Integrated Systems Research for Sustainable Smallholder Agriculture in the Central Mekong

Achievements and challenges of implementing integrated systems research

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CGIAR RESEARCH PROGRAM ON Integrated Systems for the Humid Tropics

World Agroforestry Centre

Humidtropics in the Central Mekong Action Area

Chapter 1

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Summary

This chapter introduces Humidtropics, the CGIAR Research Program (CRP) on Integrated Systems for the Humid Tropics, and the research for development (R4D) activities implemented from 2013 to 2016 in the Central Mekong Action Area. The chapter also provides an overview of the other book chapters.

1. Introduction

Humidtropics was a CGIAR Research Program on Integrated Systems for the Humid Tropics that aimed to help poor farm families in tropical Africa, Asia and the Americas boost their income and livelihoods through agricultural development. The CRP used participatory and collaborative approaches involving a wide range of local stakeholders as partners in R4D. As one of the three CRPs[1] that undertook integrated systems research, Humidtropics, along with drylands and aquatic systems, had the challenging task of looking at agriculture in a holistic manner. This meant identifying, understanding and addressing the multiple issues of productivity, natural resources management and institutional constraints across the entire system (Humidtropics 2012), as well as the interactions, trade-offs and synergies of potential innovations at household, community and policy levels (Öborn et al 2017). To facilitate this, Humidtropics adopted a multistakeholder approach that focused on bringing research, government, development and business partners together to identify key constraints, and to prioritize, design and implement innovative approaches to overcome them. Multistakeholder platforms were established, operating either at the local community level and focusing on concrete issues (e.g. the platform on commercial vegetables established in Northwest

[1] Following a comprehensive review of the CGIAR system's structure and activities in 2008, 15 research programs were implemented in the first CRP phase (2012-2016): seven CRPs that focused on a particular crop or commodity; five cross-cutting CRPs; and, three agricultural systems CRPs. The second CRP phase (2017-2022) will have eight agrifood systems (AFS) CRPs, four global integrating programs (GIP), and three technology and data platforms.

Viet Nam), or operating at a higher regional level and targeting the more structural policy barriers for agricultural innovation in the agricultural system. Working with multiple stakeholder groups was proposed for three main reasons (Schut et al 2016). First, different stakeholder groups can provide a diversity of insights about the biophysical, technological and institutional dimensions of the problem, and what type of innovations are technically feasible, economically viable and socioculturally and politically acceptable (Schut et al 2014). Second, stakeholder groups become aware of their fundamental interdependencies and the need for concerted action to overcome common constraints and reach their objectives (Leeuwis 2000). Third, stakeholder groups are more likely to support specific solutions when they have been part of the decision-making and design process (Faysse 2006).

Originally conceived as a 15-year research program, the Humidtropics' R4D activities began in 2013. Two years later, the CGIAR announced that in its second CRP phase starting 2017, the systems CRPs would be absorbed into the more value-chain oriented agrifood systems CRPs. Although it is unfortunate that Humidtropics as an independent research program was to last less than five full years, numerous and significant R4D activities were implemented and partnerships were forged at field sites in Sub-Saharan Africa, Central America and the Caribbean, and Southeast Asia. This book provides readers with a glimpse of the R4D activities and partnerships in the Humidtropics Central Mekong Action Area[2] led by the World Agroforestry Centre (ICRAF) in close partnership with international and national partners in five countries in mainland Southeast Asia. In doing so, our goal is to provide the results of our endeavours to support ongoing and future integrated agricultural systems research in Central Mekong and elsewhere.

2. Humidtropics, the CGIAR Research Program on Integrated Systems for the Humid Tropics

A systems research program that focuses on the humid tropics has several significant aspects. The humid tropics are important for their biodiversity and constitute many of the world's biodiversity hotpots (cf. Myers et al 2000). Covering almost 3 billion hectares of land, the humid tropics are home to approximately 2.9 billion people, most of whom are poor smallholder farmers (Humidtropics 2012). Considering that agriculture is a major livelihood in the humid tropics, sustainable agricultural development is essential to enable numerous challenges to be addressed, not just in environmental conservation but also in dealing with the human element in the equation. Without addressing issues such as poverty, food security and market access in these regions, it is not possible to address threats to the environment and to adapt to global changes including climate change. The Humidtropics CRP thus aimed to take a systems perspective to deal with such issues comprehensively by implementing

[2] Situated within the larger 260 million ha geopolitical boundary of the Greater Mekong subregion, the Central Mekong Action Area covers an area above the Mekong delta and below the high mountainous temperate zone (Humidtropics 2012). See also map on page ix of this book.

R4D that contributes to enhancing agricultural production and productivity while at the same time improving smallholder livelihoods and reducing the environmental degradation that often arises from intensified agriculture.

The theory of change within the Humidtropics CRP was based on the hypothesis that the region's inherent potential is best realized through an integrated systems approach involving participatory action across stakeholder groups. Humidtropics addressed this by enhancing capacity to innovate at farm, institutional and landscape levels, and engaging with women, youth and marginalized groups. The increased innovation capacity would result in systems interventions that improve productivity and natural resource management and links to markets. This way, Humidtropics contributed to delivering on the three main goals of the Strategy and Results Framework of the CGIAR (CGIAR 2015):

- ***Reduced poverty:*** through increased productivity and resilience to shocks, leading to increased incomes and employment opportunities. Enhanced access to markets for smallholder farmers and increasing the resilience of the poor are also important components.
- ***Improved food and nutrition security:*** through improved diets, food safety, and human and animal health through better agricultural practices.
- ***Improved natural resource systems and ecosystem services:*** by ensuring that natural capital is enhanced and protected from climate change and overexploitation, as well as other forms of abuse. Enhanced benefits from ecosystem goods and services, and more sustainably managed agro-ecosystems, are also key components.

Ultimately, the Humidtropics objective was to contribute to achieving these outcomes by 2023 by increasing staple food yields by 60 percent, increasing average farm income by 50 percent, lifting 25 percent of poor households above the poverty line, reducing the number of malnourished children by 30 percent, and restoring 40 percent of farms to sustainable resource management (Humidtropics 2012). In the extension proposal for 2015-2016, Humidtropics was further developed and its goals and targets refined in three, six, and nine-year targets (Humidtropics 2014).

The research program was organized into three Strategic Research Themes (SRTs) as demonstrated in Figure 1.1:

1. SRT1 focused on systems analysis and global synthesis, by establishing the baseline situation and synthesizes progress towards the expected outcome situation.
2. SRT2 worked on integrated systems improvement, by researching and mainstreaming promising systems interventions related to productivity, natural resource management, and markets and institutions. This theme also included use of modelling tools and analysis, gender considerations, research-development interactions, and scaling-out dimensions. Sustainable intensification and diversification are key drivers.

3. SRT3's research on scaling and institutional innovations focused on co-evolving institutions via social innovation with the technologies emanating from the integrated systems improvement theme. As such, it aimed to improve stakeholders' capacity to innovate and support the scaling of interventions at farm, national and global levels.

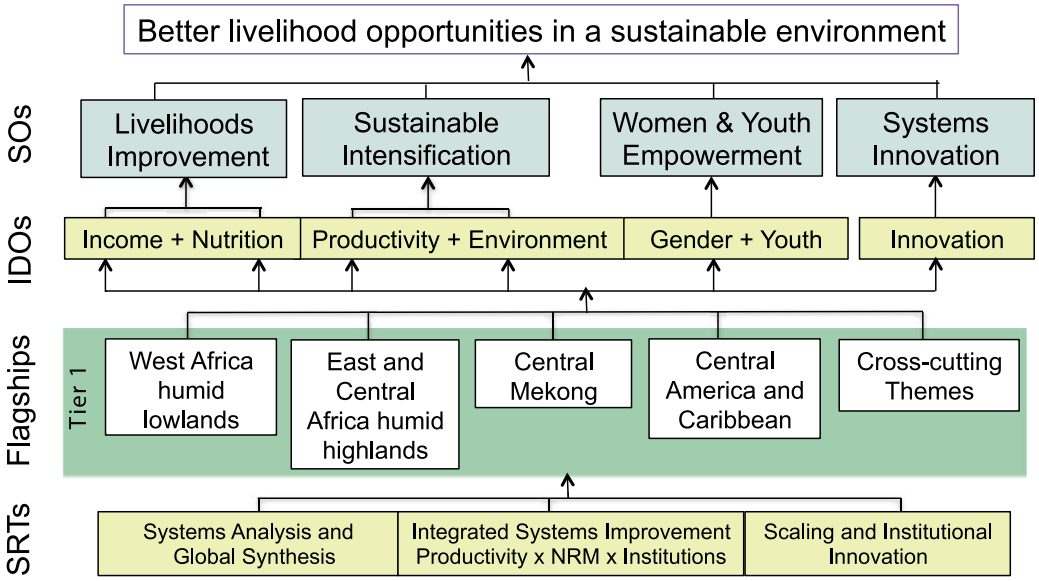

Figure 1.1 Humidtropics program framework (Humidtropics 2014)

SRT: Strategic Research Theme; IDO: Intermediate Development Objective; SO: System Outcome; NRM: Natural Resources Management

In addition to the SRTs, five cross-cutting research themes were identified and implemented:

1. Innovation systems research
2. Capacity development
3. Gender
4. Nutrition
5. Global synthesis and analysis on key outcomes from Humidtropics research

Although this ambitious program intended to encompass much larger areas across the humid and sub-humid tropics, four geographically defined Action Areas were chosen to begin with:

1. East and Central Africa Highlands, covering humid and sub-humid tropics of western Kenya, southern Uganda, the Ethiopian Highlands, eastern Congo, Burundi and Rwanda;
2. The West Africa Humid Lowlands, covering the humid and sub-humid tropics of Cameroon, Nigeria, Ghana and Cote D'Ivoire;

3. Central Mekong, situated within the larger geopolitical boundary of the Greater Mekong sub-region and including Cambodia, Lao PDR, Myanmar, Thailand and Viet Nam plus the two southwest provinces of China; and,
4. Central America and the Caribbean, including three main sites in the humid and sub-humid tropics of Nicaragua, Honduras, Guatemala, El Salvador, Haiti and the Dominican Republic.

3. Central Mekong Action Area: An overview

The Central Mekong Action Area covered six countries in mainland Southeast Asia (Cambodia, China, Laos, Myanmar, Thailand and Viet Nam), with diverse topography, farming systems, ethnic populations, markets and sociopolitical systems. The region is undergoing intense social, economic, and ecological changes that offer many economic opportunities, yet also pose potential threats to ecologically sustainable livelihoods. The area is characterized by expanding infrastructure and markets, and government policies and programs that promote rural and agricultural development; all these present opportunities to improve livelihoods. At the same time, government policies that enforce rapid conversion to specialized and intensified forms of agriculture and other land uses (Than 1998, Rerkasem et al 2009), and rapid population changes, have created significant challenges in upland agricultural systems. These include: sedentarization of agriculture and settlements; environmental degradation, including rapid deforestation and erosion of farming lands; limited and inequitable access to markets; decreasing productivity and total farm income; inequitable access to natural resources, including water; ecosystem services that do not benefit the poor; and, marginalized ethnic minorities (Rerkasem et al 2009, Friederichsen and Neef 2010, Drahmoune 2013, Fox and Castella 2013).

Humidtropics activities in the region were officially launched at a workshop in Hanoi in May 2013. Field implementation was planned within three transnational Action Sites sharing common agro-ecological and sociocultural systems and challenges, as delineated in the map of the Central Mekong Action Area on page ix of this book.

1. ***Green Triangle Action Site,*** composed of Northwest Viet Nam, northern Lao PDR, and Honghe Prefecture, Yunnan, China;
2. ***Golden Triangle Action Site,*** composed of northwest Lao PDR, northern Thailand, eastern Myanmar, and Xishuangbanna Prefecture, Yunnan, China; and
3. ***Development Triangle Action Site,*** composed of southern Lao PDR, northeast Cambodia, and Central Highlands, Viet Nam.

Delineating the action sites took into consideration the potential for cross-border learning and transboundary research, and also existing research activities by the Humidtropics core partners.

A timeline of the main events in the Action Sites (Triangles) and field sites in the Central Mekong is shown in Figure 1.2 below.

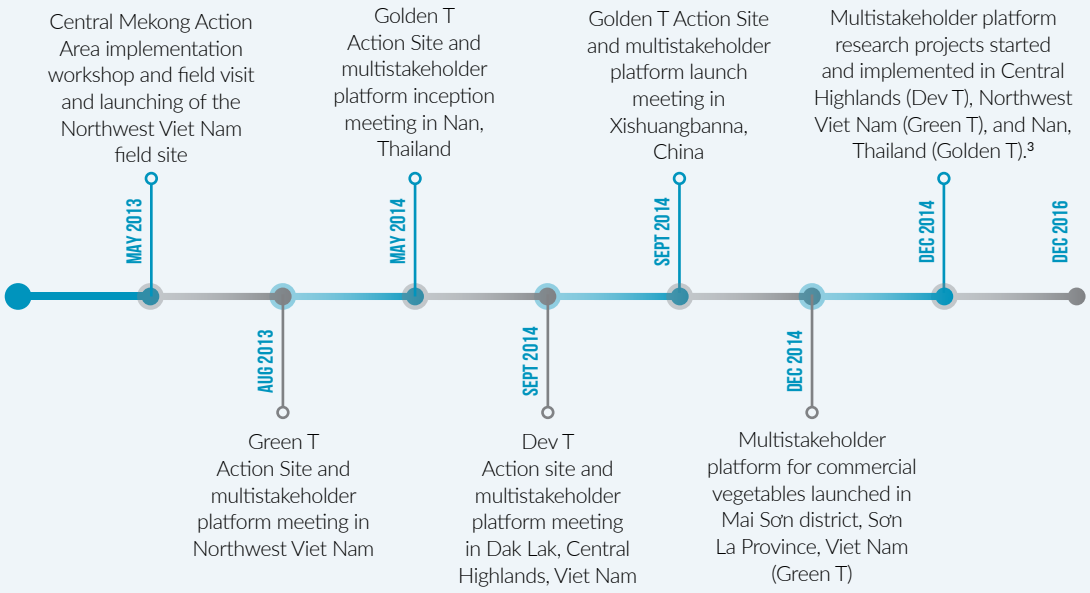

Figure 1.2 Timeline of key events in Central Mekong 2013-2016.

ICRAF coordinated the R4D activities in the Central Mekong. The Action Area Coordinator was initially based in Kunming, China, and then in Hanoi, Viet Nam from April 2013. A Core Team was formed with a representative from each of the eight Humidtropics core partners in this region. These were:

- Bioversity International
- International Center for Tropical Agriculture (CIAT)
- International Potato Center (CIP)
- The World Agroforestry Centre (ICRAF)
- International Livestock Research Institute (ILRI)
- International Water Management Institute (IWMI)
- Wageningen University (WUR)
- World Vegetable Center (WorldVeg)

The Core Team met twice a year to provide a) a coherent and effective management structure across partner organisations; b) a transparent and auditable joint decision-making process to prioritize, plan and implement the R4D activities in line with Humidtropics objectives and impact strategy; and, c) facilitate the effective implementation of cross-cutting

[3] Multistakeholder platform research projects were based on broader partnerships involving both CGIAR and non-CGIAR entities, and were launched in 2014. Emerging out of platform interactions and led by local institutions and organizations, modest amounts of financial resources were provided to generate collaborative systems research. See Table 1 below for more information on each research project.

activities within the Central Mekong Action Sites. In addition to the regular Core Team meetings, the researchers gathered in November 2013, 2014 and 2015 to plan activities and budget for the following years. Regular monitoring and evaluation (M&E) based on result-based management were implemented by an M&E officer based at ICRAF Viet Nam.

Table 1.1 Overview of research for development activities implemented in Central Mekong

Action Site / R4D activity	Development Triangle	Green Triangle	Golden Triangle
1. Site characterization and systems analysis	Situational analysis to broadly characterize important system aspects in Action Sites, to develop a shared understanding of the issues that need to be addressed among partners, and to initiate and facilitate stakeholder engagement (Cadilhon et al 2015). Reports published for Northwest Viet Nam (Green Triangle); Nan, Thailand and Xishuangbanna, China (Golden Triangle). Draft reports prepared for Central Highlands, Viet Nam (Development Triangle) and Honghe, China (Green Triangle).		
	Identification and analysis of potential entry points for interventions to improve rural household livelihoods in the Central Highlands of Viet Nam (Development Triangle) and Northwest Viet Nam (Green Triangle) through the EXTRAPOLATE (EX-ante Tool for RAnking POLicy AITErnatives) tool. EXTRAPOLATE is a decision support tool that assesses the impact of different policy measures. For more information: http://www.fao.org/ag/againfo/programmes/en/pplpi/dsextra.html.		Analysis of complex agricultural problems and innovation capacity by stakeholders in the agricultural system using the Rapid Appraisal of Agricultural Innovation Systems (RAAIS) tool in Xishuangbanna, China (see Schut et al 2015)
	Baseline survey to characterize farms and farmers using Rural Household Multi-indicator Survey (RHoMis) tool in Central Highlands, Viet Nam, Laos and Cambodia.	Baseline survey to characterize farms and farm households using IMPACT-Lite tool in Northwest Viet Nam.	
2. Integrated systems improvement		Identification and testing innovations to grow and market 'safe'[4] vegetables and off-season vegetables; field testing of crop and water management practices of home-based production of vegetables in Northwest Viet Nam.	

[4] In Viet Nam, the term 'safe' is used to signify vegetables produced under a process that ensures safety for consumers. The concrete details of such processes tend to differ according to the producers, but the standards set by VietGAP (Vietnamese Good Agricultural Practices, a national certification for agricultural products), is what farmers generally strive to follow.

Action Site / R4D activity	Development Triangle	Green Triangle	Golden Triangle
		Identification and assessment of food and nutrition gaps; identification and testing of best-bet systems innovations to improve dietary diversity and diet quality; and development of R4D tools to integrate nutrition into systems research in Northwest Viet Nam.	
	Research implemented to promote eco-efficient agriculture for poor smallholder farmers in Cambodia, Laos and Viet Nam.	Research implemented to better understand land-use change and erosion and water resources in northwest Laos and northern Viet Nam.	
		Sustainable agroforestry options with market potential identified and tested among smallholder farmers in Northwest Viet Nam.	Interventions identified and tested for diversified and sustainable rubber ('green rubber') in Xishuangbanna, southwestern China, northern Thailand, and northern Laos.
3. Institutional innovation			Testing of PRactice-Oriented Multi-level perspective on Innovation and Scaling (PROMIS) on scaling environmentally friendly rubber practices in southwest China (Wigboldus et al 2016)
	Multistakeholder platforms launched and functions supported to implement integrated agricultural R4D and to foster agricultural innovations in different triangles: Central Highlands, Viet Nam (Development Triangle); Northwest Viet Nam (Green Triangle); Nan, Thailand and Xishuangbanna, China (Golden Triangle).		

Action Site / R4D activity	Development Triangle	Green Triangle	Golden Triangle
	Multistakeholder platform research projects		
	Enhanced livelihoods and better natural resource management through appropriate integration and diversification through home gardens, forage grass, and local pig-raising by smallholder farms in the Central Highlands of Viet Nam.	Research for development of interventions such as intercropping coffee-fruit trees-grass strips and fruit trees-vegetables in a predominantly maize monocropping system on sloping and lowland for scaling up in Northwest Viet Nam.	Assessment of different opportunities for agricultural diversification such as fruit trees-vegetables, mushroom production, and home gardens in Nan, Thailand.
4. Capacity development	Support provided to set up and maintain functions of multistakeholder platforms through training sessions targeting platform facilitators and CGIAR partners supporting them, held in November 2014 and November 2015.		
5. Gender and marginalized groups	Equity and social inclusion in agricultural R4D promoted through drafting 'Guidelines to Engage with Marginalized Ethnic Minorities in Agricultural Research for Development in the Greater Mekong' (Hiwasaki et al 2016, see Annex II).		
	Qualitative research implemented to understand gender norms and agency of ethnic minorities, and their relations with innovation, in Northwest and central Viet Nam. Qualitative impact assessment of R4D platform research projects implemented in Northwest Viet Nam and Central Highlands, Viet Nam.		Qualitative research to understand how agricultural practices have different impacts on livelihoods of men and women from different ethnic groups in northern Laos.

4. Achievements and challenges of integrated systems research in Central Mekong

This book's primary objective is to describe the achievements as well as some of the challenges faced while implementing integrated systems research to contribute to livelihood improvement and sustainable development of smallholder farming in the Mekong uplands. The target audience is professionals working in national and international (including CGIAR) agricultural research for development organizations, as well as international donors, national and local government officials, other research organizations, and NGO project staff. The book is organized around three research themes:

1. Systems analysis and synthesis, establishing baselines and conducting situational analysis to characterize the target systems to better identify interventions.
2. Integrated systems improvement in practice, the various interventions undertaken to contribute to economically, socially and environmentally sustainable smallholder agriculture.
3. Nutrition dimensions, the challenges of ensuring incorporation of nutrition within the food security, agricultural production and livelihood systems.

Chapter 2 summarizes and compares the findings of site characterization research (situational analysis, baseline and household surveys: see 1. in Table 1 above) implemented in different Central Mekong Action Sites. The authors identify patterns in rural agricultural systems in Central Mekong that help guide the priority setting and targeting of ongoing and future investments in agriculture research. It also reviews methods used, with an analysis of what worked and what did not.

Chapter 3 reviews the main causes and effects of land degradation and erosion in the Central Mekong, and presents case studies of recent land-use changes caused by economic, political and institutional transitions, such as the expansion of teak plantations in northern Laos, rubber plantations in southwest China, and coffee monocropping in the Central Highlands of Viet Nam. The chapter explains how these disturbances alter water and soil resources across different geographical scales, from the agricultural plot to the headwater catchment level. Using examples from R4D activities conducted in Viet Nam and China's Yunnan Province (see 2. and 3. in Table 1 above), coping strategies combining field trials and participatory approaches are described. The authors conclude that to ensure productive agriculture and food production for future generations, the central challenge is how to best harmonize income generation from commercially-oriented, specialized tree and monocropping systems with the benefits of more diversified farming systems that allow soil and water to be better conserved. Solutions that address this challenge require long-term commitment in field sites, working especially closely with ethnic minority communities.

Chapter 4 summarizes and evaluates tools and approaches used to address nutrition in Central Mekong and presents diet and nutrition data and analysis from four case studies from Northwest Viet Nam and the Central Highlands of Viet Nam. After a review of R4D activities implemented in Central Mekong (see 2. and 3. in Table 1 above), the authors conclude that nutrition was not prioritized by the multistakeholder platforms or during the situational analyses, which led to R4D projects and activities that did not work directly to improve nutrition. Furthermore, the wide range of nutrition indicators and data collection methods applied in the nutrition-inclusive R4D activities highlights the need for more coordinated guidance and design at the program level.

In the final chapter, the conclusions and lessons learned from the three thematic chapters are synthesized, and the key achievements of more than four years of active integrated systems R4D implemented under Humidtropics along with some of the major lessons learned are presented. Despite numerous challenges, we conclude that our four years of integrated agricultural R4D activities in the Central Mekong resulted in significant research and development achievements. The partnerships and collaborative relationships made through our work, and our collaborative work with local partners on the ground to identify and test innovations, will continue beyond Humidtropics, and may be scaled up in other CRPs in the second phase. We believe lessons learned through our experience will contribute to strengthening our collective effort towards improving the income and livelihoods of poor smallholder farmers through sustainable agricultural development.

References

Cadilhon J, Child K, Raneri J, Robinson T, Staal S, Teufel N. 2015. Guidelines for conducting a Situational Analysis (SA) for the Humidtropics Research Program. Unpublished document. Downloaded from Alfresco 4 February 2016.

[CGIAR] Consultative Group for International Agricultural Research. 2015. *CGIAR Strategy and Results Framework 2016–2030*. CGIAR: 18 May.

Drahmoune F. 2013. Agrarian transitions, rural resistance and peasant politics in Southeast Asia. *Journal of Current Southeast Asian Affairs* 32(1):111–139.

Faysse N. 2006. Troubles on the way: An analysis of the challenges faced by multi-stakeholder platforms. *Natural Resources Forum* 30:219–229.

Fox J, Castella JC. 2013. Expansion of rubber (Hevea brasiliensis) in Mainland Southeast Asia: what are the prospects for smallholders? *The Journal of Peasant Studies* 40(1):155–170.

Friederichsen R, Neef A. 2010. Variations of late socialist development: Integration and marginalization in the northern uplands of Vietnam and Laos. *The European Journal of Development Research* 22(4):564–581.

Hiwasaki L, Culas C, Minh TT, Senaratna Sellamuttu S, Douthwaite B, Elias M, Kawarazuka N, McDougall C, Pannier E. 2016. *Guidelines to Engage with Marginalized Groups in Agricultural Research for Development in the Greater Mekong*. Hanoi, Vietnam: ICRAF.

Humidtropics. 2012. *Humidtropics: Integrated Systems for the Humid Tropics*. CGIAR Research Program Proposal. CGIAR: 15 August.

Humidtropics. 2014. *Humidtropics' Extension Proposal 2015–2016*. CGIAR: November.

Myers N, Mittermeier RA, Mittermeier CG, da Fonseca GAB, Kent J. 2000. Biodiversity hotspots for conservation priorities. *Nature* 403:853–858.

Leeuwis C. 2000. Reconceptualizing participation for sustainable rural development: Towards a negotiation approach. *Development and Change* 3:931–959.

Öborn I, Vanlauwe B, Phillips M, Thomas R, Brooijmans W, Atta-Krah K. 2017. *Sustainable Intensification in Smallholder Agriculture: An integrated systems research approach*. Oxford: Routledge.

Rerkasem K, Yimyam N, Rerkasem B. 2009. Land use transformation in the mountainous mainland Southeast Asia region and the role of indigenous knowledge and skills in forest management. *Forest Ecology and Management* 257(10):2035–2043.

Schut M, van Paassen A, Leeuwis C, Klerkx L. 2014. Towards dynamic research configurations. A framework for reflection on the contribution of research to policy and innovation processes. *Science and Public Policy* 41:207–218.

Schut M, Klerkx L, Rodenburg J, Kayeke J, Raboanarielina C, Hinnou LC, Adegbola PY, van Ast A, Bastiaans L. 2015. RAAIS: Rapid Appraisal of Agricultural Innovation Systems (Part I). A diagnostic tool for integrated analysis of complex problems and innovation capacity. *Agricultural Systems* 132:1–11. Open access: http://www.sciencedirect.com/science/article/pii/S0308521X14001115.

Schut M, Klerkx L, Sartas M, Lamers D, McCampbell M, Ogbonna I, Kaushik P, Atta-Krah K, Leeuwis C. 2016. Innovation Platforms: Experiences with their institutional embedding in Agricultural Research for Development. *Experimental Agriculture*. Open access: http://dx.doi.org/10.1017/S001447971500023X.

Than M. 1998. Introductory overview: Development strategies, agricultural policies and agricultural development in Southeast Asia. *ASEAN Economic Bulletin* 15(1): 1–12.

Wigboldus S, Klerkx L, Leeuwis C, Schut M, Muilerman S, Jochemsen H. 2016. Systemic perspectives on scaling agricultural innovations. A review. *Agronomy for Sustainable Development* 36:1–20. Open access: http://link.springer.com/article/10.1007/s13593-016-0380-z.

Fertilizer application by a farmer in Son La, Viet Nam. Photo credit: ICRAF/Pham Duc Thieng