17 (December 2006):4-5.

Cousin, Glynis. 2010. Neither Teacher-Centred nor Student-Centred: Threshold Concepts and Research Partnerships. *Journal of Learning Development in Higher Education* 2 (February 2010).

Cross, Rob, Jeanne Liedtka, and Leigh Weiss. 2005. A Practical Guide to Social Networks. *Harvard Business Review* 124-132.

Crossan, Mary M., Henry W. Lane, and Roderick E. White. 1999. An Organizational Learning Framework: From Intuition to Institution. *Academy of Management Review* 24 (2):522-537.

Cuff, E. C., and G. C. F. Payne, eds. 1979. *Perspectives in Sociology*. London: George Allen and Unwin.

Cuff, E. C., and G. C. F. Payne. 1984. *Perspectives in Sociology (2nd ed.)*. London, Boston: Allen and Unwin.

Cummings, Jeffrey L., and Bing-sheng Teng. 2003. Transferring R&D Knowledge: The Key Factors Affecting Knowledge Transfer Success. *Journal of Engineering and Technology Management* 20:39-68.

Cutcliffe, Stephen. 2001. Epistemic Cultures: How the Sciences Make Knowledge. *Science,Technology and Human Values* 26 (3):390-393.

Cuyvers, L., and Tran Van Binh. 2008. Aquaculture Export Development in Vietnam and the Changing Environment : The Case of Pangasius in The Mekong Delta. In *CAS Discussion paper No. 59*. Centre for Asean Studies.

Dale, Gareth. 2011. Lineages of Embeddedness: On the Antecedents and Successors of a Polanyian Concept. *American Journal of Economics and Sociology* 70 (2):306-339.

Dalkey, Norman Crolle. 1972. The Delphi Method: An Experimental Study of Group Opinion. In *Studies in the Quality of Life: Delphi and Decision-Making*, edited by Normal Crolle Dalkey, D. L. Rourke, R. Lewis, and D. Snyder. Lexington, MA: Lexington Books.

Dang, Minh Phuong, and Chennat Gopalakrishnan. 2003. An Application of the Contingent Valuation Method to Estimate the Loss of Value of Water Resources due to Pesticide Contamination: The Case of the Mekong Delta, Vietnam. *International Journal of Water Resources Development* 19 (4):617-633.

Davies, Peter, and Jean Mangan. 2005. Recognising Threshold Concepts: An Exploration of Different Approaches. Paper read at the European Association in Learning and Instruction (EARLI) Conference, at Nicosia, Cyprus.

Davies, Peter. 2003. Threshold Concepts: How Can We Recognise Them? Paper read at the European Association in Learning and Instruction (EARLI) Conference, at Padova.

Davis, Rex, and Clem Tisdell. 2001. Alternative Specifications and Extensions of the Economic Threshold Concept and the Control of Livestock Pests. In *Working Papers on Economics, Ecology and the Environment*, No.58. Australia: University of Queensland.

DCSVN (Communist Party of Vietnam Online Newspaper). 2014. Phat huy the manh san xuat trai cay o khu vuc Dong bang song Cuu Long (Promoting fruit production strengths of the Mekong Delta). *DCSVN* March 27, 2014. Available http://dangcongsan.vn/cpv/Modules/News/NewsDetail.aspx?co_id=28340531&cn_id=642673 [Accessed 05.04.2014].

Deane, James. 2000. The Role of Knowledge in Development Cooperation. *Information Development* 16 (4): 239-240.

Demerest, Marc. 1997. Understanding Knowledge Management. *Journal of Long Range Planning* 30 (3):374-384.

Denning, G. L., and Vo-Tong Xuan. 1994. *Vietnam and IRRI: A Partnership in Rice Research*. Manila: International Rice Research Institute.

Dethier, Jean-Jacques. 2007. Producing Knowledge for Development: Research at the World Bank. *Global Governance* 13 (4):469-478.

Diglio, Salvatore, and Marisa Siddivò. 1998. Agricultural Policy and Modernization of Rural Areas in Vietnam. *AION* 58 (3):547-564.

DiMaggio, Paul J., and Walter W. Powell. 1991. Introduction. In *The New Institutionalism in Organizational Analysis*, edited by Walter Powell and Paul DiMaggio. Chicago: University of Chicago Press.

Do, Kim Chung. 2005. *Chinh sach va phuong thuc chuyen giao ky thuat tien bo trong nong nghiep o mien nui va trung du phia Bac Vietnam* (Policies and approaches of advanced technology transfer in agriculture in mountainous Northern Vietnam). Hanoi: Nha Xuat ban Nong Nghiep (Agriculture Publishing House).

Doan Tue. 2011. Khi lanh dao di "xin"(When leaders ask "could you please …"). Vietnamweek 06.07.2011. Available http://tuanvietnam.vietnamnet.vn/2011-07-05-khi-la-nh-da-o-di-xin- [Accessed 10.11.2012].

Doswell, Andrew, and Vivien Reid. 2002. An Empirical Study of Knowledge and Organizations. In *Knowledge Mapping and Management*, edited by Don White. Hershey, London: IRM Press.

Duguid, Paul. 2005. The Art of Knowing: Social and Tacit Dimensions of Knowledge and the Limits of the Community of Practice. *The Information Society* 21 (2):109-118.

Dun, Olivia. 2008. Migration and Displacement Triggered by Flooding Events in the Mekong Delta, Vietnam. Paper read at International Conference on Environment, Forced Mitigation and Social Vulnerability, at Bonn, Germany.

Duong, Phu Hiep. 2008. Ve mot so dac diem cua qua trinh doi moi o Vietnam (On some characteristics of *doi moi* process in Vietnam). In *Doi moi o Viet Nam: Nho lai va suy ngam (Doi moi in Vietnam: Recall and reflections)*, edited by Dao Xuan Sam and Vu Quoc Tuan. Ha Noi; Nha xuat ban Tri thuc.

Edmonds, Christopher. 2004. Rice Production, Land Use Dynamics, and Infrastructure Development in Viet Nam's Mekong River Delta. *Asian Development Review* 21 (2):57-78.

Ehlert, Judith. 2012. *Beautiful Floods. Environmental Knowledge and Agrarian Change in the Mekong Delta,Vietnam*. ZEF Development Studies. Berlin: Lit Verlag.

Ellerman, David. 2000. Knowledge-Based Development Assistance. *Knowledge Technology & Policy* 12 (4):17-43.

Ellis, Frank, and Stephen Biggs. 2001. Evolving Themes in Rural Development 1950s-2000s. *Development Policy Review*19 (4):437-448.

Engelhardt, Robin. 2007. When Knowledge-Worlds Collide. Available: http://www.dpu.dk/en/newsandevents/news/article/artikel/when_knowledge_worlds_collide/. [Accessed 22.03.2012].

Enns, Charis. 2014. Knowledge in Competition: Knowledge Discourse at the World Bank during the Knowledge for Development Era. *Global Social Policy* Prepublished January 8, 2014 DOI 10.1177/1468018113516968.

Epperson, Cynthia K. 2010. An Analysis of the Community College Concept in the Socialist Republic of Viet Nam. University of Missouri- St. Louis, Missouri.

Escalada, M. M., K. L. Heong, and Ho Van Chien. 2009. Extension Officials' Responses to Brown Planthopper/Virus Outbreaks: FGD Report. Available http://ricehoppers.net/wp-content/uploads/2009/03/report-fgd-with-extension-officials-feb-09.pdf [Accessed 15.05.2012].

Escalada, M. M., K. L. Heong, N. H. Huan, and H. V. Chien. 2009. Changes in Rice Farmers' Pest Management Beliefs and Practices in Vietnam: An Analytical Review of Survey Data from 1992 to 2007. In *Planthoppers: new threats to the sustainability of intensive rice production systems in Asia*, edited by K. L. Heong and B. Hardy. Los Baños: International Rice Research Institute.

Escobar, Arturo. 1995. *Encountering Development: The Making and Unmaking of the Third World*. Princeton: Princeton University Press.

Escobar, Arturo. 2011. Sustainability: Design for the Pluriverse. *Development* 54 (2):137-140.

Estellès, Pedro, Heidi Jensen, Laura Sánchez, and Gianina Vechiu. 2002. *Sustainable Development in the Mekong Delta.* Aarhus: Center for Environmental Studies.

Esteva, Gustavo. 1992. Development. In *The Development Dictionary: A Guide to Knowledge as Power*, edited by W. Sachs. London: Zed.

Etzkowitz, Henry, and Loet Leydesdorff. 2000. The dynamics of innovation: from National Systems and "Mode2" to a Triple Helix of university–industry–government relations. *Research Policy* 29:109-123.

Etzkowitz, Henry. 2008. *The Triple Helix: University-Industry-Government Innovation in Action*. New York and London: Routledge

Eucker, Dennis. 2011. Development and Climate Change in the Mekong River Delta - A Case Study on Poverty, Vulnerability, and How Adaptive Capacity Can Be Enhanced. University of Hamburg, Hamburg.

Evers, Hans-Dieter and Caleb Wall. 2011. Knowledge Loss: Managing Local Knowledge in Rural Uzbekistan. In *Beyond the Knowledge Trap: Developing Asia's Knowledge-Based Economies,* edited by Thomas Menkhoff, Hans-Dieter Evers, Yue Wah Chay, and Eng Fong Pang. Singapore and London: World Scientific.

Evers, Hans-Dieter and Simon Benedikter. 2009. Hydraulic Bureaucracy in a Modern Hydraulic Society: Strategic Group Formation in the Mekong Delta, Vietnam. *Water Alternatives* 2 (3):416-439.

Evers, Hans-Dieter, and Solvay Gerke. 2005. Knowledge is Power: Experts as Strategic Group. In *ZEF Working Paper Series*. Bonn.

Evers, Hans-Dieter, and Solvay Gerke. 2009. Strategic Group Analysis. In *ZEF Working Paper Series,* No. 34. Bonn.

Evers, Hans-Dieter, and TatjanaBauer. 2009. Emerging Epistemic Landscapes: Knowledge Clusters in Ho Chi Minh City and the Mekong Delta. In *ZEF Working Paper Series*, No. 48. Bonn.

Evers, Hans-Dieter, Markus Kaiser, and Christine Müller. 2009. Knowledge in Development: Epistemic Machineries in a Global Context. *International Social Science Journal* 60 (195):55-68.

Evers, Hans-Dieter, Solvay Gerke, and Thomas Menkhoff. 2006. Little-Understood Knowledge Trap. *Development and Cooperation* 33 (6):246-247.

Evers, Hans-Dieter, Sven Genschick, and Benjamin Schraven. 2009. Constructing Epistemic Landscapes: Methods of GIS-Based Mapping. In *ZEF Working Paper Series*, No. 44. Bonn.

Evers, Hans-Dieter. 1987. The Bureaucratization of Southeast Asia. *Comparative Studies in Society and History* 29 (4):666-685.

Evers, Hans-Dieter. 2000. Globalization, Local Knowledge, and the Growth of Ignorance: The Epistemic Construction of Reality. *Southeast Asian Journal of Social Science* 28 (1):13-22.

Evers, Hans-Dieter. 2003. Transition towards a Knowledge Society: Malaysia and Indonesia in Comparative Perspective. *Comparative Sociology* 2 (2):355-373.

Evers, Hans-Dieter. 2005. Global Knowledge: The Epistemic Culture of Development. In *Local and Global: Social Transformation in Southeast Asia*, edited by Riaz Hassan. Leiden, Boston: Brill.

Evers, Hans-Dieter. 2008. Knowledge Hubs and Knowledge Clusters: Designing a Knowledge Architecture for Development. In In *ZEF Working Paper Series*, No. 27. Bonn.

Fabres, Boris. 2011. Think Global, Act Global in the Mekong Delta? Environmental Change, Civil Society, and NGOs. In *Environmental Change and Agricultural Sustainability in the Mekong Delta*, edited by Mart A. Stewart and Peter A. Coclanis. The Netherlands: Springer.

FAO. 2010. Duck Farming Systems and Avian Influenza in the Mekong Delta of Viet Nam, by Bui Xuan Men. In *FAO Smallholder Poultry Production*, Paper No. 1. Rome.

Feldman, M., and M. Kelly. 2006. The Ex Ante Accessment of Knowledge Spillovers: Government R&D Policy, Economic Incentives and Private Firm Behaviour. *Research Policy* 35:1509-1521.

Feng, Weizhe, Daoliang Li, Yanqing Duan, and Zetian Fu. 2010. A Survey of Stickiness of Agriculture Knowledge Acquisition in China. *Sensor Letters* 8 (1):198-202.

Figueiredo, António Dias de. 2005. Learning Contexts: a Blueprint for Research. *Interactive Educational Multimedia* 11 (October 2005):127-139

Finch, Helen, and Jane Lewis. 2003. Focus Groups. In *Qualitative Research Practice: A Guide for Social Science Students and Researcher*, edited by Jane Ritchie and Jane Lewis. London, Thousand Oaks, New Delhi: Sage Publications.

Fliaster, Alexander. 2003. Cross-Hierarchical Interconnectivity: Forms, Mechanisms and Transformation of Leadership Culture. Paper read at Knowledge Management Aston Conference; KMAC 2003.

Foos, Ted, Gary Schum, and Sandra Rothenberg. 2006. Tacit knowledge transfer and the knowledge disconnect. *Journal of Knowledge Management* 10 (1):6-18.

Foss N., and S. Michailova, eds. 2009. *Knowledge governance*. Oxford University Press.

Foss, Nicolai J. 2007. Knowledge Governance in a Dynamic Global Context: The Center for Strategic Management and Globalization at the Copenhagen Business School. *European Management Review 4* (3):183-191.

Gardiner, Michael. 2006. Everyday Knowledge. *Theory, Culture and Society* 23:205-207.

Garschagen, Matthias, Javier Revilla Diez, Dang Kieu Nhan, and Frauke Kraas. 2012. Socio-Economic Development in the Mekong Delta: Between the Prospects for Progress and the Realms of Reality. In *The Mekong Delta System: Interdisciplinary Analyses of a River Delta*, edited by F. G. Renaud and C. Kuenzer. Dordrecht: Springer.

Genschick, Sven. 2011. Pangasius at Risk: Governance in Farming and Processing, and the Role of Different Capital. In *ZEF Working Paper Series,* No. 85. Bonn

Gharajedaghi, Jamshid. 2011. *Systems Thinking: Managing Chaos and Complexity - A Platform for Designing Business Architecture.* Morgan Kaufmann

Gherardi, Silvia, and Davide Nicolini. 2002. Learning the Trade. A Culture of Safety in Practice. *Organization* 9 (2):191-223.

Giddens, Anthony, and Christopher Pierson. 1998. *Conversations with Anthony Giddens: Making Sense of Modernity*. Stanford, California: Stanford University Press.

Giddens, Anthony. 1979. *Central Problems in Social Theory: Action, Structure, and Contradiction in Social Analysis*. Los Angeles, CA: University of California Press.

Giddens, Anthony. 1984. *The Constitution of Society: Outline of the Theory of Structuration*. Cambridge: Polity Press.

Giddens, Anthony. 1987 *Social Theory and Modern Sociology*.Cambridge: Polity Press.

Giddens, Anthony. 1990. *The Consequences of Modernity*. Cambridge: Polity Press in association with Blackwell

Giunchiglia, Fausto, Biswanath Dutta, Vincenzo Maltese, and Feroz Farazi. 2011. A Facet-Based Methodology for the Construction of a Large-Scale Geo-Spatial Ontology. DISI - Università di Trento, Trento, Italy.

Glanville, Ranulph. 2005. A (Cybernetic) Musing: Certain Propositions Concerning Prepositions. *Cybernetics and Human Knowing* 12 (3):87-95.

Glanville, Ranulph. 2006. Construction and Design. *Constructivist Foundations* 1 (3):61-66.

Grabher, Gernot. 2006. Trading Routes, Bypasses, and Risky Intersections: Mapping the Travels of 'Networks' between Economic Sociology and Economic Geography. *Progress in Human Geography,* 30:163-189.

Grammig, Thomas. 2002. *Technical Knowledge and Development Observing: Aid Projects and Processes*. London and New York: Routledge.

Granovetter, Mark. 1985. Economic Action and Social Structure: The Problem of Embeddedness. *American Journal of Sociology* 91 (3):481-510.

Gray, David E. 2004. *Doing Research in the Real World*. London, Thousand Oaks, New Delhi: Sage Publications.

Grischow, Jeff, and Glenn H. McKnight. 2003. Rhyming Development: Practising Post-Development in Colonial Ghana and Uganda. *Journal of Historical Sociology* 16 (4):517-49.

Gross, Matthias. 2007. The Unknown in Process: Dynamic Connections of Ignorance, Non-Knowledge and Related Concepts. *Current Sociology* 55 (5):742-759.

GSO (General Statistics Office). 2012. *Results of the 2011 Rural, Agricultural and Fishery Census*. Hanoi: Statistical Publishing House.

Gunderson, Lance H., C. S. Holling, and Stephen S. Light, eds. 1995. *Barriers and Bridges to the Renewal of Ecosystem and Institutions*. New York: Columbia University Press.

Hall, Peter A., and Rosemary C. R. Taylor. 1996. Political Science and the Three New Institutionalisms. *Political Studies* XLIV (1996):936-957.

Hall, Peter M. 2003. Interactionism, Social Organization, and Social Processes: Looking Back and Moving Ahead. *Symbolic Interaction* 26 (1):33-55.

Hanafin, S. 2004. Review of Literature on the Delphi Technique. Available http://www.omcya.ie/documents/publications/Delphi_Technique_A_Literature_Review.pdf [Accessed 10.01. 2012].

Hansen, William B., Eric Reese, Kelvin S. Bryant, Dana Bishop, Cheryl H. Wyrick, and Douglas I. Dyreng. 2008. *Network Genie User's Manual*. Tanglewood Research, Inc.

Harcourt, Wendy. 2011. Editorial: The Time is Now. *Development* 54 (2):135–136.

Heiman, Bruce, Jackson Nickenson, and Todd Zenger. 2009. Governing Knowledge Creation: A Problem-Finding and Problem-Solving Perspective. In *Knowledge Governance: Processes and Perspectives*, edited by Nicolai. J. Foss and Snejina Michailova. Oxford: Oxford University Press.

Hennink, Monique M. 2007. *International Focus Group Research: A Handbook for the Health and Social Sciences*. Cambridge: Cambridge University Press.

Heong, K. L., M. M. Escalada, N. H. Huan, and V. Mai. 1998. Use of Communication Media in Changing Rice Farmers' Pest Management in the Mekong Delta, Vietnam. *Crop Protection* 17 (5):413-425.

Heong, K. L., M. M. Escalada, N. H. Huan, H. V. Chien, and P. V. Quynh. 2010. Scaling out Communication to Rural Farmers: Lessons from the "Three Reductions, Three Gains" Campaign in Vietnam. In *Research to Impact: Case Studies for Natural Resource Management for Irrigated Rice in Asia*, edited by Florencia G. Palis, Grant R. Singleton, Madonna C. Casimero, and Bill Hardy. Los Baños: International Rice Research Institute.

Heong, K. L., M. M. Escalada, N. H. Huan, V. H. Ky Ba, P. V. Quynh, L. V. Thiet, and H. V. Chien. 2008. Entertainment-Education and Rice Pest Management: A Radio Soap Opera in Vietnam. *Crop Protection* 27 (10):1392-1397.

Herbst, Susanne, Simon Benedikter, U. Koester, N. Phan, C. Berger, A. Rechenburg, and T. Kistemann. 2009. Perception of Water, Sanitation and Health: A Case Study from the Mekong Delta, Vietnam. *Water Science and Technology* 60 (3):699-707.

Hesse-Biber, Sharlene Nagy, and Patricia Leavy. 2005. *The Practice of Qualitative Research (2nd ed.)*. Thousand Oaks, London, New Delhi: Sage Publications.

Hicks, Richard, Ronald Dattero, and S. D. Galup. 2007. A Metaphor for Knowledge Management: Explicit Islands in a Tacit Sea. *Journal of Knowledge Management* 11 (1):5-16.

Hieu Minh. 2011. Luong thu "bat" an va cau chuyen nhat nong nhi si (Food "insecurity" and the "farmers first, scholars second" story). *Vietnamweek* 04.05.2011. Available http://tuanvietnam.vietnamnet.vn/2011-04-28-luong-thuc-bat-an-va-chuyen-nhat-nong-nhi-si. [Accessed on 16.11.2011].

Hirsch, Philip, Naomi Carrard, Fiona Miller, Andrew Wyatt. 2006. *Water Governance in Context: Lessons for Development Assistance*. Australian Mekong Resource Centre, University of Sydney.

Ho Van Chien, Nguyen Huu Huan, and Le Quoc Cuong. 2012. "Escape Strategy" can successfully manage BPH and virus disease in the Mekong. Rice Planthopper Project. Available http://ricehoppers.net/2012/09/escape-strategy-can-successfully-manage-bph-and-virus-disease-in-the-mekong/ [Accessed on 30.09.2012].

Ho, Van Chien, and M. M. Escalada. 2011. Ecological Engineering TV Series in Vinh Long, Vietnam. Available http://ricehoppers.net/2011/02/ecological-engineering-tv-series-in-vinh-long-vietnam/. [Accessed on 01 April 2012].

Hoang Mai. 2012. Xuong giong sai lich, lua he thu nhiem benh (Breaking the sowing calendar, summer-autumn rice crops got diseases). *Dan Viet* 16.04.2012. Available http://danviet.vn/nong-thon-moi/xuong-giong-sai-lich-lua-he-thu-nhiem-benh/84400p1c34.htm [Accessed on 20.05.2012].

Hoang, Ba Thinh. 2008. Cong nghiep hoa nong thon va nhung bien doi trong gia dinh nong thon hien nay: Nghien cuu truong hop xa Ai Quoc, Nam Sach – Hai Duong (Industrialisation of rural areas and changes in rural households in present: a case study in Ai Quoc Commune, Nam Sach – Hai Duong). Ky yeu hoi thao quoc te Viet Nam hoc lan thu ba (Proceedings of the 3rd International Conference on Vietnamese studies).

Howie, Charles Alexander. 2011. Co-operation and Contestation: Farmer-State Relations in Agricultural Transformation, An Giang Province, Vietnam. University of London, London.

Howie, Charles. 2005. High Dykes in the Mekong Delta in Vietnam Bring Social Gains and Environmental Pains. *Aquaculture News* 32 :15-17.

Hsu, Chia-Chien, and Brian A. Sandford. 2007. The Delphi Technique: Making Sense of Consensus. *Practical Assessment, Research & Evaluation* 12 (10):1-8.

Huang, Chung-Ming, Han-Chao Chang, and Steven Henderson. 2008. Knowledge Transfer Barriers between Research and Development and Marketing Groups within Taiwanese Small- and Medium-Sized Enterprise High-Technology New Product Development Teams. *Human Factors and Ergonomics in Manufacturing* 18 (6):621-627.

Huynh Loi, and An Binh. 2013. Dao tao nghe nong thon o DBSCL: Muc tieu ra roi thuc te (Rural Vocational Training in the Mekong Delta: Impractical Goals). *Sai Gon Giai Phong Online* 01.05.2013. Available http://www.sggp.org.vn/laodongvieclam/2013/5/317179/. [Accessed on 15.05.2013]

Huynh Phan. 2012. Chien luoc nong nghiep moi hay giac mo cua ong vien truong (The New Agriculture Strategy or Dream of the Research Institute Director) *TuanVietnam.net* 12.04.2012. Available http://tuanvietnam.vietnamnet.vn/2012-04-11-chien-luoc-nong-nghiep-moi-hay-giac-mo-cua-ong-vien-truong [Accessed 10.05.2012].

Huynh, Q. Tin, Paul C. Struik, Lisa L. Price, Nguyen P. Tuyen, Nguyen P. Hoan, and Heleen Bos. 2010. Increase of Farmers' Knowledge through Farmer Seed Production Schools in Vietnam as Assessed on the Basis of Ex-ante and Ex-post Tests. *Journal of Agricultural Education and Extension* 16 (3):229 -247.

Huynh, Tran Quoc. 2010. Participatory Agricultural Extension Programme - PAEX: A Guide for Farmers' Groups. Vietnam: VVOB, IAS and MDI.

Ikeguchi, Akiko, Lam My Lan, and Duong Nhut Long. 2008. The Rice-Fish Aquaculture System and Marketing in the Mekong Delta, Vietnam. *Journal of the Faculty of Education and Human Sciences* 10 :11-27.

Immergut, Ellen M. 1998. The Theoretical Core of the New Institutionalism.*Politics & Society* 26 (1):5-34.

Inkpen, Andrew C., and Eric W. K. Tsang. 2005. Social Capital, Networks, and Knowledge Transfer. *Academy of Management Review* 30 (1):146-165.

Jagannathan, Radha, Michael J. Camasso, Stefan G. Mend, Jessica Varela, and Arohiben Shah. 2011. University-Community Partnering Using a Targeted Mutual-Interests Approach. *Community Development* 42 (3):410-423.

Jakimow, Tanya. 2008. Answering the Critics: The Potential and Limitations of the Knowledge Agenda as a Practical Response to Post-Development Critique. *Progress in Development Studies* 8 (4):311-23.

Jashapara, Ashok. 2007. Moving beyond tacit and explicit distinctions: a realist theory of organizational knowledge. *Journal of Information Science* 33 (6):752-766.

Jasimuddin, Sajjad M., and Zuopeng Zhang 2011. Storing Transferred Knowledge and Transferring Stored Knowledge. *Information Systems Management* 28 (1):84-94.

Jelavic, Matthew. 2011. Socio-Technical Knowledge Management and Epistemological Paradigms: Theoretical Connections at The Individual and Organisational Level. *Interdisciplinary Journal of Information, Knowledge, and Management* 6 (1):1-16.

Jensen, Torben Elgaard. 2012. Intervention by Invitation: New Concerns and New Versions of the User in STS. *Science Studies* 25 (1):13-36.

Jin, Zhouying. 2005. *Global Technological Change: From Hard Technology to Soft Technology*. Bristol: Intellect Books.

Joshi, Kshiti D., Saonee Sarker, and Suprateek Sarker. 2007. Knowledge Transfer within Information Systems Development Teams: Examining the Role of Knowledge Source Attributes. *Decision Support Systems* 43 (2):322-335.

Juech, Claudia, and Evan S. Michelson. 2011. Rethinking the Future of Sustainability: From Silos to Systemic Resilience. *Development* 54 (2):199-201.

Julien, Heidi. 2008. Content Analysis. In *The Sage Encyclopedia of Qualitative Research Methods*, edited by Lisa M. Given. Los Angeles, London, New Delhi, Singapore: Sage Publications.

Käkönen, Mira. 2008. Mekong Delta at the Crossroads: More Control or Adaptation? *Ambio* 37 (3):205-212.

Kang, Minhyung, Young-Gul Kim, and Gee-Woo Bock. 2010. Identifying different antecedents for closed vs. open knowledge transfer. *Journal of Information Science* 36 (5):585-602.

Kenway, Jane, Elizabeth Bullen, Johannah Fahey, with Simon Robb. 2006. *Haunting the Knowledge Economy*. Oxon: Routledge.

Kerkvliet, Benedict J. Tria. 2005. *The Power of Everyday Politics. How Vietnamese Peasants Transformed National Policy*. London: Cornell University Press.

Kim, Beaumie. 2001. Social Constructivism. In *Emerging Perspectives on Learning, Teaching, and Technology*, edited by Michael Orey. Create Space Independent Publishing Platform.

Kimble, Chris, and Paul Hildreth. 2005. Dualities, distributed communities of practice and knowledge management. *Journal of Knowledge Management* 9 (4):102-113.

Kinchin, Ian M. 2010. Solving Cordelia's Dilemma: Threshold Concepts within a Punctuated Model of Learning. *Journal of Biological Education* 44 (2):53-57.

King, Nigel, and Christina Horrocks. 2010. *Interviews in Qualitative Research*. Los Angeles, London, New Delhi, Singapore, Washington DC: Sage Publications.

Klerkx, Laurens, Barbara van Mierlo, and Cees Leeuwis. 2012. Evolution of Systems Approaches to Agricultural Innovation: Concepts, Analysis and Interventions. In *Farming Systems Research into the 21st Century: The New Dynamic*, edited by Ika Darnhofer, David Gibbon, and Benoît Dedieu. Dordrecht: Springer.

Klerkx, Laurens, Marc Schut, Cees Leeuwis, and Catherine Kilelu. 2012. Advances in Knowledge Brokering in the Agricultural Sector: Towards Innovation System Facilitation. *DS Bulletin* 43(5):53-60.

Knickel, Karlheinz, Gianluca Brunori, Sigrid Rand, and Jet Proost. 2009. Towards a Better Conceptual Framework for Innovation Processes in Agriculture and Rural Development: From Linear Models to Systemic Approaches. *The Journal of Agricultural Education and Extension* 15 (2):131-146.

Knorr Cetina, K. 2001. Objectual practice. In *The Practice Turn in Contemporary Theory*, edited by T. R. Schatzki, K. Knorr Cetina and E. von Savigny. London: Routledge.

Knorr-Cetina, Karin. 1991. Epistemic Cultures: Forms of Reason in Science. *History of Political Economy* 23 (1991):105-122.

Knorr-Cetina, Karin. 1995. Laboratory Studies: The Cultural Approach to the Study of Science. In *Handbook of Science and technology Studies*, edited by S. Jasanoff, G. E. Markle, J. C. Petersen and T. J. Pinch. California, London, New Delhi: Sage Publications.

Knorr-Cetina, Karin. 1999. *Epistemic Culture: How the Sciences Make Knowledge*. Cambridge, MA: Harvard University Press.

Knorr-Cetina, Karin. 2007. Culture in Global Knowledge Societies: Knowledge Cultures and Epistemic Cultures. *Interdisciplinary Science Reviews* 32 (4):361-375.

Kogan, Marcos. 1998. Integrated Pest Management: Historical Perspectives and Contemporary Developments. *Annual Review of Entomology* 43:243-270.

Koloskov, Alexandre. 2010. Managing Knowledge or Knowing in Practice? A Critical Review of Perspectives on Knowledge Management. *iSCHANNEL* 05 (2010):5-9.

Kovačič, Helena. 2008. The Process of Knowledge Transfer: Applying Situational and Network Data. *Metodološki zvezki* 5 (2):145-160.

Krippendorff, Klaus. 2004. *Content Analysis: An Introduction to Its Methodology*. Thousand Oaks, London, New Delhi: Sage Publications.

Kronenwett, Michael. 2009. *VennMaker 0.9.5 VIP Manual*. Trier: Universität Trier.

Krueger, Richard A., and Mary Anne Casey. 2000. *Focus Groups: A Practice Guide for Applied Research (3rd ed.)*. Thousand Oaks, London, New Delhi: Sage Publications.

La, Thi Nga, Zita Sebesvari, Fabrice Renaud, Ute Arnold, and Mathias Becker. 2012. Globalgap Rice Practice in the Mekong Delta: Opportunities and Challenges. Paper read at Tropentag 2012 on "Resilience of Agricultural Systems against Crises", at Göttingen-Kassel/Witzenhausen, Germany.

Lam, Alice. 2000. Tacit Knowledge, Organizational Learning and Societal Institutions: An Integrated Framework. *Organization Studies* 21 (3):487-513.

Lampe, Klaus. 1994. Rice Research for the 21st Century. In *Vietnam and IRRI: A Partnership in Rice Research,* edited by G. L. Denning and Vo-Tong Xuan. Manila: International Rice Research Institute.

Land, Ray, and Jan Meyer. 2010. Threshold Concepts and Troublesome Knowledge (5): Dynamics of Assessment. In *Threshold Concepts and Transformational Learning*, edited by Jan Meyer, Ray Land, and C. Baillie. Rotterdam: Sense Publishers.

Lans, Thomas, Pieter Seuneke, and Laurens Klerkx. 2013. Agricultural Entrepreneurship. In *Encyclopedia of Creativity, Invention, Innovation and Entrepreneurship,* edited by E. G. Carayannis. New York: Springer.

Laszlo, Kathia Castro, and Alexander Laszlo. 2002. Evolving Knowledge for Development: The Role of Knowledge Management in a Changing World. *Journal of Knowledge Management* 6 (4):400-412.

Latouche, Serge. 1993. *In the Wake of the Affluent Society: An Exploration of Post-Development*. London: Zed Books Ltd.

Latour, Bruno. 2005. *Reassembling the Social: An Introduction to Actor-Network Theory*. New York: Oxford University Press.

Le Meur, Pierre-Yves, and Timothée Leurent. 2006. Agrarian Colonisation and Frontier Politics in the Mekong Delta. *Moussons* 9-10 (2006):231-254.

Le, Anh Tuan, Chu Thai Hoanh, Fiona Miller, and Bach Tan Sinh. 2007. Floods and Salinity Management in the Mekong Delta, Vietnam. In *Challenges to Sustainable Development in the Mekong Delta: Regional and National Policy Issues and Research Needs*, edited by Tran Thanh Be, Bach Tan Sinh and Fiona Miller. Bangkok: The Sustainable Mekong Research Network.

Le, Anh Tuan. 2010. Impacts of Climate Change and Sea Level Rise to the Integrated Agriculture-Aquaculture System Iin the Mekong River Basin - A Case Study in the Lower Mekong River Delta in Vietnam. Paper read at International workshop on the "Climate Change Responses for Asia International Rivers: Opportunities and Challenges", at China.

Le, Dai Tri. 2003. Cau tieu ca vo co the bi dep bo? (Fishpond toilets can be abolished?). *Tuoi Tre Online* December 6, 2003. Available http://chuyentrang.tuoitre.vn/Vieclam/Index.aspx?ArticleID=11643&ChannelID=12 [Access 27.02.2012].

Le, Ngoc Thach, Maimunah Ismail, Jegak Uli, and Khairuddin Idris. 2007. Provincial and District Extension Agents in Mekong Delta, Vietnam: Perceived Differences in Extension Skills and Performance. *Journal of Global Business Management* 3 (2):7-16

Le, Nguyen Doan Khoi. 2011. Quality Management in the Pangasius Export Supply Chain in Vietnam: The Case of Small-Scale Pangasius Farming in the Mekong River Delta. Groningen: University of Groningen.

Le, Quang Minh. 2010. Mekong Delta: The Current and Future States. Paper read at the international conference Deltas in Times of Climate Change, 29 September - 1 October 2010, at Rotterdam, the Netherlands.

Le, Thanh Duong, Nguyen Duy Can, and Tran Thi Phan. 2005. Current Status of Integrated Crop-Animal Systems (ICAS) in Vietnam: A Case Study in the Mekong Deta. In *Integrated Crop-Animal Systems in Southeast Asia: Current Status and Prospects*, edited by M. A. Sombilla and B. Hardy. Manila: IRRI.

Le, Thi Viet Hoa, Nguyen Huu Nhan, Eric Wolanski, Tran Thanh Cong, and Haruyama Shigeko. 2007. The Combined Impact on the Flooding in Vietnam's Mekong River Delta of Local Man-Made Structures, Sea Level Rise, and Dams Upstream in the River Catchment. *Estuarine, Coastal and Shelf Science* 71 :110-116

Le, V. G. N. 2010. The Che Hoa Phuong Phap Khuyen Nong co Su Tham Gia o Tinh Ba Ria Vung Tau (Institutionalisation of Participatory Agricultural Extension in Ba Ria, Vung Tau Province). VVOB Vietnam (Flemish Association for Development Cooperation and Technical Assistance).

Le, Van Thang, Nguyen Dinh Huy, and Ho Ngoc Anh Tuan. 2011. Nghien cuu tac dong cua bien doi khi hau va xay dung mo hinh thich ung o vung trung thap tinh Thua Thien Hue (Research on Climate Change Impact and Adaptation Model Building in Thua Thien Hue Lowland). Paper read at Scientific Conference, at Duy Tan University, Danang.

Le, Xuan Thai, Huynh Quang Tin, and Huynh Nguyet Anh. 2011. Chon tao giong lua co su tham gia cua nong dan o Dong bang Song Cuu Long (Rice variety selection with the participation of farmers in the Mekong Delta). *Tap chi Khoa hoc*, Dai hoc Can Tho (Can Tho University Journal of Sciences) 19a :156-165.

Lee, Richard E, Felix Geyer, and Bernd R. Hornung. 2000. A Journal for Sociocybernetics. *Journal of Sociocybernetics* 1 (1):1-6.
Leeuwis, Cees and Noelle Aarts. 2011. Rethinking Communication in Innovation Processes: Creating Space for Change in Complex Systems. *The Journal of Agricultural Education and Extension* 17 (1):21-36.
Leischow, Scott J., Allan Best, William M. Trochim, Pamela I. Clark, Richard S. Gallagher, Stephen E. Marcus, & Eva Matthews. 2008. Systems Thinking to Improve the Public's Health. *American Journal of Preventive Medicine* 35 (2008):196-203.
Lemmer, E. M. 2009. Empowerment of Women Students through Educational Achievement: A Narrative Enquiry. *Africa Education Review* 6 (1):80-95.
Liamputtong, Pranee. 2009. *Qualitative Research Methods* (3rd ed.). Australia, New Zealand: Oxford University Press.
Liebowitz, Jay. 2001. *Knowledge Management: Learning from Knowledge Engineering*. Florida: CRC Press.
Linstone, Harold A., and Murray Turoff. 2002. Introduction. In *The Delphi method: Techniques and applications*, edited by Harold Linstone and Murray Turoff. MA: Addison-Wesley.
Liu, Weiping. 2006. Knowledge Exploitation, Knowledge Exploration, and Competency Trap. *Knowledge and Process Management* 13 (3):144-161.
Lomas, Jonathan. 2007. The In-between World of Knowledge Brokering. *BMJ* 334 :129-132.
Long, Norman, and Jinlong Liu. 2009. The Centrality of Actors and Interfaces in the Understanding of New Ruralities: A Chinese Case Study. *Journal of Current Chinese Affairs* 38 (4):63-84.
Long, Norman. 1992. From Paradigm Lost to Paradigm Regained? The Case for an Actor-Oriented Sociology of Development. In *Battlefields of Knowledge: The Interlocking of Theory and Practice in Social Research and Development*, edited by Norman Long and Ann Long. London: Routledge.
Long, Norman. 2001. *Development Sociology: Actor Perspectives*. London and New York: Routledge
Long, Norman. 2004. Actors, Interfaces and Development Intervention: Meanings, Purposes and Powers. In *Development Intervention: Actor and Activity Perspectives*, edited by Tiina Kontinen. Helsinki: Hakapaino Oy.
Loubaresse, Elodie. 2007. How does Context Influence Broker Role in Industrial Clusters? An Analysis in Terms of Embeddedness. Paper read at the Druid Summer Conference on Appropriability, Proximity, Routines and Innovation,at Copenhagen, Denmark.
Luksha, Pavel O. 2001. Society as a Self-Reproducing System. *Journal of Sociocybernetics* 2 (2): 13-36.
MacCurtain, Sarah M.; Patrick C. Flood, Nagarajan Ramamoorthy, Michael West, and Jeremy F. Dawson. 2010. The Top Management Team, Reflexivity, Knowledge Sharing and New Product Performance: A Study of the Irish Software Industry. *Creativity and Innovation Management* 19 (3):219-232.
Mackay, Peter, and Michael Russell 2011. Socialist Republic of Viet Nam: Climate Change Impact and Adaptation Study in the Mekong Delta (Co-financed by the Climate Change Fund and the Government of Australia). In *Technical Assistance Consultant's Report (Ca Mau Atlas)*. ADB
Mai, Van Nam. 2008. Hieu qua chan nuoi o dong bang song Cuu Long. (The Efficiency of Husbandry in the Mekong Delta). *Tap chi khoa hoc* (Journal of Science) 2008 (9):76-85.
March, James G., and Johan P.Olsen. 2005. Elaborating the "New Institutionalism". In *Working Paper*, No.11. University of Oslo: Center for European Studies.
MARD (Ministry of Agriculture and Rural Development). 2008. Bao cao tong ket hoat dong khuyen nong - khuyen ngu giai doan 1993-2008 va dinh huong hoat dong giai doan 2009-2020 (Report on national agricultural and aquacultural extension in 1993-2008 and orientations for 2009-2020). Hanoi: MARD.
Markovsky, Barry. 2000. Review of Karin Knorr Cetina's Epistemic Cultures: How the Sciences Make Knowledge. *Contemporary Sociology* 29 (3):556–557.
Marks, Brian J. 2010. Small Fry in a Big Ocean: Change, Resilience, and Crisis in the Shrimp Industry of the Mekong Delta of Viet Nam, Graduate College, the University of Arizona.
Marshall, Catherine, and Gretchen B. Rossman. 2006. *Designing Qualitative Research (4th ed.)*. Thousand Oaks, London, New Delhi: Sage Publications.
Marshall, Ray, and Marc Tucker. 1992. *Thinking for a Living: Education and the Wealth of Nations*. New York: Basic Books.

Marvasti, Amir B. 2004. *Qualitative Research in Sociology*. London, Thousand Oaks, New Delhi: Sage Publications.
Mason, Jennifer. 2002. *Qualitative Researching (2nd ed.)*. London, Thousand Oaks, New Delhi: Sage Publications.
Maton, Karl. 2003. Reflexivity, Relationism and Research: Pierre Bourdieu and the Epistemic Conditions of Social Scientific Knowledge. *Space and Culture 6 (1):52-65*.
Matteson, Patricia. C. 2000. Insect Pest Management in Tropical Asian Irrigated Rice. *Annual Review of Entomology* 45 :549-574.
Mazzotta, Tina, and W. Benjamin Myers. 2008. Language and Meaning: Symbolic Interactionism. Annual *USC Upstate Undergraduate Research Journal* 1 (2008):19-23.
McCullough, Ellen B., and Pamela A. Matson. 2011. Evolution of the Knowledge System for Agricultural Development in the Yaqui Valley, Sonora, Mexico. *Early Edition* 1:1-6.
McDermott, Richard, and Douglas Archibald. 2010. Harnessing Your Staff's Informal Networks. *Harvard Business Review*: 82-89.
McDonell, Gavan. 1997. Scientific and Everyday Knowledge: Trust and the Politics of Environmental Initiatives. *Social Studies of Science* 27 (6):819-863.
McKechnie, Lynne. 2008. Unstructured Observation. In *The SAGE Encyclopedia of Qualitative Research Methods*, edited by Lisa M. Given. Thousand Oaks, CA: SAGE Publications.
McWilliam, Peter. 2011. Farmer First Revisited: Innovation for Agricultural Research and Development. *Development in Practice* 21 (3):452-453.
Mead, George Herbert. 1934. *Mind, Self and Society (1st ed.)*. London: University of Chicago Press.
Meyer, Jan, and Ray Land. 2003. Threshold Concepts and Troublesome Knowledge: Linkages to Ways of Thinking and Practising within the Disciplines. In *Enhancing Teaching-Learning Environments in Undergraduate Courses Project*, Occasional Report 4. Edinburgh.
Meyer, Jan, and Ray Land. 2005. Threshold Concepts and Troublesome Knowledge (2): Epistemological Considerations and a Conceptual Framework for Teaching and Learning. *Higher Education* 49 (3):373-388.
Meyer, Jan, and Ray Land. 2006. Overcoming Barriers to Student Understanding: Threshold Concepts and Troublesome Knowledge. London and New York: Routledge.
Miller, Fiona, Nguyen Viet Thinh, and Do Thi Minh Duc. 1999. Resource management in the Vietnamese Mekong Basin. Available http://www.arc.murdoch.edu.au/wp/wp74.rtf [Accessed on 20.04.2012].
Mohamed, Mirghani, Michael Stankosky, and Mona Mohamed. 2009. An Empirical Assessment of Knowledge Management Criticality for Sustainable Development. *Journal of Knowledge Management* 13 (5): 271-286.
Molenaar, Henk, Louk Box, and Rutger Engelhard, eds. 2009. *Knowledge on the Move: Emerging Agendas for Development-oriented Research*. Leiden: International Development Publications.
Molle, François, Peter P. Mollinga, and Philippus Wester. 2009. Hydraulic Bureaucracies and the Hydraulic Mission: Flows of Water, Flows of Power. *Water Alternatives* 2 (3): 328-349.
Mollinga, Peter P. 2010. Transdisciplinary Method for Water Pollution and Human Health Research. In *ZEF Working Paper Series*, No. 59. Bonn.
Morgan, David L. 1997. *Focus Groups as Qualitative Research (2nd ed.)*. Thousand Oaks, London, New Delhi: Sage Publications.
Mørk, Bjørn Erik, Margunn Aanestad, Ole Hanseth, and Miria Grisot. 2008. Conflicting Epistemic Cultures and Obstacles for Learning across Communities of Practice. *Knowledge and Process Management* 15 (1):12-23.
Moustaghfir, Karim, and Giovanni Schiuma. 2013. Knowledge, Learning, and Innovation: Research and Perspectives. *Journal of Knowledge Management* 17 (4):495-510.
Mulder, Martin, and Angela Pachuau. 2011. How Agricultural is Agricultural Education and Extension?.*The Journal of Agricultural Education and Extension* 17 (3):219-222.
Müller-Merbach, Heiner. 2005. How to Structure Knowledge: Aristotle and the Four Causes. *Knowledge Management Research & Practice* 3 (3):183-184.

Müller-Merbach, Heiner. 2006. Three Kinds of Knowledge, Reflecting Kant's Three Kinds of Action. *Knowledge Management Research & Practice* 4 (1):73-74.
NAEC (National Agricultural Extension Center). 2005. National Agricultural Extension Report 1993-2005. Hanoi: NAEC.
NAEC (National Agricultural Extension Center). 2006. National Agricultural Extension Report 2006. Hanoi: NAEC.
NAEC (National Agricultural Extension Center). 2007. National Agricultural Extension Report 2007. Hanoi: NAEC.
NAEC (National Agricultural Extension Center). 2008. National Agricultural Extension Report 2008. Hanoi: NAEC.
NAEC (National Agricultural Extension Center). 2009. National Agricultural Extension Report 2009. Hanoi: NAEC.
NAEC (National Agricultural Extension Center). 2010. National Agricultural Extension Report 2010. Hanoi: NAEC.
NAEC (National Agricultural Extension Center). 2012. Bao cao tong ket cong tac khuyen nong toan quoc 2010 va trien khai ke hoach khuyen nong 2012 (Report on national agricultural extension in 2010 and implementation of the plan for 2012). Hanoi: NAEC.
NAVG (National Association of Vietnamese Gardeners). 1995. Intensive Small-Scaled Farming in Vietnam. *ILEIA Newsletter* 11 (1):4-5.
Nee, Victor, and Paul Ingram. 1998. Embeddedness and Beyond: Institutions, Exchange, and Social Structure. In *The New Institutionalism in Sociology*, edited by Mary C. Brinton and Victor Nee. New York: Russell Sage Foundation.
Nee, Victor. 2005. New Institutionalism, Economic and Sociological. In *Handbook for Economic Sociology (2nd ed.*), edited by Neil J. Smelser and Richard Swedberg. Princeton: Princeton University Press.
Nerfin, Marc, ed. 1977. *Another Development: Approaches and Strategies*. Uppsala: Dag HammarskjoÈld Foundation.
Nesbitt, H. J. 2005. Water Used for Agriculture in the Lower Mekong Basin. In *MRC Discussion Paper*. Vientiane.
Neuendorf, Kimberly A. 2002. *The Content Analysis Guidebook*. Thousand Oaks, London, New Delhi: Sage Publications.
Ngo, Van Le. 2010. Lang va quan he dong ho cua nguoi Viet Nam Bo (Villages and kinship of Southern Vietnamese). In *Hien dai va dong thai cua truyen thong o Viet Nam: Nhung cach tiep can nhan hoc (Modernity and dynamics of tradition: Anthropological approaches)*, edited Luong Van Hy, Ngo Van Le, Nguyen Van Tiep, and Phan Thi Yen Tuyet. Ho Chi Minh: Nha xuat ban Dai hoc Quoc gia.
Ngoc Ha. 2013. Mekong Delta Provinces Restructuring toward Sustainable Development. *VASEP* 23.09.2013. Available http://www.seafood.vasep.com.vn/Daily-News/51_8266/Mekong-Delta-provinces-restructuring-toward-sustainable-development.htm [Accessed on 25.09.2013].
Nguyen, Duy Can, Le Thanh Duong, Nguyen Van Sanh, and Fiona Miller. 2007. Livelihoods and Resource Use Strategies in the Mekong Delta. In *Challenges to Sustainable Development in the Mekong Delta: Regional and National Policy Issues and Research Needs*, edited by Tran Thanh Be, Bach Tan Sinh and Fiona Miller. Bangkok: The Sustainable Mekong Research Network.
Nguyen, Duy Linh. 2004. Participatory Extension in Selected Development Organizations Intervening in the Northern Mountainous Region of Vietnam. Stuttgart: Institute for Agricultural Economics and Social Sciences in the Tropics and Subtropics.
Nguyen, Huu Chiem. 1994. Former and Present Cropping Patterns in the Mekong Delta. *Southeast Asian Studies* 31 (4):345-384.
Nguyen, Huu Dung, and Tran Thi Thanh Dung. 1999. Economic and Health Consequences of Pesticide Use in Paddy Production in the Mekong Delta, Vietnam. EEPSEA Research. Singapore, IDRC.
Nguyen, Huu Hieu. 2012. Dong bang song Cuu Long chua bao gio co nuoc lu (The Mekong Delta has never had flood water). Available www.hkhls.dongthap.gov.vn. [Accessed on 06.11.2012].

Nguyen, Huu Huan, L. V. Thiet, H. V. Chien, K. L. Heong. 2005. Farmers' Participatory Evaluation of Reducing Pesticides, Fertilizers and Seed Rates in Rice Farming in the Mekong Delta. *Vietnam Crop Protection* 24:457-464.

Nguyen, Huu Huan, V. Mai, M. M. Escalada, and K. L. Heong. 1999. Changes in Rice Farmers' Pest Management in The Mekong Delta, Vietnam. *Crop Protection* 18 (1999): 557-563.

Nguyen, Huu Huan. 2001. Vietnam Promotes Solutions to Pesticide Risks. *Pesticides News* 53:6-7.

Nguyen, Huu Ninh, Vu Kien Trung, and Nguyen Xuan Niem. 2007. Flooding in Mekong River Delta, Viet Nam. In *Human Development Report 2007/2008*.

Nguyen, Ngoc De, Tomohiro Uchiyama, and Kotaro Ohara. 2005. Vietnam Agricultural Extension: Its Roles, Problems and Opportunities. *Bulletin of Faculty of Bioresources* 32:79-94.

Nguyen, Ngoc De. 2006. *Farmers, Agriculture and Rural Development in the Mekong Delta of Viet Nam*. Hanoi: Education Publishing House.

Nguyen, Quy Hanh, and Hans-Dieter Evers. 2011. Farmers as Knowledge Brokers: Analysing Three Cases from Vietnam's Mekong Delta. In *ZEF Working Paper Series*, No. 86. Center for Development Research, University of Bonn.

Nguyen, Quy Hanh, and Nguyen Ngoc Khanh Van 2012. The Formation of Knowledge-based Civil Society Organisations: Cases in Vietnam. Paper read at 4S/EASST Conference, 17-20 October 2012, at Copenhagen.

Nguyen, Quy Hanh, and Nguyen Ngoc Khanh Van. 2011. The Common Good for the Few: Double Marginalisation in Ethnic Minorities in Vietnam. Paper read at Tropentag 2011 "Conference on International Research on Food Security, Natural Resource Management and Rural Development", October 5 - 7, 2011, at University of Bonn, Bonn.

Nguyen, Quy Hanh, Vo Dinh Anh Tuan, and Nguyen Ngoc Khanh Van. 2013. Beyond Interdisciplinary: Putting Systems Thinking into Climate Change and Development Practice in Thua Thien Hue Province. Paper read at The 5th "Engaging with Vietnam: An Interdisciplinary Dialogue" Conference: Integrating Knowledge: The Multiple Ways of Knowing Vietnam, 17-18 December 2013, at Hanoi, Vietnam.

Nguyen, Quy Hanh. 2007. Putting Community First: Tourism for Development in Doi Village, Central Vietnam, the University of Queensland, Australia.

Nguyen, T. K. 2009. Lowland Rice System and the Mekong Delta Economy, Vietnam. Paper read at CLRRI-IRRI International Conference: Better Rice, Better Environment and Better Life, at Can Tho.

Nguyen, Thanh Binh. 2008. Development of Agricultural Extension in the Mekong Delta of Vietnam, Ghent University, Belgium.

Nguyen, Thanh Tuyen. 2010. *Knowledge Economy and Sustainable Economic Development: A Critical Review*. New York: De Gruyter Saur.

Nguyen, Van Khanh and Nguyen Lan Dung. 2006. Dac trung kinh te hang hoa o Ha Noi thoi Phap thuoc (Features of Hanoi's Commodity Oriented Economy during the french rule). *Nghien Cuu Kinh Te* (Economic Studies) 9 (340):66-73

Nguyen, Van Luat. 2008. Ky Thuat Gieo Sa Lua Theo Hang bang May Keo Tay: Buoc Di Thich Hop trong Co Gioi Hoa Nong Nghiep (Row Seeding Technology: An Appropriate Stage towards Agricultural Mechanisation). *Kinh te Nong thon* (Rural Economics). Available: http://www.kinhtenongthon.com.vn/Story/khoahoccn/2008/11/15972.html [Accessed on 01.05.2012].

Nguyen, Van Van. 2010. Agricultural Extension System of Vietnam. Vietnam Country Report. Available http://www.afaci.org/pub/af_pubboardview.asp?boardid=91&boardtype=N012&boardsubtype=REPORTS&boardidx=65&boardstep=0&boardorder=0&searchtype=&searchword=&curpage=1 [Accessed on April 10, 2013].

Nguyen, Vinh Thanh, and Le Sy Tho. 2010. *Nong Nghiep Viet Nam sau khi Gia Nhap WTO: Thoi Co va Thach Thuc (Vietnam's Agriculture Post-WTO Accession: Opportunities and Challenges)*. Hanoi: Nha xuat ban Lao dong-Xa hoi (Labour and Society Publisher).

Nicetic, Oleg, Elske van de Fliert, Ho Van Chien, Vo Mai, and Le Cuong. 2010. Good Agricultural Practice (GAP) as a Vehicle for Transformation to Sustainable Citrus Production in the Mekong Delta of Vietnam. Paper read at 9th European IFSA Symposium, 4-7 July 2010, at Vienna, Austria.
Nimmo, Richie. 2011. Actor-Network Theory and Methodology: Social Research in a More-Than-Human World. *Methodological Innovations Online* 6 (3):108-119.
Nixon, Judy C., and Marilyn M. Helms. 2002. Corporate Universities vs Higher Education Institutions. *Industrial and Commercial Training* 34:144-150.
Nokes, Timothy J. 2009. Mechanisms of knowledge transfer. *Thinking & Reasoning* 15 (1):1-36.
Nonaka, Ikujiro, and Hirotaka Takeuchi. 1995. *The Knowledge-Creating Company*: *How Japanese Companies Create the Dynamics of Innovation*. New York: Oxford University Press.
Nonaka, Ikujiro, and Noboru Konno. 1998. The Concept of "Ba": Building a Foundation for Knowledge Creation. *California Management Review* 40 (3):40-54.
Nonaka, Ikujiro, and Ryoko Toyama. 2002. A Firm as a Dialectic Being: Toward the Dynamic Theory of the Firm. *Industrial and Corporate Change* 11 (5): 995-1109.
Nustad, Knut G. 2001. Development: The Devil We Know? *Third World Quarterly* 22 (4):479-489.
OECD. 1996. *The Knowledge-based Economy*. Paris: OECD.
OECD. 2004. *Innovation in the Knowledge Economy: Implications for Education and Learning*. Paris: OECD Publications Service.
Ogunsumi, Lucia Omobolanle. 2010. Synthesis of Extension Models and Analysis for Sustainable Agricultural Technologies: Lessons for Extension Workers in Southwest, Nigeria. *Agriculture and Biology Journal of North America* 1 (6):1187-1192.
Oldham, Geoffrey, and Rob McLean. 1997. Approaches to Knowledge-Brokering. *IISD Publications*.
PAEC (Provincial Agricultural Extension Center). 2005. Provincial Agricultural Extension Report 2005. Can Tho: PAEC.
PAEC (Provincial Agricultural Extension Center). 2006. Provincial Agricultural Extension Report 2006. Can Tho: PAEC.
PAEC (Provincial Agricultural Extension Center). 2007. Provincial Agricultural Extension Report 2007. Can Tho: PAEC.
PAEC (Provincial Agricultural Extension Center). 2008. Provincial Agricultural Extension Report 2008. Can Tho: PAEC.
PAEC (Provincial Agricultural Extension Center). 2009. Provincial Agricultural Extension Report 2009. Can Tho: PAEC.
PAEC (Provincial Agricultural Extension Center). 2010. Provincial Agricultural Extension Report 2010. Can Tho: PAEC.
Paris, Thelma R., and Truong Thi Ngoc Chi. 2005. The Impact of Row Seeder Technology on Women Labor: A Case Study in the Mekong Delta, Vietnam. *Gender Technology and Development* 9 (2):157-184.
Patton, Michael Quinn. 2002. *Qualitative Research and Evaluation Methods*. 3rd edn. Thousand Oaks, London, New Delhi: Sage Publications.
Pedersen, David Budtz. 2012. *Defining the Public Good: Revisiting the Grand Challenge Approach in STI Policy*. Paper read at o 'New perspectives on enduring research questions in university-society interaction?' Interact-Uni EU-SPRI Conference, 9th-11th May 2012, at University of Twente, the Netherlands.
Perecman, Ellen, and Sara R. Curran. 2006. *A Handbook for Social Science Field Research: Essays and Bibliographic Sources on Research Design and Methods*. Thousand Oaks, London, New Delhi: Sage Publications.
Perkins, David N. 1999. The Many Faces of Constructivism. *Educational Leadership* 57 (3):6-11.
Peschl, Markus F. 2007. Triple-Loop Learning as Foundation for Profound Change, Individual Cultivation, and Radical Innovation: Construction Processes beyond Scientific and Rational Knowledge. *Constructivist Foundations* 2 (2-3):136-145.
Peschl, Markus F., and Thomas Fundneider. 2008. *Emergent Innovation and Sustainable Knowledge Co-creation. A Socio-Epistemological Approach to "Innovation from within"*. In *The Open Knowledge Society: A Computer Science and Information Systems Manifesto*, edited by M. D. Lytras, J.M. Carroll, E. Damiani et al. Berlin, Heidelberg: Springer.

Pham Cong Huu, Eckart Ehlers, and Saravanan V. Subramanian. 2009. Dyke System Planning: Theory and Practice in Can Tho City, Vietnam. In *ZEF Working Paper Series*, No. 47. Bonn.

Pham Cong, and Quoc Dung. 2009. Cung co lai "lien ket 4 nha" (Reinforcing "the quadruple association"). *Nguoi Lao Dong* 11.1.2009. Available http://nld.com.vn/kinh-te/cung-co-lai-lien-ket-4-nha-20090111102727295.htm [Accessed on 20.07.2012].

Pham, Cao Duong. 1985. *Vietnamese Peasants under French Domination, 1861-1945*. Berkeley, California: Center for South and Southeast Asia Studies, University of California.

Pham, Cong Huu. 2006. Participatory Technology Development for Farmers in the Mekong Delta, Vietnam: Case study Hoa Nghia Farmer Club, Hoa Nghia Commune, Cho Lach District, Ben Tre Province, Swedish University of Agricultural Sciences, Sweden.

Pham, Cong Huu. 2012. *Floods and Farmers: Politics, Economic and Environmental Impact of Dyke Construction in the Mekong Delta/Vietnam*. ZEF Development Studies. Berlin: Lit Verlag.

Pham, Hoang Ngan, Nguyen Kha Thoa, Pham Quang Dieu, and Hoang Son. 2009. *Truyen thong Nong nghiep Nong thon Nong dan* (Communictions in Agricultural, Rual and Farmer's Development). Hanoi: IPSARD.

Pham, Thi Hong Ha. 2012. Nhung chuyen bien cua kinh te Viet Nam Cong hoa duoi tac dong cua vien tro Hoa Ky (1965-1975) (Transformations of the economy of the Republic of Vietnam under the impact of American assistance (1965-1975). Truong Dai hoc Khoa hoc Xa hoi va Nhan van.

Pham, Xuan Nam, Dang Viet Be, and Geoffrey B. Hainsworth. 2000. Rural Development in Viet Nam: The Search for Sustainable Livelihoods. In *Socioeconomic Renovation in Viet Nam: The Origin, Evolution, and Impact of Doi Moi*, edited by Peter Boothroyd and Pham Xuan Nam. Ottawa: International Development Research Centre.

Phan, Dinh Khoi, Truong Dong Loc, and Vo Thanh Danh. 2008. An Overview of the Development of Private Enterprise Economy in the Mekong Delta. In *Economic Development of the Mekong Delta in Vietnam*, edited by Robert Lensink and Mai Van Nam. CDS Research Paper

Phuong Chi. 2010. The First in Vietnam Fisheries Private Research Institute Set Sail. *Vietfish* 7 (5)28-31.

Pieterse, Jan Nederveen.1998. My Paradigm or Yours? Alternative Development, Post-Development, Reflexive Development.*Development and Change* 29 (2):343-373.

Pieterse, Jan Nederveen.2001. *Development Theory: Deconstructions/Reconstructions*. London: Sage Publications.

Pingali, Prabhu L., and Vo-Tong Xuan. 1992. Decollectivization and Rice Productivity Growth. *Economic Development and Cultural Change* 40 (4):697-718.

Polanyi, Karl. 1957. *The Great Transformation: The Political and Economic Origins of Our Time*. Boston, MA: Beacon Press.

Poussard, H. 1999. Building an Extension Network in Vietnam. *The Journal of Agricultural Education and Extension* 6 (2):123-130.

Powell, Mike. 2006: Which Knowledge? Whose Reality? An Overview of Knowledge Used in the Development Sector. *Development in Practice* 16 (6):518-532.

Probst, Kirsten, Jürgen Hagmann, Maria Fernandez, and Jacqueline A. Ashby. 2005. Prototypical Approaches to Innovation Development. In *Participatory Research and Development for Sustainable Agriculture and Natural Resource Management: A Sourcebook. Volume 1: Understanding Participatory Research and Development*, edited by Julian Gonsalves, Thomas Becker, Ann Braun, Dindo Campilan, Hidelisa De Chavez, Elizabeth Fajber, Monica Kapiriri, Joy Rivaca-Caminade, and Ronnie Vernooy. Ottawa: International Development Research Centre.

Punch, Keith F. 1998. *Introduction to Social Research: Quantitative and Qualitative*. London, Thousand Oaks, California : SAGE Publications.

Puusa, Anu, and Mari Eerikäinen. 2010. Is Tacit Knowledge Really Tacit? *Electronic Journal of Knowledge Management* 8 (3):307-318.

Pyka, Andreas. 1997. Informal Networking. *Technovation* 17:207-220.

Rama, Martin. 2008. *Making Difficult Choices: Vietnam in Transition*. Washington, DC: The International Bank for Reconstruction and Development / The World Bank.

Ramady, Mohamed A. 2005. *The Saudi Arabian Economy: Policies, Achievements and Challenges*. New York: Springer International.

Rambo, A. Terry. 1973. *A Comparison of Peasant Social Systems of Northern and Southern Vietnam: A Study of Ecological Adaptation, Social Succession and Cultural Evolution.* Carbondale: Center for Vietnamese Studies, Southern Illinois University.

Ravallion, Martin, and Dominique van de Walle. 2001. Breaking up the Collective Farm: Welfare Outcomes of Vietnam's Massive Land Privatization. In *Policy Research Working Paper* 2710. World Bank.

Rayner, Alan D. M. 1997. *Degrees of Freedom - Living in Dynamic Boundaries.* London: Imperial College Press.

Rayner, Alan D. M. 2004. Inclusionality and the Role of Place, Space and Dynamic Boundaries in Evolutionary Processes. *Philosophica* 73 (2004):51-70.

Rayner, Alan D. M. 2011. Space Cannot Be Cut: why self-identity naturally includes neighbourhood. *Integrative Psychological and Behavioural Science* 45:161-184.

Reagans, Ray, and Bill McEvily. 2003. Network Structure and Knowledge Transfer: The Effects of Cohesion and Range. *Administrative Science Quarterly* 48 (2):240-267.

Reed, A. Scott., and Viviane Simon-Brown. 2006. Fundamentals of Knowledge Transfer and Extension. In *Forest Landscape Ecology: Transferring Knowledge to Practice,* edited by Ajith H. Perera, Lisa Buse, and Thomas Crow. New York: Springer.

Regeer, Barbara J., and Joske F. G. Bunders. 2009. *Knowledge Co-Creation: Interaction between Science and Society: A Transdisciplinary Approach to Complex Societal Issues*. Den Haag: RMNO (Advisory Council for Spatial Planning, Nature and the Environment).

Reis, Nadine, and Mollinga, Peter P. 2009. Microcredit for Rural Water Supply And Sanitation in the Mekong Delta: Policy Implementation Between the Needs for Clean Water and 'Beautiful Latrines'. In *ZEF Working Paper Series*. Bonn.

Rejesus, Roderick M., Florencia G. Palis, Aileen V. Lapitan, Truong Thi Ngoc Chi, and Mahabub Hossain. 2009. The Impact of Integrated Pest Management Information Dissemination Methods on Insecticide Use and Efficiency: Evidence from Rice Producers in South Vietnam. Rev. *Agricultural Economics* 31 (4):814-833.

Renaud, Fabrice G. and Claudia Kuenzer, eds. 2012. *The Mekong Delta System. Interdisciplinary Analyses of a River Delta*. Springer Environmental Science and Engineering, Springer.

Richter, Rudoft. 2003. 'New institutional economics and knowledge sharing'. In *The economics of knowledge sharing: a new institutional approach*, edited by Ernst Helmstaedter. Glos and Massachusetts: Edward Elgar Publishing.

Riegler, Alexander, and Andreas Quale. 2010. Editorial: Can Radical Constructivism Become a Mainstream Endeavor? *Constructivist Foundations* 6 (1):1-5.

Riffe, Daniel, Stephen Lacy, and Frederick Fico. 2005. *Analyzing Media Messages: Using Quantitative Content Analysis in Research (2nd ed.)*. New Jersey: Lawrence Erlbaum Associates.

Robinson, Guy M. 2008. Rural Systems: An Introduction. In *Sustainable Rural Systems: Sustainable Agriculture and Rural Communities*, edited by Guy M. Robinson. Hampshire: Ashgate Publishing Limited.

Rogers, Everett M. ([1962] 2003).*Diffusion of Innovations (5th ed.)*. New York: Free Press.

Rogers, Everett M. 1995. *Diffusion of Innovations (4th ed.)*. New York: Free Press.

Roper, Laura, and Jethro Pettit. 2003. Development and the Learning Organisation: An Introduction. In *Development and the Learning Organisation*, edited by Laura Roper, Jethro Pettit, and Deborah Eade. Oxford: Oxfam Publications

Rowbottom, Darrell Patrick. 2007. Demystifying Threshold Concepts. *Journal of Philosophy of Education* 41 (2): 263-270.

Royeen, Charlotte Brasic, Gail M. Jensen, Tracy A. Chapman, and Tony Ciccone. 2010. Is Interprofessionality a Threshold Concept for Education and Health Care Practice? *Journal of Allied Health* 39 (Supplement 1):251-252.

Sachs, Wolfgang. 1992. Introduction. In *The Development Dictionary: A Guide to Knowledge as Power*, edited by Wolfgang Sachs. London: Zed.

Sandri, Orana Jade. 2013. Threshold Concepts, Systems and Learning for Sustainability. *Environmental Education Research* (iFirst):1-13.

Santerre, Lise. 2008. From Democratization of Knowledge to Bridge Building between Science, Technology and Society. In *Communicating Science in Social Contexts: New Models, New Practices*, edited by Donghong Cheng, Michel Claessens, Nicholas R. J. Gascoigne, Jenni Metcalfe, Bernard Schiele, and Shunke Shi. Netherlands: Springer.

Sardesai, D. R. 1998. *Vietnam: Past and Present*. Boulder: Westview Press.

Schad, Iven, Regina Roessler, Andreas Neef, Anne Valle Zárate, and Volker Hoffmann. 2011. Group-based Learning in an Authoritarian Setting? Novel Extension Approaches in Vietnam's Northern Uplands. *Journal of Agricultural Education and Extension* 17 (1):85-98.

Schön, Donald. [1973] 2010. Government as a Learning System. In *Social Learning Systems and Communities of Practice* edited by Chris Blackmore. London: Springer.

Scoones, Ian, and John Thompson, eds. 1994. *Beyond Farmer First: Rural People's Knowledge, Agricultural Research* and Extension Practice. London: IT Publications.

Scoones, Ian, and John Thompson, eds. 2009. *Farmer First Revisited: Innovation for Agricultural Research and Development*. Rugby, UK: Practical Action Publishing.

Scott, W. Richard. 2003. *Organizations: Rational, Natural and Open Systems*. New Jersey: Prentice Hall.

Senge, Peter M. 1990. *The Fifth Discipline: The Art and Practice of the Learning Organization*. New York: Doubleday/Currency.

Senker, Jacqueline. 1995. Tacit knowledge and models of innovation. *Industrial and Corporate Change* 4 (2):425-447.

Sepehri, Ardeshir, and A. Haroon Akram-Lodhi. 2005. Transition, Savings and Growth in Vietnam: A Three-Gap Analysis. *Journal of International Development* 17 (4):553-574.

Seth, Ashok. 2009. Institutions and Rural Services: Lessons from IFAD-Supported Projects in Asia. Asia and the Pacific Division, IFAD.

Shkedi, Asher. 2005. *Multiple Case Narrative: A Qualitative Approach to Studying Multiple Populations*. Amsterdam: John Benjamins Publishing Company.

Simmons, Luke, and Steffanie Scott. 2008. Organic Agriculture and "Safe" Vegetables in Vietnam: Implications for Agro-Food System Sustainability. Available http://oacc.info/Docs/Guelph2008SocialSciences/Simmons%20and%20Scott%20(2008).pdf.

SNV, CIDSE, SFDP et al. 2003. Phuong Phap Khuyen Nong co Su Tham Gia cua Nguoi Dan (Participatory Agricultural Extension). Hanoi, Vietnam: Agriculture Publishing House.

Son Nam. 2004. Lich su khan hoang mien Nam (The relaimation history of the Southern region). Ho Chi Minh: Tre Publishing House.

Son Nam. 2005. Noi ve Mien Nam, Ca tinh mien Nam, Thuan phong my tuc Viet Nam (The South, characteristics of the Southerners and Vietnamese traditional habits and customs). Ho Chi Minh: Tre Publishing House.

Sorenson, Olav, Jan W. Rivkin, and Lee Fleming. 2006. Complexity, Networks and Knowledge Flow. *Research Policy* 35 (2006):994-1017.

Sörlin, Verker, and Hebe Vessuri. 2007. Introduction: The Democratic Deficit of Knowledge Economies. In *Knowledge Society vs. Knowledge Economy: Knowledge, Power, and Politics*, editted by Sverker Sörlin, and Hebe Vessuri. New York: Palgrave Macmillan.

Stehr, Nico. 2007. Societal Transformations, Globalisation and the Knowledge Society. *International Journal of Knowledge and Learning* 3 (2/3):139-153.

Stiglitz, Joseph E. 1999. Public Policy for a Knowledge Economy. Remarks at the Department for Trade and Industry and Center for Economic Policy Research. London, U.K.

Stijkel, Anne. 2006. Science, Systems, Spirit: Towards Local and Global Societies with the Sense and Essence of Inclusionality. In *Endogenous Development and Bio-cultural Diversity: The Interplay of Worldviews, Globalization and Locality,* edited by Bertus Haverkort and Stephan Rist. Leusden: ETC/Compas.

Stremmelaar, Josine. 2009. Knowledge Integration for Development: The Hivos Approach. *Knowledge Management for Development Journal* 5 (1):75-84.

Stryker, Sheldon, and Kevin D. Vryan 2003. The Symbolic Interactionist Frame. In *Handbook of Social Psychology,* edited by John Delamater. New York: Kluwer Academic/Plenum Publishers.

Stryker, Sheldon. 1981. Symbolic Interactionism: Themes and Variations. In *Social Psychology: Sociological Perspectives*, edited by Morris Rosenberg, and Ralph H. Turner. New York: Basic Books.

Stryker, Sheldon. 2008. From Mead to a Structural Symbolic Interactionism and Beyond. *Annual Review of Sociology* 34:15-31.

Subramanian, Saravanan V. 2009. Decentralisation and Water Resources Management in the Indian Himalayas: The Contribution of New Institutional Theories. *Conservation and Society* 7 (3):176-191.

Swan, Jacky, Harry Scarbrough, and Maxine Robertson. 2002. The Construction of 'Communities of Practice' in the Management of Innovation. *Management Learning* 33 (4):477-496.

Swanson, Burton E., and Riikka Rajalahti. 2010. Strengthening Agricultural Extension and Advisory Systems: Procedures for Assessing, Transforming, and Evaluating Extension Systems. Washington, DC: The International Bank for Reconstruction and Development/The World Bank.

Tagliaventi, Maria Rita, and Elisa Mattarelli. 2006. The Role of Networks of Practice, Value Sharing, and Operational Proximity in Knowledge Flows between Professional Groups. *Human Relations* 59 (3):291-319.

Tahmasebi, Asghar, Eckart Ehlers, and Conrad Schetter. 2013. Climate Change and Mountain Pastoralism: The Shahseven of Northwest Iran. *Erdkunde* 7 (4):309-323.

Tan, Siwei. 2012. Reconsidering the Vietnamese Development Vision of "Industrialisation and Modernisation by 2020". In *ZEF Working Paper Series*, No. 102. Bonn.

Taylor, Peter. 2000. New perspectives, new curricula: a case study of participatory curriculum development in forestry education in Vietnam. Keynote Paper, Workshop on: Changing learning and education in forestry. SaPa, Vietnam, 16-19 April 2000. Social Forestry Support Programme, Vietnam. 28p. http://www.socialforestry.org.vn.

Taylor, Steven J., and Robert Bogdan. 1984. *Introduction to Qualitative Research Methods*. New York: Wiley Interscience.

Thai, Thi Minh, Andreas Neef, and Volker Hoffmann. 2011. Agricultural Knowledge Transfer and Innovation Processes in Vietnam's Northwestern Uplands: State-governed or Demand-driven?. *Southeast Asian Studies* 48 (4):425-455.

Thai, Thi Minh, Carl Erik Schou Larsen, and Andreas Neef. 2010. Challenges to Institutionalizing Participatory Extension: The Case of Farmer Livestock Schools in Vietnam. *The Journal of Agricultural Education and Extension* 16 (2):179-194.

Thorlindsson, Thorolfur, and Runar Vilhjalmsson. 2003. Introduction to the Special Issue: Science, Knowledge and Society. *Acta Sociologica* 46 (2):99-105.

Tidd, Joe. 2006. A Review of Innovation Models. In *Imperial College London Discussion Paper*, No. 1.Tanaka Business School.

Tien Trinh. 2011a. Nhung Chuyen Gia "Chan Dat" - Ky 1: Nguoi Nong Dan So 1 ("Barefoot" Experts – Series 1: The No. 1 Farmer). *Thanh Nien Online* 17.08.2011. Available: http://www.thanhnien.com.vn/pages/20110817/nhung-chuyen-gia-chan-dat.aspx [Accessed on 04.04.2012].

Tien Trinh. 2011b. Nhung Chuyen Gia "Chan Dat" - Ky 5: Nguoi Sua Lua ("Barefoot" Experts – Series 5: The Rice Repairer). *Thanh Nien Online* 21.08.2011. Available: http://www.thanhnien.com.vn/pages/20110821/nhung-chuyen-gia-chan-dat-nguoi-sua-lua.aspx [Accessed 04.04.2012].

Tien Trinh. 2011c. Nhung Chuyen Gia "Chan Dat" - Ky 8: Do la Nhung Nguoi Tien Phong ("Barefoot" Experts – Series 8: They are Pioneers). *Thanh Nien Online* 24.08.2011. Available:http://www.thanhnien.com.vn/pages/20110824/nhung-chuyen-gia-chan-dat-ky-8-do-la-nhung-nguoi-tien-phong.aspx [Accessed on 04.04.2012].

Ton, Wouter. 2005. Participatory Research and Extension in Agriculture: Organisation of Learning in Participatory Research and Extension Approaches, University of Twente, Enschede.

Torraco, Richard J. 2000. A Theory of Knowledge Management. *Advances in Developing Human Resources* 2 (1):38-62.

Tran Thai Le. 2010. Chiec bay den huyen thoai (The legendary light trap). *Lao dong* 15.06.2010. Available http://laodong.com.vn/kinh-doanh/chiec-bay-den-huyen-thoai-31409.bld [Accessed on 12.10.2013].

Tran Van Hieu. 2004. Thuc trang va giai phap cho su lien ket "Bon nha" trong san xuat va tieu thu nong san o Dong bang song Cuu Long (Real situation and solutions to "quadruple association" in agricultural production and consumption in Vietnam's Mekong Delta). *Tap chi Khoa hoc Dai hoc Can Tho* 2004 (1):180-185.

Tran, Ngoc Ca, and Nguyen Vo Hung. 2011. Vietnam: Current Debates on the Transformation of Academic Institutions. In *Universities in Transition: The Changing Role and Challenges for Academic Institutionsm*, edited by Bo Göransson, and Claes Brundenius. Ottawa: Springer.

Tran, Ngoc Them. 2008. Tinh Cach Van Hoa Nguoi Nam Bo Nhu Mot He Thong (Cultural Characters of Vietnamese Southerners as a System). Southern Vietnam in The Modern Time Workshop (Nam Bo Thoi Ky Can Dai) Organised by Vietnam Ministry of Science and Technology & Association of History Science, 2008, Can Tho.

Tran, Phu Hue Quang. 2011. Tinh bao dung cua nguoi Viet mien Tay Nam Bo (Tolerance of Southwestern Vietnamese). Centre for Theoretical and Applied Culturology, Ho Chi Minh National University. Available http://vanhoahoc.net/nghien-cuu/van-hoa-viet-nam/van-hoa-nam-bo/1898-tran-phu-hue-quang-tinh-bao-dung-cua-nguoi-viet-mien-tay-nam-bo.html [Accessed on 20.04.2012].

Tran, Thanh Be, Bach Tan Sinh, and Fiona Miller. 2007. Introduction. In *Challenges to Sustainable Development in the Mekong Delta: Regional and National Policy Issues and Research Needs*, edited by Tran Thanh Be, Bach Tan Sinh and Fiona Miller. Bangkok: The Sustainable Mekong Research Network.

Tran, Thanh Be. 2007. Challenge of the "Three Reductions" Program in Vietnam: Potential Role of Biofertiliser Technology. Paper read at the BioGro Project Conference, at Hanoi.

Tran, Thanh Be. 2009. Mekong Delta Rice Farmers: From Growers to Breeders. Paper read at CLRRI-IRRI International Conference: Better Rice, Better Environment and Better Life, at Can Tho.

Tran, Thanh Phong. 2011. Nhung Chuyen Gia "Chan Dat" - Ky 3: Ong Tam Lua Giong ("Barefoot" Experts – Series 3: Mr. Tam The Rice Breeder). *Thanh Nien Online* 19.08.2011. Available: http://www.thanhnien.com.vn/pages/20110819/nhung-chuyen-gia-chan-dat-ong-tam-lua-giong.aspx [Accessed on 04.04.2012].

Tran, Thuan. 2010. Su phat trien kinh te hang hoa o My Tho the ky XVII-XVIII (The Development of Commodity Economy in My Tho in the 17th and 18th Centuries). *Science and Technology Development* 13 (X1):72-85.

Tran, Van Hieu. 2004. Thuc trang va giai phap cho su lien ket "Bon nha" trong san xuat va tieu thu nong san o Dong bang song Cuu Long (Real situation and solutions to "quadruple association" in agricultural production and consumption in Vietnam's Mekong Delta). *Tap chi Khoa hoc Dai hoc Can Tho* 2004 (1):180-185.

Tress, Bärbel, Gunther Tress, and Gary Fry. 2006. Defining concepts and the process of knowledge production in integrative research. In *From Landscape Research to Landscape Planning*, edited by Bärbel Tress, Gunther Tress, Gary Fry, and P. Opdam. Dordrecht: Springer.

Trinh, Huy Quach and Hoang Thi Tay Ninh. 2004. Van de di dan trong phat trien kinh te - xa hoi o cac tinh mien nui phia Bac" (Migration in socio-economic development in the northern mountainous provinces). *Tap chi Cong san* 62.

Trung Chanh. 2011. Gia lua tang cao, nong dan "xe lich" xuong giong (Rice price rockets, farmers break out the sowing calendar). *Kinh te sai Gon 20.10.2011*. Available http://www.thesaigontimes.vn/Home/nongsan/tintucthitruong/63743/Gia-lua-tang-cao-nong-dan-%E2%80%9Cxe-lich%22-xuong-giong.html [Accessed on 1.11.2011].

Truong, Dong Loc, Ger Lanjouw, and Robert Lensink. 2006. The Impact of Privatization on Firm Performance in a Transition Economy. *Economics of Transition* 14 (2):349-389.

Truong, Thi Ngoc Chi. 2010. Factors Affecting Mechanization in Rice Harvesting and Drying in the Mekong Delta, South Viet Nam. *Omonrice* 17:164-173.

Tuyet Nhu. 2010. Xoa trang nha ve sinh tren song: Can y thuc trach nhiem cua nguoi dan (Eradication of toilets on rivers: People's awareness and responsibilities needed). Dat Mui Online March 1, 2010. Available http://www.baoanhdatmui.vn/vcms/html/news_detail.php?nid=11106 [Accessed on 25.04.2012].

UN Millennium Project. 2005. *Innovation: Applying Knowledge in Development*. Task Force on Science, Technology, and Innovation. London: Earthscan.

Van Baalen, Peter, Jacqueline Bloemhof-Ruwaard, and Eric Van Heck. 2005. Knowledge Sharing in an Emerging Network of Practice: The Role of a Knowledge Portal. In *ERIM Report Series Research in Management*. Rotterdam: Erasmus Universiteit Rotterdam.

van de Walle, Dominique and Dileni Gunewardena. 2001. Source of Ethnic Inequality in Vietnam. *Journal of Development Economics* 65 (1): 177-207.

Van Den Ban, Anne. 2010. Global Review of Good Agricultural Extension and Advisory Practices. *Journal of Agricultural Education and Extension* 16 (3):342-345.

Van Mele, Paul, Nguyen Thi Thu Cuc, and Arnold Van Huis. 2001. Farmers' Knowledge, Perceptions and Practices in Mango Pest Management in the Mekong Delta, Vietnam. *International Journal of Pest Management* 47 (1):7-16.

Venzin, Markus, Georg von Krogh, and Johan Roos. 1998. Future Research into Knowledge Management. In *Knowing in Firms: Understanding, Managing and Measuring Knowledge*, edited by Georg von Krogh, Johan Roos, & Dirk Kleine. London: SAGE Publications.

Vessuri, Hebe. 2007. The Hybridization of Knowledge: Science and Local Knowledge in Support of Sustainable Development. In *Knowledge Society vs. Knowledge Economy: Knowledge, Power, and Politics*, editted by Sverker Sörlin and Hebe Vessuri. New York: Palgrave Macmillan.

Vietnam News Agency. 2012. Ket cau ha tang DBSCL: "An cu" tren nha vuot lu (Infrastructure in the Mekong Delta: "Sustainable resettlement" in flood avoidance residential zone). *TTXVN* 28.05.2012. Available http://canthotv.vn/tin-tuc/ket-cau-ha-tang-dbscl-%E2%80%9Can-cu%E2%80%9D-tren-nha-o-vuot-lu/ [Accessed on 12.06.2012].

Visscher, Jan Teun, Jaap Pels, Viktor Markowski, and Sascha de Graaf. 2006. *Knowledge and Information Management in the Water and Sanitation Sector: A Hard Nut to Crack*. Delft: Thematic Overview Paper 14, IRC International Water and Sanitation Centre.

Vo, Thanh Thu, and Cao Thi Viet Huong. 2008. Doanh nghiep vua va nho thuoc khu vuc dan doanh sau mot nam gia nhap VTO. *Tap chi Cong San* 12.03.2008.

Vo, Thi Thanh Loc. 2003. Quality Management in Shrimp Supply Chain in the Mekong Delta, Vietnam: Problems and Measures. In *CAS Discussion paper No. 43*. Center for Asean Studies.

vom Lehn, Dirk, and Will Gibson. 2011. Interaction and Symbolic Interactionism. *Symbolic Interaction* 34 (3):315-318.

Von Krogh, Georg, and Johan Roos. 1995. *Organizational Epistemology*. London: Palgrave Macmillan.

Vo-Tong, Xuan. 1994. History of Vietnam - IRRI Cooperation. In *Vietnam and IRRI: A Partnership in Rice Research*, edited by G. L. Denning and Vo-Tong Xuan. Manila: International Rice Research Institute.

Vredeseilanden/VECO. 2013. A Win-Win Situation for Both Farmers and Private Companies: A Case Study of Tea Marketing in Phu Tho, Vietnam. Leuven: VECO.

Vu, Dinh Cu. 2007. Scientific and Technological Development to Serve the Doimoi.In *Vietnam- Twenty Years of Renewal*, edited by Mai Ly Quang. Hanoi: The Gioi Publisher.

VVOB, IAS, and MDI. 2008. Chuong Trinh Khuyen Nong co Su Tham Gia o Phia Nam - Ke Hoach Thuc Hien Chuong Trinh 2008-2010 (Participatory Agricultural Extension in the Southern Vietnam - Implementation Plan 2008-2010). Vietnam.

VVOB, IAS, and MDI. 2009. Chuong Trinh Khuyen Nong co Su Tham Gia tai Vietnam: Nhung Buoc Di Dau Tien (Participatory Agricultural Extension Programme in Vietnam: First Steps). In *Bulletin* 2(October 2009).

Waibel, Gabi. 2010. State Management in Transition: Understanding Water Resources Management in Vietnam. In *ZEF Working Paper Series*, No. 55.Bonn.

Wall, Caleb. 2008. *Agrorods of Western Uzbekistan: Knowledge Control and Agriculture in Khorezm*. Berlin: Lit Velag.

Ward, Vicky L., Allan O. House, and Susan Hamer. 2009. Knowledge Brokering: Exploring the Process of Transferring Knowledge into Action. *BMC Health Services Research* 9(12):1-6.

Wasko, Molly McLure, and Samer Faraj. 2005. Why Should I Share? Examining Social Capital and Knowledge Contribution in Electronic Networks of Practice. *MIS Quarterly* 29 (1):35-57.

Webb, Eugene J., Donald T. Campbell, Richard D. Schwartz, and Lee Sechrest. 1966. *Unobtrusive Measures: Nonreactive Research in the Social Science*. Chicago: Rand McNally.

Weber, Robert Philip. 1990. *Basic Content Analysis*. California, London, New Delhi: Sage Publications.

Wells-Dang, Andrew. 2012. *Civil Society Networks in China and Vietnam Informal Pathbreakers in Health and the Environment*. Houndmills: Palgrave Macmillan.

Wenger, Etienne, Richard McDermott, and William M. Snyder. 2002. *Cultivating Communities of Practice: A Guide to Managing Knowledge*. Boston, Massachusetts: Harvard Business School Press.

Wenger, Etienne. 1998. *Communities of Practice: Learning, Meaning and Identity*. New York: Cambridge University Press.

Westoby, Peter, and Gerard Dowling. 2009. *Dialogical Community Development with Depth, Solidarity and Hospitality*. Brisbane: Tafina Press.

Wieneke, Florian. 2005. Acceptance Analysis of New Technology for Sustainable Water Management and Sanitation: A Case Study of Operating Farm Households in the Mekong Delta, Vietnam, University of Bonn, Bonn.

Wierzbicki, Andrzej P., and Yoshiteru Nakamori. 2007. Knowledge Sciences: Some New Development. Zeitschrift für. *Betriebswirtschaft* 77 (3):271-296.

Wilder, Marcy, and Nguyen Thanh Phuong. 2002. The Status of Aquaculture in the Mekong Delta Region of Vietnam: Sustainable Production and Combined Farming Systems. The Proceedings of International Commemorative Symposium: 70th Anniversary of the Japanese Society of Fisheries Science. Fisheries Science Vol. 68, Supplement I, November 2002.

Willer, Helga, and Minou Yussefi. 2006. *The World of Organic Agriculture: Statistics and Emerging Trends 2006*. Bonn: International Federation of Organic Agriculture Movements (IFOAM) and Frick, Switzerland: Research Institute of Organic Agriculture (FiBL).

Williams, Glyn. 2010. *The Knowledge Economy, Language and Culture*. Bristol, Buffalo, Toronto: Multilingual Matters.

Witjes, Nina. 2011. Whose' Knowledge for Development? Knowledge Management in Development Cooperation: Lessons from the Development Gateway. *German Journal for Young Researchers* 3 (3):29-34.

World Bank. 1999. *World Development Report 1998/1999: Knowledge for development*. New York: Oxford University Press.

World Bank. 2005. *The Capacity Enhancement through Knowledge Transfer: A Behavioral Framework for Reflection, Action and Results*. Knowledge and Learning Group, Africa Region.

World Bank. 2011. Vietnam Urbanization Review: Technical Assistance Report. Hanoi: World Bank in Vietnam.

World Bank. 2012. *Agricultural Innovation System: An Investment Sourcebook*. Washington, DC: World Bank.

Yang, Baiyin, Wei Zheng, and Chris Viere. 2009. Holistic Views of Knowledge Management Models. *Advances in Developing Human Resources* 11 (3):273-289.

Yang, Baiyin. 2003. Toward a Holistic Theory of Knowledge and Adult Learning. *Human Resource Development Review* 2 (2):106-129.

Zarrinmehr, Elham, and Mohd Zaidi Abd Rozan. 2012. Influential Factors for Knowledge Transfer in Information System Outsourcing. Paper read at the Asia-Pacific Business Research Conference, at Kuala Lumpur, Malaysia.

Zeleny, M. 2005. Knowledge of Enterprise: Knowledge Management of Knowledge Technology?.In *Governing and Managing Knowledge in Asia*, edited by Thomas Menkhoff, Hans-Dieter Evers, and Yue Wah Chay. Singapore: World Scientific Publishing.

Zhou, Chunyan. 2008. Emergence of the Entrepreneurial University in Evolution of the Triple Helix: The Case of Northeastern University in China. *Journal of Technology Management in China* 3 (1):109-126.

Zhuge, Hai. 2006. Knowledge Flow Network Planning and Simulation. *Decision Support Systems* 42 (2006):571-592.

Ziai, Aram. 2004. The Ambivalence of Post-Development: Between Reactionary Populism and Racial Democracy. *Third World Quarterly* 25 (6):1045-1060.

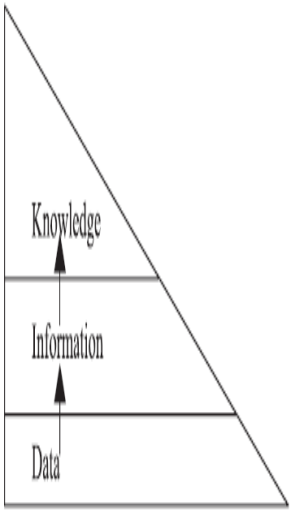
Ziai, Aram. 2011. Some Reflections on the Concept of 'Development'. In *ZEF Working Paper Series*, No. 81. Bonn.

Ziglio, Erio. 1996. The Delphi Method and Its Contribution to Decision-Making. In *Gazing Into The Oracle: The Delphi Method And Its Application To Social Policy And Public Health,* edited by Michael Adler and Erio Ziglio. London, England: Jessica Kingsley Publishers.

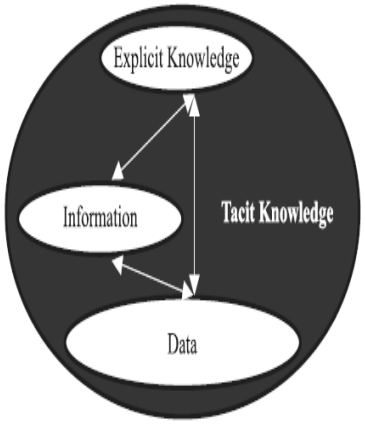
Zink, Eren. 2013. *Hot Science, High Water: Assembling Nature, Society and Environmental Policy in Contemporary Vietnam*. Nias. Copenhagen.

Zolvinski, S. 2008. Listening to Farmers: Qualitative Impact Assessments in Unfavorable Rice Environments.In *IRRI Technical Bulletin* No. 12. Los Baños, Philippines.

Appendix 1.1: Data, information and (explicit and tacit) knowledge



Knowledge	• integrated information in context • justified personal belief that increases an individual's capacity to take effective action • professional expertise appropriate for the domain • things that are held to be true and drive people to action • the power to act and make decisions • information made actionable in a way that adds value to the enterprise • information in context, together with an understanding of how to use it • information that has been authenticated and thought to be true • information made actionable • situated skills and pragmatic knowledge (cognitive anthropologist, ethnomethodologiests, symbologists and structuralists) • A fundamental truth (Post-modernists) • "justified true belief"
Information	• data in context • a result of analyzing and interpreting data that carries meaning • data with special relevance and purpose • data that makes a difference
Data	• discrete facts



The knowledge hierarchy: Data is combined to create information, and information is combined to create knowledge

Explicit islands in a tacit sea: "As the classes of explicit knowledge are distinguishable, they are represented by three islands. Explicit knowledge is the most actionable class so it is placed on top, followed by information and then data. This ordering indicates that explicit knowledge is more desirable because it is more actionable and can be more highly verified than information or data. The relative sizes of the islands indicate that data is more plentiful than information, which in turn is more plentiful than explicit knowledge"

Source: Inputs from Hicks, Dattero, and Galup (2007, 5-10)

Appendix 1.2: Research Methods

Interview

In-depth interview: In-depth interviewing is the main data collection method in this study. By in-depth interviewing, the researcher gained rich qualitative data from the perspective of participants and understands knowledge constructed in different contexts through a face-to-face interaction between him and a participant (Hesse-Biber and Leavy 2005, 120; Liamputtong 2009, 43; Mason 2002, 63; Taylor and Bogdan 1984, 77). Marvasti (2004) asserts that in from in-depth interviewing, a researcher sees the world from the respondent's point of view and can access the hidden perceptions of his/her study subjects more deeply. Mastering advantages of the in-depth interview method, this study investigated information and knowledge transfer flows in the agriculture sector from the different perspectives of participants.

The first group of participants in this study comprise government officials who work for administration organisations and for mass organisations at all levels in Can Tho and other provinces in the Mekong Delta (see Table A1). At provincial and district levels, representatives of sub-departments of agriculture department (aquaculture, veterinary, rural development, and water and sanitation), relevant departments (technology science, nature resources and environment, health, foreign affairs, etc.), and mass organisations (Women's Union, Farmers Union, and Science and Technology Association) were interviewed in depth. Before interviews, a list of questions focused on an organisation's functions, roles and working relations, development planning and orientations, current situations, challenges, and solutions was sent to government officials for their reference. Commonly, two or three representatives who come from different functional divisions of a provincial or district level organisation participated in the interview so as to contribute integrated information to the research. For participants from the higher sub-national levels, one of the greatest challenges in interviews is to discuss with them the issue of concern in depth as they appeared to give answers or opinions more broadly. At the commune level, it is often those who participated in the in-depth interviews that are most experienced about local agriculture and rural development. They are chairmen or vice chairmen of People's Committees who are responsible for affairs related to agriculture or local economics, chairmen or vice chairmen of the Farmers' Union or leaders of People's Councils. Apart from the common questions specified above, the researcher asked them about local agrarian changes, local agricultural and rural development policies and projects, and knowledge transfer to farmers.

Table A1: Interviewed government officials

			Number	**Percentage**
Gender	Male		86	81
	Female		20	19
Function	Administration		79	75
	Mass organisations		27	25
Operational level	Regional		2	2
	Provincial		39	37
	District		29	27
	Commune		36	34
Area	Can Tho	Ninh Kieu	42	40
		Binh Thuy	10	9
		O Mon	8	8
		Thot Not	9	8
		Cai Rang	9	8
		Phong Dien	6	6
		Thoi Lai	8	8
		Co Do	4	4
		Vinh Thanh	6	6
	Vinh Long		1	1
	An Giang		3	3

Secondly, extension workers from different levels and different locations were invited to in-depth interviews (see Table A2). The characteristics of such groups are that most of them are in the age cohort of 30 to 40 years, have completed their undergraduate studies and have five to ten years' experience in the field of agriculture extension. All of them were asked to talk about their working functions and roles, information and knowledge networking (organisational and individual), knowledge transfer modes, experiences of working with farmers, and recommendations for extension improvement. In addition, the researcher made an attempt to access both female and male extension workers in order to gain deeper insights into working challenges and motivations and possibly make comparisons when needed.

Table A2: Interviewed extensionists

		Number	**Percentage**
Gender	Male	20	67
	Female	10	33
Age	Under 30 years	8	27
	30-40 years	18	60
	41-50 yeas	3	10
	Above 50 years	1	3
Education	High school	1	3
	Vocational school	7	23
	Undergraduate	17	57
	Master	5	17
Experience	Under 5 years	9	30
	5-10 years	16	53
	Over 10 years	5	17
Administration level	Provincial/city	6	20
	District/quarter	8	27
	Commune/ward	16	53
Geographical location	Can Tho	19	63
	Other provinces	11	37

A large number of university lecturers and institute researchers constituted the third group of participants providing information to this study (see Table A3). One of the characteristics of this group is that they were willing to share information and experience in both their academic studies and their practical work with farmers. Relationships between the researcher and this group of participants were easily established due to the fact that all of them work as researchers, so they could understand difficulties in conducting a study and appreciate knowledge sharing in academia. In addition, some participant researchers are members of the WISDOM project, so they enthusiastically contributed their opinions and sharing to the interviews. For university lecturers and institute researchers that took leadership positions in universities and institutes, the researcher asked them about their organisations' roles (training, researching, and technology transfer), technology and knowledge transfer channels and research relationships. For researchers, they were asked to share experiences and information about technology and knowledge transfer projects they had participated in and relate anecdotes about working with farmers.

Table A3: Interviewed academic researchers

		Number	**Percentage**
Gender	Male	21	72
	Female	8	28
Age	Under 30 years	2	7
	30-40 years	8	28
	41-50 yeas	4	14
	Above 50 years	15	52
Education	Undergraduate	4	14
	Master	9	31

	PhD	8	28
	(Assoc) Prof.	8	28
Experience	Under 10 years	3	10
	10-20 years	6	21
	21-30 years	10	34
	31-40 years	9	31
	Above 40 years	1	3

The following group of participants is agribusinesses mostly located in Can Tho city (see Table A4). In this group, the researcher interviewed staff of companies operating in the field of agro materials, agriculture processing, fishery, and animal husbandry. They were interviewed about material zone development, research and development, product marketing, and extension activities of their company. In addition, four rural traders shared their experiences in sales activities and consultation delivery to farmers in the agriculture sector. There were many difficulties involving access to agribusinesses, as most of them were unwilling to participate in interviews as they seemingly lacked time for their participation or had no interest in the research. More importantly, it was likely that they did not want to spend much time on a researcher whose research results might bring potentially negative impacts to their business operations. In such cases, more efforts were expended to establish a rapport and trust between the researcher and agribusinesses.

Table A4: Interviewed agribusinesses

		Number	**Percentage**
Production area	Agro materials	19	86
	Fishery	2	9
	Animal husbandry	1	5
Operational level	Company	18	82
	Rural trading	4	18

Finally, farmers are the most important and biggest participant groups of the research. Taking stock of gender, age, ethnicity, livelihoods, membership, positions, and residential locations on selecting participants as farmers, the researcher tried to understand farmer's lifestyles and production activities and listen to different voices and opinions in different contexts. For this purpose, a total of 123, both male and the female, Kinh and Khmer, old and young, residential and absentee farm farmers, party members and non-members, leading farmers, good farmers, farmer trainers, farming teachers, and normal farmers in Can Tho, Hau Giang, An Giang, Tien Giang, Tra Vinh and Vinh Long were invited to in-depth interviews. Apart from information about demographical characteristics, the researcher interviewed farmers to understand more about their livelihoods, modes of productions and changes, production difficulties, agricultural initiatives, information and knowledge sources, and networks through interactions.

It was observed that most farmers found it difficult, at the beginning of the conversation, to share their experiences and information to the researcher, who is a stranger from a different region (see Table A5). A Vietnamese idiom says 'chewing betel before starting a conversation' as a 'betel' is traditionally symbolic of greetings and 'chewing betel' means tokens of affection, cosiness, comforts, and sharing. In the Mekong Delta, 'chewing betel' is replaced by 'drinking wine' or 'having a tea'. Taking the cultural feature of the Mekong Delta in carrying out interviews with local farmers, the researcher spent a lot of time to involve in daily activities of farmers such as familial celebrations, drinking together with them, and then talking to them rather than simply asking them some questions and leaving. Apart from formal individual interviewing, some interviews were conducted in less formal settings such as parties and other get-togethers and in such contexts, when a question is asked, not only the interviewee but also others share their opinions. Such cases required the researcher to quickly record different perspectives from farmers but not distract their attention from the important matters discussed in the interviews.

Table A5: Interviewed farmers and rural population

			Number	Percentage
Gender	Male		106	86
	Female		17	14
Age	<30		7	6
	31-60		99	80
	>61		17	14
Ethnicity	Kinh		112	91
	Khmer		11	9
Livelihood	Farm		105	85
	Non-farm		18	15
Participation	Collective		27	22
	Non-collective		96	78
Position	Leading posts		21	17
	Good farmers		20	16
	Farmer trainers		3	2
	Farming teachers		3	2
	Normal farmers		76	62
Area	Can Tho	Ninh Kieu	0	0
		Binh Thuy	6	5
		Cai Rang	9	7
		Thot Not	23	19
		O Mon	11	9
		Phong Dien	4	3
		Thoi Lai	22	18
		Co Do	16	13
		Vinh Thanh	15	12
	Hau Giang		2	2
	Vinh Long		2	2
	An Giang		9	7
	Tra Vinh		4	3

Interviews lasted between 90 and 120 minutes with research practitioner and government official groups and 60 minutes with farmers. In some cases, a quick conversation occurred in fewer than 15 to 20 minutes and some narrative interviews lasted two to three hours (see Figure A1). All interviews were conducted in Vietnamese and digitally recorded. For Khmer participants, a local official accompanied the researchers to assist with interpretation when necessary. All interviews were transcribed, rendered pseudonymous, and thematically analysed.

Figure A1: (a, left) A common interview background with organisational representatives, (b, right) Besides individual interviews, discussion with farmers sometimes takes place in group and informal contexts.

Narrative interview: In the study, a qualitative narrative inquiry was applied. Viewed from the constructivist perspective, the stories people tell are instrumental in understanding the way they make sense of and change their lives (Shkedi 2005, 13). Lemmer (2009, 85) explains that narrative analysis is a powerful research tool for creating accounts of "epiphanic moments, crisis or significant events in life, relationships or careers".

Difficulties arose in accessing information for selecting research participants. Due to the fact that the profession is not recognised and registered, it is nowhere mentioned in farmers' profiles that they are knowledge brokers. Even involved farmers did not identify knowledge brokering as their formal job. Conversely, university scientists did not always fully know all of the brokering work and activities performed by a farmer who had participated in their project. The study employed snowball sampling as a data accessing strategy towards this "hidden population". Three generational male farmers participated in narrative interviews. The respondents were invited to tell their stories, starting with the umbrella question: "Please tell me about changes in your personal and occupational life. I am interested in your whole life, especially since you worked to further transfer your farming knowledge and skills to other farmers. You have as much time as you need to tell it. I will not ask you any questions for now. I will make some notes that I will ask you later." Doing a narrative interview greatly depended on the respondents' moods to share, memory and ability to express their ideas over a long period. To ensure the quality of the interview, therefore, questions such as, "Can you recall the situation when you…?" or "Could you please tell me more about your personal experience in…?" were incorporated. All interviews were digitally recorded, lasted from two to two and a half hours, and transcribed verbatim, from which stories were produced thematically.

Network analysis: Interviewees such as extension workers, researchers, and farmers were invited to draw their networks of information and knowledge flows outlined by the researcher. The interviewees identified the actors, their attributes, and their importance to their knowledge transfer processes. The networks provided an understanding of the interaction, significance, and intensification of farmers and organisations, individually or as a group, over the knowledge transfer flow network. Data were transferred and analysed by the use of VennMaker software.

Focus group discussion (FGD)

Ten FGDs were conducted during one year of field research in the Mekong Delta provinces (see Table A6). Focus group discussion was used as a method in this study since it enables the researcher to observe a process of interaction among and between group members and access their orally-expressed views, opinions, experiences, and attitudes towards a "focused issue of concern" (Bruce Berg 2001; Finch and Lewis 2003; Liamputtong 2009; Morgan 1997). In addition, this method is useful for producing consensus as people collectively address concerned topics to which, as individuals, they may have previously devoted little attention (Barbour 2008). Eight focus groups were organised in Can Tho districts (Binh Thuy, Phong Dien, Cai Rang) and two in Hau Giang province. To facilitate focus groups, the researcher first contacted local extensionists or officials to request that they select participants for focus groups based on pre-determined criteria (for example, participants as good farmers, as women, as old farmers, etc.). The local officials helped to negotiate the time and location of focus groups to fit the availability and convenience of participants. Most of the focus groups were held at local participants' houses that were enough large and easily accessible for others. For agriculture production clubs, the researcher contacted a representative of the clubs and then asked for an introduction to other members in the clubs. Each focus group interview involved a group of five to seven people who share similar social, economic, and cultural backgrounds and similar experiences or concerns in agriculture production activities. Homogenous group composition enhanced a productive, cohesive, and free discussion between participants (Hennink 2007, cf. King and Horrocks 2010; Krueger and Casey 2000; Liamputtong 2009).

Table A6: Information about focus groups

No.	Time	Venue	Participants	Length
1	16.11.2010	Information house- Tra Noc, Binh Thuy	- 10 farmers - Rice production - Old farmers	3 hours
2	20.11.2010	Farmer's house- Long Tuyen, Binh Thuy	- 5 farmers - Vegetable production - Middle-aged farmers	1,5 hours
3	22.11.2010	Farmer's house- Thoi Hung, Giai Xuan, Phong Dien	- 5 farmers - Fruit production - Middle-aged farmers	2 hours
4	23.11.2010	Farmer's house- Truong Dong B, Tan Thoi, Phong Dien	7 farmers	2 hours
5	25.11.2010	Farmer's house- Nhon Loc 1, Nhon Ai, Phong Dien	4 farmers	2 hours
6	25.11.2010	Farmer's house -Phong Dien town, Phong Dien	5 farmers	2 hours
7	3.12.2010	Information house- Thanh Phu, Thuong Thanh, Cai Rang	- 5 farmers - Mixed farming models - Young farmers	2 hours
8	7.12.2010	Information house- Phu Thu, Cai Rang	- 3 farmers - Rice and fruit production - Gender-mixed farmers	1 hours
9	5.3.2011	Farmer's house- Hiep Hung, Phung Hiep, Hau Giang	- 5 farmers - Sugarcane production - Middle-aged gender-mixed farmers	2 hours
10	7.3.2011	Farmer's house- Vi Tan, Vi Thanh, Hau Giang	- 5 female sugar farmers - Mixed-farming production - Middle-aged female farmers	2 hours

All focus groups began with the informed consent of participants. The researcher then introduced the purposes of the study, the main topics that would be discussed, and the group's working method. The focus groups were structured into three main sections. In the first part, participants were asked to redefine concepts of new agriculture cultivation techniques such as "three reductions three gains", "one must five reductions", four right things to do, IPM, GAP, and Global GAP. The researcher then collected information and made an attempt to connect different concepts in a systematic knowledge chain in order to help participants easily acquire the knowledge. Challenges in applying such techniques were identified and ranked in terms of their importance. The second part focused on exploring sources of knowledge, which participants had and which knowledge they need. Based on the lists of various knowledge sources and knowledge needs, participants chose the five most important knowledge sources and five kinds of knowledge or skills essential for their production. In this stage, the researcher re-checked participants' answers by asking whether they want to make any changes. In the final part, the researcher gave many advertisement pictures and posters related to agriculture production and asked participants to evaluate the effects of the visualised message. Digital recording and note-taking were performed during all focus groups, which lasted from one to three hours.

Figure A2: (a, left) Female farmers are writing down their opinions towards a question for group discussion, (b, right) Farmers are prioritising their sources of knowledge/information in a FGD

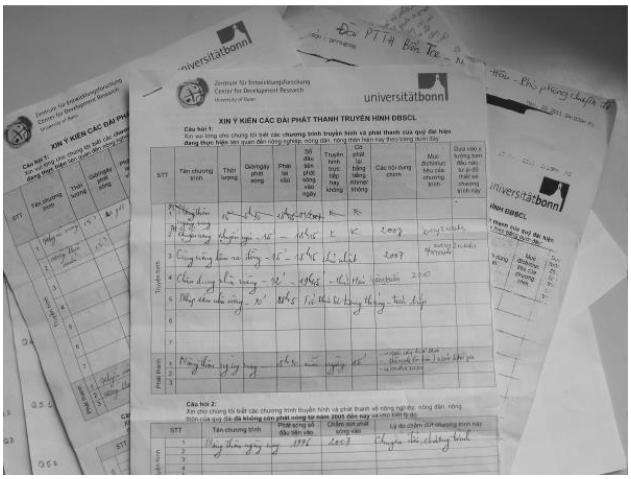
Survey

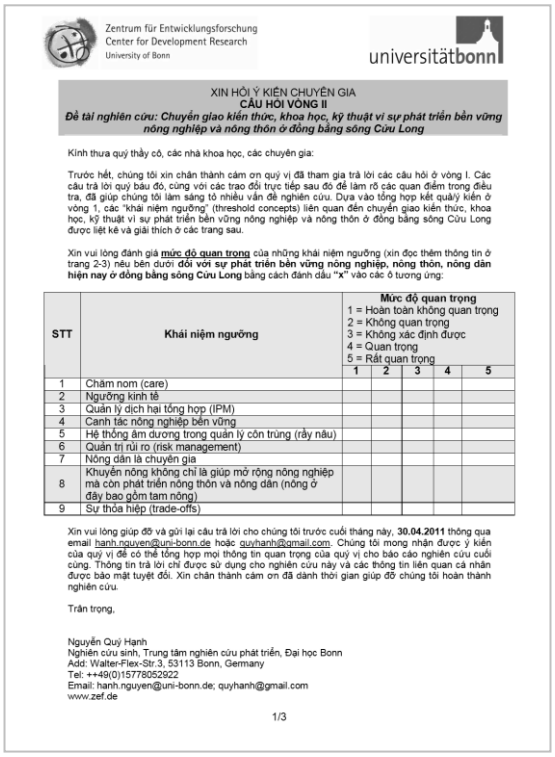
Television survey: Preliminarily analysing interviews' results conducted during a nearly one-year field trip in the Mekong Delta shows that rural people access knowledge and technology more and more and from various channels among which radio and television programs are one of the most important channels in agriculture-related information and knowledge transfer. This questionnaire survey, grounded on the initial analysis, was designed and targeted to local media outlets aiming to gain a thorough understanding about programs related to agriculture and rural development as well as information and knowledge transfer to the Mekong Delta population (see Figure A3a). The questionnaire consists of seven umbrella closed and open questions covering broad themes such as on-going radio and television programs, terminated programs, technical procedures of program production, how speakers and farmers are selected for the live programs, how "good" farmers are portrayed, and development orientations of local media outlets in terms of bettering their roles of facilitating information and knowledge transfer between government managers, scientists, businesspersons and farmers. The questionnaire was distributed to thirteen stations throughout Mekong Delta provinces in the end of February 2011. A reminder was sent out in mid-March 2011, also by email or telephone with the attached electronic or faxed questionnaire, respectively. In conducting the survey, the greatest challenge was persuading the stations to participate in the survey due to lack of trust between the researcher and the participants. Finally, six questionnaires completed by stations in Long An, Bac Lieu, Tien Giang, Ben Tre, Soc Trang, and Vinh Long provinces were received, three by post, one by fax, and two by emails. Those who were responsible for answering the questionnaire were chosen by the station leaders. They are senior managers of various functional divisions at the stations, namely the administration division, the news division, and the editorial division; they average twenty years of work experience in the mass media sector. As they were charged with collecting integrated information from the relevant specialised divisions to respond the survey, points of views presented in the questionnaires are collective rather than individual.

Delphi survey: The Delphi technique is described as a structured process for collecting and distilling knowledge from a pre-recruited group of experts by a series of questionnaires interspersed with controlled opinion feedback in order to clarify ill-defined topics or deal systematically with complex problem for decision-making (Ali 2005, 730; Dalkey 1972, 2; Hanafin 2004, 7; Linstone and Turoff 2002,3; Ziglio 1996, 3). The Delphi process can be summarised by two phases. The first, also called the exploration phase, aims to explore knowledge of a given subject while the second, the evaluation phase, is the process for collecting and assessing experts' opinions to address the issues under investigation (Linstone and Turoff 2002, 6; Ziglio 1996, 9). Given the fact that the Delphi technique enables researchers to better understand issues of concern by consulting the opinions of experts whose anonymity are maintained, it is highly appreciated for encouraging free and true opinions from experts and minimising biases caused by dominant individuals.

A two-round Delphi survey was carried out close to the end of the research field trip in the Mekong Delta. The researcher initially sent emails to invite 40 male and female experts in different spheres to the Delphi survey. A panel of 40 people was selected from among those who participated in interviews conducted during the interview implementation, based on the criterion that they were professionals in the agriculture sector. Most of them are lecturers of Can Tho University, researchers at different institutes, government officials, and research staff for agribusinesses. A round one questionnaire of Delphi study was sent to selected experts. In the first round, the Delphi process begins with an open-ended questionnaire. The goal of this round is to identify challenges in the process of information and knowledge transfer to local farmers and propose threshold concepts related to that information and knowledge transfer. A follow-up e-mail was used to encourage prompt responses to the round one questionnaire. Although 40 experts confirmed their participation, only 16 contributed to this survey round. Next, based on group feedback from the first questionnaire, a second round Delphi survey was designed and sent to respondents to inform them of the findings of the analysis of responses to the first round and request them to rank threshold concepts proposed in the first round on five-point Likert scales (1 = very unimportant, 5 = very important). In the second round, only seven out of 16 respondents sent in their answers (see Figure A3b). There are some challenges when carrying out the Delphi survey. The term "threshold concept" is a novel idea in academia and thus translating it successfully into Vietnamese is difficult. One respondent said that threshold concepts are interesting and then requested to directly meet the researcher to further discuss the concepts before giving opinions. An English version further explaining the term 'threshold concept' was thus included; however, it might cost respondents much time to read it and reduce their interests in the survey.

Figure A3: (a, left) Filled television survey questionnaires, (b, right) A second round Delphi survey questionnaire





Zentrum für Entwicklungsforschung
Center for Development Research
University of Bonn

universitätbonn

XIN HỎI Ý KIẾN CHUYÊN GIA
CÂU HỎI VÒNG II
Đề tài nghiên cứu: Chuyển giao kiến thức, khoa học, kỹ thuật vì sự phát triển bền vững nông nghiệp và nông thôn ở đồng bằng sông Cửu Long

Kính thưa quý thầy cô, các nhà khoa học, các chuyên gia:

Trước hết, chúng tôi xin chân thành cảm ơn quý vị đã tham gia trả lời các câu hỏi ở vòng I. Các câu trả lời quý báu đó, cùng với các trao đổi trực tiếp sau đó để làm rõ các quan điểm trong điều tra, đã giúp chúng tôi làm sáng tỏ nhiều vấn đề nghiên cứu. Dựa vào tổng hợp kết quả ý kiến ở vòng 1, các "khái niệm ngưỡng" (threshold concepts) liên quan đến chuyển giao kiến thức, khoa học, kỹ thuật vì sự phát triển bền vững nông nghiệp và nông thôn ở đồng bằng sông Cửu Long được liệt kê và giải thích ở các trang sau.

Xin vui lòng đánh giá **mức độ quan trọng** của những khái niệm ngưỡng (xin đọc thêm thông tin ở trang 2-3) nêu bên dưới **đối với sự phát triển bền vững nông nghiệp, nông thôn, nông dân hiện nay ở đồng bằng sông Cửu Long** bằng cách đánh dấu "**x**" vào các ô tương ứng:

STT	Khái niệm ngưỡng	Mức độ quan trọng 1 = Hoàn toàn không quan trọng 2 = Không quan trọng 3 = Không xác định được 4 = Quan trọng 5 = Rất quan trọng				
		1	2	3	4	5
1	Chăm nom (care)					
2	Ngưỡng kinh tế					
3	Quản lý dịch hại tổng hợp (IPM)					
4	Canh tác nông nghiệp bền vững					
5	Hệ thống âm dương trong quản lý côn trùng (rầy nâu)					
6	Quản trị rủi ro (risk management)					
7	Nông dân là chuyên gia					
8	Khuyến nông không chỉ là giúp mở rộng nông nghiệp mà còn phát triển nông thôn và nông dân (nông ở đây bao gồm tam nông)					
9	Sự thỏa hiệp (trade-offs)					

Xin vui lòng giúp đỡ và gửi lại câu trả lời cho chúng tôi trước cuối tháng này, **30.04.2011** thông qua email hanh.nguyen@uni-bonn.de hoặc quyhanh@gmail.com. Chúng tôi mong nhận được ý kiến của quý vị để có thể tổng hợp mọi thông tin quan trọng của quý vị cho báo cáo nghiên cứu cuối cùng. Thông tin trả lời chỉ được sử dụng cho nghiên cứu này và các thông tin liên quan cá nhân được bảo mật tuyệt đối. Xin chân thành cảm ơn đã dành thời gian giúp đỡ chúng tôi hoàn thành nghiên cứu.

Trân trọng,

Nguyễn Quý Hạnh
Nghiên cứu sinh, Trung tâm nghiên cứu phát triển, Đại học Bonn
Add: Walter-Flex-Str.3, 53113 Bonn, Germany
Tel: ++49(0)15778052922
Email: hanh.nguyen@uni-bonn.de; quyhanh@gmail.com
www.zef.de

Observation

Apart from collecting data from in-depth interviews, focus groups, surveys and content analysis, this study used observation to triangulate and supplement data from such sources. As defined by McKechine (2008, 573), observation mainly involves watching and listening in a systematic and purposeful way to understand

a phenomenon of interest. However, Gray (2004) argues that observation is a complex process that requires the researcher to use senses and perception to directly capture not only the opinions but also the behaviours and attitudes of people in the social setting chosen for study through indirect data collection methods (cf. Marshall and Rossman 2006; Punch 1998). In this study, the researcher used audio recording and field notes in observing nine training sessions, workshops, conferences, and rural development activities. They include:

- A rural sanitation workshop for peri-urban people initiated by the health prevention center of the Can Tho health department in order to implement a clean water and latrine construction program: this is a component of a national clean water program which the Can Tho health department directs and organises many workshops in different localities. Apart from providing information about clean water and rural sanitation, the program aims to financially support some households to build latrines. Commonly, local people are expected to be involved in the workshop; however, it is observed that most participants are leaders of the locality, such as village heads or leaders of relevant agencies rather than everyday local people.
- A district's training workshop for fish farmers organised by the aquaculture department to introduce methods of raising a new kind of fish and disease treatment and prevention: this is an annual program of the aquaculture department, which is combined with the introduction of Can Tho university research achievements and updated information on aquaculture.
- A hamlet's celebration of Solidarity Day with the participation of rural locals from all backgrounds: this activity is financially supported by high authorities and participated in by all local people with the purpose of commending good farmers and those who make contributions to the locality. This is also a chance for people to gather and discuss together for constructing new rural development.
- A university conference to introduce scientific results to the public, organised by the agriculture faculty of Can Tho university: this conference is conducted every three years and participated in by company representatives, agriculture managers in the Mekong Delta, alumni, and good farmers.
- A commune-level conference to introduce "good" gardening models: this conference is organised by an extensionist. The extensionist, through creativity, flexibility, and social networks, coordinates with a company and receives the company's financial support for organising such conferences, which is not as common in other regions.
- A research institute's training session for provincial extensionists: Cuu Long Delta Rice Research Institute (CLRRI) annually organises a training program for all junior and senior extensionists of the Mekong Delta provinces to update them on the current situation of agriculture extension. Such training courses comprise 40 to 50 participants and last four to five days.
- A research institute's training for agricultural trainee students: the training was organised by the Southern Sub-department for Plan Protection for trainee students from different regions, in order to provide them with agriculture development information in the Mekong Delta. Such training is usually combined with theory and practice sessions.
- A company training session for local farmers on new pesticides: the company organises training programs by a rolling method in all provinces of the Mekong Delta according to the local seasonal calendar. It means that they introduce different kinds of products (pesticides, fertiliser, etc.) for each stage of the rice production process. Local farmers are invited by local agro-materials agents and such sessions often take place in informal contexts such as coffee shops. Informal contexts give a demonstrably comfortable environment for farmers to discuss freely and express their opinions.
- An international agricultural fair in Can Tho, which as the center of the Mekong Delta region is the location of many international agricultural fairs. The fair encompasses several components such as exhibits, introductory sessions about agriculture products, scientific seminars, and consultation sessions. University lecturers and institute researchers participated in the fair as

consultants to farmers. Agriculture fairs have become popular in the farming community for visiting and sharing information.

Usually, through previously implemented interviews, the researcher received information about training programs, workshops, conferences, and public activities from interviewees who were largely government officials and lecturers or researchers, and then asked to participate as an observer at such events. Being admitted as an observer, the researcher was able to understand how such events were organised and arranged, which means of communications were used and what information and knowledge was transferred. All observations took place in Can Tho city and lasted from one to two hours.

Besides observations carried out in training sessions, workshops, conferences, and public activities, observations were also made during the field trip, sometimes combined with interviews and focus group discussions.

Unobtrusive methods

Apart from collecting first-hand information from interviewing, focus group interviewing and observing, the research focused on using such unobtrusive methods as the "non-reactive research method" to examining "material items produced within the culture" (Liamputtong 2009, 88; Webb et al. 1966). Specifically, this method uses "non-living forms of data" such as historical documents, newspapers, books, diaries, films, television, and so forth as the subjects studied, rather than research interaction (Hesse-Biber and Leavy 2011, 228). It enables the production of "naturalistic" and authentic data (Hesse-Biber and Leavy 2011, 228, Liamputtong 2009, 92). The research used the content analysis technique as the major method to examine written texts (newspaper articles, field notes, propaganda posters (see Figure A4), pesticide prescriptions, leaflets and instructions, and researcher's consultation diaries) and visual records (television programs) in order to understand specifically which themes such written texts and visual records contained, how effectively messages were conveyed to which groups of readers and broadly explore how mass media contributed to information and knowledge flow in agriculture and rural development in the Mekong Delta.

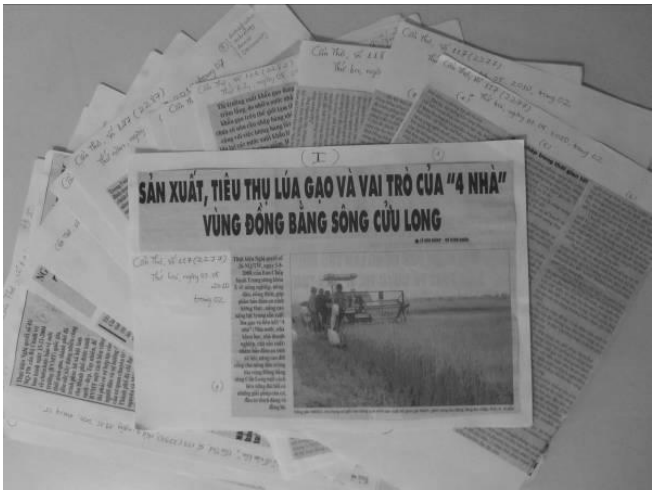
Content analysis: As a research technique that involves the drawing of replicable and valid inferences from texts, content analysis helps researchers to transform large amount of descriptive data into organised segments, understand particular phenomena that occur a long period of time, listen to the words of the text, and gain insights into the perspectives of the producers of these words (Bruce Berg 2001; Gray 2004; Krippendorff 2004; Marvasti 2004; Neuendorf 2002; Weber 1990). It is also critically useful for researchers to analyse collected data or existing texts and draw conclusions from contents in an unobtrusive and nonreactive manner without any access to communicators and participants (Bruce Berg 2001; Julien 2008; Riffe, Lacy, and Fico 2005).

In this research, the Can Tho daily newspaper was deliberately selected for content analysis. The Can Tho newspaper, like other local newspapers, is the voice of its provincial party committee, government, and people. In addition, Can Tho is recognised as a regional city of the Mekong Delta, which has been dramatically affected by process of globalisation and industrialisation and has been the location of several high-quality specialised universities, institutes, and centers in the agricultural sector. Undoubtedly, the Can Tho newspaper plays an important role in updating and providing information to both the city and the wider Mekong Delta. The newspaper was therefore ordered and delivered daily during the one-year field trip research in the Mekong Delta (1.4.2010 – 31.3.2011) by post to the researcher for reading and collecting articles related to agriculture and rural development. 257 articles from the one-year newspaper collection were chosen and analysed due to their high relevance to the research theme. Such articles were read by the researcher and a research assistant to determine their key themes. For some articles with mixed themes that were difficult to categorize, the researcher and the assistant discussed the matter and decided which theme was dominant in each article. That procedure helps to reduce bias when categorising and analysing data. Several themes identified include agricultural activities, farming models, sustainable development, agricultural cooperation, and knowledge and skills transfer in the agriculture sector. Practically speaking, content analysis was accomplished by using pencil and paper and coloured felt pens to

identify themes, followed by counting frequencies of themes mentioned in the 257 articles. The purpose of the content analysis in this research is to understand which and how information, knowledge, and skills related to the agriculture sector was presented in the newspaper and provided to different groups of readers in the Mekong Delta.

In addition, some agriculture-focused television programs, propaganda posters, pesticide prescriptions, leaflets, instruction and researcher's consultation diary were chosen for analysis.

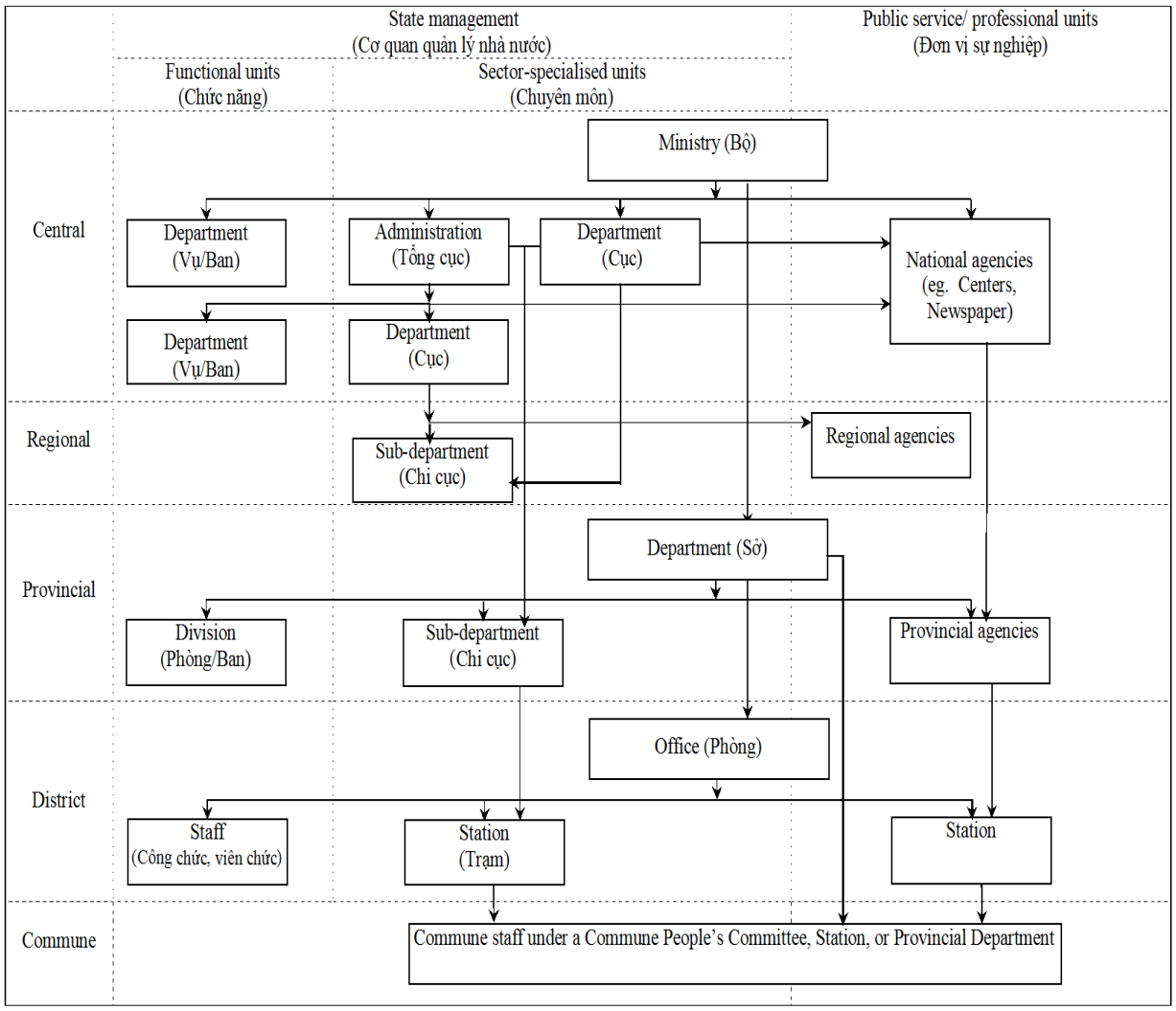
Figure A4: (a, let) Can Tho newspaper one year collection (daily, 257 articles), (b, right) A propaganda poster on new rice cultivation technique that can be widely found in rural Mekong Delta



Appendix 3.1: Differentiation of a Vietnamese Ministry's agencies

Vụ/Ban is a unit organised as counsellor for the Minister in implementing state management in responsible fields and sectors. It does not have its own sub-units or seal.

Cục is a unit organised to implement professional State management missions within its Ministry's management scope. It is allowed to form sub-units and has it owns seal and bank account. Some ministries form *Tổng cục* when professional State management missions are of great scope and complexity that are not devolved to the lower levels. Under *Tổng cục* includes *Vụ/Ban* and *Cục*. *Tổng cục* and *cục* might establish their regional agencies.



Source: Own presentation

Appendix 4.1: Agriculture and rural development research organisations in Vietnam

	Research institutes under MARD	Acronym	Vietnamese name	Location	Founding year	Predecessors
1	National Institute of Animal Husbandry	NIAH	Viện Chăn nuôi	Hanoi	1952	
2	Institute of Policy and Strategy for Agriculture and Rural Development	IPSARD	Viện Chính sách và Chiến lược Phát triển Nông nghiệp Nông thôn	Hanoi	2005	Institute of Agricultural Economics
3	Vietnam Institute of Agricultural Engineering and Post Harvesting Technology	VIAEP	Viện Cơ điện Nông nghiệp và Công nghệ sau thu hoạch	Hanoi	2003	Mergence of Institute of Agricultural Engineering and Post-Harvest Technology Institute
4	Vietnam Academy of Agricultural Sciences	VAAS	Viện Khoa học Nông nghiệp Việt Nam	Hanoi	2005	Crop Production Research Institute (1952)
5	Vietnam Academy for Water Resources	VAWR	Viện Khoa học Thủy lợi Việt Nam	Hanoi	2007	Research Institute of Irrigation and Electricity (1959)
6	Forestry Science Institute of Vietnam	FSIV	Viện Khoa học Lâm nghiệp Việt Nam	Hanoi, sub-institute in HCMC	1988	Mergence of Forest Research Institute (1961), Forest Industry Institute (1971) and Forest Economics Institute (1982)
7	Research Institute for Aquaculture No. 1	RIA No. 1	Viện Nghiên cứu Nuôi trồng Thủy sản I	Bac Ninh	1983	Research Station of Fresh-Water Fish (1963)
8	Research Institute for Aquaculture No. 2	RIA No. 2	Viện Nghiên cứu Nuôi trồng Thủy sản II	HCMC	1983	Research Sub-Institute for Aquaculture No. 1 (1976)
9	Research Institute for Aquaculture No. 3	RIA No. 3	Viện Nghiên cứu Nuôi trồng Thủy sản III	Khanh Hoa	2005	Research Institute for Aquaculture No. 3 (1984)
10	Research Institute for Marine Fisheries	RIMF	Viện nghiên cứu Hải sản	Hai Phong , sub-institute in Vung Tau	1975	Research Station of Marine Fish (1961)
11	National Institute of Agricultural Planning and Projection	NIAPP	Viện Quy hoạch và Thiết kế Nông nghiệp	Hanoi	1977	Department of Planning under Ministry of State Farms (1961)
12	National Institute of Veterinary Research	NIVR	Viện Thú y	Hanoi and sub-institute in Nha Trang	1969	

Research institutes under VAAS		Acronyms	Vietnamese name	Location	Founding year	Predecessors
1	Center for Technology Development and Agricultural Extension	CETDAE	Trung tâm Chuyển giao Công nghệ và Khuyến nông	Hanoi	2010	Center for Technology Transfer and Agricultural Extension (under FCRI)
2	Vietnam Sericulture Research Center	VIETSERI	Trung tâm Nghiên cứu Dâu tằm tơ Trung ương	Hanoi	2010	Sericulture Research Center (under FAVRI)
3	Plant Resources Center	PRC	Trung tâm Tài nguyên Thực vật	Hanoi	2006	
4	Plant Protection Research Institute	PPRI	Viện Bảo vệ Thực vật	Hanoi	1968	
5	Field Crops Research Institute	FCRI	Viện Cây lương thực và Thực phẩm	Hai Duong	1968	
6	Agricultural Genetics Institute	AGI	Viện Di truyền Nông nghiệp	Hanoi	2005	Agricultural Genetics Center (1984)
7	Cuu Long Delta Rice Research Institute	CLRRI	Viện Lúa Đồng bằng Sông Cửu Long	Can Tho	1985	Cuu Long Delta Agricultural Technology Center (1977)
8	Northern Mountainous Agriculture and Forestry Science Institute	NOMAFSI	Viện Khoa học Kỹ thuật Nông Lâm nghiệp Miền núi Phía Bắc	Phu Tho	2005	Emergence of Tea Research Institute of Vietnam (Vietnam Tea Corporation), Northern Mountainous Agriculture Research Center (Vietnam Institute of Agricultural Science and Technology) and Ba Vi Coffee Research Center (Vietnam Coffee Corporation)
9	Western Highlands Agriculture and Forestry Science Institute	WASI	Viện Khoa hoc Kỹ thuật Nông Lâm nghiệp Tây Nguyên	Dac Lac	1997	Emergence of Research Institute of Coffee (Vietnam Coffee Corporation) and Bao Loc Sericulture Research Center (Vietnam Sericulture Corporation)
10	Northern Central Agricultural Science Institute	ASINCV	Viện Khoa học Kỹ thuật Nông nghiệp Bắc Trung Bộ	Nghe An	2005	Emergence of Northern Central Agricultural Research and Development Center and Phu Quy Center of Fruit Research
11	Southern Coastal Central Agricultural Science Institute	ASISOV	Viện Khoa học Kỹ thuật Nông nghiệp Duyên hải Nam Trung Bộ	Binh Dinh	2005	Southern Coastal Central Agricultural Research Center (1997)
12	Institute of Agricultural Science for Southern Vietnam	IAS	Viện Khoa học Kỹ thuật Nông nghiệp Miền Nam	HCMC	2005	
13	Institute for Agricultural Environment	IAE	Viện Môi trường Nông nghiệp	Hanoi	2008	
14	Southern Horticultural Research Institute	SOFRI	Viện Nghiên cứu Cây ăn quả Miền Nam	Tien Giang	1994	Long Dinh Fruit Research Center
15	Maize Research Institute	MRI	Viện Nghiên cứu Ngô	Hanoi	2006	

16	Fruits and Vegetables Research Institute	FAVRI	Viện Nghiên cứu Rau quả	Hanoi	1990	
17	Soils and Fertilizers Research Institute	SFRI	Viện Thổ nhưỡng Nông hóa	Hanoi	1969	

Research institutes under MARD Administrations		**Acronyms**	**Vietnamese name**	**Location**	**Founding year**	**Under MARD Administrations**
1	Forest Inventory and Planning Institute	FIPI	Viện Điều tra Quy hoạch Rừng	Hanoi	1961	Vietnam Administration of Forestry
2	Vietnam Institute of Fisheries Economics and Planning	VIFEP	Viện Kinh tế và Quy hoạch Thủy sản	Hanoi and sub-institute in HCMC	1984	Vietnam Administration of Fisheries
3	Institute of Water Resources Planning	IWRP	Viện Quy hoạch Thủy lợi	Hanoi	1961	Vietnam Administration of Irrigation
4	Southern Institute of Water Resources Planning	SIWRP	Viện Quy hoạch Thủy lợi Miền Nam	HCMC	1977	Vietnam Administration of Irrigation

Universities in agriculture and rural development		**Acronyms**	**Founding year**	**Location**	**Component institutes/centers**
Under MOET					
1	Hanoi University of Agriculture	HUA	1956	Hanoi	- Institute of Agrobiology (IAB, 1999) - Rice Research Institute (RRI, 2005) - Institute of Economics and Development (IED) - Institute for research and training on electromechanics - 11 agriculture-specialised centers
2	Hue University of Agriculture and Forestry	HUAF	1967	Hue	- Center for Agricultural Forestry Research and Development (CARD, 1992) - Center for Rural Development in Central Vietnam (CRD, 1995) - Institute for Development Research
3	Nong Lam University	NLU	1955	HCMC	- Research Institute for Biotechnology and Environment (RIBE, 2009) - 5 agriculture-specialised centers
4	Thai Nguyen University of Agriculture and Forestry	TUAF	1970	Thai Nguyen	- Center for Mountainous Agricultural Forestry Research and Development - Research Center of Temperate Crops of Northern Mountainous Region- Viet Nam (2010)
5	Can Tho University (mainly College of Agriculture and Applied Biology)	CTU	1966	Can Tho	- Mekong Delta Development Research Institute (MDI, 2005) - Biotechnology Research and Development Institute (BiRDI, 1991) - Delta Research And Global Observation Network (DRAGON Institute-Mekong-CTU, 2008)

6	An Giang University (mainly Department of Agriculture and Natural Resources)	AGU	1999	An Giang	- Research Center for Rural Development (RCRD)
Under MARD					
1	Vietnam Forestry University	VFU	1964	Hanoi	Institute for Forest Ecology and Environment (IFEE, 2006)
2	Water Resources University	WRU	1959	Hanoi	- Institute for Water and Environment Research (IWER, 2007, HCMC) - Institute of Construction Engineering (ICE) - Institute of Water Resources Technology (IWRT)
3	Bac Giang University of Agriculture and Forestry	BAFU	2011		

Research institutes under Central City's Governments		**Acronyms**	**Vietnamese name**	**Location**	**Founding year**	**Predecessors**
1	Hanoi Institute for Socio-Economic Development Studies	HISEDS	Viện Nghiên cứu Phát triển Kinh tế - Xã hội Hà Nội	Hanoi	2008	
2	Ho Chi Minh City Institute for Development Studies	HIDS	Viện Nghiên cứu Phát triển Thành phố Hồ Chí Minh	Hanoi and sub-institute in HCMC	2008	Mergence of Institute of Economics, Institute of Social Sciences (under HCM CPC) and Institute of Construction and Planning (under HCMC Department of Architecture and Planning)
3	Danang Institute for Socio-Economic Development	DISED	Viện Nghiên cứu Phát triển Kinh tế - Xã hội Đà Nẵng	Da Nang	2007	
4	Can Tho City Institute for Socio-Economic Development	CIDS	Viện Kinh tế Xã hội Thành phố Cần Thơ	Can Tho	2008	

Source: Data collected from institute's websites and interviews

Appendix 4.2. SOFRI international cooperation projects 2006-2011

No	Project	Time	Int. partner(s)
1	Improvement of fruit farming in the South Vietnam	2002-2007	ADB
2	Huanglongbin management for Indonesia, Vietnam and Australia	2003-2007 2008-2009	ACIAR (Australia)
3	Managing pest fruit flies to increase production of fruit and vegetable crops in Vietnam	2002-2005 2006- 2009	ACIAR, AusAID, Crawford (Australia)
4	Huanglongbin management program in Vietnam	2003-2006	CIRAD-FLHOR (France)
5	Development of new technologies for control of citrus Huanglongbin in Southeast Asia	2004-2010	JIRCAS (Japan)
6	Developing GAP systems for dragon fruit producers and exporters in Binh Thuan and Tien Giang	2005-2007	CARD (Australia)
7	Improvement of export and domestic markets for Vietnamese fruit through improved post-harvest and supply chain management	2005-2008	CARD (Australia)
8	Management of Phytophthora diseases in Vietnamese horticulture	2005-2006	CARD (Australia)
9	Amélioration de la qualité de la mangue fraiche par le tri qulitatif non destructif à la récolte	2006-2007	AUF (France)
10	Postharvest technology for mango	2006-2007	AUF (France)
11	Greening disease management on cam sanh orange by integrated pesticide management	2006-2010	JIRCAS-SOFRI-Vĩnh Long
12	Value chain for fruit and vegetable (GTZ project) and result on Mango Value chain analysis in Tien Giang and Dong Thap	2006	GTZ (Germany)
13	Programme of agricultural development	2006-2009	ADB
14	Agricultural science and technology	2007-2011	ADB
15	Building disease management capacity in Vietnam	2007-2008	CABI-GPC (UK)
16	Project of advanced rural development model for Cu Chi District- Ho Chi Minh City	2007-2011	Chinfon (Taiwan)
17	Extending export opportunities to small-plot dragon fruit growers through good agriculture practice	2007-2010	CARD (Australia)
18	Assist SOFRI and SIAEP develop 5-year strategic plans	2008	HortResearch (New Zealand)
19	Assist development of breeding programmes	2008	CARD HortResearch (New Zealand)
20	Assist development of a packhouse business plan	2008	CARD HortResearch, New Zealand
21	Improvement of extension system for applying better farming system and cultivation techniques for poor farmers in the Mekong Delta	2009-2014	JICA (Japan)
22	Developing twinning relationship between plant and food research and SOFRI/SIAEP	2008-2009	CARD HortResearch, New Zealand
23	Value chain analysis for sustainable and profitable farming systems on the South Central Coast	2009-2012	ACIAR (Australia)
24	Developing twinning relationship between plant and food research and SOFRI/SIAEP	2009-2010	HortResearch (New Zealand)
25	Expanding export opportunities to small-plot dragon fruit growers through Good Agriculture Practice	2010-2011	CARD (Australia)
26	Novel post harvest treatments of dragon fruit for export	2010-2011	CARD (Australia)
27	Agricultural growth and poverty pockets	2011 – 2014	Copenhagen (Sweden)
28	Integrated postharvest extension program for Cambodia and Vietnam		Hawaii, Honolulu (USA)
29	Area wide integrated pest management of fruit flies in South and South East Asia	2011-2012	FAO
30	Plant wise clinic	2011	GPC-CABI (UK)
31	Agriculture competitiveness	2011- 2013	World Bank

Source: Data provided by SOFRI

Appendix 6.1 : Agriculture related programs of a provincial television and radio center in the Mekong Delta

	No	Name of program	Duration	Broadcast time	Re-broadcast	First time broadcast	Live program	In Khmer	Main content	Knowledge diffusion objective	Initiated by
Television	1	Farmer's friends	90'	Every 2nd Sat of the month 15h	Mon.9h	2002	✓	×	Exchange – consultation with invited experts	Direct provision of knowledge for farmers across monthly themes	IPM program
	2	Agriculture and rural development	15'	Every Tue 19h 45'	×	2006	×	×	Agriculture related information – successful models	Provision of information	Editorial board
	3	Agricultural tactics	15'	Every Sat 16h30'	×	2010	×	×	Agricultural good tactics of Mekong Delta farmers	Farmers experience sharing	Editorial board
	4	Agricultural safety	15'	Every Mon 16h	×	2006	×	×	Information of technology & innovation of agricultural safety	Knowledge supply	Editorial board
Radio	1	Rural page	30'	Daily 5h-5h30'	Daily 13h30' - 14h	2006	×	×	Daily episodes: agricultural and rural issues, farmers get rich, farmer's talent test, environment, rural life, farmer mailbox	Provision of knowledge, information, models, experience etc.	Editorial board
	2	Animal husbandry - Veterinary medicine-Aquaculture	60'	Every Tue 19-20h	Following day 9-10h	N/A	✓	×	Live consultation with experts, knowledge in questions & answers	Provision of information and knowledge	Editorial board
	3	Live exchange with scientists - A farmer's forum	60'	Every Wed & Thu 19-20h	Following day 9-10h	N/A	✓	×	Live consultation with experts, knowledge in questions & answers	Provision of knowledge	Editorial board

Source: Author's Mekong Delta Local Television & Radio Survey 2011

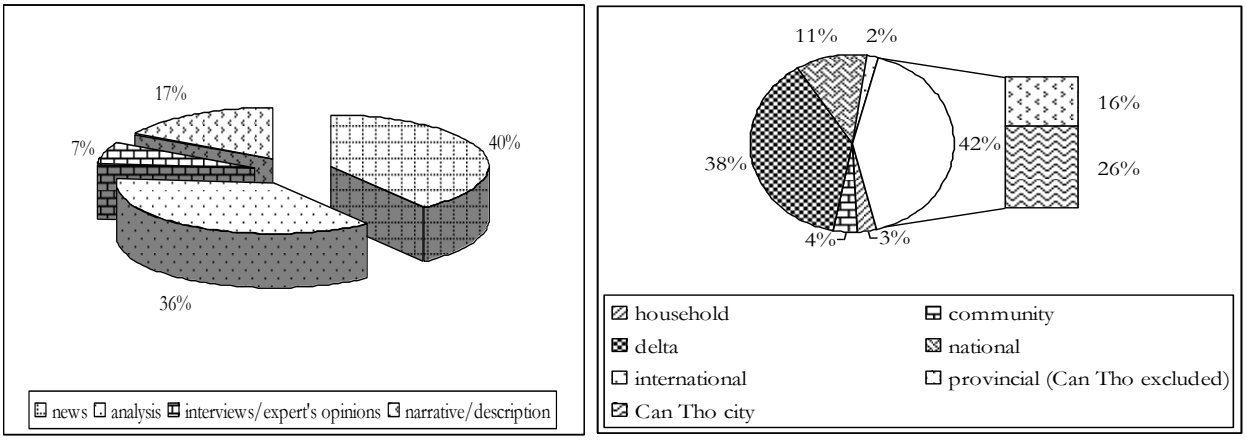
Appendix 6.2: Content analysis of Can Tho daily newspaper volume 01.04.2010-31.03.2011

A. Classification of agricultural/rural development topics

Theme	Example	Number	Percentage
water use and management	sanilisation, water-controlled works, river-bank erosion, conflicting water-sources for rice-shrimp production, polluted canal, water supply, industrial water waste	48	19
aquaculture and fishery	sector's new development directions, shrimp culture	48	19
rice	rice production, new seeds, "five reductions and one must" model, rice export	47	18
rural development	new rurality, *tam nong*, rural development and industrialisation	28	11
fruit and vegetable	standardised fruit supply, clean vegetable market	17	7
alternative agricultural practices	integrated farming, machinisation, hi-tech application, GAP, sustainable agriculture, comprehensive agriculture	12	5
supporting sectors	science associations, farmer's association, agriculture-related scientific research by students	12	5
climate change	national climate change committee, climate change and adaptation	10	4
environment protection	campaigns, new environment protection regulations, punishments for violations	9	4
agribusinesses	state farm equitisation, Viet trademark, agricultural product processing industry	6	2
advanced farmers	"good" farmers, farmers with innovations	6	2
collective agriculture	agricultural clubs, agricultural cooperatives	4	2
rural micro-finance	bank's preferential policy for agriculture loans, credit groups	4	2
animal husbandry	swine raising, bird flu	2	1
rural vocational training	rural vocational training programs	2	1
Mekong Committee	Mekong Committee meetings and messages	2	1
		257	**100**

Source: Author's content analysis

B. (a, left) Type of content presentation (b, right) Locus of issues



Source: Author's content analysis