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CONTRACT FARMING AND ITS IMPACT ON PRODUCTION EFFICIENCY AND RURAL HOUSEHOLD INCOME IN THE VIETNAMESE TEA SECTOR

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SUMMARY

Over the last two decades, Vietnam accomplished rapid economic growth under the transitional economy. Significant developments in the agricultural sector brought in by the renovation policy have propelled the country to the rank of the second largest rice exporter in the world. The steady economic growth along with increasing population has led to a rise in demand for agricultural products in the domestic market. Furthermore, Vietnam's accession to the World Trade Organization (WTO) in 2007 is seen to have boosted the country's economic reforms resulting in greater integration with the global economy.

Despite these massive political and economic changes, Vietnam is still struggling with high poverty levels, particularly in the remote North West region. The country's income poverty rate stands at 15.5% while its reaches a 39.4% in the North West Region of the country (GSO 2007). The North West region, with its mountainous topography and temperate climate, is one of the main and historical tea cultivation areas in Vietnam. Its surrounding big cities offer steady demand for high quality tea produced in this region.

In 1999, the Vietnamese government implemented a development plan for tea production for the period of 2005-2010 (Decision 43/1999 QD-TTg) with an aim to increase production, export and create employment. The implementation of this policy was expected to alleviate poverty in the uplands tea producing areas, which are often poor mountainous regions with small scale farming, and limited off-farm income opportunities. Other important public policies measures adopted by Vietnam to stimulate the development of the tea value chain and promote greater access to market for the rural poor farmers include "the law of Private Enterprise" which was promulgated in 1990, and "the Enterprise Law" which was enacted in 1999 and revised in 2005.

In addition to such public policies, vertical coordination in tea supply chain is required to ensure greater small-scale farmers participation to market. Tea being a perishable agricultural commodity which needs early processing after harvesting, vertical coordination can reduce production and marketing risk faced by small-scale farmers. Contract farming is a type of vertical coordination that encourages small-scale farmers' participation in tea production. It refers to an arrangement between producers and processors to exchange inputs and outputs with pre-agreed price, time, quality and quantity (Singh, 2002). It is also applied widely in the tea sector of North-Western Vietnam.

The role of contract farming as a rural development tool has been discussed in many empirical studies. One major thread of that literature is that contract farming permits to link

producers with agricultural markets especially in less developed countries. It is argued that contract farming offers advantages for small-holder farmers in ensuring their access to inputs, credit, insurance, information, technology and markets. In economics theory, particularly in the framework of new institutional economics, contract farming is often explained as an institutional response to market failures such as information asymmetric with respect to price and/or quality and the incompleteness or imperfections in the markets for credit, inputs and agricultural services.

Transaction cost is one of the important elements in the analysis of market institutions. Empirical studies reveal that high transaction costs discourage small-holders to participate in markets. In tea production, sunk costs associated with high initial investments, and commodity's perishable and time specific processing characteristics, heighten their asset specificity. This high degree of asset specificity in tea production emphasizes the need for contract farming. Furthermore, contracting is one way to divide risks associated with production and marketing between the firm and the producer. In short the method of contract farming provides a foil for the shortcomings in both parties.

The objective of this study is to investigate the importance of income from tea production for the household income of poor small-holder farmers in North West Vietnam. More specifically, given the importance of vertical coordination in agricultural production, the study's main focus is to investigate the involvement of small-holder farmers in the integrated agro-food channels and evaluate its impact on their livelihood.

There are three specific research questions included in the study:

1. Does contract farming enhance production efficiency compared to non-contract farming?
2. What are the differences in socio-economic characteristics of contract and non-contract farmers?
3. How strong is the impact of contract participation on household income?

For this study, Moc Chau district, one of the traditional tea producing areas in Vietnam, was selected as the research site. The district has 3,200ha of tea producing area with a total of 6,726 households engaged in tea production. Moc Chau is located 950m above sea level, and has tropical monsoon climate, which is ideal for tea production. Three types of organizational arrangements are found in terms of production and marketing where tea producer were involved:

1. via state-owned enterprise
2. via private company

3. and via direct spot market

The population is stratified into four clusters:

1. tea farmers contracting with state-owned enterprise (SOE)
2. tea farmers contracting with private firms or cooperative
3. tea farmers with no contract
4. and non-tea farmers

A sample of 40 households was randomly drawn from clusters 1 and 2 each. A larger sample was obtained from each of the clusters 3 and 4, since they serve as control groups with higher heterogeneity and variance with respect to socio-economic and farming characteristics. Overall the samples from the four clusters consisted of 245 farm households. The survey questionnaire included modules on household demography, other socio-economic characteristics and tea production. The socio-economic modules of the questionnaire were based on Living Standard Measurement Surveys (LSMS) methodology. These modules aim to measure and understand the living standards of households. The tea production modules aim to obtain information on production, costs and production efficiency, and the market module consisted with the questions on contract participation associated with socio-economic characteristics of households. In addition, quantitative and qualitative surveys at the village level and on a few selected tea firms were conducted to understand institutional changes in the village and to investigate socio-political factors influencing tea production. The entire survey was conducted during the period between June and November 2007.

The first research question was investigated using the Stochastic Production Frontier Function (SPFF) model to estimate the technical efficiency associated with socio-economic characteristics of households, and to assess the difference among the clusters. The results showed high coefficient estimates of partial production elasticity associated with land size and material costs (a sum of costs of fertilizer, manure and pesticide). The SPFF model also identified significantly higher technical efficiency estimate of the group which is in contract with the SOE by applying non-parametric tests. This observation is associated with three different household characteristics: age, education and number of farm income source. Contrary to our initial expectation, living standard of households was not a determining factor for achieving higher technical efficiency. This result threw light on one concern: there might be a selection bias if contract participation is associated with household characteristics. To deal with the problem of homogeneity in the model, a treatment effects model was applied to control selection bias, and estimate and assess the technical efficiency with reduced-bias samples.

The second research question was investigated using the Binary Outcome model to find the probability of participation. Ten variables obtained from household survey were included in the model to determine contract participation in a contract farming scheme. The results revealed that six out of ten variables associated with household characteristics are statistically significant determinants of participation in contract farming. The six variables are average age of adults, squared average age of adults, proportion of adults who finished secondary school, years of experience in tea production, number of years of residence in the village, and number of memberships in organizations of adults.

The results indicated that older farmers participate more in contracts than younger farmers; perhaps to avoid risks associated with marketing and production. Also, those farmers who have more experience in tea production tend to participate more in a contract farming scheme. Access to information also might be one of the important determinants for farmers to decide to participate in a contract. Longer residence in the village negatively affects contract participation because it broadens farmers' social networks where they can acquire more market information which enables the establishment of their own marketing channels. On the other hand, farmer's membership in any kind of organizations positively affects contract participation. By being members of an organization, farmers are more exposed to positive information on contracting which might enhance their participation.

To assess the impact of contract farming participation on income, the propensity score matching method was applied to reduce the bias in the estimation of the treatment effect of contract farming participation. The estimation revealed a statistically significant, but very small impact of contract farming participation on daily per-capita income of about 900 Vietnamese Dong (VND). The technical efficiency estimate after matching revealed a statistically significant difference between farmers who contract with SOE and non-contract farmers, but there was no statistically significant difference between farmers who contract with private firms and non-contract farmers. Hence, it can be assumed that the SOE provides more precise and experienced extension service or technical advice than the private firms.

The empirical study shows that production efficiency and income of households could be increased through participation in contract farming. It also highlights that government can play a crucial role in linking resource-poor farmers to market, particularly in developing countries.

ZUSAMMENFASSUNG

Seit Beginn der wirtschaftlichen Öffnung vor zwei Jahrzehnten verzeichnet Vietnam ein rapides Wirtschaftswachstum. Die Erneuerungspolitik führte zudem zu einer sehr positiven Entwicklung des Landwirtschaftssektors, was Vietnam zum zweitgrößten Reisexporteur aufstiegen ließ. Neben dem stetigen Wirtschaftswachstum führte die Zunahme der Bevölkerung zu einer steigenden Binnennachfrage nach landwirtschaftlichen Produkten. Des Weiteren wird der WTO-Beitritt 2007 als positiv angesehen, die ökonomischen Reformen voranzutreiben und Vietnam stärker in die globale Wirtschaft zu integrieren.

Im Gegensatz zu den drastischen politischen und ökonomischen Veränderungen hat Vietnam immer noch eine landesweite Armutsrate von 15,5 %, mit der höchsten Rate in der Nordwest Region von 39,4 % (GSO, 2007). Mit seiner bergigen Topographie und dem gemäßigten Klima ist die Nordwest Region eines der Hauptanbaugebiete von Tee in Vietnam. 1999 führte die Regierung den Entwicklungsplan der Teeproduktion für den Zeitraum von 2005 – 2010 ein (Decision 43/1999 QD-TTg), mit dem Ziel, die Produktion zu verbessern, Exporte zu erhöhen, und Arbeitsplätze zu schaffen.. Die politischen Maßnahmen zur Verbesserung der Teeproduktion sollen zur Armutsminderung in den Bergregionen beitragen, in denen kleinbäuerliche Betriebe und unzureichende Einkommensmöglichkeiten außerhalb der Landwirtschaft vorherrschen. Die Entwicklungsstrategie ist dahingehend Erfolg versprechend, dass Tee als traditionelle Kulturpflanze und Genussmittel in der nördlichen Bergregion Vietnams beheimatet ist und in den größeren Städten der Region einen stabile Nachfrage herrscht. Daher könnte die Ausweitung der Teeproduktion ein geeignetes Mittel zur ländlichen Entwicklung in den Bergregionen Vietnams darstellen. Im Zuge des wirtschaftlichen Wandels wurden mehrere politische Maßnahmen durchgeführt, die einen Einfluss auf die Verbesserung der Teeproduktion haben. In diesem Zusammenhang sind besonders zwei treibende Kräfte zu nennen. Zum einen förderten das Gesetz des privaten Unternehmens (bekannt gegeben 1990) und das Unternehmensgesetz (verordnet 1999 und 2005) die Entwicklung privater Unternehmen im Markt. Zum anderen sollte die oben erwähnte Politik (Decision 43/1999 QD-TTg) die nötigen Rahmenbedingungen zur Verbesserung und Erhöhung der Teeproduktion schaffen. Tee ist eine mehrjährige Pflanze, die eine lange Vegetationsperiode benötigt. Die unbedingt notwendige direkte Verarbeitung der frischen Teeblätter bedarf eines hohen Kapitaleinsatzes für Verarbeitungsanlagen. Da Kleinbauern solche Investitionen nicht tätigen können, kommt der vertikalen Koordination in diesem Zusammenhang eine besondere Bedeutung zu. Hierbei sind auch institutionelle Interventionen wie die Preisfindung und Vertragsbindung zu erwähnen.

Vertragsanbau wird als Übereinkunft und Verbindlichkeit zwischen dem Produzenten und dem Verarbeiter angesehen, bei dem Produktionsmittel und Erzeugnisse unter einem vorher vereinbarten Preis, Zeitpunkt, Qualität und Menge bereitgestellt werden. Vertragsanbau ist im nordwestvietnamesischen Teesektor weit verbreitet, und verschiedene Arten der institutionellen Gestaltung sind zu beobachten. Die Anwendbarkeit und Notwendigkeit von Vertragsanbau als Mittel der ländlichen Entwicklung wurde in vielen empirischen Studien erkannt und diskutiert. In diesem Zusammenhang ist speziell die Rolle der Verknüpfung von Produzenten, besonders aus weniger entwickelten Ländern, mit den Agrarmärkten zu erwähnen, die durch den Zugang zu Produktionsmitteln, Krediten, Versicherungen, Informationen, Technologie und Absatzmärkten profitieren können. Beweggründe und Theorie, die zur Verbreitung von Vertragsanbau führen, werden häufig als institutionelle Antwort auf unvollkommene Märkte gesehen, die die ökonomische Effizienz beinträchtigen.

Daher wird Vertragsanbau im Rahmen der Neuen Institutionenökonomie analysiert. Diese beschäftigt sich vornehmlich mit Problemen, die durch unvollkommene Transaktionsinformationen und anderes Marktversagen entstehen, und unterstreicht die Rolle der Institutionen auf verschiedenen Ebenen dieses Problemfelds. Transaktionskosten sind ein wichtiges Element der Analyse von Marktinstitutionen, der zentralen Komponente Organisationsstudien. In empirischen Studien wurde gezeigt, dass hohe Transaktionskosten Kleinbauern am Marktzugang hindern. Bei der Teeproduktion wirken die versunkenen Kosten verbunden mit hoher Kapitalinvestition und die Produkteigenschaften, wie die Verderblichkeit und Notwendigkeit der zeitnahen Verarbeitung, zusätzlich erschwerend. Dies bestärkt die Notwendigkeit der intensiven vertikalen Koordination der Teeproduktion. Des Weiteren helfen die vertraglichen Vereinbarungen das Risiko, das mit dem Anbau und der Vermarktung von Tee einhergeht, zwischen der Firma und dem Produzentenzu verteilen.

Das Ziel der vorliegenden Arbeit ist es, die Bedeutung des Einkommens aus der Teeproduktion für das Einkommen von Kleinbauern in Nordwest Vietnam zu untersuchen. Betrachtet man die Wichtigkeit der vertikalen Koordination bei der Produktion von hochwertigen Agrarprodukten, lag der Fokus der Arbeit besonders auf der Beteiligung der Kleinbauern an den integrierten Agri-Food Kanälen und dessen Einfluss auf deren Lebensstandard. Es gibt drei spezielle Forschungsfragen in der vorliegenden Studie; 1) Erhöht Vertragsanbau die Produktionseffizienz gegenüber Nicht-Vertragsanbau? 2) Was sind die Unterschiede in den sozioökonomischen Charakteristika zwischen Vertragsanbauern und Nicht-Vertragsanbauern? 3) Wie stark ist der Einfluss der Vertragsbeteiligung auf das Haushaltseinkommen?

Zur Beantwortung dieser Fragen wurde der Distrikt Moc Chau, eines der traditionellen Teeanbaugebiete Vietnams, als Forschungsregion ausgewählt. In der gesamten Provinz wird Tee auf rund 3,200 ha angebaut, und es sind insgesamt 6,726 Haushalte in die Teeproduktion involviert. Moc Chau liegt auf 950m über der Meereshöhe und ist durch ein tropisches Monsun Klima gekennzeichnet, welches ideal für den Teeanbau ist. Es gibt hauptsächlich drei Arten von organisatorischen Regelungen für die Produktion und Vermarktung, an denen Teeproduzenten teilhaben können; über staatseigene Betriebe, über private Firmen, und über den direkten Spotmarkt. Neben diesen drei Arten der vertikalen Koordination wurde die Bevölkerung zuerst in vier Cluster eingeteilt; 1) Teebauern mit Vertrag mit Staatsbetrieb, 2) Teebauern mit Vertrag mit Privatfirma oder Kooperative, 3) Teebauern ohne Vertrag, und 4) Nicht-Teebauern. Es wurden circa 40 Stichprobenhaushalte der Cluster 1 und 2 einbezogen; von Cluster 3 und 4 wurden mehr Haushalte ausgewählt, da diese als Kontrollgruppe dienen sollten. Insgesamt wurden quantitative Daten von 245 landwirtschaftlichen Haushalten erhoben, die sowohl demographische Haushaltsdaten als auch Daten über die Teeproduktion beinhalteten. Die demographischen Haushaltsdaten basieren auf den LSMS Haushaltsbefragungen, die darauf abzielen den Lebensstandard zu messen und zu verstehen. Zudem wurden die Einflussfaktoren der Produktionseffizienz und der Beteiligung am Vertragsanbau, die mit den sozioökonomischen Haushaltscharakteristika assoziiert sind, untersucht. Außerdem wurden quantitative und qualitative Befragungen auf Dorfebene und in ausgewählten Teefirmen durchgeführt mit dem Ziel den institutionellen Wandel im Dorf sowie die sozialpolitischen Faktoren mit Einfluss auf die Teeproduktion zu verstehen. Die gesamte Untersuchung wurde zwischen Juni und November 2007 durchgeführt.

Für die erste Forschungsfrage wurde die stochastische Produktionsgrenzfunktion angewendet, um die mit den sozioökonomischen Haushaltscharakteristika einhergehende technische Effizienz abzuschätzen und die Unterschiede zwischen den einzelnen Gruppen zu bestimmen. In den Ergebnissen werden hohe Koeffizientenschätzer der partiellen Produktionselastizität in Verbindung mit Landfläche und Materialkosten durch die Anwendung der stochastischen Grenzproduktionsfunktion abgeleitet. Im Model der technischen Effizienzabschätzung werden signifikant höhere Schätzer für die Gruppe mit Vertrag mit Staatsbetrieben durch die Awendung nichtparametrischer Tests identifiziert. Diese Beobachtung hängt mit drei verschiedenen Haushaltscharakteristika Alter, Ausbildung und Anzahl der Einkommensquellen zusammen. Entgegen der Erwartungen hat der Lebensstandard des Haushalts keinen positiven Einfluss auf die technische Effizienz. Dieses Ergebnis ruft ein Bedenken hervor; es könnte sich eine Auswahlverzerrung ergeben, falls die Teilnahme am Vertragsanbau mit den Haushaltscharakteristika zusammenhängt. Um mit dem Homogenitätsproblem im Modell umzugehen, wurde ein Behandlungseffektmodell zur

Kontrolle der Selektionsverzerrung angewandt, und die technische Effizienz wurde mit reduzierter Verzerrungs-Stichprobe abgeschätzt und bestimmt.

Für die zweite Forschungsfrage wurde das binäre Outcome-Modell gewählt, dass die Wahrscheinlichkeit der Teilnahme am Vertragsanbau ergibt. Zehn Variablen aus der Haushaltsbefragung wurden für das Modell ausgewählt, die als entscheidend für die Teilnahme am Vertragsanbau angesehen werden. Die Ergebnisse zeigen, dass sechs der zehn mit den Haushaltscharakteristika zusammenhängenden und im Modell angewandten Variablen einen signifikanten Einfluss auf die Teilnahme am Vertragsanbau haben: Durchschnittsalter der Erwachsenen, quadratisches Durchschnittsalter der Erwachsenen, Anteil der Erwachsenen mit Mittelschulabschluss, Jahre an Erfahrung im Teeanbau, Jahre der Dorfansässigkeit und Anzahl der Mitgliedschaften der Erwachsenen in Organisationen. Die Ergebnisse zeigen außerdem, dass mehr ältere Bauern am Vertragsanbau teilnehmen als jüngere Bauern. Ein Grund könnte eine niedrigere Risikobereitschaft, die mit dem Anbau und der Vermarktung des Tees einhergeht, sein. Es scheint, dass der begrenzte Marktzugang der Anbauregion die Entwicklung eigener Vermarktungskanäle selbst für erfahrene Produzenten erschwert. Die durch eine längere Dorfansässigkeit entwickelten individuellen sozialen Netzwerke und daraus resultierenden individuellen Vermarktungsmöglichkeiten mögen die geringere Beteiligung der etablierten Familien am Vertragsanbau erklären. Des Weiteren kann angenommen werden, dass die Mitgliedschaft in Organisationen zu einem breiten Netzwerk führt, das den Zugang zu Information, auch jene über den Vertragsanbau, erleichtert. Zugang zu Information ist einer der Entscheidungsfaktoren für oder gegen den Vertraganbau. Jene Bauern, die mehr Information bekommen, sind eher davon überzeugt, am Vertragsanbau teilzunehmen.

Der Einfluss der Teilnahme am Vertragsanbau auf das Einkommen als dritte Forschungsfrage, wurde mit Hilfe der Matching Methode bestimmt. Propensity Score Matching wurde angewandt um den reduzierten Verzerrungseffekt der Beteiligung am Vertragsanbau auf Einkommen und technische Effizienz zu erhalten. Die Schätzung offenbarte einen signifikanten Einfluss des Vertragsanbaus auf das Einkommen von ungefähr 900VND pro Kopf. Die Schätzer der technischen Effizienz nach dem Matching zeigten einen signifikanten Unterschied zwischen den Vertragsanbauern mit Staatsbetrieben und den Nicht-Vertragsanbauern und einen nicht signifikanten Unterschied zwischen privaten Anbauern und Nicht-Vertragsanbauern. Es ist anzunehmen, dass die Staatsbetriebe einen präziseren und erfahreneren Beratungsservice und angepasstere technische Hilfe bieten als die privaten Firmen, was einen Einfluss auf die technische Effizienz haben kann. Ein signifikanter Einfluss der Beteiligung am Vertragsanbau auf die Produktionseffizienz und das Haushaltseinkommen konnte nachgewiesen werden. Die empirische Studie zeigt, dass es ein

signifikantes Potential gibt, die Produktionseffizienz und das Einkommen der Haushalte durch die Beteiligung am Vertragsanbau zu erhöhen. Jedoch wurden verschiedene politische Maßnahmen, die im Zusammenhang mit dem vorliegenden Fallbeispiel stehen, nämlich Förderung der Privatisierung, Intensivierung der Teeproduktion und Verbreitung des Vertragsanbaus, landesweit auf verschiedenen strategischen Dimensionen durchgeführt. Es kann festgestellt werden, dass die Effekte dieser Maßnahmen teilweise einen starken Einfluss auf die ländlichen Haushalte hatten, wie die Ausweitung des Anbaugebiets, steigende Zahl der privaten Teefirmen und die zunehmende Beteiligung von Teeproduzenten am Vertragsanbau, jedoch einige dieser Maßnahmen fehlschlugen. Für die Entwicklung spezieller landwirtschaftlicher Sektoren wird deutlich, dass nicht einzelne sondern ein Bündel abgestimmter, multi-dimensionaler politischer Maßnahmen nötig ist, um effiziente komplementäre Effekte zu erhalten.

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ADB	=	Asian Development Bank
CGAP	=	Consultative Group to Assist the Poor
CIEM	=	The Central Institute for Economic Management, Ministry of planning and investment, Vietnam
FAO	=	Food and Agriculture Organization of the United Nations
GSO	=	General Statistics Office Of Vietnam
IFPRI	=	International Food Policy Research Institute
IMF	=	International Monetary Fund
LSMS	=	Living Standards Measurement Study
NGO	=	Non-governmental organization
OLS	=	Ordinary least squares
PCA	=	Principal component analysis
SFPF	=	Stochastic frontier production function
SOE	=	State-owned enterprise
USD	=	US Dollar
VINATEA	=	Vietnam national Tea Corporation
VND	=	Vietnamese Dong
WTO	=	World Trade Organization

1. INTRODUCTION

1.1. Background of the study

1.1.1. Background of marketing system in Vietnam

Since the launch of the "Doi Moi" economic reform, the Vietnamese agricultural sector underwent dramatic transformation aimed at boosting growth and efficiency. The evolution of its overall economic policy can be categorized into two broad periods. First, in the 1970s, the policy focus was on the promotion of the unification of the country. Second, in the early 1980s, Vietnam economic policies introduced market-oriented reform such as trade and price liberalization to encourage economic efficiency. However, most of these reforms performed below expectations mainly due to the inconsistency in their applications (Cho, 2001). The performances of state-owned enterprises (SOEs) and collective enterprises were often poor, and many critics denounced central planning of agricultural production which ignored market conditions and farmer's decisions (Dieu, 2006).

In the late 1980s, Vietnam initiated the process of "decollectivization", market reform, and trade liberalization (Minot and Goletti, 2000). The first significant reform in agriculture was implemented in 1981 with the introduction of contracts for agricultural commodities between agricultural cooperatives and farming households. The terms of the contract system allowed farmers to produce determined amount of commodities on publicly-owned agricultural land and sell them to cooperatives at a fixed market price. The input materials and extension services, such as land preparation and irrigation system, on the other hand, were provided by the cooperatives (Cho, 2001). However, the reform reached a limited number of agricultural households as contract farming was restricted to farming households that previously worked with cooperatives. Although this initial type of contract system was effective in increasing yield and income for the participating farmers, it discouraged agricultural production to a great extent as it proved disadvantages on many grounds. Those were: high rental prices of farm lands, limited rights for farmers to make decisions on land use and crops to be produced,

inefficient central planning, untimely input supply, and increased amount of outputs that have to be sold to the government. These aspects of the reform negatively impacted the incentives which severely impaired agricultural production.

In 1986, the Sixth Party Congress adopted a comprehensive economic reform known as Doi Moi. It aimed at bringing about a fundamental change in the economic system by replacing a centrally planned economy with a market-oriented economic system. Meanwhile, in the year 1988, the agricultural sector saw the implementation of the "Resolution No.10" policy that reformed and restructured the marketing system, the land tenure system, and lifted the institutional restrictions that had been constricting the private sector to participate in agricultural markets. For the private sector, it provided more rights to free enterprise similar to that of SOEs.

Price liberalization was initiated in order to strengthen the market-based economic system through the reform of SOEs that came into play with the implementation of Doi Moi. It stimulated private sector's investments in profit-making activities. This reform process removed state subsidies for SOEs enabling fair competition between SOEs and private firms in the market (Mekong Economics, 2002). In addition, foreign direct investments law was amended several times to attract foreign investments (CIEM, 2006). In the case of the Vietnamese tea sector, these institutional changes paved way to an increase in the number of private firms, and foreign investments that stimulated further market competition. In the agricultural sector, land reform policy extended the length of agricultural land tenure and reduced the tax rate of agricultural land. These reforms introduced a long-term crop production plan for households, with free choice over cropping decisions.

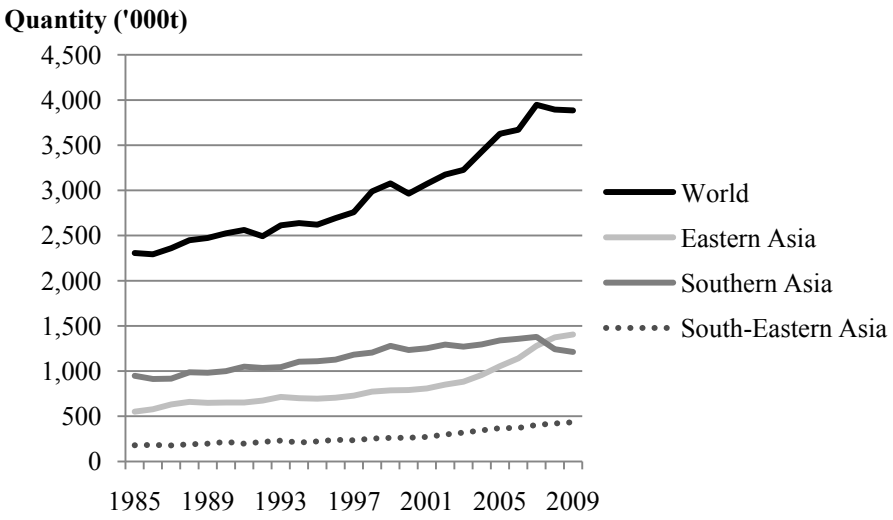
Following these comprehensive reforms, Vietnam recorded rapid economic growth in the last two decades. Significant progress was observed in agriculture as well. For instance, the renovation policy made the country the second largest rice exporter in the world (FAOSTAT 2011).

Despite these massive political and economic changes, Vietnam still faces high poverty levels. The average national poverty rate is estimated at 15.5%, with the North West region recording the highest at 39.4% (GSO, 2006).

1.1.2. Tea production in the world

Tea (*camellia sinensis)* is one of the most popular and commonly-consumed beverage in the world. It has been cultivated and consumed for 2000 to 3000 years in South East China (Eden, 1976). Tea is a perennial crop which can be grown in tropical or sub-tropical environments. Tea was first consumed in South and South East Asian cultures, and later spread all over the world. In the last century, the increasing demand in the European countries has further pushed the production in South Asia and some parts of Africa. Figure 1.1 shows the amount of tea harvested in the world and in Asia in the last two decades. The total amount of tea produced in the world in 2007 was about 4 million tonnes. South Asia represented by India and Sri Lanka used to lead the world's tea market, but East Asia has remarkably increased its production mainly in line with China's economic growth. In comparison, South-East Asia, headed by Indonesia and Vietnam, has only marginally increased its production.

Figure 1.1 Tea production in the world and in Asia



Source: FAOSTAT, 2011

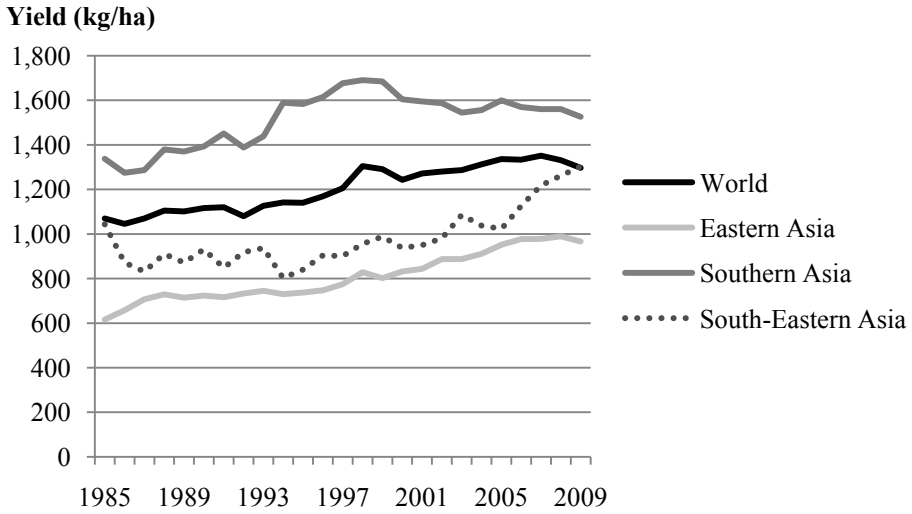
Figure 1.2 shows the yield (kg/ha) of tea in the world and Asia. Southern Asia shows the highest yield compared to the other regions of Asia and the world average. Tea yield varies among countries depending on factors like varieties, site condition, climate, soil type, and scale of production (den Braber et. al, 2011). Weather plays a vital role in ensuring optimal yield (Wijeratne, 1996). The relationship between yield and the temperature in particular has been studied by many researchers who revealed that an increase in temperature of up to 25-26^{o}C increases tea yield (Carr and Stephans, 1992, and Wijeratne, 1996).

Figure 1.3 shows tea production and yield in eight major countries in 2007. India and Sri Lanka achieved higher yield than China, Vietnam and Indonesia. One of the reasons for China's low yield could be due to its low temperature relative to Southern and South-East Asian countries.

The high yield of South Asian countries could be attributed to the production techniques, which vary among countries (den Braber et. al, 2011). For example, Mendis (1992) studied tea production in Southern Asia and indicated that tea produced in large-scaled plantations obtains higher yield due to the scale of economy, availability of labour and processing units. These large-scaled tea plantations in Southern Asia were established over 100 years ago,

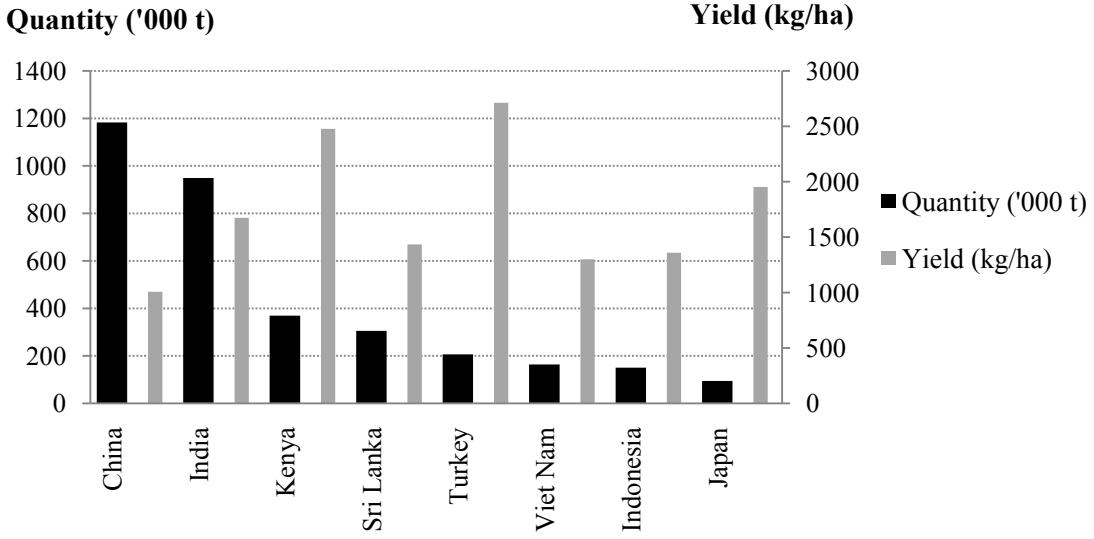
during the colonial era, for the purpose of exporting tea to United Kingdom (Sivaram, 2000). On the other hand, most tea production in Eastern and South-East Asian countries are carried at household level (Senapati et.al., 1999). Thus, the type of producing operations seems to influence the yield of tea production.

Figure 1.2 Yield of tea in the world and Asia



Source: FAOSTAT (2011)

Figure 1.3 Tea production and yield of eight major countries in 2007



Source: FAOSTAT (2011)

1.1.3. Tea production in Vietnam

The North West region, with its mountainous topography and temperate climate, is one of the main tea cultivation areas in Vietnam. In 1999, Vietnamese government adopted the development plan for tea production for 2005- 2010 (Decision 43/1999 QD-TTg) with the aim to increase production, export and create employment in this primary commodity sector. Over the last decade, Vietnam became an important supplier of tea in the world market. In 2007, Vietnam was ranked the 7th biggest exporter of tea accounting for 6.7% of total production export in the world (FAOSTAT, 2011).

Boosting tea production is expected to alleviate poverty, especially in the upland tea production regions. In these areas, agricultural production is dominated by small scale farming systems with limited off-farm income sources. In addition, the promotion of upland tea production in northern mountainous areas has its own advantages. Since tea is one of the traditional crops of these areas, required initial costs for land preparation might be lower than other unfamiliar crops, and existing technical know-how might make production intensification easy. Therefore, tea production has a high potential of being stable income source for upland regions. Hence, enhancing tea production is expected to have a positive impact on livelihood of rural households.

Since tea is a perishable cash crop, its production system requires some degree of vertical coordination. For instance, in the production stage, stable and timely inputs supply and access to technical advice is crucial for efficient cultivation. In the harvesting stage, timely processing is quite important in order to prevent oxidation of plucked tea leaves, thereby protecting the quality of the final product. It is also important to ensure organized system of grading, labeling and packing of the product to retain the level of quality during the supply. In the marketing stage, farmers often prefer to stick to a certain buyer, trader or a contract to ensure a good sale and to reduce associated marketing risks. In response to these requirements, there is growing awareness for value chain development in the Vietnamese tea sector, which has improved the efficiency of supply channel since the implementation of *Doi Moi* (CIEM, 2006).

The participation of smallholders in the new agricultural marketing system is an important consideration for rural development in the course of Vietnam's ongoing economic growth. In fact in the North West region, although SOEs used to control marketing and pricing of the final products in the tea sector, an increasing number of private companies are creating new marketing channels that are encouraging smallholder farmers' participation. This is also bolstered by government policies such as Decision 80 implemented in 2002, which aims to provide incentives to smallholders to participate in contract farming via technical support, information dissemination for building awareness and coordination with contract partners with the support of provincial Departments of Agriculture and Rural Development (ADB, 2005).

Since tea is one of the traditional export commodities which has been contributing substantially to the economy of Vietnam (ADB, 2009), Vietnamese government recognizes its important role in the country's economy. In 2007, tea was ranked the 7th largest export commodity of Vietnam, accounting for 2.3% of the country's total export value of crops and livestock products (FAOSTAT, 2011). Various rural development policies mentioned above were implemented to impact tea production and to integrate smallholders into supply chains. The various policy tools implemented in Northern uplands have ensured that tea production under contract farming holds strong potential for intensifying production and broadening marketing opportunities for smallholders. Therefore, the aforementioned reasons form the basis for the assumption that the development of contract farming promises improved livelihood of agricultural households in the poorest region of Vietnam.

1.2. Objectives of the study

The overall objective of this study is to investigate the contribution and importance of income from tea production for the livelihood of poor smallholder farmers in North West Vietnam. Considering the importance of vertical relationships in the production of perishable agricultural commodities, the main focus of the study is to investigate the degree of involvement of smallholders in integrated agro-food channels and evaluate its impact on their livelihood.

In the North West region, the first agricultural reform in the late 1980's initiated contract arrangement between farmers and processors or traders in the tea sector restricted only to plantation workers. In the 1990s, due to the expansion of the private sector, contract arrangement included private firms and any tea producer in the region. Therefore, the study considers contract farming as a new institutional arrangement introduced in the course of the development of agro-food system and investigates the effect of incentives on production and income of resource poor farmers in North West Vietnam.

Three main research questions are investigated:

1. Does contract farming lead to greater production efficiency compared to non-contract farming?
2. What are the differences in socio-economic characteristics of contract and non-contract farmers?
3. What is the impact of contract participation on farm household income?

2. CONTRACT FARMING

This chapter provides an overview of contract farming, including a review of contract evolution and a review of different typologies and arrangements of contract farming in the context of agriculture in developing countries. The study attempts to define contract farming, and trace its history and emergence. The onset of contract farming can be attributed to the production and marketing benefits it yields that can be explained in the context of the study of new institutional economics. In addition, contract enforcement mechanism is reviewed by referring to the different relationships that exist between firms and farmers. And finally, the present study refers to how the contract theory can explain the existence of contract farming in tea sector.

2.1. Definition of contract farming

Contract farming is an organizational or institutional arrangement, which enables especially smallholders to access input and output markets. For C. Eaton, and A. Shepherd (2001), contract farming can be defined as: "An arrangement between farmers and processing and/or marketing firms for the production and supply of agricultural products under forward agreements, frequently at predetermined prices."

Therefore, contract farming refers to an arrangement and commitment between producers and processors to provide inputs and outputs with pre-agreed price, time, quality and quantity. Contract farming is applied especially for the perishable agricultural commodities that need to be processed, such as vegetables, fruits and dairy (Bijman, 2008). Its applicability and necessity as a rural development tool has been recognized and discussed in many empirical studies in the context of its role of linking producers with agricultural markets, especially in developing countries.

2.2. Evolution of contract farming

In neo-classical economics, institutions and organizations play practically no role as standard economic assumptions such as the existence of complete set of markets, full and perfect information hold. However, since contract farming often emerges as a response to missing markets (Key and Runsten, 1999), it has been analyzed in the framework of the new institutional economics, which focuses on problems caused by imperfect information and other market failures (Kirsten, et al., 2009). Therefore, this study investigates contract farming in relation to the framework of the new institutional economics.

The reasons for the limited or failure of farmer's participation in trading or market can be attributed to various constraints associated with high transaction costs, imperfect information, and uncertainty. These aspects form the core issues address by the new institutional economics framework. Thus, it is appropriate to apply the theory of new institutional economics to investigate and understand the logic behind the economic institutions and arrangements such as contract faming, since it is perceived as one of the responses to market imperfections.

2.3. Advantages of contract farming

There are strategic advantages in participating in a contract. Contract farming draws in on a combination of benefits of the plantation system (such as strict quality control, close coordination of interdependent stages in production and marketing) and smallholder production system (such as superior incentives and equity considerations) (Glover, 1987, and Williams and Karen, 1985). According to Simmons (2002), there are mainly four areas of strategic advantages that allow cost savings for smallholders participating in a contract:

1. Smallholders may have access to product markets where high transaction costs effectively prevent their access.
2. Smallholders may have access to relatively inexpensive credit where, for a range of reasons, smallholders face high interest rates or have no access.
3. Contract farming may provide services for managing on-farm risk.

4. Contract farming may provide information on extension, logistics and marketing at relatively low cost.

To better understand the theoretical background and the existence of contract farming, one needs to look into the constraints that smallholders face.

2.3.1. Reducing transaction costs

Transaction costs are an important element in the course of analysis of market institutions, which is a central component of the study of organizations. A number of studies have pointed out that high transaction costs discourage smallholders to participate in markets. When both farmers and firms face high transaction costs market functioning is impaired; moreover, transaction costs have an adverse impact on activities like searching, negotiating, monitoring and enforcing in contract farming, thus affecting the exchange and flow of commodities. In addition, transaction costs raise the prices of inputs and reduce profits from the sale of output by lowering its price (Ouma et al., 2010). One of the advantages of the participation of both parties in contract farming is that the transaction costs are minimized, thus enabling economic efficiency. Firms in particular, while choosing their management style, must consider the factors that are associated with transaction costs given as follows (Silva, 2005, Hobbs, 1996).

There are three factors contributing to transaction costs:

1. bounded rationality
2. opportunism
3. and asset specificity

The first two aspects are based on behavioral assumption, a theory on which transaction cost analysis relies on, making this approach different from the neo-classical approach (Williamson, 1981). Asset specificity can originate from site specificity, physical asset specificity, human capital specificity, and time specificity (Williamson, 1981, Silva, 2005). In tea production, sunk costs associated with high initial costs which are driven by commodity characteristics like perishability and dependency on time specific processing, heighten their

asset specificity. Thus, commodities with a higher degree of asset specificity require an involvement in vertical coordination to reduce costs and risks.

Key et al. (2000) categorize transaction costs into fixed and variable transaction costs, whereas the former include the costs associated with market action. Fixed transaction costs do not vary with the size of the transaction whereas variable costs do. Fixed transaction costs include costs associated with searching sellers or markets, costs for negotiating and bargaining, and costs for screening, enforcing and supervising (Key et al., 2000). Also in tea production, fixed costs emerge when producers decide in which market to participate, or to whom they wish to sell their products. Those who participate in a contract would face relatively less fixed transaction costs than the non-contracted producers because of their secure marketing channel.

Goetz (1992) examined the Senegalese food marketing behavior of both sellers and buyers, and revealed that high fixed transaction costs prevent farmers from participating in the coarse grain market. The study included the variables associated with transportation, distance to the market, and household characteristics assumed to affect market participation in the form of fixed transaction costs. Renkow et al. (2004) estimated the size of fixed transaction costs using household survey data of Kenyan maize farmers. They developed a framework of estimating the size and determinants of fixed transaction cost which includes costs for searching markets, bargaining, screening and monitoring of transactions, and those are invariant to the quantity of the amount exchanged. Their analysis throws light on the magnitude of transaction costs, associated with variables such as mode of transportation and distance to the market. Their results empirically prove that transaction costs act as deterrents to market participation of agricultural households.

However, the final assumption underlying transaction cost economics is that, even though important dimensions of transaction costs can be identified and measured, and although each of these transactions is distinct (Macher and Richman, 2006), it is difficult to define and empirically measure transaction costs, as they are often associated with endogeneity bias of influential variables (Kirsten et al., 2009). Hence, transaction costs could not be measured in

the present survey. However, variables such as distance of transportation, which influence fixed transaction costs, were measured in order to investigate the determinants of production efficiency and contract participation.

2.3.2. Reducing production and marketing risks

Contracting is one way to divide risks associated with production and marketing between the firm and the producer (Glover, 1984), by offsetting deficiencies in each other. The players in each level who are involved in contract farming try to increase their economic efficiency by sharing risks in supply chains. Agricultural risks are associated with negative outcomes derived from predictable and measurable biological, climatic, and price variables (The World Bank, 2005). They are a source of uncertainty for agricultural producers. The level of uncertainty rises with human behavior which is influenced by opportunism and bounded rationality, leading to differences between firms and farmers. Firms face uncertainty in procuring the necessary amount of raw material at the right time, in farmers violating agreements, and in the limitations they face in monitoring farmers' work effort; whereby firms sometimes incur ethical dilemmas.

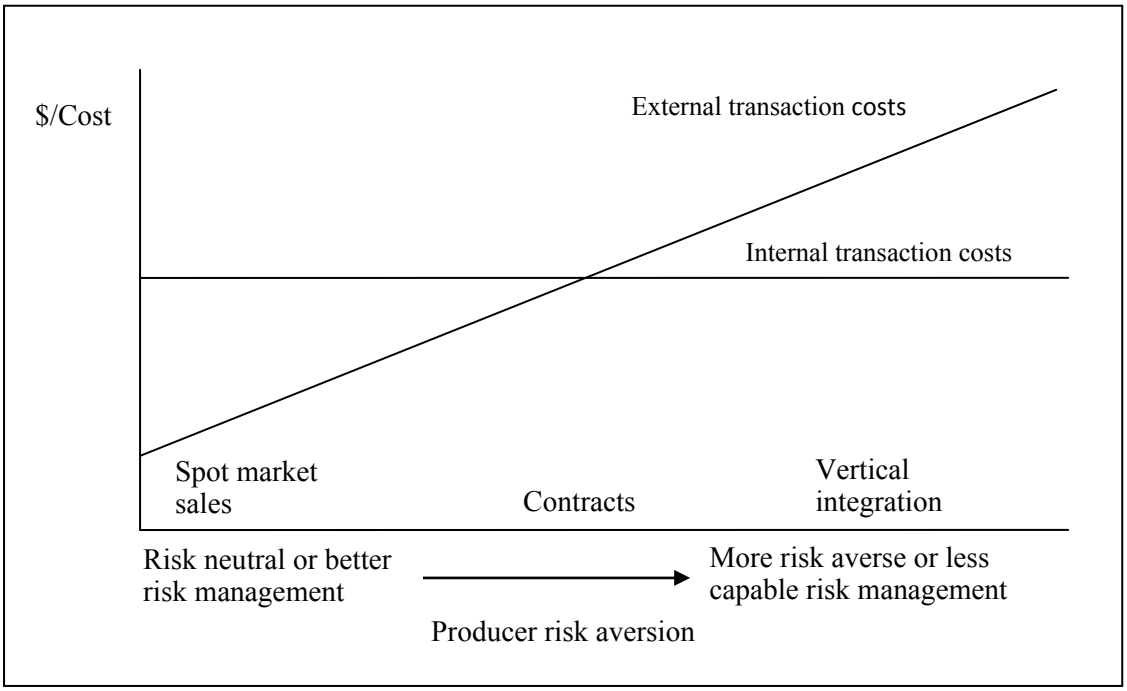
Furthermore, imperfect or asymmetric information results in problems pertaining to product information. For example, in the absence of sophisticated test techniques or the lack of official inspections, firms may run the risk of farmers showing the best quality products on top while hiding under them poorly-harvested products (Grosh, 1994). This typical problem of information asymmetry leads to inefficient function of markets (Akerlof, 1984, Grosh, 1994). On the other hand, contracts based on social networks, which depend on the reputation of both the firms and farmers result in long-term relationships and therefore may reduce opportunism of producers and help raise efficient resource allocation (Williamson, 1979). It is more rational for the producer to secure future market opportunities instead of engaging in opportunistic behavior (Grosh, 1994). And, efficiencies are often gained more accurately by sharing information between parties in the chain (Gray and Boehlje, 2005).

In agricultural supply chain, both firms and farmers face the production risk of crop failure caused by climate factors or farmer's socio-economic factors. Furthermore, uncertainties

around availability of inputs, overuse of chemicals due to lack of experience and knowledge, and unaffordable costs of inputs, mechanized equipment and transportation add to production risks faced by farmers. Farmers are also vulnerable to marketing risks such as price fluctuations and market accessibility

Producers also face various kinds of institutional and price risks along with production and marketing risks such as changes in governmental laws and regulation, decreasing yields, and price of output. The research on supply chain risk sharing in agriculture has often been focused on the impact on producers (Gray and Boehlje, 2005). Gray and Boehlje (2005) explain the relation between the ability to manage risk and transaction costs while differentiating between internal and external transaction costs (figure 2.1). Internal transaction costs are associated with agency and influence costs increased production risks and employee risks. External transaction costs are associated with producer's moral hazard (shirking behavior) which is the result from misalignment of incentives and producer's risk averse (adverse selection) nature.

Figure 2.1 Conceptual framework for external transaction costs of risk sharing versus internal transaction costs of vertical relationship



Source: Gray and Boehlje 2005

In figure 2.1, the external transaction costs line represents the additional risk sharing costs which are borne by processors. These costs increase when processors interact with producers who are more risk averse or less capable of managing risks. Internal costs are assumed to be higher than external costs, and they will not change relative to producer risk aversion because only the risk sharing transaction costs of market-based exchange increase. The participation of market exchange of producers varies depending on the degree of risk management capability or preference of producers. Risk takers or those who are capable of managing risk might choose spot market-based exchange. Those who are risk averse or less capable of managing risks would prefer to participate in a tighter and vertically integrated chain where the channel partner absorbs most of the risk and a larger share of overall return. Since contract farming often provides services to manage on-farm risk, it is advantageous for risk-averse poor smallholder farmers to seek vertical integration through engaging in contract farming so that they can diversify their risk.

2.4. Contract enforcement

Contract enforcement is often an issue in contract farming because contracts are seldom legally enforceable in practice (Grosh, 1994). Since smallholders have a weak or no voice against contracted firms, particularly state-owned enterprises, it is nearly impossible for them to assert their rights to force obligations on firms. This kind of situation occurs especially in countries where political instability and lack of institutional settings prevails. In the case of tea production, for instance, contract breach can occur at the stage of product delivery. Firms or farmers must arrange suitable transportation for the delivery of products. This is an important factor for timely processing of qualified products. Often farmers fail to meet product quality standards and delivery timelines, which lead to breaching of the contract. In addition, contract breach can occur at the stage of sale of output due to opportunistic pricing behavior of producers. Producers in such a scenario sell their product to other traders or at the spot market which may offer a higher price than the contract's pre-agreed price. These enforcement issues often arise in countries with weak economic governance systems. Such cases require incentive-compatible self-enforcement institutions (Gabre-Madhin, 2009). Without enforcement, it mostly results in corruption of the contract system and leads to

significant losses for both producers and firms. Hence, contracting can be successful in countries where enforcement costs are low and are supported by a functioning legal system or in the case of a monopolistic processing firm (Key and Runsten, 1999).

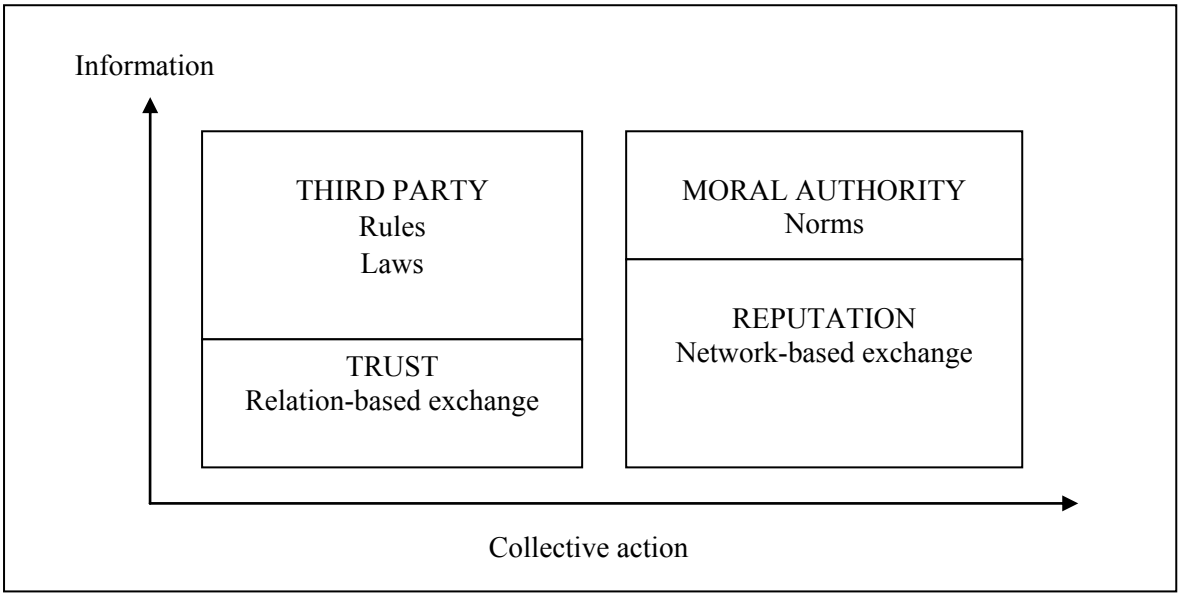
There are several ways to overcome contract enforcement issues for smallholders. Coulter et al. (1999) discussed effective mechanisms that could possibly resolve the contract default problem by, for example, lending through groups, promoting good communication and close monitoring. Contracting through groups by forming farmer's associations is one of the important strategies for the rural poor in Vietnam (M4P, 2006) to exploit economies of scale or to raise selling power in product sales. Establishing close relationship with producers is based on social and relation-specific incentives. For example, "reputation mechanism" (MacLeod 2007, and Bijman, 2008) works for producers to keep the expected future benefits of contracts for themselves and prevents foreclosing of future trade with other buyers. In addition, more services will attract producers as they offer more benefits and can increase trust between firm and producer. Providing incentives to producers is also important to maintain contracts. For example, rewarding good behavior of producers or threatening to punish their bad behavior (Key and Runsten, 1999). Cooperation with the buyer is one way to tighten the producers at products sales, which can reduce the risk faced by firms in the procurement of raw material.

Although there are institutional systems working towards legal contract enforcement, Fafchamps and Minten (1999) found that trust-based relationships play a dominant role in contract enforcement mechanisms in Malagasy grain market. Trust is established primarily through repeated interaction with other traders providing referrals. However, Fafchamps and Minten could not clarify the reason for trader's little use of justice system in contract enforcement. They only assumed that legal costs are more problematic for traders than legal risk such as non-payment.

Gabre-Madhin (2009) developed a typology of contract enforcement based on two parameters which determine the degree of private and public enforcement and attempts to capture the specificities of the products and market (figure 2.2). The parameters are: the availability and ease of obtaining information about market behavior, and the extent to which

market actors are willing to engage in collective action (collective sanction/ punishment). This typology of contract enforcement will help to understand the difference in degree of contract enforcement between SOE and private firms in Moc Chau tea sector. Exchange based on trust only takes place among agents who have formal and long-lasting relationships (Fafchamps 2004). This type of contract-enforcement mechanism is often observed in small scaled private firms who newly participate in Moc Chau tea production. But in the case of SOE where information about cheaters can be more easily transmitted (Gabre-Madhin2009), multilateral punishment strategy based on reputation (Greif 1993) prevails in contract enforcement. In this type of enforcement, network-based exchange may dominate in markets where market actors are willing to collectively sanction or punish the cheater.

Figure 2.2 Typology of contract enforcement



Source: Gabre-Madhin (2009)

2.5. Types and models of contract farming

In this section, we overview existing types and models of contract farming by reviewing several studies on contract farming in the world. Different types of contracts applied to various agricultural products in different countries, and it is interesting to know if our case of contract farming in Moc Chau can also be generalized into those classifications. However,

detailed description of contract arrangement and vertical coordination of our study are discussed in chapter 4.

Minot (1986) classified contracts into three types, namely Market Specification Contract, Resource Providing Contract and Production Management Contract.
Market Specification Contract is a pre-harvest agreement where firms often provide information on demand on price, timing, location and form of products. Sale of products is the main focus of this type of contract where the firms often specify quality, price and timing of products (Runsten and Key, 1996).

Resource Providing Contract mandates firms to provide production inputs partly to producers, under the agreement of procurement of products with pre-agreed price. Inputs are often supplied on credit, and their values are subtracted from crop sales. This type of contract is often applied to situations with substantial purchased input requirements and a long production cycle.

Production Management Contract restricts the producer to follow specific production methods or an input regime planned by firms, under the marketing agreement of producers or resource provision of firms.

According to the classification by Minot, our cases of contract farming applied by private firm, cooperative, and one part of SOE which we define as SOE II in chapter 4, are classified as Resource Providing Contract. On the other hand, contract farming managed by the other part of SOE which we define as SOE I in chapter 4, is mainly similar to Production Management Contract under resource provision of firms.

Singh (2002) suggests modifications to the three types of contracts;

1. procurement contract wherein only sale and purchase conditions are specified by firms
2. partial contract where some of the inputs are supplied by firms and products are bought at pre-agreed prices, and
3. total contract wherein firms supply and manage all the inputs and farmers

become no more than suppliers of land and labor.

These types are not mutually exclusive, and its relevance and appropriateness varies from product to product (Singh, 2002, and Key and Runsten, 1999).

Furthermore, Eaton and Shepherd (2001) classify contract farming into five models.

The centralized model is one of the classic types of contract farming with tight arrangement and strict quality control and quantity determined at the beginning of the production. This type of contract is often applied to products that need a high degree of processing, like tree crop, to ensure large economies of scale in the processing stage. It is also called "outgrower scheme".

The nucleus model is a variation of the centralized model: contractors own the production facilities and manage an estate plantation located closely to the processing plant. Contractors are often state-owned farmers, and the arrangement in this model commonly includes a period of demonstration or trial followed by firms introducing technology and management techniques to growers.

The multipartite model normally involves a joint venture between a statutory body and private firms, and might have separate organizations responsible for credit provision, production, management, processing and marketing. Although the arrangement is characterized by poor management due to lack of economic interest or knowledge leading the contractor into difficulties, there are significant advantages that come with this model, as in sharing of marketing risks and the firm's costs in dealing with individual farmers.

The informal model is applied to individual entrepreneurs or small companies who normally enter into simple, informal production contracts with farmers on a seasonal basis, particularly for crops such as vegetables, watermelons and tropical fruits. These crops normally require minimum processing, and material inputs are often limited to the provision of seeds and basic fertilizers, and technical advice for grading and quality control. This model is the most transient and speculative among the five models, with risks of contract default by both firms

and farmers. Hence, if the support services are rendered by governmental agencies, it will result in an increase of informal initiatives and thereby encourage contract enforcement.

The intermediate model includes traders or collectors between producers and processing firm who have their own informal arrangement with farmers. This type of contract is quite common in Southeast Asia. The model comes with strong disadvantages mainly due to the company's weak control over intermediaries, which results in either lower commodity price received by farmers or lower quality of products received by the company.

This detailed classification by Eaton and Shepherd provides a clearer view of models of existing contract farming. In our case, SOE I is partly similar to the nucleus model since its production takes place close to the processing plant, and producers used to be state-owned farmers in the past. The other three contract farming types applied by private, cooperative and SOE II can be classified into the informal model due to their limited provision of material inputs and simple and informal contracts.

Although production takes place in the same area with the same commodity, we can find two different types of contract farming in Moc Chau tea production within the categorizations of existing studies. An interesting finding is that the informal model described by Eaton and Shepherd can be the case for contract applied by private, cooperative and SOE II in our study, which is often provided for seasonal crops such as vegetables. Although tea is not a seasonal product, this type of contract emerges perhaps due to the fact that tea is a perishable crop, similar to vegetables. Yet, since it was noted that this type of contract is most transient and speculative with a high risk of contract default by both firms and farmers, the informal model contract might not suitable for tea production. A Contract which provides tight arrangements such as the centralized model might be more reasonable for tea production, since tea requires a high degree of processing to ensure large economies of scale, and tea production is not seasonal but a year- round activity.

2.6. Vertical coordination and institutional arrangements in tea sector

In this section, the studies of vertical coordination and institutional arrangement in tea sector are reviewed to provide the backdrop for a better understanding of existing contract farming in tea production. We first draw characteristics of tea production, which are assumed to be the important factors involved in vertical coordination. Later, we look at studies which refer to vertical coordination and institutional arrangement in tea production.

Tea is a tree crop with an estimated economic life of about 40 to 60 years. It requires a long time to mature before harvesting (Eden, 1976, and Minot, 1986). Tea can be harvested four to five years after planting, and during that time it requires continuous investment of inputs and labour. The process of tea harvesting requires certain skills and timing for plucking the right leaves in order to obtain high quality tea (Minot, 1986). Due to its high perishability, tea needs to be immediately processed; preferably in large processing facilities to ensure economies of scale. Because of its commodity characteristic, tea production necessitates vertical coordination. This is because smallholders have to bear initial investments associated with the non-harvest period, where they often need input provision in advance from the contract suppliers. In addition, integrated large-scaled processing management is preferred to enable efficient processing operation. Therefore, the initial stages of tea production often involve tightly aligned coordination such as plantation production system or outgrowers scheme which refers to production with tight arrangement and strict quality controlby firms (Glover and Kunsterer, 1990, and Baumann, 2000).

Establishing vertical arrangement in tea production requires institutional intervention in pricing and legal enforcement of contract.

The case study by Chirwa and Kydd (2009) about the institutional changes and its driving forces associated with socio-political factors in the Malawian tea sector is one example. It addresses the history of Malawian tea sector starting from the establishment of Smallholder Tea Authority (STA), which was initially funded by the government and which provides services to smallholders. Along with the expansion of production, there was a need for the establishment of a wider scaled organization to facilitate tea processing. After the establishment of a joint venture estate, financial instability caused by inefficient management

together with political confusion in the country resulted in the corruption of the whole system. According to their study, contract enforcement of state enterprise is the biggest issue, since the state did not draw up a legally written enforceable contract. Producers lost trust in the state enterprise, and alternative institutional arrangements emerged under the initiative of elite producers while the state enterprise was being restructured by the government. In the end, there are three ways for smallholders through which they can be integrated into vertical coordination:

1. Through a state enterprise,
2. through a commercial enterprise,
3. through a farmer's association

Corruption of the state enterprise system started gradually due to its disruption from different dimensions at the same time. At the farm level, corruption starts due to the delay in delivery service and payments which causes fatal damage to tea leaves and livelihood of farmers. These failures in contract enforcement occur due to negative events at the management and political level. State failure in tea sector led to the growing need for producers to change vertical coordination both in terms of their decision making and establishment of alternative processing organizations. This case study of Malawian tea sector by Chirwa and Kydd (2009) indicates the importance of functioning legal systems and institutional settings to enable contract enforcement at both levels of enterprises and producers.

Herath and Weersink (2009) investigate the role of policy in Sri Lankan tea sector, in the transition from vertically integrated plantation system (complete management of production and land by firms with hired labor) to independent traders' purchases from individual producers. They revealed three cost factors affecting this change; transaction, production and management costs. Transaction costs are reduced due to the decrease of uncertainty associated with final products pricing which is guaranteed by policy intervention. Production costs, which are dominated by labour cost, are raised especially in accordance with the plantation type. This is due to the fact that after the establishment of labour unions plantation farmers have gradually obtained a stronger voice for insisting on labour rights instead of being exploited with low wage rates. The management costs for plantations have increased for larger and integrated production schemes because of the complexity of supervisory tasks

and the greater risk of shirking (work). The investigation by Herath and Weersink (2009) is based on the plantation type of production. Production in plantations was dominant before the economic reforms took place in Vietnam. However, after the economic reform, this type of production decreased because the nationwide decentralization of state-owned enterprises gave farmers no chance to enhance their power.

We found that tea requires vertical coordination in its production due to its special characteristics like perishability, requirement of processing and long non-harvest periods. Production often starts either in large scale plantation production or in outgrower scheme with tight production and management control, or small scale individual tea production contracted with state owned enterprises. To make these arrangements work, a functioning legal system play an important role for reducing transaction costs, pricing and contract enforcement. This draws implications for the importance of a legal pricing system and an institutional contract enforcement mechanism of the Vietnamese tea sector. For example, the tea price of SOE is defined once a year by VINATEA which is the national representative of SOE of tea, and its pricing mechanism is non-public. This price is disseminated to all tea SOEs in the country, and farmers contracted with SOE need to accept this price even if the market tea price is higher. Furthermore, there are no existing legal contract enforcement supports or services for private firms or cooperatives. In any case of contract default, it is difficult for both firms and farmers to deal with worst case scenario such as failure in procurements or sales of tea leaves.

2.7. Summary

This chapter attempts to provide the theoretical understanding of evolution of contract farming in Moc Chau tea sector. Figure 2.3 summarizes underlying economic aspects in the evolution of contract farming in Moc Chau which we discussed in this chapter. There are high fixed transaction costs in tea production such as market searching and screening, high production risks due to crop failure or long non-harvest periods, high marketing risks due to the geographical difficulties or uncertainty in trading, and high asset specificity characterized by the perishability of tea. Those economic constrains of tea production are the motives of emergence of contract farming in Moc Chau tea sector. Thus, the evolution of contract

farming in Moc Chau and the phenomenon of contract enforcement mechanisms can be explained in the context of new institutional economics. Attributes of farmers such as opportunistic, risk averse, and moral hazard in contract farming lead the incidence of different mechanisms of contract enforcement and types of contract arrangements.

In contract enforcement, as Gabre-Madhin (2009) noted, the relationship between firm and farmer is a considerable factor to decide on the degree of contract enforcement when the firm's accessibility of information on farmer's behavior is given. A trust based relationship which is the case for contracts by privates and cooperatives, does not involve strong collective sanction in the case of contract default. On the other hand, SOE applies a multilateral punishment strategy with more given information of producers. As a result, there are some considerable differences in contract enforcement between SOE and others, which may affect actions in contract default.

According to the studies on typologies of contract farming, we find that the informal contract model (Eaton and Shepherd, 2001) or resource providing contract (Minot, 1986) is wide spread in Moc Chau tea production. However, SOE applies a different type of model which involves a tighter arrangement with the centralized management.

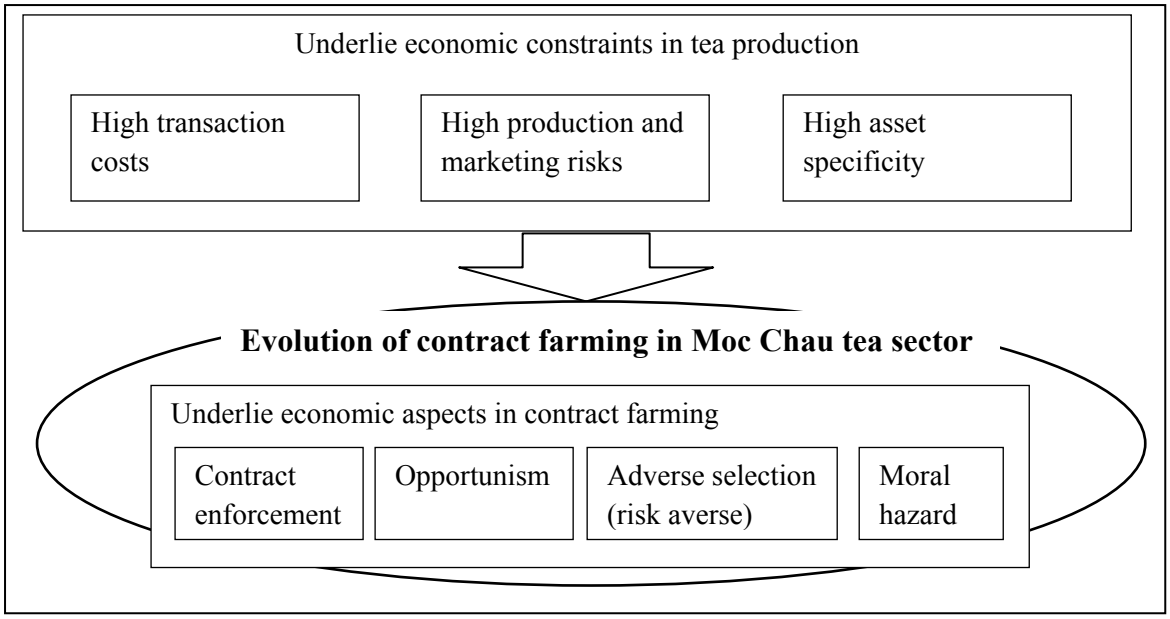
Eaton and Shepherd (2001) point out the informal model bears the highest risks of contract default due to the limited production management in input provision and technical advice. When looking at contract enforcement mechanisms in Moc Chau tea production, it can be summarized that trust based informal contracts are widely applied. Those contracts provide minimum production management by firms and their degree of collective sanction is weak. On the other hand, the centralized model with a tighter contract arrangement is applied in the cases of SOE under the contract enforcement of multilateral punishment strategy based on reputation with collective sanction or punishment in contract default.

In the last section, studies of vertical coordination and institutional arrangement in tea production are reviewed. Those reviews aim to understand the backdrop of the evolution of contract farming especially in tea production, and investigate the role of institutions in tea production.

The existence of vertical coordination in tea production can be explained by the commodity characteristics of the tea plant, such as high perishability, requirement of processing, and high

initial costs which are not bearable for small scaled farmers. Therefore, as Glover and Kunsterer (1990), and Baumann (2000) noted, the initial stages of tea production often involve tightly aligned coordination with tight arrangements and strict quality control by firms. This also holds true for Moc Chau tea production, since tea production in that area started from a vertically integrated plantation system (which is with complete management of production and land by firms with hired labor) under SOE, and gradually has increased the number of individual tea producers after the economic reform. However, the study of Herath and Weersink (2009) revealed that the production costs associated with labor and management increased in the transition of the production scheme from plantation system to individual production in Sri Lanka's tea sector. This implies the possibility of higher costs in management of private firm and cooperatives compared to SOE in Moc Chau tea production. Furthermore, their empirical study revealed that policy intervention plays an important role for reducing transaction costs associated with pricing final products. Similarly, Chirwa and Kydd (2009) pointed out an importance of functioning legal system to ensure contract enforcement in Malawian tea sector.

Figure 2.3 Underlying economic aspects in the evolution of contract farming in Moc Chau tea sector



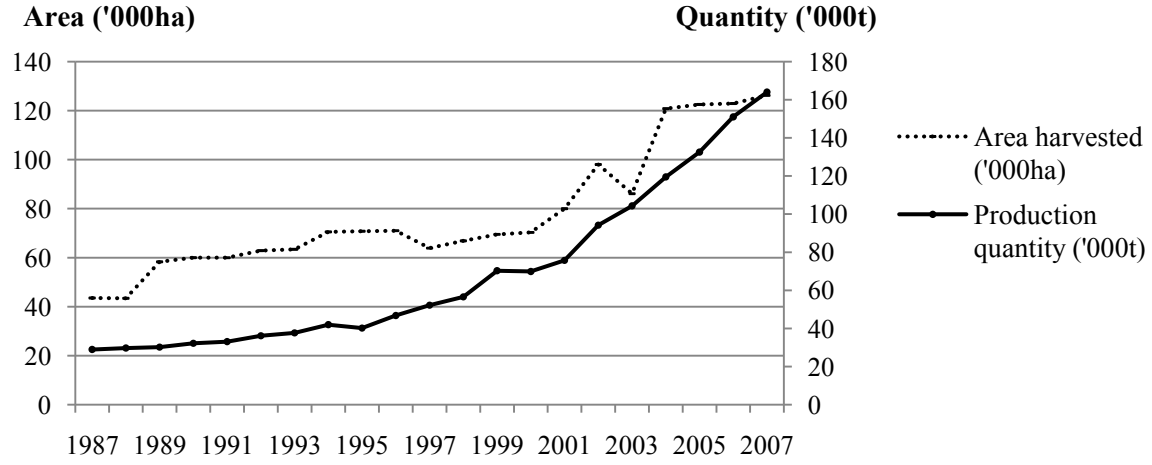
Source: Adopted from Key and Runsten, 1999, Silva, 2005, Hobbs, 1996, Williamson, 1981,Glover, 1984, Gray and Boehlje, 2005, and Ray,1998.

3. RESEARCH DESIGN

3.1. Tea production in the research area

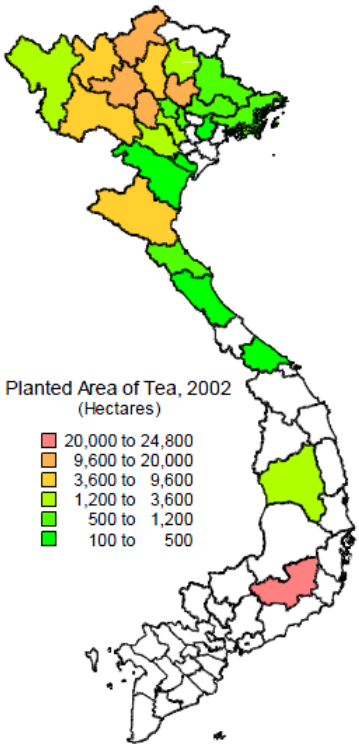
Over the last decade, Vietnam became an important supplier of tea in the world market, and production has increased significantly (Figure 3.1). In 2007, Vietnam was the 6th largest tea producer in the world in both quantity and value base (FAOSTAT 2011), with a major chunk of its production coming from the areas of Northern midlands and mountain areas, North central and central highlands (Figure 3.2). Development history varies across the regions in the Northern mountainous areas where tea has been grown and consumed as a native plant, and after 1975, it was planted in central highlands with the support of former Soviet Union (MPI, 2006).

Figure 3.1 Tea production and area harvested with tea in Vietnam



Source: FAOSTAT(2011)

Figure 3.2 Areas under tea production in Vietnam in 2002



Source: Agrifood Consulting International 2004

The North West region is one of the tea growing areas of Vietnam. Tea is a native plant of the region, and has been grown and consumed for many years. One of the major varieties grown in the region called *Shan Tuyet* thrives in the climatic condition and mountainous topography of the North West region (MPI, 2006). According to our qualitative interviews, *Shan Tuyet* variety is popular with the Vietnamese consumers and has represented the North West region as a high quality tea production area for a long time. In addition, North West region is heavily populated by ethnic minorities, who are potentially targeted for reducing poverty and minimizing the income gap between the urban and the rural populations.

Various policy measures implemented with respect to tea production are expected to reduce the income difference between the Kinh and the ethnic minorities (MPI, 2006). This is because tea is predominantly cultivated by rural poor farmers including a large proportion of ethnic minorities. In addition, tea production in Vietnam is led by smallholders whose land area on an average is less than one (1) hectare (ha). The comparative advantages of smallholders relative to large scaled commercial farms lies in their low transaction costs of

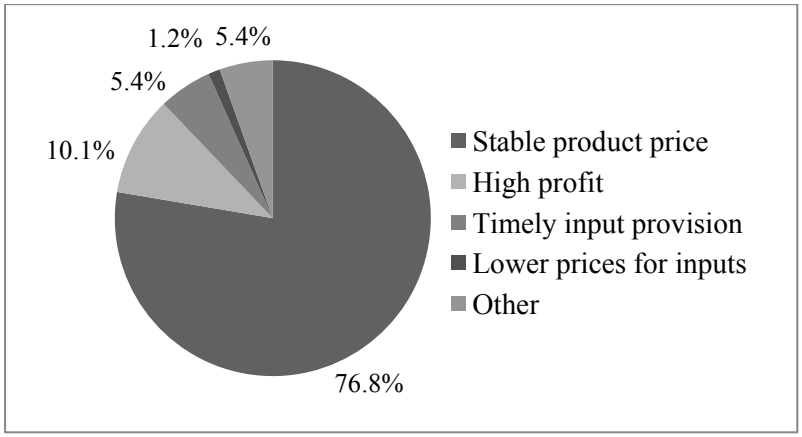
family labour (Poulton et al., 2005, 2010, Gebremeghin et al., 2009). These transaction costs pertain to monitoring labour, supervision, motivation, and local knowledge. Tea production is known for its labour intensiveness (Sivaram, 2000), especially at the stage of plucking which is a year round activity and needs skilled labour for high-quality production (Minot, 1986). In addition, the availability of low cost labour in Vietnam is one of the comparative advantages of the country. These characteristics associated with tea production especially in terms of its labour requirement and the advantages the size of Vietnam's population renders are the motivating factors for this crop to be chosen for the current case study.

What encourages farmers to engage in tea production? Figure 3.3 and figure 3.4 show qualitative questions to our sample households asking about the reasons for engaging in tea production. 77% of farmers enjoy tea production because of its stable price. In this assessment, the distinction between guaranteed stable price through contract and the price stability of tea itself compared to other crops could not be clearly ascertained. However, 10% of producers recognize the profitability of tea production relative to producing other crops. Provision of timely inputs is not only an important reason in selecting crops but also in selecting contacts for those who have poor access to markets. Among non-tea farmers, nearly 50% state the issue of lack of cultivable land as their reason for not engaging in tea production.

After the latest land reform in 2003, liquidity of land market in Moc Chau rose except for the areas located in steep hills. Now the possibility of land use in mountainous regions might influence producers in considering expansion into these areas. 27% of non-tea farmers face non-availability of labour which is a fundamental problem in producing tea since it requires year round harvest. Since tea cultivation is not seasonal in nature peasant households do not face difficulties over their subsistence (Otsuka et al., 1992). Furthermore, it is difficult participating in tea production while cultivating another crop on the side since it is not possible for farmers heavily engaged in other crop production to allocate their family labour into tea production. 4% of non-tea farmers cite lack of access to credit for not participating in tea production. Access to credit for tea production is important because of high initial costs due to long vegetation period for enabling harvest, and as a cash crop, it often requires intensive input regime (Key and Runsten, 1999) relative to that of traditional crops. Although

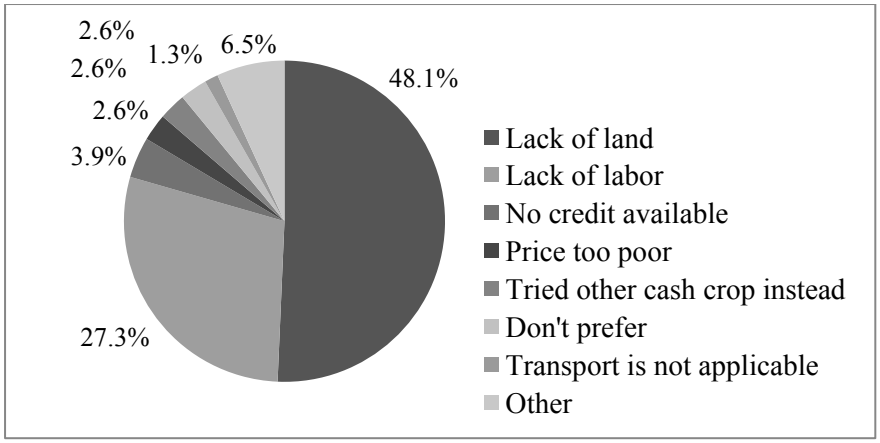
physical access to credit in the region is not constrained, other deterrents like high interest rate, prolongation of payment and limited payback period, make it all the more difficult to start producing tea for smallholders. Hence, most of the contract arrangements in Moc Chau include initial support for beginning tea production in terms of providing free seeds, inputs subsidies, and free extension supply.

Figure 3.3 Reasons for engaging in tea production (N=163)



Source: Own data

Figure 3.4 Reasons for not engaging in tea production (N=75)



Source: Own data

In line with the economic development of the country, several specific policies for enhancing tea production have been implemented following two important legislations. One was the law of Private Enterprise (promulgated in 1990), and the Enterprise Law (enacted in 1999 and 2005) that encouraged private sector's participation in the market. The other was the

Prime Minister's decision of Tea Development Plan for 2005-2010 (Decision 43/1999/QD-TTg) formulated in 1999 for the purpose of increasing production, productivity, exports and creating job opportunities. As it can be seen in Figure 3.1, area under tea cultivation in the country dramatically increased after 1999. This increase in production was supported by direct investment by the government in transport infrastructures, construction of processing units in rural mountainous regions, and technology transfer of new high-yield varieties. The government also provided political support, widely initiated by private firms that contributed in stimulating the market in both pricing and quality of tea.

3.2. Description of the research area

Moc Chau district, located in Son La province of the North West region, is about 195km far from Hanoi with an area of about 3200 ha under tea cultivation (2007) (figure 3.5). It is located about 950m above sea level, and the tropical monsoon climate is characterized by cool winters and summers with light rain. Moc Chau consists of two towns including a district capital Moc Chau town, and 29 communes. It is 36 km away from the border of Laos. Since the province is less than 200km from the capital city of Hanoi, and has sixth national road going across the region, there is access to bigger cities despite its mountainous location. The district's total area of 205,530 ha is mainly devoted to agricultural production, which accounts for 42% of its GDP (2006). The GDP per capita in the year 2006 was on an average 4.95 million VND. The population of 147,000 consists of seven different ethnic minorities: Thai, Muong, H'mong, Kinh, Dao, Sinh Mun and Kho Mu. 85% and 72% of the population are supplied with electricity and sanitary water respectively.

Tea is one of the major agricultural products in Moc Chau. Hence, both central and local governments have initiated technological development and institutional arrangements especially to encourage private sector investments to enhance production in the region after *Doi Moi*. The condition of soil, especially which is under active production, is characterized by red and yellow humus on limestone which is most suitable for tea production in terms of water drainage. Moc Chau is blessed with natural conditions that are necessary for growing tea such as soil, rainfall and temperature. Thus, tea production supported by comparative advantage of natural conditions and the natives' deep rooted specialization in its cultivation is

expected to alleviate poverty through creating job opportunities and enhancing production with the help of the local government and existing tea firms. In Moc Chau, 13 communes out of 31 (two towns and 29 communes) are growing tea. Four communes are traditionally growing tea. Not only in these areas, but tea production has been introduced and adopted in other areas for income generation supported by new private firms across communes. Table 3.1 shows planted area of tea and number of tea companies in Moc Chau in 2007.

Table 3.1 Tea production in Moc Chau in 2007

Commune[a)] units	Planted area: ha (planted with Shan Tuyet)	Number of tea companies	
		State-owned	Private/ Cooperative
Moc Chau town	974 (740)	1	1
Chieng Son	280 (270)	0	1
To Mua	489 (484)	1	0
Chieng Khoa	243 (243)	1	0
Phieng Luong	193 (190)	0	2
Tan Lap	321 (113)	0	1
Van Ho	328 (215)	1	1
Long Luong	49 (49)	0	1
Xuan Nha	13 (13)	0	1
Suoi Bang	3 (3)	0	1
Chieng Yen	166 (166)	0	1
Dong Sang	18 (18)	0	1
Cho Long	71	0	1
Total in whole province	3,159 (2515)	1(HQ[b)])/3(Branch offices)	12

[a)] Commune is the administrative level below district.
[b)] Abbreviation of Head Quarters.
Source: Interview with provincial office in Moc Chau

There is only one state-owned enterprise in the district that was established in 1958, along with three cooperatives and nine private firms that include joint ventures and three companies owned by foreign investors. The state-owned enterprise has three branch offices in the whole district that are closely linked with farmers for supplying inputs and collecting fresh leaves. In Moc Chau, cooperatives and private firms function similarly in terms of their management system. When a new company is established for tea production, it has to separate its targeted households from those which are already in contract with other companies. For this reason, most of the communes prefer to have only one company in their area to avoid conflicts

between companies. In Phieng Luong commune, two companies agreed on specific villages that they can target and seek contract. And in Van Ho commune, a foreign investor company implemented plantation-style tea farm and sought no contract with the surrounding individual tea farmers. This is aimed to avoid any conflict in terms of taking away contracted producers of state-owned enterprise. In Moc Chau, there is less chance for a new company to work solely based on market demand; instead its success is driven by the trust of the individual participating in the business. Also, since all the foreign investor companies in Moc Chau hold lands for their own production, and their entry is arranged by the local or central government, the tea farmers in Moc Chau stand to gain no direct benefit from the establishment of a foreign investor company.

3.3. Methods used for sampling

In 2007, a total of 6,726 households were engaged in tea production in Moc Chau. As stated in the introduction, the main objective of this study is to investigate the impact of contract farming on production and income of tea farmers. Therefore, the population was first divided into the following four groups:

1. tea farmers in contract with a state-owned enterprise
2. tea farmers contracting with private firms or cooperatives
3. tea farmers with no contract (independent tea farmers)
4. non-tea farmers.

As stated in the previous section, the study excluded foreign investor companies, since they do not offer contracts to tea farmers. After the pre-survey, the state-owned enterprise group was divided into two sub-groups due to fact that after 1996, tea farms located around the headquarters of state-owned enterprises have been converted to peasant farms. These farmers lease land from a state-owned enterprise for a period of 50 years, and these lands are restricted to producing tea only. Land rent is deducted from payments for tea delivery. In contrast, lands in the villages located far from the headquarters are leased by the government, and are not restricted in their use.

Assuming that those who had been plantation workers might be more skilled at tea production than others, the present study sampled households from each of the following five groups:

1. tea farmers contract with a state-owned enterprise including land lease
2. tea farmers contract with a state-owned enterprise not including land lease
3. tea farmers contract with a private firm or cooperative
4. tea farmers with no contract (independent tea farmers)
5. non tea farmers

The sampling was aimed at representing each of the five groups. The total number of households of each group in Moc Chau district is unknown, and due to limited time and budget, the two stage sampling method was applied. This procedure involves random or stratified sampling within the identified clusters (Black, 1999). The clusters referring to the elements of the contract scheme were first identified, and then probability proportional was applied to size sampling within the cluster to randomly select the households.

3.4. Identifying clusters and sampling households

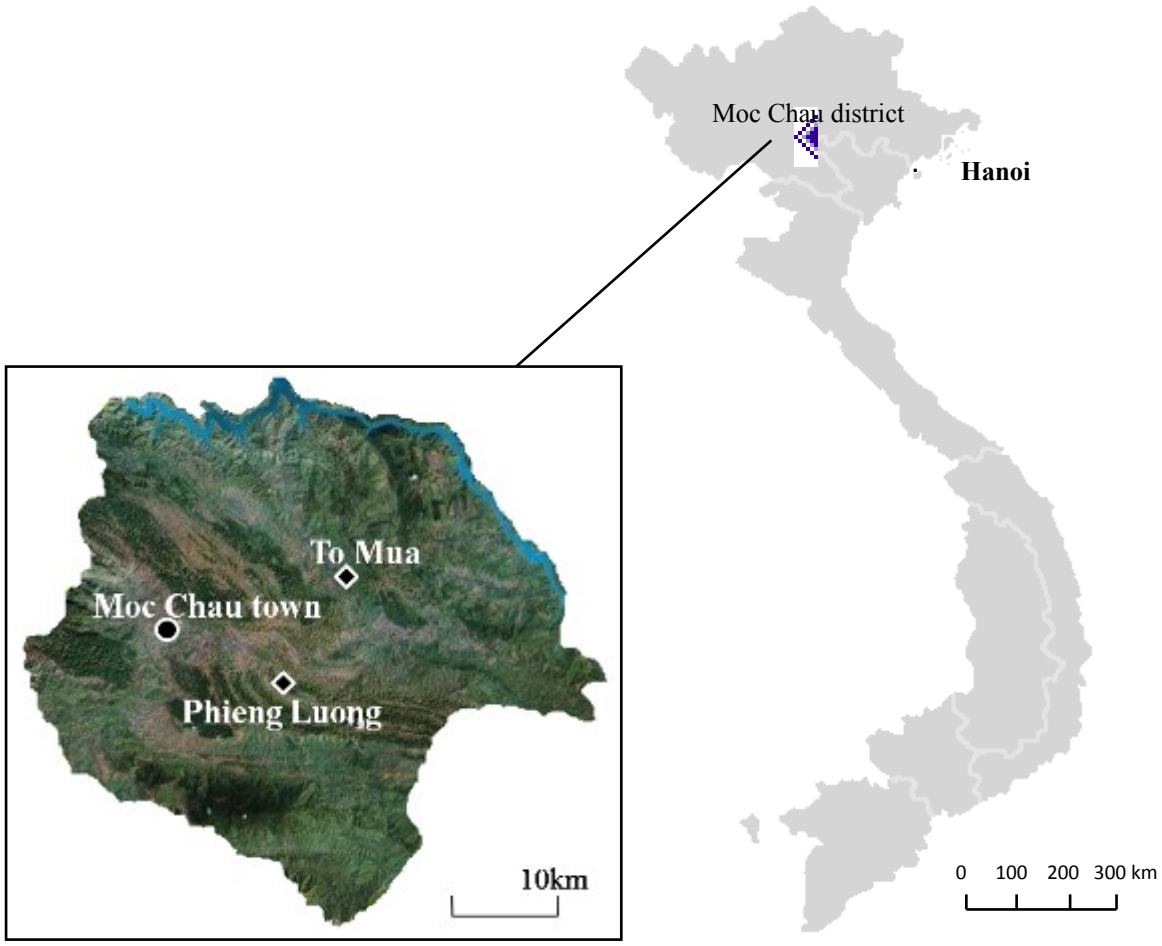
First, one company is selected from each of the three clusters:

1. cluster 1 is state-owned enterprise with land lease in the production contract (SOE type I),
2. cluster 2 is state-owned enterprise without land lease (SOE type II),
3. and cluster 3 is private firms/ cooperatives.

One company from each cluster was selected rather than randomly sampling households from the whole population. This is mainly because most of the companies in the region are in contract with households located in the same or neighboring communes. As only one SOE type I exists in a given region, the next step was to randomly select one company out of three from the second cluster (SOE type II). The reason behind the selection of these two clusters is that private firms or cooperatives in Moc Chau outnumber SOEs as can be seen in table 3.1. Furthermore, three companies were randomly selected from the third cluster (private firm/cooperative) from the neighboring communes where SOE type I and type II are located.

Figure 3.5 describes the geographical location of the research site and the selected communes in Moc Chau district.

Figure 3.5 Location of the research area



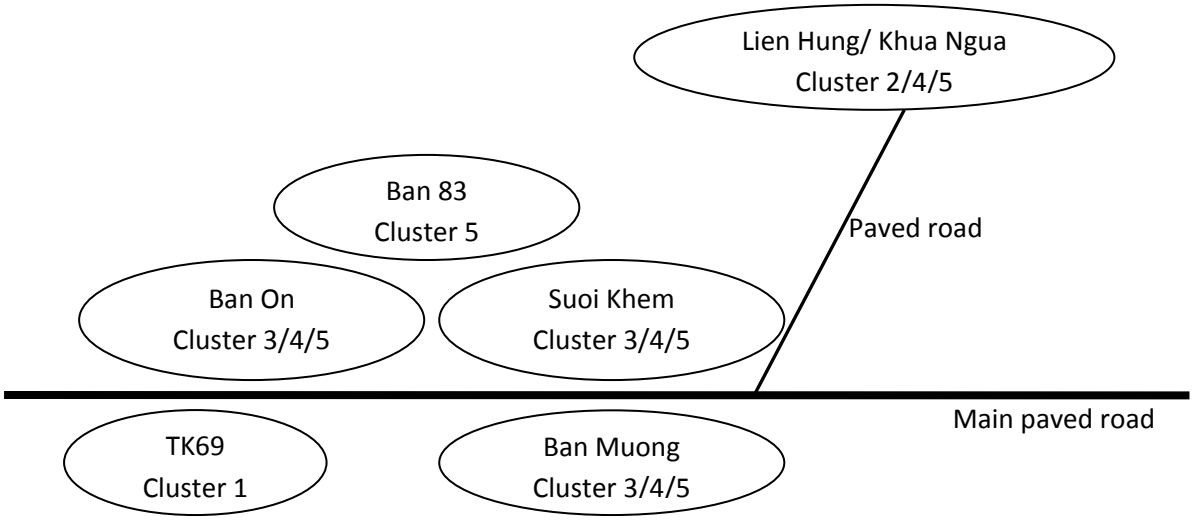
Moc Chau district and sampled communes

Map of Vietnam

Source: Adapted from Vietnam Administrative Atlas (2005) and Google Earth (accessed in Jan 2010)

After selecting the company, the lists of the communes and villages where contracted households reside, were obtained from each company. One or two villages were randomly selected from the list of each of the three clusters, and the list of the whole population was obtained from each village representative. This process aims to identify smaller groups (cluster of subjects), and to obtain successive samples from clusters (Black, 1999). Figure 3.6 describes simplified geographical locations of sampled villages and clusters held in these villages.

Figure 3.6 Geographical location of sampled villages and clusters



Source: Own data.

Finally, samples within the cluster are randomly selected with respect to the relative frequency of the elements in the population of selected villages. Table 3.2 shows the number of samples in each cluster. The target was to obtain 40 samples from each of the clusters 1 to 3, and relatively more samples were drawn from clusters 4 and 5, since those serve as controls for later analyses. Since not many non-tea households exist in the villages Ban Muong and Suoi Khem, an additional village called Ban 83, which has similar socio-economic conditions as the other two villages, was selected. Since the non-tea households group is used as a control group in the analysis for relative poverty status, its sample size is larger than that of the other groups. As mentioned by Zeller et.al., (2006), the larger sampling size for non-tea farmers captures the presumably larger variance among non-tea farmers with respect to any poverty indicator that exists among tea farmers.

Table 3.2 Number of sampled households by villages and clusters

			Number of samples in the cluster				
			1	2	3	4	5
Commune	Village	Selected Cluster	SOE type I	SOE type II	Private/ Cooperative	Independent	Non tea
Moc Chau town	TK69	1	40	-	-	-	0
	Ban On	3, and 5	-	-	8	0	21
Phieng Luong	Ban Muong	3, 4 and 5	-	-	19	14	15
	Suoi Khem	3, 4 and 5	-	-	11	17	-
	Ban 83	5	-	-	0	0	28
To Mua	Lien Hung	2, 4 and 5	-	33	-	19	13
	Khua Ngua	2	-	7	-	-	-
Total			40	40	38	50	77

Source: Own data

3.5. Methods used for data collection

The data used for this study consists of two survey parts: one attained from the household survey and the other from the survey of village and organization. The following sections explain the methods used for data collection and describe the data in detail.

3.5.1. Households data

The procedure of sampling and pre-testing was followed by a household survey between August 2007 and October 2007. Quantitative data of 245 farm households was collected using a questionnaire based on household demographics and tea production. A demographic survey was only applied to non-tea farmers. The household demographic questionnaires are based on LSMS type household survey data, which aims to measure and understand the living standard of households, and to investigate factors which determine production efficiency and contract participation associated with socio-economic characteristics of households. The questionnaire consists of seven parts pertaining to household roster, housing, assets, basic food consumption, basic expenditure, social capital and land use, and income source. The second part of the questionnaire is about tea production, including qualitative information about participating in a contract, costs of inputs, contract details, land information, access to credit, technology transfer and transportation. Table 3.3 shows the

number of indicators collected in each part. The reporting period of the survey was the last 12 months using September 2007 as a reference. Data were collected on a total of 145 indicators of socio-economic characteristics of households and 80 indicators of tea production.

Table 3.3 Number of indicators in household survey questionnaire

Contents of data	Number of indicators	Total
Household roster	25	
Housing	17	
Assets	29	
Food consumption	15	
Expenditure	14	
Social capital	38	
Land use and income source	7	145
Tea production	80	80

Source: Own data.

3.5.2. Village and organization data

In addition to the household quantitative survey, quantitative and qualitative surveys of villages and selected tea companies were conducted in order to understand institutional changes in the research area and to investigate socio-political changes in the region influencing tea production.

Interviews of village heads were conducted with the help of specially designed quantitative questionnaires with the objective of gathering village information in terms of its demography, governance, access to facilities, infrastructure, land use and prices. Qualitative interviews focused on the institutional framework and poverty levels of each village and its history with respect to the development of tea production.

For the survey on tea companies, four companies were interviewed by using structured questionnaires consisting of qualitative questions. Due to political reasons, the interview could not take place at the headquarters of Moc Chau Tea Company, whose information is controlled by the central government. Instead, qualitative and quantitative interviews were conducted with the technical and administrative representative of Moc Chau Tea Company in the village, where the implementation of the land reform, particularly allocation of land is

controlled by the company. Furthermore, due to the unavailability of the tea company's branch office representative, the person in charge of the management of contracted tea farms in the village was interviewed. The quantitative questionnaires aimed at drawing information regarding contract arrangements such as input supply, technical support, transportation of fresh tea leaves, and price fluctuations during the past 12 months. The qualitative interviews, on the other hand, obtained information about the history of the company, contract arrangement, processing, marketing and general working calendar of the tea production. These interviews helped the study to gain a thorough understanding of the region's history, particularly the development of tea sector and the socio-political issues faced by households.

3.6. Summary

This chapter presented the tea production and description of the research area, as well as methods used for the field research. The research area is Moc Chau district in Son La province. The area is blessed with geographical and climatic condition which is suitable for tea production. Tea production in the area is heavily engaged by poor and ethnic minorities. Hence Moc Chau has targeted by government to enhance tea production through policy implementations, and to thereby reduce income differences between Kinh and ethnic minorities. A total of 13 tea firms are located in Moc Chau district. In order to measure the impact of contract farming, we first divided the population into five groups which are:

1. tea farmers contracting with a state-owned enterprise including land lease (SOEI),
2. tea farmers contracting with a state-owned enterprise not including land lease (SOEII)
3. tea farmers contracting with a private firm or cooperative
4. tea farmers with no contract (independent tea farmers)
5. non tea farmers.

As only one SOE type I exists in a given region, a random selection of one company out of three from the second cluster (SOE type II) was made. Furthermore, three companies were randomly selected from the third cluster (private firm/cooperative). The latter are located in the neighboring communes of SOE type I and type II. After obtaining the household lists from each firm, samples within the cluster were randomly selected with respect to the relative frequency of the elements in the population of selected villages.

Quantitative data of 245 farm households was collected using a questionnaire based on household demographics and tea production. In addition, quantitative and qualitative data of the village and tea firms was collected to capture an overview of the village's demography, governance, access to facilities, infrastructure, land use, and prices. Qualitative interviews focused on the institutional framework and poverty levels of each village, and its history with respect to the development of tea production.

4. DESCRIPTIVE ANALYSIS

4.1. Socio-economic characteristics of sampled households

This section presents the socio-economic characteristics of sampled households by differentiating the five groups. Table 4.1 shows the socio-economic characteristics of households.

The number of income source of SOE Type I is significantly lower than any other in the four clusters. On the other hand, SOE Type I has a significantly higher number of non-farm income sources at 1% of error level than any other of the four clusters. Since farmers in SOE Type I do not have land use rights certified by the government, their use of land is limited to tea production, and this kind of contract constraints their crop diversification strategy resulting in reduced income diversification. In addition, it is necessary for farmers to diversify their non-farm income activities to manage the risk associated with mono-crop production.

It is interesting to see the difference in distribution of ethnic groups among the clusters. Kinh makes up the majority of Vietnamese population, and it is the most populous ethnic group in the two clusters contracting with the SOE. It accounts to more than 80% of the sampled population. The sample villages taken for the cluster SOE Type II are located about 60km away from the district center. The governmental migration program, aimed at diversification of ethnic groups and development of the area, also brought into the picture migrants who added to the Kinh population. Hence, in the case of SOE Type II, it could be assumed that SOE allocated contracts pertain to the area of the Kinh group, although its geographical location is not easily accessible. This may be due to the fact that the government intends to develop the mountainous region through implementing migration programs. The private sector would hardly consider expanding business in the region. Population compositions of other clusters are well distributed among the different ethnic groups. These ethnicity differences are considered in the econometric analyses.

Data of agricultural land, differentiating between irrigated and non-irrigated land, was collected. In table 4.1, it can be observed that the area of non-irrigated land is tremendously

larger than that of irrigated land. Since the geographical landscape is conducive only for rain fed cultivation, maize production dominates the land use in northern mountainous region. However, this type of land use causes landslides and soil degradation, which is one of the serious problems concerning sustainable land use in the area. Apart from "Decision 80" implemented by the central government in 2002, the provincial level or local policy aimed at promoting intensification of tea production for sustainable land use and income. In addition, the government also implemented a credit program, which makes it possible to provide a credit of up to 2,000,000 VND to households towards purchasing inputs. Since "Decision 80" was criticized on the grounds that it provided advantages only to the State-Owned Enterprises (ADB, 2005), the provincial level initiative taken by the regional government is likely to encourage private sector participation and prove favorable for rural development in the true sense of its term.

Table 4.1 Socio-economic characteristics of sampled households

	Household cluster				
Characteristics	SOE I	SOE II	Private	Non contract	Non tea
Number of household members	3.5	4.5	5.1	4.4	4.0
Mean education year of adult	8.5	6.9	6.7	6.6	6.0
Female head in the cluster (%)	37.5	5.0	5.3	5.8	20.0
Year of residence	16.4	20.3	19.2	17.2	15.4
Number of income sources	1.9	2.4	3.3	2.9	2.3
Source of non-farm income	0.6	0.1	0.1	0.1	0.3
Ethnicity (% in the cluster)					
Kinh	95.0	80.0	18.4	38.5	36.0
Thai	5.0	20.0	44.7	21.2	28.0
Dao	0.0	0.0	28.9	34.6	26.7
Muong	0.0	0.0	7.9	5.8	9.3
Area of agricultural land (m^2)					
Irrigated (% under land title)	0 (0)	25 (100)	1081.6 (76.3)	378.9 (60.7)	209.3 (50.0)
Non-irrigated	3402.5 (0)	7656.3 (94.1)	12671.1 (65.1)	10865.9 (68.9)	7739.9 (39.6)
By crops					
Tea	3382.5	4075.0	4479.4	4020.0	316.0
Rice	0.0	50.0	1908.8	1366.0	608.0
Maize	12.5	4217.0	7235.3	6436.0	139681.3
Number of samples	40	40	34	50	75

Source: Own data

4.2. Living standard of sampled households

4.2.1. Application of a poverty line

In 2006, Moc Chau district reached a regional total GDP of 611.53 billion VND (USD 38,447,700 proxy in 2006), comprising of agriculture and forestry (42%), industry and construction (34%), and services and others (24%). GDP per capita in Moc Chau is USD 262, which is far below the national average of USD 723 at market price (IMF, 2010). North West region, which is characterized by ethnic diversity and mountainous topography, holds the highest poverty rate in the country. The absolute poverty rate of the whole of North West region measured by monthly income per capita was 38.1%, with a national poverty line of 260,000 VND for urban and 200,000 VND for rural area in 2006 (GSO, 2006). The absolute

poverty line has been adjusted for every national living standard survey. According to the village and commune representative, the national poverty line for the villages is derived from village discussions, or imposed by the commune decision. Since 2005, a commune level new poverty line that takes into account the difference in living standards has been calculated. By this measure, the number of poor households that will receive poverty certificates is decided at the commune level. In the current study, To Mua commune located in the mountainous area farthest from the district center has a lower poverty line compared to the other two communes (Moc Chau city, and Phieng Luong). This is understandable because households in To Mua commune have less job opportunities than others, which makes their living standards lower, which then again also sets their poverty line lower.

In order to have an overview of the living standard of the research site, the general poverty line was applied on the expenditure data which was obtained from household survey. Due to the constraints of survey time and budget, 12 short-cut questions were applied on household expenditure together with per capita daily clothing expenditure derived from demography to measure total consumption expenditure. These 12 questions have been tested in four different countries by the University of Maryland together with University of Göttingen. They obtained a very high correlation coefficient between the per capita daily expenditures (measured with an LSMS type questionnaire) and the per-capita daily expenditures derived from the 12 short-cut expenditure questions ranging from 0.55 to 0.79 in the four different countries (See Zeller et.al, 2005a and 2005b, Zeller and Alcaraz, 2005a and 2005b). The questionnaire comprised of questions shown in table 4.2.

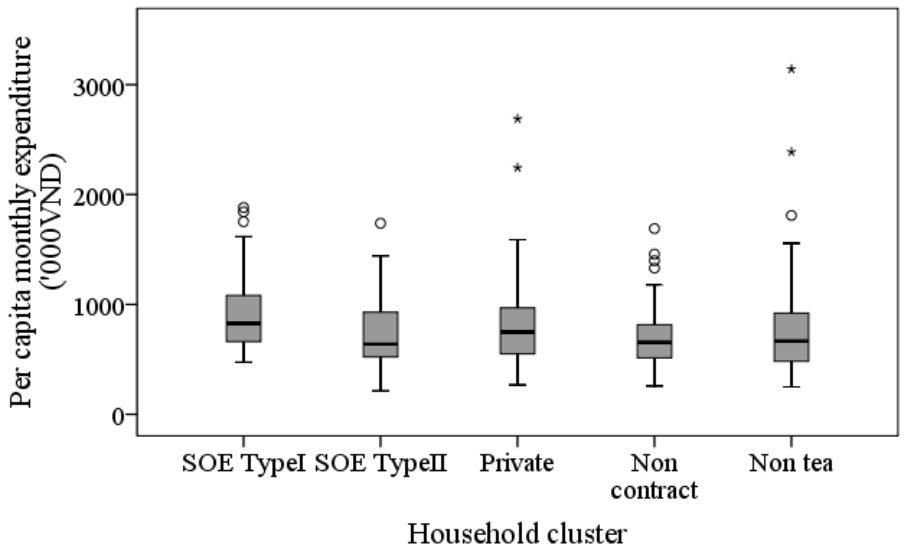
Table 4.2 Short-cut questions on expenditure

Time period	Questions
Last 7 days	Total food consumption of household purchased and home produced
Average 7 days	Total food consumption of household purchased and home produced
Average 30 days	Expenditures of utilities, transport, fuel, and goods
Last 12 months total	Expenditures of education, health, furniture and appliances, remittances sent, and others

Note: Recall period is last 12 months for average expenditures.
Source: Adopted from own questionnaire.

On the basis of derived per capita daily expenditure, two poverty lines, adapted to different villages that are 180,000 and 250,000 VND per capita monthly expenditure, were applied. Figure 4.1 shows the distribution of estimated per capita monthly expenditure across clusters. All estimated expenditures are above poverty lines of 180,000 and 250,000 VND. In conclusion, the absolute poverty status is not applicable to capture comparable living standards in this study, so the relative poverty status of households was used by applying an alternative method.

Figure 4.1 Distribution of per capita monthly expenditure



Source: Own data.

4.2.2. Constructing a poverty index

Since poverty status measured by poverty line does not obtain accurate comparable living standards of household, the relative poverty status of households is assessed by applying the statistical method of Principal Component Analysis (PCA). PCA is one of the poverty assessment tools developed by the International Food Policy Research Institute (IFPRI) with technical and financial support from the Consultative Group to Assist the Poorest (CGAP), in order to obtain immediate, low-cost and accurate measurement of the poverty status in the field of microfinance (Zeller et.al., 2006). This approach seemed ideal due to its applicability for our data, since there are limitations of time and budget in our survey which affects the data quantity in terms of measuring expenditures.

Technically, the Principal Component Analysis is used to extract the components pertaining to the different dimensions of poverty and to create an indicator such as a poverty index. The current study followed the technical instruction for constructing a poverty index developed by Henry et.al. (2003).

In the process of reducing indicators, correlation coefficients between the poverty benchmark variable (expenditure per capita) and various other variables are measured. Only those which show a high linear correlation are chosen as a component unit. These variables are used in the application of PCA, to construct the components attributed to different dimensions of poverty. PCA extracts information from various indicators and creates components that capture common underlying attribute of households. In our analysis, four dimensions of poverty were created: human resources, dwelling, assets, and food security (see table 4.3). After obtaining the poverty index, control groups were defined for relative comparison among the groups. The poverty group was divided into three clusters: lower, middle and highest. Among the three clusters, the control group sample is divided equally to enable relative measure of poverty status. In our measure, the group of non-tea farmers serves as the control group.

Table 4.3 Variables consisted in the poverty index

Dimension of poverty	Variables	Component Matrix
Human resources	Percentage of adults who can write	0.235
	Birth of own child - in the last five years	-0.377
Dwelling	Area (m^2) per capita (area covered by roof)	0.477
	Type of toilet facility	0.316
Assets	Total resale value of dog	0.608
	Value of assets per capita	0.693
	Land area (m2) owned per capita	0.503
Food security	Borrowing food in the last 365 days (times)	-0.510

Benchmark variable is daily expenditure per capita
KMO: Measure of sampling adequacy = 0.691
Significant at the 1% level
Source: Own data

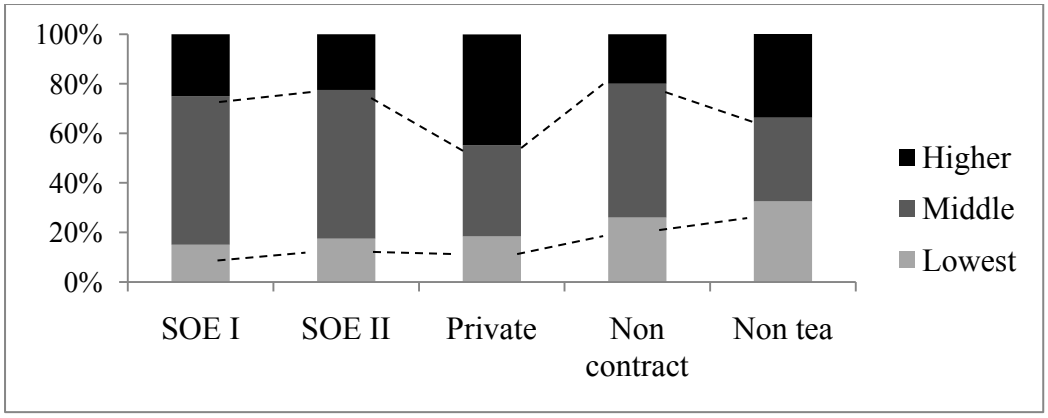
Table 4.3 shows wealth variables used to construct the poverty index. To test the sampling adequacy of PCA, the statistical test of Kaiser-Meyer-Olkin (KMO) was applied. KMO is an index which compares the magnitude between observed and partial correlation coefficients (Henry et al., 2003). The bigger the value, the more accurate it is. Hence, our result of 0.691 is acceptable.

Human resources include two variables; the ratio of literate adults, and the number of births in the last five years. The sign of component matrix of those two is as expected. The households comprising more literate adults have a higher ranking in the poverty index, and households with more than one child birth in the last five years rank low. As for the dwelling component, households that have more area under the roof (per capita) rank higher on the poverty index. The types of toilet facilities range from 1 to 7 in ordinal measure: 1 corresponding to a natural source (at a bush or a field), 7 to a flush toilet. It is with a positive sign, which is against our expectation. This might be the result of unevenly distributed variables: 85% of the households own a kneel-down toilet, or a shared sit-down toilet, which correspond to 3 and 4 respectively on the indicator. The component of assets includes total resale of dog, total value of assets and area of land owned per capita. All three variables show a positive coefficient to the poverty index. The component measure for food security of a household is comprised of the variable of frequency of food borrowing in the last 365 days. It

shows a negative sign as expected and household borrowing more food ranks lower on the poverty index.

Figure 4.2 shows distribution of relative poverty status of tea farmers among the four clusters.

Figure 4.2 Distribution of poverty status by clusters

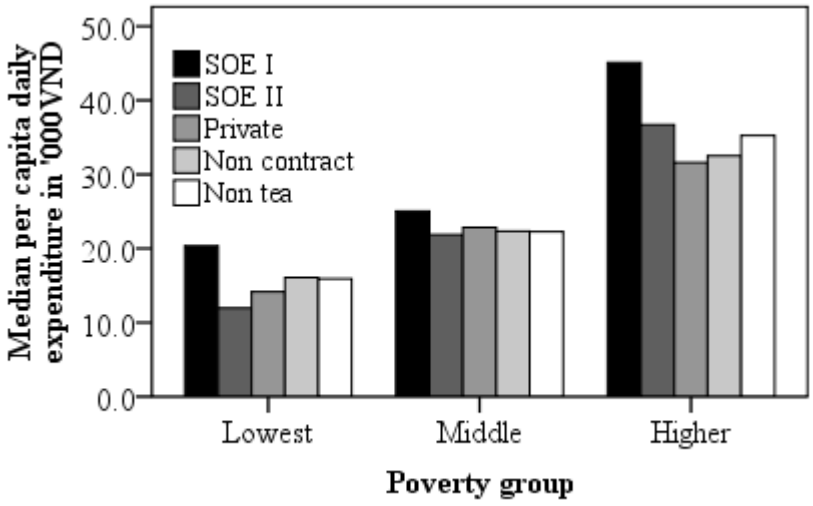


Source: Own data

Non-tea farmers constitute the control group for relative poverty status. From figure 4.2, the proportion of middle and lowest poverty levels in non-contract farming reveals to be higher than in other clusters. The clusters of SOE I and II have a similar structure, where the majority of the households belongs to the middle level, and nearly 45% of households that are contracting with private firms, rank high in poverty status within their cluster.

The bar chart of Figure 4.3 represents the median of per capita daily expenditure data of each cluster, terciled (low, middle, and high) by the result of estimated poverty index. It allows checking the validity of the estimated poverty index compared with expenditure data. The height of the bar chart of the poverty group becomes higher from left to right. This indicates that there is a similarity between the estimation of absolute poverty status measured by expenditure and the estimation of relative poverty status measured by poverty index.

Figure 4.3 Household expenditures, by poverty tercile and clusters



Source: Own data

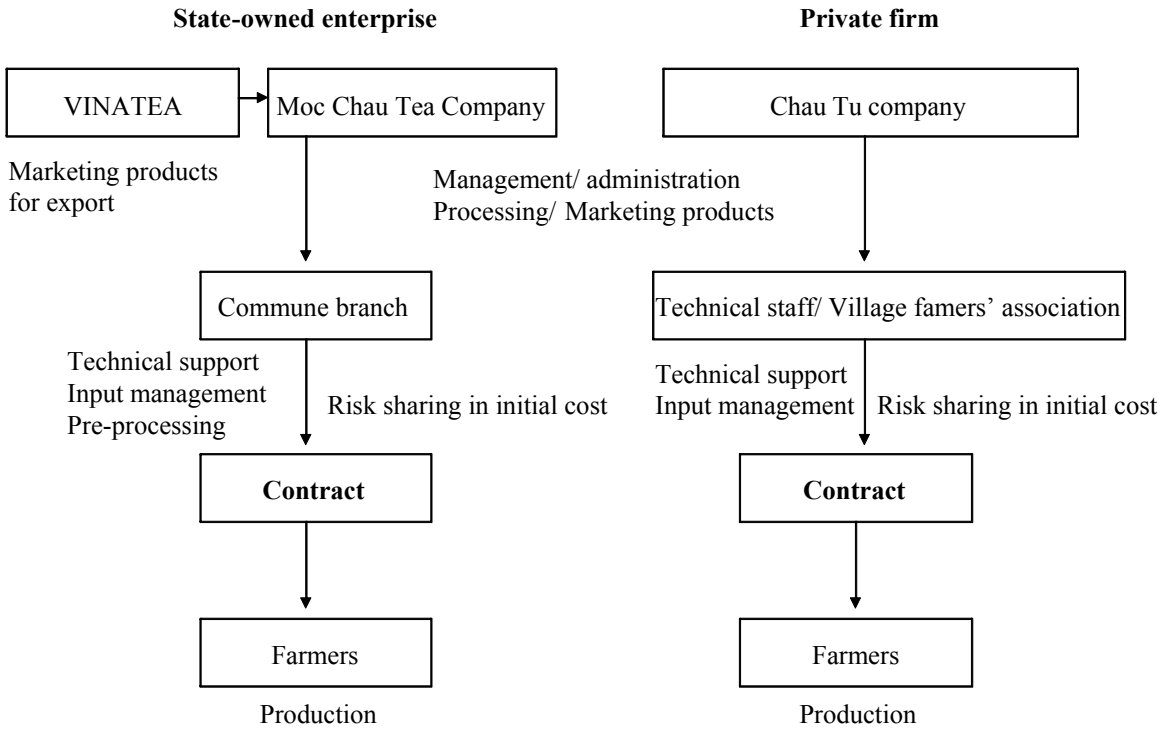
4.3. Overview of contract farming in Moc Chau

4.3.1. Vertical coordination of tea production in Moc Chau

Contract farming plays a vital role in the Vietnamese agricultural sector.90% of fresh milk and cotton, 40% of rice, and 50% of tea are purchased by enterprises under the contract (Silva, 2005). Contract farming today is highly developed, especially in the sector which deals with perishable products including commodities that require immediate processing.

As noted in the description of the research site, there are mainly three kinds of institutions that provide contracts in Moc Chau: state-owned enterprise, private firms, and cooperatives. We do not distinguish between private firms and cooperatives as they function similarly in terms of contract participation, arrangements and marketing strategies. Figure 4.4 shows the framework of contract farming in the context of its role in the vertical coordination.

Figure 4.4 Framework of contract farming in Moc Chau: case of tea production



Source: Own data

The vertical coordination of state-owned enterprises starts with VINATEA, which is the national headquarters of stated-owned enterprises for tea, and Moc Chau Tea Company at the regional level, under the supervision of VINATEA. VINATEA manages nationwide marketing strategies, particularly in the sphere of tea export. At the district level, Moc Chau Tea Company, which was established in the 1950s as a state-owned enterprise with certain independent rights instead of being fully controlled by VINATEA, handles production strategies ensuring flexible and timely production management. At the communal level, Moc Chau Tea Company has set up communal branch offices in order to manage contracted tea farmers in a more flexible way. The company is in charge of only administrative arrangements in organizing contracts, and manages the entire course of processing to marketing. In the processing stage, pre-processed green tea prepared by communal branches all over Moc Chau province is used and some part of the raw product is sent to VINATEA for export, which then blends it with tea leaves from other regions. As communal branches are located in the production area, they have more interaction with farmers in the production management. They share the risk in initial costs by providing primary inputs, production materials and extension advices, and collect raw products from contracted farmers.

As mentioned in Chapter 1, the number of private tea firms in Moc Chau is increasing bolstered by domestic and foreign investments. However, the operation size of a private firm is smaller compared to state-owned enterprise as they are new to the sector. In addition, the size of factory operation might bring inefficiency problems, because tea farming requires large economies of scale in processing (Kirsten et. al, 2009: p.214), an aspect that must be considered in addressing overall economic efficiency of tea production in Moc Chau. As seen in figure 4.4, these private firms are positioned right at the top of vertical coordination, on par with state-owned enterprises, except that they are in full charge of the final marketing products. Most of the private firms have been established only a decade ago, and the long-existing tea producers in the area had already built up their own access to market channels. For this reason, private firms first targeted non-tea producers and introduced them to tea production by taking away all the risks associated with initial investments. In this way, farmers overcame capital-constraints at the establishment stage, where the problems often emerge in terms of high-fixed costs. At the level of production management, although most private firms are located in the production area, the company is often run by a single person facing shortage of labor. Hence, interaction between the company and farmers, especially on production management, is taken over by farmer's associations or other village organizations in most cases. Technical workers from farmer's organizations provide extension advice, and manage input materials necessary for farmers. It means farmers' decision making on production management is accepted by contractors, and by this way, contractors avoid incurring full risks associated with production management. However, most farmers buy input materials from contractors because of its lower prices relative to purchasing directly from the market.

4.3.2. Contract arrangements

Detailed contract assignments of state-owned enterprise (SOE) and private firms are described in table 4.4. The total production area contracted with Moc Chau Tea Company accounts for 50% of the whole district, which was more than 1,600ha in 2007. Since the establishment of Moc Chau Tea Company in 1958, they have been managing the traditional plantation production system in the surrounding communes.

State -owned enterprise with central management (SOE I)

SOE Type I is one of the sub-groups in our sample and had been consisted with employed labors who, until 1996, were under an employment contract with the state enterprise. Its management is centralized, and is located close to the processing facility of Moc Chau Tea Company. As part of the economic reform Doi Moi, Moc Chau Tea Company also came under the purview of the re-construction and decentralization of state-owned enterprises. Furthermore, farmers, who had been the employed labor before, have contracted a land tenancy agreement with Moc Chau Tea Company for 50 years. In addition, participation in the contract of SOE Type I is quite limited and selective, thus contract participation is unidentified based on inevitable selection bias. Since we were interested in comparing the contractual arrangement of SOE and private under similar socio-economic conditions, contract arrangement of SOE Type I was not taken into account in our econometric analyses.

State-owned enterprise with producer's management (SOE II)

SOE Type II refers to a group of households contracted with SOE, where the land tenure right belongs to the farmers. The contract arrangement of the state-owned enterprise presented in table 4.4 refers to this type of contract Type I. The format of this contract is written and arranged by an intermediary who is the village representative.

Those who want to newly participate in the contract with the SOE, both previous tea growers and non-tea farmers, can freely contact the village representative and negotiate participation. Duration of the contract is "no limitation", which is strongly influenced by and depends on the land property right policy of the country. Once farmers enter into this contract, production inputs such as fertilizers and pesticides are provided by the SOE upon farmer's direct payment to the branch offices in the region. Extension service is freely available whenever a farmer requires. The price of tea leaves is decided once a year by VINATEA, which is the center of state-owned tea enterprises of Vietnam, and it is neither negotiable nor fluctuates depending on the market price. The main concern about this type of contract is the stable procurement of tea leaves. Since Moc Chau Tea Company is located in the area of production which is dominated by small holders, it is necessary for the company to have reliable access to tea leaves from individual farmers to prevent side-selling. Hence, to ensure contract enforcement, the SOE together with the local government sets up a penalty in case of contract default which might occur particularly during the tea leaves sale.

Table 4.4 Contract arrangements of tea production in Moc Chau

Specifications	**State-owned enterprise**	**Private firm**
Land ownership	Farmer	Farmer
Contract format	Written	Written / Verbal agreements
Duration	No limit	More than 30 years
Input supply		
- Fertilizer and pesticides	As farmer requires	In principal company plans, additionally farmers can apply
- Extension advice	As farmer requires (free)	Once a month for free (when farmer requires)
Input payment	Farmer who needs inputs must pay directly to SOEs	Subtracted by firm from fresh tea selling during production period (normally once/ month)
Tea leaves price		
- Price arrangement	Fixed price, once a year	Prices calculated regarding market prices, every month
- Average price	2,300VND/kg (USD 0.14)	2,500VND/kg (USD 0.16)
Sanction/ punishment of contract default	Yes	No
Contract enforcement	Strong	Weak
Participation in contract	Free, arranged by village	Free

Source: Own data

Private firms

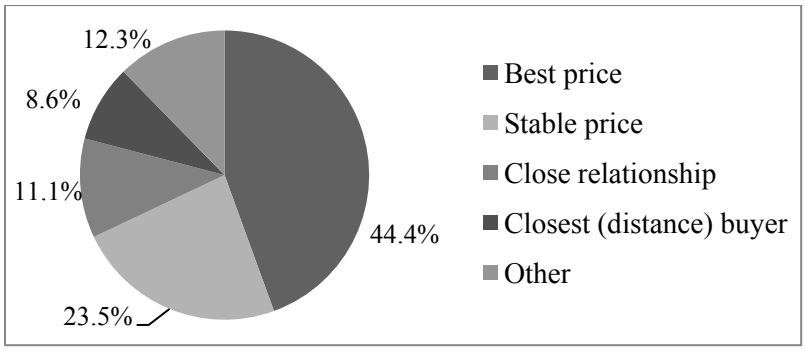
Private firms provide contracts through farmer's associations in villages where the SOE has not implemented its contract arrangement. It is based on horizontal coordination between tea companies in order to prevent undermining each other's business (Poulton et al., 2010). The firms we investigated were Chau Tu tea company, Co Do joint stock company and Doan Ket cooperative. Despite one of the companies being a cooperative, all three were grouped together on the basis that they administered similar contract arrangements. A contract with individual farmers is mediated by village representatives, mostly with new tea growers. The company shares the initial risk of production by providing seeds for no charge, since the vegetation period of tea takes at least three years before harvest. Technical support is often provided through the farmer's association regularly once a month and, additionally, upon request. Input application for production is implemented by the company within the management practice under the supervision of farmer's association. These inputs are subtracted from the sales once a month. The price per kg of fresh leaves is adjusted on spot market price every month. To prevent the side-selling of farmers, Doan Ket cooperative set their buying price at 100 to 200 VND (per kg), higher than that of SOE, and in addition, gave

incentives to growers by providing the bonus to mass producers. It often sets the floor price for procurement, this way the company shares the marketing risks of price fluctuations. Contract enforcement is indeed relatively weak compared to that of SOEs, since it is not covered within the legal framework. Contract default depends mainly on the tightness of social networks in rural areas where people are often close to each other, and the company can restrict side-selling of growers only by sense of community.

4.3.3. Reasons for choosing a specific contract in Moc Chau

Contracting provides certain advantages for smallholders. They are assured of their marketing, often floor price is guaranteed, they have access to input materials provided by the company, access to extension service, new technology, and information, and easier access to credit. The credit-facilitating aspect of the contract is often the farmer's principal motive for signing up (Glover 1987). Meanwhile, what can be the reason for producers to select a specific contract? Our qualitative data shows that nearly 45% of famers chose the tea leaves sale price offered by the company as the primary reason for selecting a contract (see figure 4.5). Not only the degree of price, but also its stability is an important criterion in the selection, since vulnerable smallholders are exposed to the risk of fluctuating prices in spot markets. A trustworthy relationship between the producers and contractors also affects the contract selection. Especially in a rural society, it is possible to establish closer and narrower relationships than in urban areas. Thus, tight social networks help linking producers and processors.

Figure 4.5 Reason for selecting specific buyer/ contract



Source: Own data

4.3.4. Economic performance of tea production – Gross margin of tea production –

It is in the best interest of not only producers but also of agricultural firms to investigate the economic performance of production. Gross margin is defined as gross revenue minus variable costs, and it is a simple measure to evaluate the cost and benefit performance of production. Variable costs defined in our data are presented in table 4.5. They include production material costs pertaining to manure, fertilizer, and pesticide, rent of land, small tools, hired labor, transport, and interest. Investment on production material such as manure, fertilizer and pesticides is likely to be higher for non-contract groups compared to the contracted groups. Household contracts with private firms spend much more on rent of land for tea production. This might be influenced by the availability of land in the village, and also the incentive for producers to expand the scale of production. SOE I and private firms are likely to hire more seasonal labor especially during the harvest season. In the case of Private, hired labor, which mostly comes from outside the village, is paid 20,000VND per day (approx. USD 1.2 at the time of survey). Transportation cost for SOE II seems to be the highest among the groups, since households sampled are located in relatively deep mountainous area. The mean total variable cost per kg of non-contract farmers is significantly higher than that of the other three groups at 1% error level in multiple comparison tests. SOE I yielded the lowest variable costs among the four, but the statistically significant difference was observed only with non-contract farmers. All in all, it indicates that the variable costs of production per unit of tea leaves of non-contract farmers are significantly higher than those of the contracted groups.

Table 4.5 Variable costs of tea production (in VND, per kg of tea leaves, N =163)

Cost description		SOE I	SOE II	Private	Non contract	Total
Manure	Mean	51.16	7.72	34.77	100.45	52.47
	S.D.	199.80	27.59	117.18	420.71	259.58
Fertilizer	Mean	512.48	551.92	368.11	830.09	589.23
	S.D.	298.13	329.88	262.06	978.77	616.95
Pesticide	Mean	211.81	196.78	214.25	255.07	221.99
	S.D.	209.89	126.98	179.14	263.52	206.05
Land rent	Mean	1.95	29.14	55.12	5.22	20.55
	S.D.	7.21	161.04	203.37	36.89	123.93
Tools	Mean	43.44	112.03	224.13	355.84	193.37
	S.D.	52.68	99.13	718.79	694.11	519.07
Hired labor	Mean	20.77	14.37	26.60	8.90	16.81
	S.D.	79.61	48.89	78.65	35.13	61.35
Transportation	Mean	12.52	49.70	29.57	45.71	35.16
	S.D.	10.07	32.37	23.75	55.53	39.20
Interests	Mean	1.73	1.50	0.76	0.00	0.94
	S.D.	6.16	7.28	4.46	0.00	5.11
Total variable costs	Mean	855.86	963.16	953.31	1601.30	1130.50
	S.D.	598.00	495.75	749.70	1643.18	1084.10
Area of tea cultivated	Mean	4280.0	4212.9	4661.8	4152.0	4304.3
	S.D.	5161.1	2653.6	2924.3	3692.0	3737.0

Source: Own data, computed by Pham 2008

The gross margin was calculated with using the variable costs shown above. Gross revenue is yield multiplied by the price of leaf, which also includes the amount spent on personal consumption. Table 4.6 shows the gross margin per sale of kilogram of tea leaves in all groups. The group comprising of households contracted with private or cooperative (cluster 3) achieved the highest gross margin. In addition, all the groups comprising of contracted households yielded a higher gross margin than non-contract households. Although the price per kg of tea leaves is higher for the non-contract group compared to that of the other three groups with a maximum difference of 700VND, the variable costs of non-contract households amount to 800VND, lending to a bigger difference between cost and benefit for non-contract groups. Also, the application of production inputs in the case of non-contract groups may not be accurate since they do not take the help of extension service frequently. Hence, it can be assumed that there might be inefficient use of production materials such as

overuse of chemicals, which in fact causes low land productivity. The private groups achieved the highest gross margin, which might be explained by the fact that they provide more incentives for production since they retain full autonomy on production decisions enabling skilled producers to apply timely and appropriate management practice on their own. Furthermore, unskilled producers in contract with private firms have timely access to extension services through farmer's associations when required. Hence, obtaining technical advice is made easy for producers contracting with private firms as farmer's associations have extensive presence in the village.

Table 4.6 Gross margin (VND) per kilogram of tea leave

	Mean of Gross Margin	S.D.
SOE I	1349	0.595
SOE II	1378	0.535
Private	1562	0.707
Non contract	1151	1.692

Source: Own data, extracted from Pham 2008

After calculating the gross margin, Pham (2008) further analyses it by comparing contract and non-contract households by applying matching methods to correct household characteristics in each group. The result shows larger difference in gross margin between contract and non-contract, although the results are not statistically significant with the t-test. With the ANOVA test, it is concluded that SOEI yields a higher gross margin than non-contract groups, but no other comparison is significant.

4.4. Summary

The relative poverty status of households is assessed by applying the statistical method of Principal Component Analysis. The result revealed that non-contract group includes lower-ranked households compared to other groups. In the group of SOE I and II, the majority of households belongs to the middle level, and in the group of private firms, nearly 45% of households rank high in poverty status within the group. Among five groups, the proportions of Kinh people in group of SOE I and II are higher than in any other groups. This indicates

that SOE enters into contracts preferably with Kinh, or, SOE only targets the area where the Kinh form the majority of the population.

Vertical coordination of SOE and private firms are rather similar when regarding production management. Some differences in contract arrangement between SOE and private firms are noted. Compared to the contract with private firms, access to technical advice is easier for those contracts to SOE with more skilled technical advisers. SOE contractors have to bear a lower but fixed price of tea leaves compared to the market price or the price given by private firms. The tea leaves price is an important factor for choosing a specific contract: 45% of the sampled households choose a specific contract due to the highest leaves price, and 24% choose because of its price stability. New participants can freely enter both contracts, but sanction or punishment in case of contract default is strict for producers contracted with SOE, which makes its contract enforcement strong. On the other hand, contract enforcement of private firms is weak perhaps due to the lack of third party intervention such as by law or governmental authority. Under those contract arrangements, the gross margin of production contracted with SOE I is revealed to be significantly higher than non-contract production (Pham, 2008). However, considerable differences of gross margin among different contracts are not derived from their estimation.

5. TECHNICAL EFFICIENCY OF TEA PRODUCTION

5.1. Objective of this analysis

In this section, we assess the effect of contract participation on productivity and efficiency of tea production. Advantages of participating in contract farming are often associated with marketing and management aspects, and there are some studies that estimate the effect of contract participation along with comparative production efficiency analysis. By investigating observed differences in production efficiency among the groups of SOE, private and non-contract, one can assess the potential of contract farming at the production level and derive the required institutional arrangements for improving tea yields of farmers.

5.2. Methodology

When considering contract farming as a tool for rural development, it is necessary to understand its production efficiency compared to other schemes. There are a considerable number of efficiency analyses applying the Stochastic Production Frontier Model to the studies of agriculture in developing countries. With regard to our research objective, we first review the empirical studies, especially those that focus on the comparative estimates of technical efficiency, that investigate the effect which are associated with participation, or technology adoption.

5.2.1. Empirical studies on production efficiency

Rawlins (1985) evaluated effects of the Jamaican Second Integrated Rural Development Project (IRDPII) on technical efficiency for peasant farmers by using the stochastic frontier model with cross sectional data. Although the results showed that non-contract farmers have a higher average technical efficiency, it was concluded that contract farming drives up the production frontier of contract farmers. Kalirajan and Shand (1986) compared the two groups of Malaysian rice farmers, inside and outside of targeted area of irrigation. Those who are

outside the targeted area, depend entirely on rainfall for their rice production. Stochastic frontier estimate showed a significant difference in technical efficiencies between the two groups. They concluded that a technological transfer may not contribute to long term technical efficiency, especially in comparison to the traditional production technology. Khairo and Battese (2004) studied the effect of the New Extension Program (NEP) on technical efficiency of maize farmers in Ethiopia with a set of panel data. While taking into consideration the study conducted by Seyoum and Battese (1998) that revealed positive technical efficiency impact of SG2000 on an agricultural project implemented in Ethiopia, Khairo and Battese (2004) evaluated the changes of technical efficiency over time of those who participated in the project. However, the estimated technical efficiency of both participants and non-participants are not comparable due to the adoption of different technologies.

The application and development of frontier production function model has been researched in quite a number of empirical studies in agricultural economics. KaliBravo-Uretaand Evenson (1994) examined technical, allocative and economic efficiency by Cobb-Douglas production frontiers of peasant farmers in eastern Paraguay estimated separately. They found that there is no strong relation between socio-economic characteristics and the productivity of farmers. Battese (1992) reviewed the empirical application of frontier production functions in agricultural economics with farm-level data. He mentioned that careful and appropriate selection of variables included in the model and its functional form would lead to a more accurate analysis. We applied the Stochastic Frontier Production Function instead of Deterministic Frontier Function because of the existence of a random error associated with random factors that farmers cannot control.

5.2.2. Estimating technical efficiency

The Stochastic Frontier Production Function (SFPF) model is used to estimate the technical efficiency of farmers.

SFPF was first proposed by Meeusen and van de Broeck (1977), and Aigner, Lovell and Schmidt (1977) independently, and has since been further developed in a number of studies

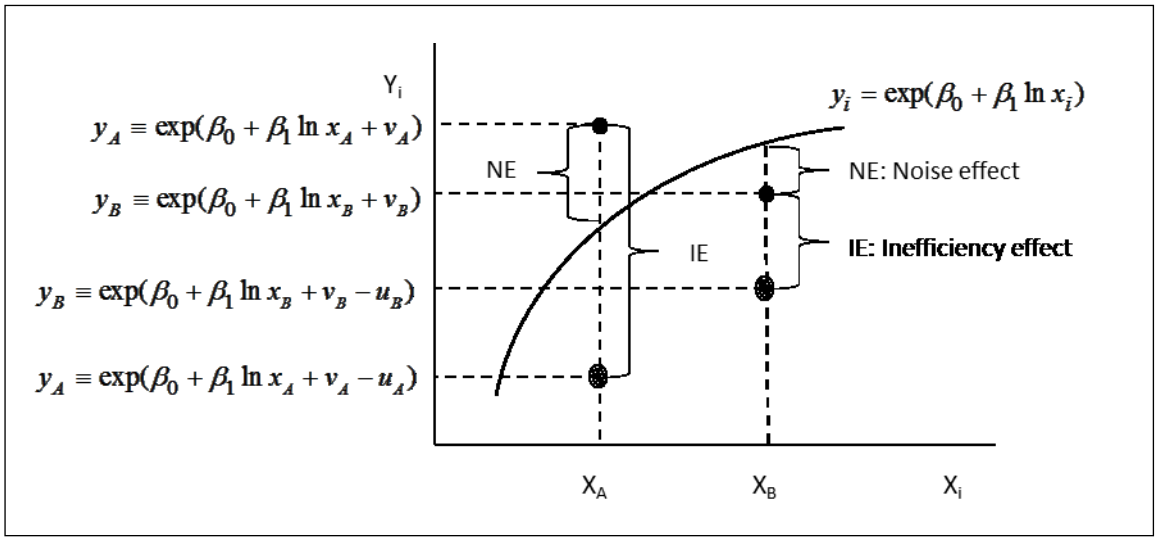
related to production models and technical efficiency estimations. The model includes two stages of estimation with respect to two error components: one associated with the presence of technical efficiency (u_i) and the other a conventional random error (v_i) that is:

$$\ln Y_i = x_i'\beta + v_i - u_i \,. \qquad (5.1)$$

Where ln*Yi* denotes natural logarithm of output of *i*-th farm (*i*=1,….., 124),
β are the unknown parameters to be estimated,
X_j is a vector of inputs.

The model defined by (5.1) is called Stochastic Frontier Model because the output function includes the stochastic variable exp ($x_i'\beta+v_i$) (Coelli et al., 2005). Figure 5.1 illustrates the stochastic production frontier, where the random error v_i can be either positive or negative, so the output varies with the domestic part of the model (Coelli et al., 2005).

Figure 5.1 The Stochastic Production Frontier



Source: Coelli et.al. 2005 (p.244)

As approved by many studies, the Cobb-Douglas type production function equations are appropriate for functional analysis intended for agricultural activities and are applicable for small sets of data (Battese, 1992, and Bravo-Ureta and Pinheiro, 1993). Although the Cobb-Douglas function seems to be adequate for this study, the translog production function, which

is more flexible than Cobb-Douglas function, is alternatively applicable. The Cobb-Douglas function is a special form of translog function that is $\beta_j\beta_l = 0$, where the hypothesis test of adequacy of functional form is tested after the estimation of each function. Cobb-Douglas and translog functions are specified in the following functions respectively:

$$(5.2) \quad \ln Y_i = \beta_0 + \sum_{j=1}^{4} \beta_j \ln X_{ji} + \sum_{k=1}^{N} \beta_k D_{ki} + v_i - u_i \text{, and}$$

$$(5.3) \quad \ln Y_i = \beta_0 + \sum_{j=1}^{4} \beta_j \ln X_{ji} + \frac{1}{2}\sum_{j=1}^{4}\sum_{l=1}^{4} \beta_j\beta_l \ln X_{ji}X_{li} + \sum_{k=1}^{N} \beta_k D_{ki} + v_i - u_i .$$

$$(5.4) \quad u_i = \delta_0 + \sum_{m=1}^{7} \delta_m Z_{mi} + w_i$$

Where D_k is a vector of dummy variables, v_i is N (0, σ^2_v) distributed random error, and u_i is the non-negative random variable representing technical inefficiency of production. u_i is assumed to be distributed independently, which can have either half-normal, exponential or truncated- normal distribution. δ is the unknown parameter to be estimated, Z_m is a vector of explanatory variables associated with technical inefficiency of production, and w_i is N (0, σ^2_u) distributed random variable.

The total variance of the production function is expressed as variances of two error components:

$\sigma^2 = \sigma^2_v + \sigma^2_u$. $\gamma = \sigma^2_u / (\sigma^2_v + \sigma^2_u)$ is tested to be zero by performing log- likelihood ratio test.

Technical efficiency has been defined in many ways. We define technically efficient production as that when farmers maximise output with the given inputs. This is the most common output-oriented measure of technical efficiency, and it is defined as the ratio of observed output to the corresponding stochastic frontier output:

$$(5.5) \quad TE_i = \frac{y_i}{\exp(x'_i \beta + v_i)} = \frac{\exp(x'_i \beta + v_i - u_i)}{\exp(x'_i \beta + v_i)} = \exp(-u_i) .$$

Although the underlying assumption provides consistent estimators of the slope coefficients applying Ordinary Least Squares, the OLS estimator of the intercept coefficient is biased downwards (Coelli et al., 2005). For the solution, some distributional assumption concerning two error components is made and the method of maximum likelihood can be applied. Estimations are obtained by using software FRONTIER 4.1 following the instruction of Coelli (1994).

5.3. Variables in the model

Here, we will explain the variables included in the technical efficiency estimates. First, we will present the variables used in the maximum likelihood estimate, and later explain the variables associated with socio-economic characteristics of households which determine technical efficiency of production.

5.3.1. Variables in the maximum likelihood estimate

Table 5.1 shows the descriptive statistics of input variables and variables for inefficiency effects. All variables are household level data from October 2006 to September 2007. Dependent variable from equation (5.1) is logged total amount of tea harvested in kg. Input variables X_j in the equation (5.1) are the following: *ln_land* is the logged total tea production area in acres, including the land rented. Total family and hired labour spent for tea production *ln_labour* is counted in days since all hired labour is paid daily. *ln_mate* is the logged material costs (manures, fertilizers and pesticides) that are in monetary value of '000 Vietnamese Dong (VND)[1]. All material costs are summed together instead of including individually into the model to avoid the multi-collinearity problem. *ln_age* is the logged age of tea tree, weighted by area. Since the economic life of a tea tree is expected to be around 40 to 60 years in general, and the older the tree is, the more leaves due to its absolute size it provides, we hypothesized that older trees enhance productivity. Input dummy variables D_k are as follows: Dummy variable *D_mate* is applied to those who did not use any material in production. Studies based on zero-values of some input variables in production often arise in agricultural economics. By using a dummy variable, associated with the incidence of zero

[1] 10,000 VND accounts for 0.6 USD in September 2007.

observations, the appropriate parameters of Cobb-Douglas production functions can be estimated in an unbiased way (Battese, 1997). Considering different elevations ranging from 850m to 930m among three communes, two dummy variables *D_PL* and *D_TM* are included. These variables are commonly used as input variables in the agricultural research based on the Stochastic Frontier Production Function (Battesse and Coelli, 1992, Bravo-Ureta and Pinheiro, 1993, and 1997).

5.3.2. Socio-economic factors related to technical efficiency

Technical efficiency of the model in equation (5.2) is explained as the functional form of socio-economic attributes of households. The variables included in this study refer to the study of Bravo-Ureta and Pinheiro (1993),who reviewed the studies on farm level inefficiency in developing countries. Eleven variables with five dummy variables are considered as effective socio-economic characteristics for achieving technical efficiency.

The age of the household head (*mem_age*) and mean education year of family labour (*educ_mean*) are commonly applied attributes to explain the efficiency effects in many studies (Bravo-Ureta and Pinheiro, 1993). *pro_fe_fam* represents the proportion (%) of female family labour in the total labour, considering the fact that tea production is labour intensive, especially for year round plucking activity, and these activities are predominantly devoted to female labour (Sivaram, 2000). Sivaram noted that plucking/ harvesting accounts for 70% of the total working days on estates, and this applies to our study as well. We assume that those who have more female labour are expected to have an efficient production due to the plucking activities.

The variable *farm_income* refers to a number of farm income sources, which do not include tea production. Due to the engagement in other agricultural activities other than tea production, farmers might miss plucking tea leaves at the right time and also might face time constraints in carrying tea leaves for processing right after harvesting. As tea leaves are perishable, it is necessary to start processing within three to five hours after plucking (especially in the case of processing green tea), in order to avoid untimely delivery, which could lead to rejection of sale by contractors. *pov_index* is the relative poverty status of

households (see chapter 3). It is expected to positively affect technical efficiency as it is seen to enhance depending on relative living standard of households. *extenuse* is the number of times extension service is used in a year. It is hypothesized that those households which have received more extension services stand a better chance in increasing their technical knowledge or receiving timely advice leading to improved technical efficiency.

The variable *tealoan* is the dummy variable and is applicable only when a household applies for credit (= 1) or otherwise (= 0). Considering the availability of credit institutes in the area, most of the households have access to some kind of credit offer or the other. Hence, application of the variable is more suited to measure the influence of credit on efficiency rather than accessibility. Village dummy variables (*v_2* to *v_5*) are included to determine the geographical effects on technical efficiency, in terms of steepness and distance to the companies that vary by villages. This is considered because, with reference to green tea, tea leaves are a perishable product, and companies demand timely transport of the produce. In some cases, inconvenience that arises due to the transportation of harvested leaves on steep fields makes farmers abandon the produce, which affects the value of output in the technical efficiency model.

Table 5.1 Variables in the Cobb-Douglas production function

			SOE	Private	Non- contract	Total
Dependent variable: Logged total amount of tea harvested in 2007 (kg)			3635.00	4315.88	2651.60	3425.16
Input variables						
ln_land	*β1*	Logged land area planted with tea (Ares)	41.49	45.72	42.32	42.98
ln_labour	*β2*	Logged family and hired labour days spent for tea production	497.68	508.05	469.78	489.27
ln_material	*β3*	Logged material costs (manures, fertilizers, and pesticides in '000VND)	2397.50	2320.89	1572.68	2043.91
ln_age	*β4*	Logged age of tea tree (years)	14.21	14.31	9.39	12.29
D_PL	*β5*	Dummy variable household located in Phieng Luong commune (1=yes, 0=no)	0.00	0.76	0.60	0.45
D_TM	*β6*	Dummy variable household located in To Mua commune	1.00	0.00	0.38	0.48
D_mate	*β7*	Dummy variable of household does not apply materials	0.00	0.03	0.02	0.02
Efficiency effects						
mem_age	*δ1*	Age of household head	46.73	42.71	42.94	44.10
educ_mean	*δ2*	Mean education year of family labours	6.39	6.63	5.87	6.25
pro_fe_fam	*δ3*	Proportion (%) of female family labour in total labour	0.41	0.51	0.40	0.43
farm_income	*δ4*	Number of farm income source (except tea production)	1.10	1.76	1.50	1.44
pov_index	*δ5*	Poverty index	-0.04	0.08	-0.12	-0.04
extenuse	*δ6*	Number of extension use in a year	1.20	1.41	0.90	1.14
tealoan	*δ7*	Dummy variable that household apply credit to tea production	0.08	0.09	0.00	0.05
v_2	*δ8*	Dummy variable household located in Ban Muong	0.00	0.47	0.24	0.23
v_3	*δ9*	Dummy variable household located in Suoi Khem	0.00	0.29	0.36	0.23
v_4	*δ10*	Dummy variable household located in Lien Hung	0.85	0.00	0.36	0.42
v_5	*δ11*	Dummy variable household located in Khua Nhua	0.15	0.00	0.02	0.06
Number of observation			40	34	50	124

Note: All means of variables are not logged.
Report period is last 12 months.
Source: Own data

5.4. Hypothesis testing

After the estimation, joint tests of several hypotheses were conducted with respect to the coefficients. The value of log-likelihood function is used for likelihood ratio test value specified:

$$(5.1) \quad LR = -2\left\{\ln[LL(H_0)] - \ln[LL(H_1)]\right\}.$$

LL (H_0) and *LL* (H_1) denote the maximum value of restricted and unrestricted log-likelihood functions respectively. Test statistic is followed by number of restrictions of *J*, and test rejects H_0 at the 100α% significant level if the test value exceeds the critical value $\chi^2_{1-\alpha}(J)$ (Coelli et al., 2005).

Table 5.2 shows the results using the estimations for likelihood ratio test. All the critical χ^2 values are taken from 1% level of significance. As per the Null hypothesis (1) that tests the H_0, Cobb-Douglas production function is more adopted than translog function. Null hypothesis cannot be rejected at the 1% level of significance, but can be rejected at the 5% level of significance. This implies that Cobb-Douglas production function is applicable at the 1% level, and translog function is also applicable at the 5% level of significance. We cannot validate a functional form from likelihood ratio test, hence, we evaluate and compare the results of returns to scale and technical efficiency estimates derived from Cobb-Douglas function and translog function in the later part.

Second Null hypothesis tests one-sided error term accounting for inefficiency, which is zero, since all households are technically efficient. The distribution of this test value follows a mixed-χ^2 since inefficiency effects do not have the asymptotic chi-square distribution (Coelli, 1995, and Coelli et al., 2005). $H_0$is rejected at the significant level of 1%, hence we can conclude that tea farmers are not fully technical efficient.

Table 5.2 Likelihood ratio test of hypothesis for parameters of the inefficiency frontier model for tea farmers in north-western Vietnam

Null hypothesis	Description of test	Crit. χ^2 value	Test value λ
(1) $H_0 : \beta_{ij} = 0, i \leq j = 1,...,4$	Functional form	18.31	19.94**
(2) $H_0 : \gamma = 0$	Inefficiency term	28.49[a)]	61.91***
(3) $H_0 : \delta_1 = ... = \delta_7 = 0$	Inefficiency determinants	24.73	50.28***

Note: The Null hypothesis is rejected at the **5%, and ***1% level of error probability.
[a)] Critical value is obtained from mixed χ^2 distribution.
Source: Own data

Last Null hypothesis accounts for the coefficients in inefficiency model that are jointly zero. This hypothesis was also strongly rejected at 1% level of significance.

5.5. Estimated parameters in the Stochastic Frontier Model

Table 5.3 presents the result of coefficients estimate in the stochastic frontier model. The signs for estimated coefficients in stochastic frontier are assumed, as only one variable *D_mate* shows negative estimation. Estimated coefficients of stochastic frontier by using Cobb-Douglas function can be directly interpreted as partial production elasticises.

Coefficient of land size is 0.48 which has high significance as it indicates that by expanding 1% of land size would result in 0.48% increase in output. The coefficient for labor is relatively smaller at 0.19, while the coefficient for material costs is 0.36 and highly significant. In table 5.1, difference in labour inputs between private and non-contract households is discernible. Additionally, we applied median tests to investigate the difference in inputs of family and hired labour between groups and the results show that hired labour spent for tea production is not significantly identical among the three groups. Therefore, we assessed the estimated result taking into consideration only family labour. The total number of family labour devoted to tea production is not significantly different among the three groups, but a mean of total days that family labour spends in tea production is significantly different between SOE and the other two groups. The insignificance coefficient estimate of labour in the frontier model can be related to the location of households that are in contract with SOE; due to the fact that it is the most mountainous remote area, it provides less job

opportunities than others. Thus, households contracting with SOE have not much choice of devoting their labour in any other work areas other than in tea production. All in all, there might be over input of labour, and this might result in insignificant coefficient estimate of labour.

Significant coefficient estimate of material costs reveals a positive relationship between material input and total amount of production. Meanwhile, the coefficient of the age of tee is estimated to be insignificant, as well as the three dummy variables. One of the tea varieties, Shan Tuyet, accounted for 94% of our samples, which is a larger share compared to its nationwide distribution of 27% (MPI, 2006). Unfortunately, there is no empirical study on the economic age of Shan Tuyet variety in relation to its productivity. It can be grown only under limited conditions, hence it is adaptable only to mountainous regions. Therefore, Vietnamese government paid more attention to promoting new varieties instead of Shan Tuyet to scale up nationwide tea production. Apart from this, there is a common consensus on the relation between tree age and productivity: the older the better. But this is satisfied only under the condition that farmers control and manage the tree by pruning it from time to time, to make branches thick for getting more nutritious leaves. There is a possibility that the farmers in our samples may neglect this procedure or due to the lack of knowledge might influence the result of insignificant coefficient estimate of tree age.

The commune dummy variables *D_PL* and *D_TM* are found to have insignificant coefficients. This confirms that there is no effect of geographical location including elevation on productivity. Dummy variable for no application of materials is estimated with an insignificant negative coefficient as assumed. This variable is used in place of a value of zero for *ln_material* to estimate the stochastic frontier in an unbiased way. Only two households out of 124 samples contain value of0. We can still confirm the effect of material use on productivity with an estimated coefficient of *ln_material* which is highly significant.

Table 5.3 Maximum likelihood estimates in the stochastic frontier model

Dependent variable: Logged total amount of tea harvested in 2007 (kg)				
Variables		Description	Coefficients	S.E.
Constant	*β0*		2.73	(0.65) ***
ln_land	*β1*	Land size	0.48	(0.08) ***
ln_labour	*β2*	Labor spent for tea production	0.19	(0.12)
ln_material	*β3*	Material costs	0.36	(0.08) ***
ln_age	*β4*	Age of tea trees	0.07	(0.08)
D_PL	*β5*	Dummy variable of Phieng Luong commune	0.60	(0.46)
D_TM	*β6*	Dummy variable of To Mua commune	0.06	(0.16)
D_mate	*β7*	Dummy variable of material costs	-0.72	(0.51)
Partial production elasticises				
ln_land			0.48	(0.08) ***
ln_labour			0.19	(0.12)
ln_material			0.36	(0.08) ***
Returns to scale			1.03	(0.09)

Note: Reporting period is last 12 months.
Significant at the *10%, **5%, and ***1% level of error probability.
Source: Own data

5.6. Estimated parameters in the inefficiency model

Table 5.4 shows the estimated coefficients of inefficiency and corresponding standard error. Age of household head (*mem_age*) is estimated negative, which indicates a positive effect on technical efficiency of production. This means that older farmers are more efficient than younger farmers. This can be attributed to the fact that older workers are more skilled in production due to their extensive experience. The coefficient of *educ_mean* is also significantly negative as assumed, and it confirms the effect of the level of education on efficiency. The coefficient for the proportion of female labour (*pro_fe_fam*) is negative and insignificant. This variable is supposed to represent the effect of plucking skill of female labour on technical efficiency as per the study on South Asian tea industries (see Sivaram, 2000). The insignificant estimate of parameter may be due to the relatively small proportion of female labour in our sample ranging from 0.40 to 0.51 due to which we could not measure the contribution of female labour to efficiency. The coefficient of number of farm income sources (*farm_income*), except of tea production, is estimated significantly positive, which

implies that those farmers with diverse agricultural production tend to be less efficient in tea production. This is understandable considering the fact that specializing in tea production increases expertise of farmers, which may enhance production efficiency. Variable measures for relative poverty status of household (*pov_index*) shows that those with higher living standard are efficient but the measure is surprisingly insignificant. The variables *extenuse* and *tealoan* also have insignificant estimations, and efficiency increasing. Unfortunately, we could not obtain enough and accurate qualitative information about the level of knowledge on tea production of each farmer. The coefficient estimate pertaining to the use of extension service by the group of non-contract farm households was not statistically significant. We were supposed to investigate the impact of geographical location of villages on efficiency with dummy variables for villages (*v_2* to *v_5*). Initially, we included a variable of distance measured from the tea field to the company where farmers have to transport their output. However, we decided to exclude that from our analysis due to the multi-collinearity problem with village dummies and its weak relationship to efficiency, relative to its estimated standard error. Furthermore, insignificant "efficiency reducing" estimates were observed among all villages, hence it can be assumed that geographical disadvantages with respect to transportation may not differ among the villages.

Variance estimate of gamma ($0<\gamma<1$) is 0.94, hence efficiency effect is highly significant in the estimated model.

Table 5.4 Maximum likelihood estimates in the inefficiency effects model

Variables		Description	Coefficients	S.E.
Constant	*δ0*		-2.53	(6.32)
mem_age	*δ1*	Age of household head	-0.02	(0.01) *
educ_mean	*δ2*	Mean education year of family labour	-0.11	(0.05) **
pro_fe_fam	*δ3*	Proportion of female labour	-0.13	(0.45)
farm_income	*δ4*	Number of farm income sources	0.26	(0.16) *
povindex	*δ5*	Poverty index	-0.02	(0.14)
extenuse	*δ6*	Use of extension service	-0.05	(0.11)
tealoan	*δ7*	Application of credit	-0.22	(0.51)
v_2	*δ8*	Dummy variable of village 2	5.44	(6.29)
v_3	*δ9*	Dummy variable of village 3	4.89	(6.20)
v_4	*δ10*	Dummy variable of village 4	3.38	(6.17)
v_5	*δ11*	Dummy variable of village 5	4.79	(6.51)
Variance parameters				
sigma-squared (σ^2)			0.60	(0.17) ***
Gamma (γ)			0.94	(0.05) ***
Mean efficiency			0.50	

Note: Reporting period is last 12 months.
Significant at the *10%, **5%, and ***1% level of error probability.
Source: Own data

5.7. Assessing predictive performance derived from Cobb-Douglas and translog function

5.7.1. Returns to scale

As the likelihood ratio test did not provide enough evidence of validity to use the Cobb-Douglas function in the previous section, we first compared the results of returns to scale and the technical efficiency estimates.

Table 5.5 shows the values of returns to scale obtained from Cobb-Douglas and translog function and the *t*-value of tested Null hypothesis. *T*-values are used for testing the Null

hypotheses that are constant returns to scale, and testing the value of returns to scale yielded from translog function is the same as that of Cobb-Douglas function. These are calculated from estimated partial productivity and sum of covariance.

Table 5.5 Returns to scale and *t*-value derived from Cobb-Douglas and translog functions

Functional form	Returns to scale	*t*-value	
		H_0: Constant returns to scale	H_0: Returns to scale is 1.03
Cobb-Douglas	1.03	0.32	-
Translog	0.87	-0.02	-0.04

Source: Own data

All three *t*-values did not exceed critical values so they validate the Null hypotheses. It can be concluded that returns to scale derived from Cobb-Douglas function are constant. For model adequacy, returns to scale estimated from translog function are not different from that of Cobb-Douglas function. Hence, Cobb-Douglas function is applicable to this data.

5.7.2. Test of efficiency estimates

Model adequacy of production function is often evaluated by conducting some tests (Coelli et al., 2005). Lastly, we compare the estimates of technical efficiency yielded from Cobb-Douglas and translog functions, and evaluate the validity of applying Cobb-Douglas function for our data.

Table 5.6 shows the ranking test for technical efficiency estimates of both Cobb-Douglas and translog function. As values are not normally distributed, we applied Wilcoxon signed ranks test using the test value of:

$$(5.1) \quad W = \sum_{i=1}^{n'} R_i^{(+)} .$$

Where $R_i^{(+)}$ is the rank assigned to the pair of technical efficiency estimates derived from Cobb-Douglas and translog functions of *i*-th household (X_i, Y_i) with *n'* observations that are $X_i > Y_i$. When *n'*>50, the distribution of *W* is approximated to normal distribution (see Conover, 1999). Therefore, we can use standardized Z-test statistic with mean μ_w and standard deviation σ_w, that is:

$$(5.2) \quad Z = \frac{W - \mu_w}{\sigma_w}.$$

Table 5.6 Test of efficiency estimates of Cobb-Douglas function and translog function by Wilcoxon signed ranks test

	Number of observations
Negative ranks (Cobb-Douglas [a)]<Translog [b)])	67
Positive ranks (Cobb-Douglas >Translog)	57
Ties (Cobb-Douglas = Translog)	0
Total	124
Z-test statistic	-1.62
p-value [c)]	0.11

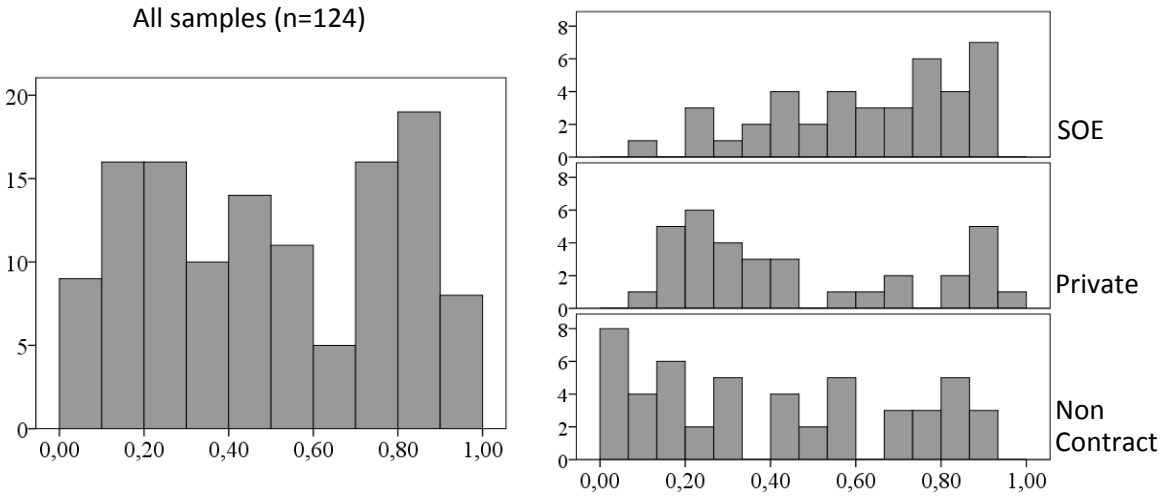
Note: [a). b)] Ranking in overall technical efficiency estimation in [a)]Cobb-Douglas function and [b)]Translog function.
[c)] Test the Null Hypothesis that the difference of median between pairs of observations is zero.
Source: Own data.

The Null hypothesis that the median difference between pairs of observation is zero cannot be rejected. Therefore, we can conclude that the technical efficiency estimates of Cobb-Douglas and translog functions are identical. Kopp and Smith (1980) evaluated empirical performance on three different functional forms (Cobb-Douglas, CES, and translog) of frontier estimation. Their results revealed "discernible but rather small impact on estimated efficiency". All in all, we affirm the validity of Cobb-Douglas function by applying it for our technical efficiency analysis by evaluating predictive performance in the following section.

5.8. Technical efficiency estimates

The functional adequacy of Cobb-Douglas function is satisfied by applying several post-estimation tests. Following these results, we assessed the technical efficiency estimate derived from Cobb-Douglas function. Figure 5.2 shows the frequency of estimated technical efficiency of all 124 samples and of each group. Equal distribution of frequencies is observed neither in the overall sample, nor in the group's sample. While frequency distribution of SOE is upward-sloping, non-contract is unbalanced and is marked by a frequent count of the lowest range (0.1 to 0.2) compared to the other two groups.

Figure 5.2 Frequency of technical efficiency estimates



Note: Vertical axis presents counts of frequency.
Source: Own data.

Table 5.7 presents the result of a non-parametric rank test (Kruskal-Willis test) used for comparing technical efficiency estimates between the three groups. Null hypothesis is rejected at 1% of significant level, so that further estimation of multiple comparisons is applied which is shown in table 5.8. In the rank test, estimated technical efficiency of SOE is the highest, which is also confirmed by the visual analysis of frequency distribution.

Table 5.7 Test of mean ranks of technical efficiency

	Mean rank	N
SOE	78.88	40
Private	59.56	34
Non contract	51.40	50
Test value [a)]	13.30	
Critical χ^2 value	9.21***	

Note: [a)] Test the Null Hypothesis that the rank difference between groups is zero.
[b)] Weighted sample.
*** Significant at the 1% level of error probability.
Source: Own data.

According to the results of multiple comparisons (see table 5.8), households contracted with state-owned enterprises achieve significantly higher technical efficiency compared to the other two groups. Significant difference in technical efficiency between SOE and Private is perhaps due to the difference in experience in tea production. SOE has been engaged in tea production since the 1950s, which is the longest in the region. The production expertise of extension workers of companies might differ in their quality, in terms of technological advice, or timely input provisions, which might affect technical efficiency. In addition, as seen in Chapter 4, SOE directly hires regional extension/ technical workers in each contracted village. In contrast, private company ensures farmers are in direct contact with the regional farmer's association due to their limited knowledge or skill of tea production. The difference in the level of direct management of farmers might influence the incentive or motivation of extension workers in the following way; though SOE follows strict control of technical officer's work, it leaves room for compensations on their achievement, thereby increasing technical workers' incentives. On the other hand, private companies lack monitoring mechanisms for technical workers. And due to an indirect relationship between their achievements and profits, it results in reduced incentives for the workers to provide accurate and adequate advice for enhancing production and hence lowering technical efficiency.

Estimated technical efficiency of non-contract group is the lowest in a ranking test, but only significantly different from that of SOE.

Table 5.8 Test for multiple comparisons

Compared groups	*p*-value [a)] of Mann-Whitney U test
SOE – Private	0.011***
SOE – Non contract	0.001***
Private – Non contract	0.226

Note: [a)] Significance level is 0.05/(number of comparisons) following the adjustment of Bonferroni correction to avoid statistical error of type I.
Source: Own data.

5.9. Conclusion and discussion

In this chapter, we applied the Stochastic Production Frontier Function to estimate technical efficiency associated with socio-economic characteristics of households, and assess the difference among the groups. High coefficient estimates of partial production elasticity associated with land size and material costs were derived. The effect of each input on the productivity could not be assessed, because material cost is a sum of costs pertaining to fertilizers, manures, and pesticides to avoid the multicollinearity problem in a model. It is necessary to apply an appropriate amount of fertilizer and in the right time frame in order to increase tea yield (Sedaghathoor et al., 2009), which requires some level of expertise in pesticide management. In our research site, we observed crop failure caused by over-application of pesticides due to the lack of producer's knowledge. Thus, although the result shows that increase in material input might enhance productivity, it also requires careful and cautious implementation.

In the model of technical efficiency estimates, a significantly higher estimate of the group which is in contract with SOE is identified by applying non-parametric tests. This observation is associated with three different household characteristics: age, education and number of farm income. Contrary to our expectation, the living standard of households is not a determining factor for achieving higher technical efficiency. This result leads to the concern that there might be a selection bias if the contract participation is associated with household characteristics. In this case, it is not appropriate to apply only the statistical tests to compare the technical efficiency estimates among the groups. Tayler and Shonkwiler (1986) estimated the technical efficiency of Brazilian farmers under the influence of a credit programme

sponsored by World Bank (PRODEMATA), by applying two alternative frontier specifications. Their conclusion is slightly disappointing and confusing since very different influences derived from each model. In addition, the effect of the credit programme in improving technical efficiency is not clear due to the lack of further assessment on homogeneity of the frontier on programme participation. In order to deal with the homogeneity problem in our model, we applied a treatment effects model to control for selection bias, and estimate the technical efficiency with reduced bias samples. The treatment effect model and its result are presented later (see chapter 7).

6. DETERMINANTS OF CONTRACT PARTICIPATION

6.1. Objective and methodology

In order to answer the research question: what are the determining factors to participate in a contract, the binary outcome model was chosen which yields the probability of participation. Although there are probit and logit models that are standard qualitative outcome models for estimating probability, the results attained by both models are not very different in terms of binary outcomes. The only difference in the two models is the specification of probability as a function of regressors. Hence, the choice of model depends more on the preference, and the purpose of post estimation calculations. In this study, logit model was chosen because it yields odds ratio that is applied later to the propensity score matching.

Let Y_i denote participation in the contract of i-th household, where Y_i=1 represents participation, and Y_i=0 represents non-participation. x_{ij} denotes the socio-economic characteristics of household i. The logit model specifies:

$$(6.1) \qquad P_i = \Pr[Y_i = 1 \mid x_{ij}] = \Lambda(x_i'\beta) = \frac{\exp(\alpha + \sum_{i=1}^{j} \beta_i x_i)}{1 + \exp(\alpha + \sum_{i=1}^{j} \beta_i x_i)} = \frac{e^{x_i'\beta_i}}{1 + e^{x_i'\beta_i}}$$

Where 0 <p_i< 1. $\Lambda(\cdot)$. This is the logistic cumulative distribution function, with $\Lambda(z) = \frac{e^z}{1+e^z} = \frac{1}{1+e^{-z}}$.

Maximum likelihood estimation leads to the estimation of parameter β_i (i=1,.., j).

In the logit models, the marginal effects can be easily obtained from the estimated coefficients, since $\partial p_i / \partial x_{ij} = p_i(1-p_i)\beta_j$, where $p_i = \Lambda_i = \Lambda(x_i'\beta)$ (Cameron and Trivedi, 2005).

When *Pi* denotes *i*-th household's probability of participation, (1 – *Pi*) denotes probability of no participation, so that *Pi* / (1 – *Pi*) can be defined as an odds ratio which measures relative probability of participation (Y_i =1) to non participation (Y_i=0).

In the logit model, $P_i/ (1–P_i) = \exp(x_i'\beta)$ so that the log-odds ratio which is linear in the regressors can be defined by $\ln \frac{p_i}{1-p_i} = x_i'\beta$ which can be directly obtained from coefficients estimate.

6.2. Variables in the model

Ten variables that are assumed to determine contract participation, are included in the model (see table 6.1). All the variables including the dependent variable were obtained from a household survey. Variable *av_age_adult* denotes the average age of adults in the household and forms the basis for the hypothesis that the younger the age there is an increased chance of participation in a contract, given the fact that contract farming is a relatively new activity. According to this hypothesis, farmers belonging to older age group would be more conservative in a manner that they would want to protect their habits, customs and are not willing to embrace changes. Variable *edu_second_pro* is the proportion of adults who finished secondary school or proportion of adults who completed more than nine years of education. Variable *tea_experience* represents the number of years of experience in tea production. The more experienced a household has in tea production, the more likely that household has developed a larger and tighter social network and reputation with the traders or buyers. The Variable *distance* is the distance from the field where farmers produce tea to the closest tea company. This variable takes into account the transportation cost that households can reduce if the distance is shorter, an incentive that encourages contract participation.

The Variable *p_t_income* is the proportion of tea income in the overall income of a household in the year 1997, before contracting started in 1998. With this variable, the influence on contract participation of being tea producer before entering into a contract could be observed. The Variable *child_rate* is the ratio of child dependency on an adult, which assumes that households having more children tend to avoid marketing risks, leading to contract participation. Variable *red_book* is the area of tea field belonging to a farmer with the land

title issued by the Vietnamese government. Land allocation ensures equality and efficient use of land with the recent most allocation in the area having taken place in the year 2003. It provides farmers with a land hold for a period of 50 years, and enables the implementation of a long-term production plan, an incentive for farmers to invest in their own land. Planting perennial crops like tea requires long-term planning, and farmers who are into tea production prefer avoiding associated risks by choosing a marketing channel like contract farming. In addition, in a liberalized land market, smallholders tend to be excluded from contract farming due to the concentrated land ownership of more competitive farmers. Since the Vietnamese government permits farmers to sell or rent their land use rights, there are efficient resource allocations introduced in the land market which may enhance the economy of scale in production. Meanwhile, rental markets dealing in lands without titles do exist, but it is assumed that farmers would not invest in these kinds of land because of uncertain land assurance, and lack of incentives, and in fact, such cases were rarely observed in our sample. Therefore, we assume that those who have more land with legal titles including leased land holders prefer to participate in contracts from the aspect of minimizing the risk associated with production and marketing, and in accordance with their long-term investment plans. The Variable *res_year* stands for the number of years of residence of a household in the inhabited village. We expect that those who stay in a village for a longer time period have more chances to obtain the information with respect to their broader community network, and this provides easier access to information about contract farming, which might enhance contract participation. The Variable *org_adult* is the number of memberships in organizations (governmental, agricultural, trade, political, NGOs, local groups, major mass organizations) per adult. It represents the accessibility to information for households. As mentioned earlier, contract farming in the area is a relatively new concept, hence one way to introduce new farming schemes is through word of mouth, for example in the meeting of organizations. It is assumed that those who belong to more organizations rather tend to participate in contracts.

Table 6.1 Average characteristics of tea farmers in the logit model

Variables		Mean		
Dependent variable: Contract participation (1=yes, 0=no)		SOE	Private	Non-contract
av_age_adult	Average age of adults (age between 15 to 65)	34.2	34.4	32.3
sq_av_age_adult	Square of average age of adults	1186.5	1207.7	1079.6
edu_second_pro	Proportion of adults who finished secondary school	0.5	0.5	0.4
tea_experience	No. of years of Experience in tea production	17.0	8.9	7.9
distance	Weighted distance to the selling site of tea leaves	1224.0	746.1	1072.8
p_t_income	Proportion of income from tea production in 1997	0.2	0.0	0.1
child_rate	Child dependency ratio	0.3	0.3	0.3
red_book	Proportion of tea area with land title	0.9	0.6	0.7
res_year	Years of residence in the village	20.3	18.0	17.7
org_adult	Number of memberships in organizations per adult	0.9	1.4	1.0
Number of observations		40	34	50

Source: Own data.

6.3. Test for overall fitness of binary logit model

The Goodness-of-fit test for logistic regression evaluates the null hypothesis that there is no difference between observed and predicted probability. It is aimed to compare the observed and expected number of outcomes for each independent variable. Hosmer and Lemeshow (1980) proposed the fit measure with the test statistics distributed as chi-square. They recommended dividing the observations into 10 equal sized groups according to their predicted probabilities. Then the test statistic with M - k degrees of freedom is:

$$\chi^2 = \sum_{j=1}^{M} \frac{(y_j - m_j p_j)^2}{m_j p_j (1 - p_j)} \tag{6.2}$$

Where:

k is the number of independent variables,

M is the total number of covariate patterns among N observations,

j is the number of covariate patterns where j=1,…,M,

m_j is the total number of observations having covariate pattern j,

y_j is the total number of positive responses among observations with covariate pattern j, and

p_j is the predicted probability of positive outcome.

Since there are too few observations for each covariate M, the data is divided into 10 deciles to compare the groups in Hosmer and Lemeshow goodness-of-fit test.

Table 6.2 Hosmer-Lemeshow goodness-of-fit test [a)]

Number of observations	Number of groups	Hosmer-Lemeshow chi^2	Prob > chi^2
124	10	5.59	0.69

Note: [a)] Tests the null hypothesis that there is no difference between observed and model predicted value.
Source: Own data

Table 6.2 presents the result of Hosmer-Lomeshow test. The value of probability of Chi-square test statistic is far from 0.01, which indicates that the model estimation fits with the 1% level of significance, so that rejects the null hypothesis.

6.4. Empirical results

Table 6.3 shows the results of determinants to contract participation derived from logit model. Six variables are significant at different error probability levels.

Table 6.3 Parameters estimated of contract participation in logit model

Variables	Description [a)]	Coefficients (S.E.)		Marginal Effects
Dependent variable: Contract participation (1=yes, 0=no)				
av_age_adult	Average age adults	1.384	(0.455)***	0.318
sq_av_age_adult	Age squared	-0.018	(0.006)***	-0.004
edu_second_pro	Education	1.273	(0.751)*	0.293
tea_experience	Experience in tea production	0.100	(0.042)**	0.023
distance	Distance	-0.000	(0.000)	-0.000
p_t_income	Income share from tea in 1997	0.831	(1.263)	0.191
child_rate	Child dependency ratio	0.697	(1.279)	0.160
red_book	Land tenure	0.235	(0.559)	0.054
res_year	Year of residence	-0.048	(0.027)*	-0.011
org_adult	Memberships in organizations	0.961	(0.440)**	0.221
Constant		-27.221	(8.009)***	-
Pseudo R squared	0.215			
Log likelihood	-65.670			
LR chi^2	35.890 ***			
% of correct prediction	71.77%			

Note: [a)] More detailed descriptions of variables are presented in table 6.1.
Significant at the *10%, **5%, and ***1% level of error probability.
Source: Own data.

The average age of adults (*av_age_adult*) is found to be highly significant since it has the highest marginal effect on contract participation among all parameters. According to the estimation, if the average age of households increases due to an addition of one older person, the probability of contract participation would increase by 31.8%. This tendency of older farmers participating more in contracts than younger farmers can be explained as follows: Older farmers tend to be more averse to the risks associated with marketing and production, which can be alleviated by participating in a contract. The proportion of adults finishing secondary school (*edu_second_pro*) is significant at 10% level of error probability, and has a positive effect on contract participation. It shows a Marginal effect of 0.29, which implies that a household with 1% higher proportion of educated adults would lead to an increase in contract participation by 29%. As shown in many studies, education level is one of the vital factors influencing decision making. In our case, education level leads to positive

participation in a contract. The number of years of experience in tea production (*tea_experience*) is estimated to be at 5% significant level, which has a positive impact on contract participation. Its marginal effect is 2.3% which is relatively lower than the former two variables. It seems that if farmers have more expertise in tea production, they would be more aware of the advantages of participating in a contract. Contrary to our assumption that farmers who have more experience establish their own marketing strategy, including marketing channel, the estimated result might have been impacted by the constraint of limited market access in the region due to its remoteness. The number of years of residence of a household in a village (*res_year*) negatively impacts contract participation, at 10% of significant level. The reason might be that those who live longer in a village tend to not participate in a contract perhaps due to the creation of larger social networks, which then leads to the establishment of individual market connections. The number of memberships in organizations per adult (*org_adult*) shows a positive effect on contract participation at 5% level of significance. It can be assumed that those who belong to more organizations can create broader social networks, where they can access and collect information about contract farming. Access to information is one of the most important determinants of contract participation; hence those who have more information can be convinced to participate. This is indicated by a marginal effect of 0.22, which implies that one additional membership in an organization increases the probability of contract participation by 22%.

6.5. Summary

The binary logit model was applied to identify the determinants of contract participation of tea farmers. The results revealed that six out of ten variables associated with household characteristics which are included in the model are significant determinants of contract participation. They are: average age of adults, squared average age of adults, proportion of adults who completed secondary school, number of years of experience of households in tea production, number of years of residence in a village and average number of organizations' memberships of adults The average age of adults shows the highest marginal effect of 0.32, perhaps due to the fact that elder producers are more risk averse, or less capable of risk management. This result validates the theory that we discussed in Chapter 2 on the relation between degree of integration in the value chain and producers' risk-averse attitude.

Education of adults also has considerable influence on contract participation with a marginal effect of 0.29. It revealed that education is an important influence on decision making especially in terms of employing specific marketing strategy in a rural society which lacks or has limited access to information.

These results from the binary logit model are applied on matching methods in the next chapter, in order to obtain further accurate measurements of the impact of contract participation on income and production efficiency.

7. IMPACT OF CONTRACT PARTICIPATION ON INCOME AND TECHNICAL EFFICIENCY

In this chapter, we investigate the impact of contract participation on income and technical efficiency by applying propensity matching. Before doing so, however, we first review the literature on contract farming, focusing on recent empirical research on the economic impact of contract farming.

7.1. Objective and methodology

Contract farming has been analyzed with interest in its economic impact on livelihood from different dimensions. Minot (1986) discussed the role of smallholders in the course of economic growth and the influence of contract farming. By considering all the potentials and constraints of contract farming, he concluded that in almost all cases contract farming succeeded in improving income. Comparative case studies of African countries by Glover and Kunsterer (1990) and Little and Watts (1994) attempted to develop an overall scheme for contract farming and to comprehensively assess its social impact.

Warning and Key (2002) determined how participation in the NOVASEN (a private company) program affected the agricultural income of 32,000 peanut growers in Senegal. They found that contract participation (participation in the program) had an impact on their income, compared to those who did not participate. Similarly, Miyata et al. (2007) examined the impact of contract participation on household income of apple and green onion farmers in China. Both studies controlled unobservable factors by applying selection correction models to contract participation and income models in order to obtain unbiased results.

Ramaswami et al. (2006) focused on the efficiency factor in contract farming of Indian poultry producers. They found that producers involved in contracts reached higher efficiency mainly due to a higher feed-conversion ratio. Moreover, by estimating the average returns of contract and non-contract producers, they concluded that a contract enables farmers with

poorer prospects to generate a comparable income to non-contract farmers with better prospects.

The impact of contract farming on income can be estimated by applying propensity score matching. Propensity score matching was first proposed by Rosenbaum and Rubin (1983).It is a treatment effect correction model used to reduce bias when estimating the effect of treatments. As a non-experimental approach, propensity score matching has been applied in many projects and policy evaluation studies because it formulates comparison of treatment groups better than previous models and enables estimation of the reduced-bias treatment effect. In the studies of contract farming, Katchova (2008) applied propensity score matching to correct farmer's receiving price from contractors depending on whether the contracted group has alternative marketing choice or not. It is based on a principal-agent study, and revealed the absence of price distortion in six different agricultural commodity markets of contract farming where there were no marketing options. Fort and Ruben (2009) investigated the impact of fair trade involvement on farmers' income and the overall welfare indicators of Peruvian banana farmers by applying propensity score matching. There are two other commonly used correction models for cross-sectional data: Instrument Variable Method and Heckman Selection Correction Model. The disadvantages of applying these models to this study are, that first there is no suitable variable associated with contract participation that is independent of income estimation for instrument variable approach; second, the Heckman's correction model assumes strict condition of distribution function of joint error term associated with participation and income equation, which does not fit with our data (Owusu and Abdulai, 2009, and Bryson et al., 2002). Propensity score matching does not require any functional form assumption for matching and thus can obtain more robust estimation than imposing regression model with the risk of inaccurate distributional assumption. Also, if the variables in the participation and income equation mostly overlap, like in this study, it will result in a multicollinearity problem between participation and income assumptions. Because of these assumptions of our data, propensity score matching was more applicable than any other approach for estimating impact of contract participation on income.

The expected treatment effect of contract participation is the difference between the actual income and the income if they did not participate. This can be written following Ravallion (2001):

$$(7.1) \quad ATT_i = E(Y_{1i} - Y_{0i} \mid D = 1).$$

Where Y_{ji} denotes the actual income of the i-th farmer participating in a contract (j=1), and otherwise (j=0).
D denotes contract participation, 1=participate, 0=otherwise.

ATTi, the conditional mean impact or Average Treatment effect on Treatment (ATT), is conditional on contract participation. In other words, *ATTi* is the income difference between the observable outcome of treatment and the unobservable counterfactual outcome of control. The mean difference from sample estimation between observable treatment and control is written as:

$$(7.2) \quad E(Y_1 \mid D = 1) - E(Y_0 \mid D = 0) = ATT + \varepsilon.$$

Term ε denotes bias given by

$$(7.3) \quad \varepsilon = E(Y_0 \mid D = 1) - E(Y_0 \mid D = 0).$$

The equation (7.3) is the difference between the counterfactual mean of contract participation and the mean output of non-participation.

The true parameter of *ATT* is identified only if the outcome of treatment and control under the absence of contract are the same. This is written as:

$$(7.4) \quad E(Y_0 \mid D = 1) = E(Y_0 \mid D = 0) = 0.$$

The situation expressed in the equation (7.4) might be possible if contract participation is randomized as long as it provides the same mean and equal whole distribution between

participant and non-participant (Ravallion, 2001). However, there are no "perfect" random samplings in practice due to the sampling error. Additionally, average treatment effect is defined as:

$$(7.5) \quad ATE_i = E(Y_1 - Y_0).$$

To measure *ATE*, both counterfactual outcomes of $E(Y_1 | D = 0)$ and $E(Y_0 | D = 1)$ need to be estimated. The possible identification strategy to overcome the problem of measuring counterfactual outcomes is to make Conditional Independence Assumption (CIA) which enables comparison between outcomes from both treatment and control with the same value of Xs. This can be written as:

$$(7.6) \quad Y_0, Y_1 \perp D \mid X.$$

Equation (7.6) indicates that outcome is independent of the treatment assignment (participating in a contract) by controlling observable Xs.

To evaluate the impact of participation on income, all observable characteristics Xs between the contract (treatment) and the non-contract (control) group have to be the same. The initial idea of Propensity Score Matching was to construct a variable derived from all Xs in order to avoid fitting same values for each variables pertaining to each treatment and control samples, which is impossible. The procedure of Propensity Score Matching starts by obtaining probability of participation $p(x)$ for all samples through either probit or logit model. To estimate the participation probability, logit model with its maximum likelihood method is often preferred due to its consistency of parameter estimation associated with the assumption that error term *v* in the equation has a logistic distribution (Ravallion, 2001, and Baker, 2000). After estimating the propensity score, the results of both treatment and control are compared under the condition of:

$$(7.7) \quad 0 < p(D = 1 \mid X) < 1.$$

Equation (7.7) presents an overlap assumption, that is, samples with the same value of Xs have a positive probability of being both treatment and control (Smith and Todd, 2004, and Heckman, Lalonde, and Smith, 1999).

7.2. Matching method

Once the propensity score (estimated probability of participation) is estimated, the use of either propensity score or odds ratio for the matching method needs to be decided. The ratio of number of treatments to controls has to be considered because the one which is oversampled, relative to its frequency in the population, misleads the estimations with incorrect weights (Smith and Todd, 2005, Baker, 2000, and Heckman, 2008). Heckman and Smith (1995) investigated this issue and found that matching methods are applied even with unknown weights, considering the fact that odds ratio with incorrect weights is scalar multiple of the true odds ratio, and this is the monotonic transformation of propensity score (Heckman and Smith, 1995, and Caliendo and Kopeinig, 2005). In the nearest neighbour matching method, ranking of observation is identical so that same neighbours are selected anyway; it does not matter whether to choose odds ratio with incorrect weights or propensity score as a matching indicator. Whereas, in the matching that is performed on absolute distance, such as kernel matching, it is necessary to consider these issues of choosing between odds ratio and propensity score.

In the next step, the matched controls for each treatment are explored using selected matching algorithms on the estimated probability as a propensity score. The matching algorithm for this study is the single nearest neighbour due to the nature of the dataset. Each treated sample will be matched to one closest untreated sample in terms of estimated propensity score (odds ratio). Matching is done with replacement in consideration of relative sample size of control on treatment. In other words, each untreated sample can be used more than one time for matching. Region of common support S_p is imposed to eliminate the treatments if their estimated propensity scores are higher or lower than the maximum or minimum propensity score of controls. Assuming that treatment unit i matched with control unit j, p_i and p_j denote estimated propensity score of each treatment and of matched control of each treatment. Nearest neighbour sets the unit of control j for treatment i with:

$$(7.8) \quad C(i) = \min_j \| p_i - p_j \|.$$

After the matching, the difference between the outcome of treatment and the outcome of weighted matched control, ATT_i is estimated with the following equation:

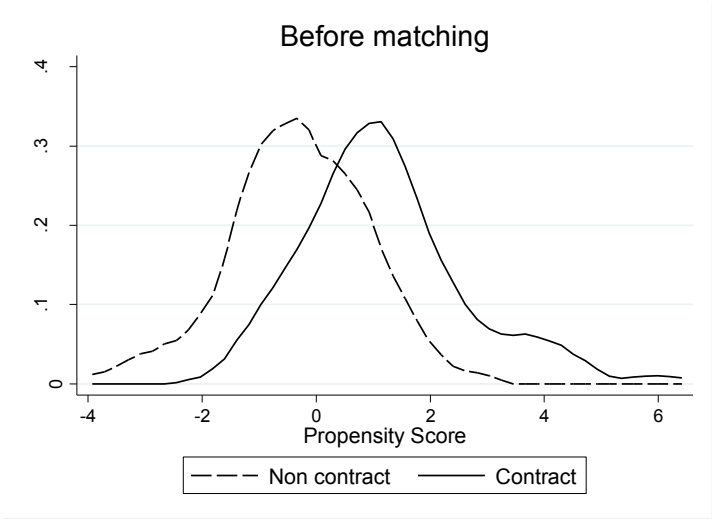
$$(7.9) \quad ATT_i = \frac{1}{n^1} \sum_{i \in I_1 \cap S_p} [Y_{i1} - \sum_{j \in I_0} W_{ij} Y_{j0}]$$

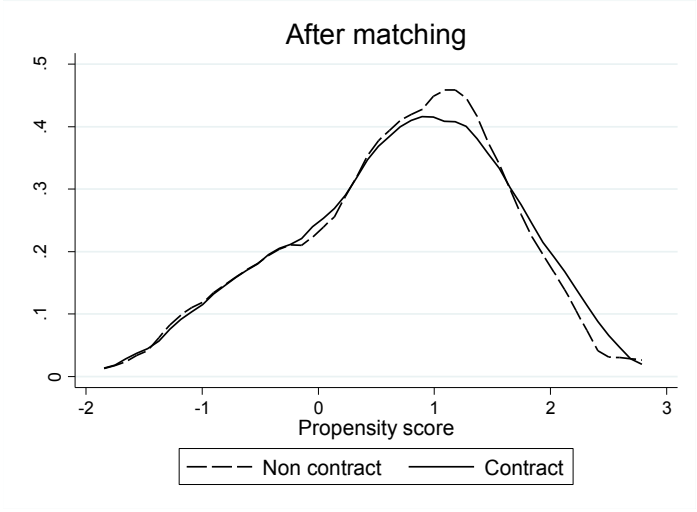
Where n^1 denotes the number of persons in the set of $I_1 \cap S_p$,
I_1 is the set of treatment, and I_0 is the set of control.
S_p is the region of common support,
Y_{i1} is the outcome of observed treatment unit,
Y_{j0} is the outcome of matched control unit, and
W_{ij} is a weight where W_{ij}=1 if $j \in C(i)$, and W_{ij}=0 otherwise. This weight is arrived at depending on the distance between p_i and p_j.

7.3. Distribution of propensity scores before and after matching

After matching treatments and controls, we first check for the common support functions in the matching procedure which is dropping treatment observations whose propensity score is higher than the maximum or lower than the minimum propensity score of the controls.
For this, distribution of propensity score between the treatment and control is checked by visual analysis before and after matching. For visual analysis of propensity score distribution before and after matching, density function is commonly applied to check the overlap and the region of common support (see figure 7.1). Note that the propensity score in this study is odds ratio p / (1-p), where p denotes estimated probability gathered from logit model.

Figure 7.1 Kernel density before and after matching





Source: Own data

After the matching, observations that hold larger number of propensity scores are dropped, and both groups yield similar density function of propensity scores.

7.4. Assessing the matching quality: Balancing test before and after matching

After matching, several tests are applied to assess the matching quality. Although there are several tests for sensitivity analysis that take into account hidden bias associated with contract participation, they are not applicable for this study due to the selected matching

method. However, sensitivity analysis in observational studies has become very important, hence, the brief concept developed by Rosenbaum (2002) is shown in Appendix 1.
Matching quality is assessed by three different tests comparing groups before and after matching.

7.4.1. Standardized test of differences of normalized covariates between groups

Test of Standardized bias before and after matching was developed by Rosenbaum and Rubin (1985) that checks the balance between the treatment group and control. They suggest that standardized bias can be large if the absolute estimate is larger than 20. Standardized biases were first developed by comparing the mean of continuous variables between two groups, and are the common approach in many evaluation studies (Caliendo and Kopeinig, 2005). The standardized bias is defined by the formula:

$$(7.10)\quad B_{Before}(X) = 100.\frac{\bar{X}_T - \bar{X}_C}{\sqrt{\frac{V_T(X) + V_C(X)}{2}}} \qquad B_{After}(X) = 100.\frac{\bar{X}_{TM} - \bar{X}_{CM}}{\sqrt{\frac{V_{TM}(X) + V_{CM}(X)}{2}}}$$

Where:

$\bar{X}_T, \bar{X}_C$ are the sample means of treatment and control before matching.

$\bar{X}_{TM}, \bar{X}_{CM}$ are the sample means of treatment and control after matching, and

$V(X)$ is the corresponding sample variance.

Table 7.1 Test of standardized bias

Variables	Standardized bias before matching	Standardized bias after matching
av_age_adult	35.81	3.20
sq_av_age_adult	29.05	3.94
edu_second_pro	34.49	17.83
tea_experience	64.83	-38.35
distance	-6.40	**28.41**
p_t_income_sum	32.04	17.38
child_rate	-8.44	-4.61
red_book	15.89	0.04
reg_year	14.84	6.69
org_adult	19.98	**61.67**
Number of samples	124	107 [a)] (=124 weighted)

[a)]Number of samples of Standardized bias after matching is 124 when it is weighted to adjust the number of matched control for number of all matched treatment that are $N_{treatment}$ (=62) + $N_{control}$ (=62) = 124.
Source: Own data

Table 7.1 shows the result of the test of standardized bias. Since all variables between treatment and control are not expected to be the same before matching, there are obvious differences in covariates between treatment and control resulting in a value exceeding 20, or in a value not close to zero. The standardized biases of several variables are reduced after matching as they become smaller or closer to the value of zero. But the variables *distance* and *org_adult* are still imbalanced leading to a larger bias after matching. Although the variable *tea_experience* showed reduced bias after matching, the absolute value of standardized bias is still larger then 20,which means there are some differences remaining between contract and non-contract groups after matching (Rosenbaum and Rubin, 1985, and Lee, 2006).

7.4.2. Test for equality of each variable between groups

The test for normality of all variables in the model reveals some of them are not normally distributed. Because of this reason, Mann-Whitney U is estimated to check the equality of explanatory variables before and after matching.

Mann-Whitney test statistic is given with the test value by Conover (1999, p.273) when the population of each group exceeds 20:

$$Z = \frac{\sum_{i=1}^{n} R(X_i) - n\frac{N+1}{2}}{\sqrt{\frac{nm}{N(N-1)}\sum_{i=1}^{N} R_i^2 - \frac{nm(N+1)^2}{4(N-1)}}} \quad (7.11)$$

Where:

X_n denotes the random sample of size n from population 1, which is smaller than the other non-contract group,

$\sum_{i=1}^{n} R(X_i)$ denotes the sum of ranks assigned to the sample from population1,

N is the number of total samples of both groups,

m is the size of the other population group (contract group),

$\sum_{i=1}^{n} R_i^2$ refers to the sum of the squares of all N of the ranks.

Table 7.2 Mann-Whitney U test of each variable before and after matching

Variables	*p*-Value of U statistic before matching	*p*-Value of U statistic after matching
av_age_adult	0.011**	0.958
sq_av_age_adult	0.011**	0.958
edu_second_pro	0.061	0.212
tea_experience	0.000***	0.254
distance	0.250	0.062
p_t_income_sum	0.036**	0.774
child_rate	0.593	0.738
red_book	0.267	0.871
reg_year	0.290	0.984
org_adult	0.909	0.022**
Number of samples	124	107 (=124 weighted)

Significant at the ** 5% level, and *** 1% level of error probability.
Source: Own data

Table 7.2 presents the test result. Before matching, six variables are significantly different between the treatment group (contract) and the control group (non-contract), and after matching only *org_adult* is significantly different between the two groups at 5% level of error probability.

7.4.3. Test for joint equality of all variables between groups

Hotelling's T^2 tests the equality of means of multiple variables. It is applied to see the robust joint equality of means of all the variables in the model, and tests for balances of the matched samples after nearest-neighbour matching with the null hypothesis; joint means of variables of the two groups are the same.

Additionally, Pseudo R^2 is compared before and after matching to check how the variables explain the probability of participating in the contract. If the matching is done well Pseudo R^2might become lower, which ensures that there are no systematic differences in the distribution of covariates between the two groups, which means, the variables in the model are less explanatory for participating in the contract than before matching.

Table 7.3 Hotelling's t-test and Pseudo R^2 before and after matching

Test statistics	Before matching	After matching
Hotelling's t-test, *F*-Value	3.5678***	1.6486
Pseudo R^2	0.2146	0.1131
Number of samples	124	107 (=124 weighted)

***Significant at the 1% level or error probability.
Source: Own data

After matching, Hotelling's *F*-value becomes insignificant (see table 7.3), which indicates that there is no bias in the joint equality of the model between matched control and treatment, although the *org_adult* variable remains biased in the Mann-Whitney test. Also, Pseudo R^2 becomes lower after matching, leading to the conclusion that overall fitness of the model is acceptable.

7.4.4. Summary of balancing tests

In the standardized bias test, three variables (*tea_experience*, *distance*, and *org_adult*) remained unbalanced after matching. The test compared the rank difference in each variable, which revealed that only the variable *org_adult* showed considerable difference between treatment and control. In the overall model fit test, Hotelling's T^2 test cannot be rejected and PseudoR^2became lower after matching, which can be interpreted as the joint equality of variables between the two groups after matching. Hence, it can be concluded that the matching quality is acceptable after conducting three different balancing tests.

7.5. Empirical results

7.5.1. Impact of contract participation on income

The results of the balancing tests showed that the matching was done with the acceptable level, so that the income (expenditure proxy) between contract and non-contract can be compared.

Table 7.4 Difference of mean income daily per capita ('000VND) between contract and non-contract

	Before matching	After matching
Contract	27.450	25.164
Non contract	23.537	24.269
Difference	3.912	0.895
p-value	0.209	0.013***
% reduced bias	-	77.1

*** Significant at the 1% error probability.
Source: Own data

Table 7.4 presents the difference of mean income daily per capita between contract and non-contract households before matching, which is 3,900 VND or USD 0.24 in September 2007. After matching, the difference became much smaller at 895 VND or USD 0.06. Considering that the outcome is estimated daily per capita income, and the average number of household

members with working age (above 15 and below 65 years old) of matched control group is 3.40, this result could be taken as to an average 3,043 VND (895 VND multiplied by 3.4) income impact for each non-contract household if they participate in the contract (see table 7.5). Non-contract households have the potential to increase their income by 2.7% by participating in contract production.

Table 7.5 Selected results of household characteristics after matching

	Mean value		
	Contract	Non contract	*p*-value
Daily expenditure per capita	25.16	24.27	0.65
Number of household members	4.84	4.74	0.61
Number of adults per household	3.66	3.40	0.25
Daily expenditure per household	120.40	112.80	0.44

Note: None of the variables is significant after matching.
Source: Own data.

7.5.2. Impact of contract participation on technical efficiency

In the technical efficiency analysis, we conclude that household contracts with state-owned enterprise achieved significantly higher technical efficiency than non-contracted households. Furthermore, we evaluated the results of propensity score matching, as these households are comparable on the basis of their socio-economic characteristics, and applied matched samples to compare technical efficiency.

Table 7.6 shows the result of ranking test of mean technical efficiency before and after the application of matching, of each contractual arrangement. There are slight changes in the absolute ranking value of matched samples, but the result stays the same for the unmatched samples. SOE achieved the highest technical efficiency, and private and non-contract groups were closer in their rankings after matching. Differences in mean technical efficiencies were observed with 1% of significant level, although test value became lower than the value before matching.

Table 7.6 Test of mean ranks of technical efficiency before and after matching (Kruskal- Willis test)

	Before Matching		After Matching	
	Mean rank	N	Mean rank	N
SOE	78.88	40	79.25	32
Private	59.56	34	58.43	30
Non-contract	51.40	50	55.82	62 [b)]
Test value [a)]	13.30		9.49	
Critical χ^2 value	9.21***		9.21***	

[a)] Test the Null Hypothesis that the rank difference between groups is zero.
[b)] Weighted sample.
*** Significant at the 1% level of error probability.
Source: Own data

For a detailed comparison of mean technical efficiency among different contracts, multiple comparison of non-parametric test was applied. The results are presented in table 7.7. Before matching, SOE showed significant difference in technical efficiency compared to other two groups, but after matching, considerable difference was observed only between SOE and non-contract group, and not between any other combinations. This indicates that SOE achieved significantly higher technical efficiency than non-contract. However, there was no major difference between SOE and Private and between Private and non-contract. These differences, with respect to the household characteristics, cannot be investigated using the contract participation model applied in Chapter 6.Binary logit model on the other hand, although it is applied to assess household characteristics as determining factors of contract participation, it does not distinguish between the participation of SOE or Private.

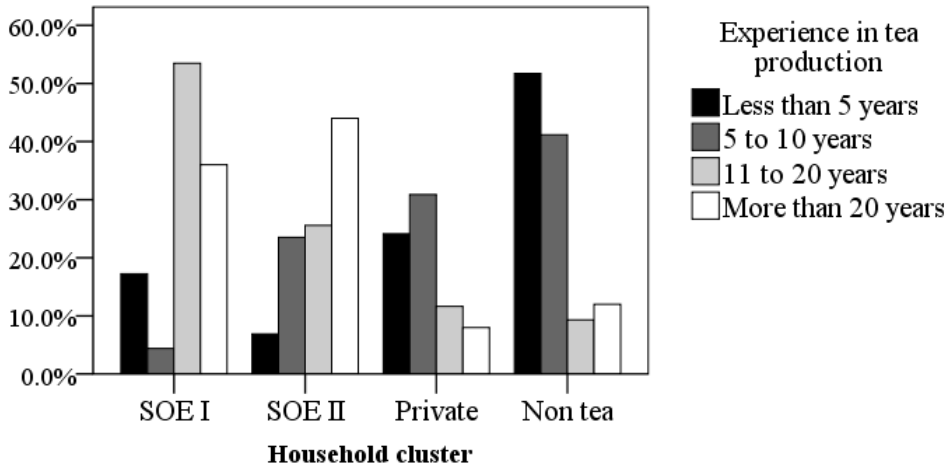
Table 7.7 Test for multiple comparison of technical efficiency

Compared groups	*p*-value [a)] of Mann-Whitney U test before matching	*p*-value [a)] of Mann-Whitney U test after matching
SOE – Private	0.011***	0.025
SOE – Non-contract	0.001***	0.000***
Private – Non-contract	0.226	0.144

[a)] Significance level is 0.05/ (number of comparisons) following the adjustment of Bonferroni correction to avoid statistical error of type I.
Source: Own data

Qualitative investigation might be affected by the difference in skilled family labor (Minot, 1986, and Sivaram, 2000). Figure 7.2 shows that more than 50% of family labor of SOE has more than 10 years of experience in tea production, which can lead to more efficiency in management knowledge, or plucking skills in the most labor intensive stage resulting in better production efficiency.

Figure 7.2 Number of years of experience in tea production of sampled households



Source: Own data

7.6. Conclusion and discussion

Propensity score matching was applied to obtain the reduced bias treatment effect of contract participation on income and technical efficiency. Estimation revealed the significant impact of contract participation on income, by approximately 900VND per capita. This evaluation

works on the condition of contract participation or non-participation but doesn't take into account the type of contract households enter into. This is due to the division of research site where SOE and private have isolated their target villages respectively. Taking into account this situation in the framework of sampling design, binary logit model seemed to be the logical choice to investigate the determinants of contract participation and was applied. Based on this reasoning, although the mean technical efficiency of each group (SOE, Private and non-contract) was indeed estimated individually, the influential household characteristics derived from propensity score matching could not be directly used as a ground for the results. Technical efficiency estimates after matching revealed the significant difference between SOE and non-contract, and insignificant difference between Private and non-contract. It can be assumed that SOE enabled more precise and experienced extension service or technical advice compared to Private, which might have influenced the technical efficiency positively.

8. CONCLUSIONS

During the last two decades, Vietnam experienced essential and fundamental institutional changes under the transition economy, which enabled rapid economic growth in the country. One of those institutional changes is observed in the restructuring of agricultural markets enhanced by policies such as deregulation of foreign investments, decentralization of state-owned companies, and more initiatives for private sector establishment. Besides these national economic reforms, another important factor impacting Vietnamese economy is the growing force of globalization. However, the economic growth has not resulted in a substantial reduction of rural poverty especially in north western Vietnam. Since tea predominately produced by poor farmers, greater access to markets can play key roles in reducing poverty in north western Vietnam. Therefore, we consider contract farming can be one of the rural development tools in order to effectively involve poor farmers into agricultural markets.

This study investigates the potential of contract farming as one of the institutional innovations in terms of market participation of smallholders in rural Vietnam.

We have highlighted contract farming scheme, which is one form of vertical coordination between producers and processors. Contract farming is often established as an institutional response to market imperfections and failures confronting smallholder farmers. Its advantages include reducing costs emerging from transactions and reducing risks associated with commodity exchange in the market.

Tea production is one of the main income sources for Northern mountainous rural households. Since the country's economic reform in 1986, notable increase in private and foreign investment has been observed, which led to further development of the tea sector. However, remaining institutional and political constraints impair fair competition, particularly in contract enforcement. For example, state-owned enterprise has a stronger say in the local government, and this enables them to bind contracted producers legally, which is not applicable for private companies. Private companies on the other hand only rely on trust-

based relationships or network-based relationships such as reputation, which make contract enforcement difficult, especially for newly established firms in the village. There is an urgent need for effective governance and administration to enforce laws that are often lost in the dilemma posed by the political and economic institutions of Vietnam; the government-legislative, administrative, and judicial bodies are not independent of each other. Furthermore, in our case study we observed that tea producers selected specific contracts depending on the output price. Qualitative investigation revealed that output price creates a strong incentive for producers to decide on the type of market they choose to sell their products.

Our empirical study shows that there is significant potential for enhanced production efficiency and increase in income in contract production.

First, it revealed that contract farming leads to greater production efficiency compared to non-contract farming. This result refers to our first research question.
Technical efficiency estimate result indicates that skilled labor is vital to tea production as older, more experienced, more educated, and more specialized tea farmers are more efficient. In addition, producers contracting with state-owned enterprise achieved significantly higher technical efficiency than non-contract producers. This indicates that the provision of extension service or technical advice by a state-owned enterprise might improve efficiency since state-owned enterprise has more experience in tea production than private companies.

Second, we found some significant differences in characteristics of households between contract participants and non-participants. Among the determinants of contract participation identified, we found that age, education, experience in tea production, and degree of social network of household positively effect on contract participation. On the other hand, year of residence in the village negatively affects contract participation. Age of adults scored the highest elasticity. We suppose that the age effect on contract participation might be the reflection of more risk averse behavior of older producers compared to younger producers. We also found that the degree of social networking of household members positively affects participation in tea contract farming, presumably because of improved access to information through the social network. With these results, we can draw considerable policy implications

such as providing higher education and access to information to enhance contract participation by smallholders.

Finally, we applied propensity score matching to investigate the impact of contract participation on income. This model is selected to obtain the reduced bias treatment effect of contract participation on income. The result revealed that the households producing under a contract had significantly higher incomes than non-contract households. And non-contract households can increase their per capita daily income (expenditure proxy measured) by 2.7% by participating in contract farming.

Several policies along the lines of our case study on contract farming in the tea sector have been implemented through different dimensions of nationwide strategy, like boosting privatization, increasing tea production and dissemination of contract farming. The changes brought in by some of these policies reached rural households in terms of expansion of cultivation area, increase in the number of private tea firms and boosting contract participation. However, some policies failed to uplift agricultural and rural sector. The development of agricultural sector requires implementation of multi-dimensional policies for efficient complementary effects.

Our empirical results point out a significant positive impact of contract farming on technical efficiency on tea production under the tightly arranged vertical coordination by SOE but not under the informal contract arrangement by private firms which are based on trust. This implies a contract arrangement in Moc Chau tea production functions better in the centralized contract management which involves organized production managements and some degree of collective sanction in the contract enforcements. Our study also empirically reveals that participation in contract farming provides significant impact on income for small scale tea producers. However some characteristics differ between contractors and non-contractors such as age, educational level, or organizational memberships.

Throughout this study, we find that public enterprises play a crucial role in promoting agricultural development and in alleviating rural poverty in developing countries, particularly in an economy ridden with market failures and imperfections. Furthermore, our results point

out to the absence of fair competition between state-owned enterprise and private firms in implementation of contract enforcement. Further institutional improvements are necessary to facilitate efficient resource allocation for further development of the Vietnamese tea sector. Along with institutional improvements such as pricing, contract enforcement, and land tenure, contract farming in Moc Chau tea production should be enhanced by adopting a suitable contract model and providing more information on contract farming to small scaled tea producers.

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APPENDIX 1. SENSITIVITY ANALYSIS OF TREATMENT EFFECTS

Sensitivity of unobservable variables associated with contract participation can be tested with Rosenbaum-bounds proposed by Rosenbaum (2002). It is clear that propensity score matching are not robust against hidden bias arising from unobservable variables that affect assignment to treatment and the outcome variable (Diprete and Gangl 2004). Assuming that those who are most likely to participate in the contract also have a higher income, the estimated treatment effect would be overestimated due to those positive unobserved selection. Hidden bias commonly refers to the characteristics which are not observed, and that are not in the x_i, therefore is not controlled by adjustment for x_i like in propensity score matching (Rosenbaum 2002).

Test for unobserved heterogeneity

If there are unobservable factors assigned with contract participation, the matching method is not anymore robust, thus estimated treatment effect might be over- or underestimated. Rosenbaum proposed Rosenbaum-bounds for non experimental data that can investigate the degree of influence by selection biases to the matching method using bounding approach (Rosenbaum 2002). This sensitivity analysis indicates neither the presence of bias nor eligible magnitude of test statistic. However, it shows how the influence of treatment effects may be altered by hidden bias, and how large would differences of hidden bias have to be to alter the qualitative conclusions of study (Rosenbaum 2002, Aakvik 2001, and Becker and Caliendo 2007).

Let probability of participation $p(x_i)$ express with observed variable x_i and unobserved variable u_i and the effect of $u_i$on participation γ that is:

$$(1)\quad p(x_i) = \Pr(D_i = 1 \mid x_i) = F(\beta x_i + \gamma u_i)$$

When we compare the pair of matched treatment i and control j those who have the same x_s, possibly have different $p(x)$ because of the hidden bias expressed by γu_i. The odds that

unit i and j receive the treatment are $p(x_i)/(1\text{-}p(x_i))$ and $p(x_j)/(1\text{-}p(x_j))$ respectively. The odds ratio of receiving treatment when the units i and j have same values on x_s:

$$(2)\quad \frac{p(x_i)/1-p(x_i)}{p(x_j)/1-p(x_j)} = \frac{p(x_i)(1-p(x_j))}{p(x_j)(1-p(x_i))} = \frac{\exp(\beta x_j + \gamma u_j)}{\exp(\beta x_i + \gamma u_i)} = \exp[\gamma(u_i - u_j)]$$

This odds ratio for units with the same x_s is some known number written as:

$$(3)\quad \frac{1}{\Gamma} \leq \frac{p(x_i)(1-p(x_j))}{p(x_j)(1-p(x_i))} \leq \Gamma .$$

If Γ is 1, then $p(x_i) = p(x_j)$ so the estimated treatment effect is free from hidden or unobserved selection bias that is associated with either no difference in unobserved variables ($u_i = u_j$) or unobservable variable has no influence on the participation probability ($\gamma = 0$) (Caliendo and Kopeinig 2005). If it is 2, then the one unit has twice as likely as to receive the treatment than the other unit under the condition those two units have same x_s. Rosenbaum (2002) suggest that Γ is a measure of the degree of departure from study that is free from hidden bias. Sensitivity analysis with Rosenbaum bounds considers several measure of Γ and will show with which degree of hidden bias would alter the treatment effect. However, sensitivity analysis is only applicable for the matching without replacement so that it does not suit for this study.

APPENDIX 2. SURVEY QUESTIONNAIRES

Questionnaire for household survey

I. Identification

1.1. Date of Interview : **Day** **Month** **Year**

_____

Code

1.2. Commune name ..... ☐

1.3.Village name..... ☐

1 …TK 69 2 …Ban Muong 3 …SuoiKhem 4 …Lien Hung 5 …KhuaNhua 6 …Ban 83 7 …Ban On

1.4. Household identification number .....
(please write this number on all pages)

1.5. Name of the Household head ..... ☐

1.6. Name of respondents
(Name and ID) ..... ☐

1.7 Type of farming ..... 1- tea farmer, 2- non-tea farmer ☐

1.8. Ethnic group of the household head ☐
Kinh..... 1
Thai..... 2
H'mong..... 3
Dao…..... 4
Muong……5
Other (specify)_____ 6

1.9. Ethnic group of the spouse of the household head *(See code above)* ☐

1.10. Interviewer name and code..... ☐

1.11. Supervisor name and code ..... ☐

1.12. Date checked by supervisor _____/_____/_____

Signature of the supervisor ☐

1.13 Type of Cluster (by supervisor) _____ ☐

Tea Farmer contract with MCTC with leased land	1
Tea Farmer contract with MCTC without leased land	2
Tea Farmer contract with Private company or cooperative	3
Independent Tea Farmer	4
Non- tea Farmer	5

2. Household Roster

Note to the interviewer: A household consist of all people who live under the same roof, eat from the same pot and share expenditures. A person is not considered as a member if she spent more than 3 months away in the past 12 months.

2.1 ID	2.2. Name	2.3 Sex 1= Male 2= Female	2.4. Age	2.5. Relation to hh head (code 1)	2.6. Marital Status (code 2)	2.7. Can read/ write (code 3)	2.8. What languages does this member speak? (code 4) 1st lang.	2nd	3rd	4th	2.9. Highest class passed (code 5)	2.10. *If children from 6-15 years old* (i.e. if born between 1992 and 2001) Is he/she regularly going to school ? (code 6)	2.11. *If 2.8.>1* Why ? (code 7)
1				1									
2													
3													
4													
5													
6													
7													
8													
9													
10													

Code 1 Relation to hh head

Household head.....1
Spouse.....2
Son or daughter.....3
Father or mother.....4
Grandparent.....5
Grandchild.....6
Brother or sister.....7
Other relative.....8
Other non relative.....9

Code 2 Marital status

Child, not old enough to marry…0
Single.....1
Married with spouse permanently present in the household.....2
Married with the spouse migrant.....3
Widow / widower.....4
Divorced / separated.....5

Code 3 Read/write

Cannot read or write.....1
Can read only.....2
Can read and write.....3

Code 4 Languages

Kinh.....1
Thai.....2
Hmong.....3
Dao.....4
Muong.....5
Other.....6

Code 5 Education

Read in 1st year of Primary school….. 0

Put the number of the highest class passed (1-8)

Secondary degree…….. 9
Vocational diploma…….. 10
High school certificate…….. 11
High education degree…….. 12
Bachelor degree…… 13
Master and more…….. 14

Code 6 School attendance

Regularly..... 1
Not Regularly..... 2
Children attended to school before but not this year.....3
Children never attended to school..... 4

Code 7 Non attendance

Cannot afford expenses……. 1
Children must work……... 2
Too young……. 3
Other reason…….. 4

	2.12. *If > 6 years Old* Main occupation in the 12 past months Put / in the cell if they engaged in only one occupation. (code 8)		2.13. How many days in the past 12 months this person was sick and therefore unable to work? Nb of Days	2.14. Does this member have any chronic illness (e.g. chronic fever, heart disease, diabet, blood pressure, dysentry, etc.)? 1= Yes 2= No	2.15. Does this member have disabilities (e.g. blindness, body member lost, etc.)? 1= Yes 2= No	2.16. Clothing expenses in the past 12 months '000 dong
	Primary	Secondary				
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Code 8 Occupation

Self employed in agriculture..... 1
Self employed in non farm enterprise... 2
Student/pupile..... 3
Government employee..... 4
Salaried worker in agriculture..... 5
Salaried worker in non agriculture..... 6
Daily agricultural labor..... 7
Daily non agriculturallabor..... 8
Domestic worker..... 9
Military service..... 10
Unemployed
Looking for a job.....11
Homework.....12
Retired..... 13
Disable to work..... 14
Leisure.....….... 15

2.16. In which year was your household established in this Village? year

2.17. Where were born the following persons?

a. Household head	b. Father of the household head	c. Mother of the household head	d. Spouse	e. Father of the spouse	f. Mother of the spouse

1- In this village
2- Elsewhere in Moc Chau district
3- Elsewhere in Son la province
4- Elswhere

3. Housing indicators

Serial #	Questions	Response		Response Code
3.1	Is this dwelling owned by a member of your household?			Yes ..... 1 No ..... 2 >> 3.4
3.2	If you sold this dwelling – including the land plot – today, how much would you receive for it?			'000 VND
3.3	Estimate please, the amount of money you could receive as rent if you let this dwelling – including the land plot – to another person.		A. '000 VND	
			B. Time unit	Day..... 1 Week..... 2 Fortnight ..... 3 Month..... 4 Quarter..... 5 Half Year ..... 6 Year 7
3.4	Do you rent this dwelling for goods, services or cash?			Yes ..... 1 No ..... 2 >>**3.6**
3.5	How much does your household pay in cash to rent this dwelling? Interviewer: If does not pay in cash write zero "0".		A. '000 VND	
			B. Time unit	Day..... 1 Week..... 2 Fortnight ..... 3 Month..... 4 Quarter..... 5 Half Year ..... 6 Year 7

3.6. What kind of lock does the main entrance have?
(Gather this information through observation only)

No lock..... 1
Wood or metal bar to close from inside only….. 2
Key lock..... 3
Security key lock/metal frame with padlock…..... 4

3.7. How many rooms does the dwelling have? Number
(Include detached rooms in same compound if same household
Exclude bathrooms, toilets, kitchen and basement)

3.8 What is a total area of your house? Only the place which are covered by roof. M^2

3.9. What type of roofing material is used in the house?

Straw leaves….....1
Wood, bamboo….....2
Canvas, tar paper….....3
Panels (wood)….....4
Galvanised iron….....5
Tile….....6
Big Tile….....7
Concrete…….. ….....8

3.10. What type of exterior walls does the house have?

Leaves, branches….....1
Bamboo….....2
Wood….....3
Galvanized iron….....4
Earth….....5
Brick, stone….....6
Concrete….....7

3.11. What type of flooring does the main room have?

Earth….....1
Bamboo….....2
Wood….....3
Concrete….....4
Brick….....5
Concrete with additional covering…...6

3.12. What type of cooking fuel source is primarily used?

Leaves/ grass/ rice husks/ stubble/ straw /
thatch/ stems.....1
Wood.....2
Coal/ charcoal.....3
Kerosene.....4
Biogas.....5
Bottled gas.....6
Electricity.....7

3.13. What is the main source of lighting for your main living rooms?

Cannot afford lighting at night.....1
Candles/ battery lamb/ Resin torches.....2
Gas, oil, kerosene lamp.....3
Electricity (public, shared connection).....4
Electricity (public, owned connection).....5
Generator.....6

3.14. What is your primary source of drinking water?

River, lake, spring, pond.....1
Rain water.....2
Public well – open.....3
Public well – sealed with pump.....4
Public tap.....5
Well in residence yard – open.....6
Well in residence yard – sealed with pump.....7
Outside private tap.....8
Inside private tap.....9

3.15. What type of toilet facility do you have?

Bush, field.....1
Shared kneel-down toilet.....2
Owned kneel-down toilet.....3
Shared sit-down toilets.....4
Owned sit-down toilets.....5
Shared flush toilets.....6
Owned flush toilets.....7

3.16. Where do you usually cook your meals?

Outside.....1
In one of the rooms in the house.....2
In a separate kitchen.....3

3.17.Do you have any of the following utilities for your household?

a.Piped water
b.Electricity
c.Telephone
d.Mobile (cell phone)

Yes, own connection..... 1
Yes, shared connection.....2
No.....3

4. Assets based indicators

4.1. Assets owned

Assets type and code	4.1.1. Number owned	4.1.2. Total resale value at the current market price/animal '000 dong
Animals		
a. Buffalo		
b. Pig		
c. Goat		
d. Cattle		
e. Dog		
f. Chicken		
Farm assets		
g. Motor tiller		
Transportation- related assets		
h. Motor bike		
i. Bicycle		
Appliances and electronics		
j. Colour TV		
k. Black TV		
l. Telephone sets		
m. Mobile phones		

4.2.Land use certificates:

4.2.1 Does your household own a Red book at the moment?

Yes…..... 1 ☐

No…..... 2 >> 4.2.3

4.2.2. If yes, in which year did you get it for the first time? ☐ Year

4.2.3. How many plots are currently registered on your certificate? What is the total area (m^2) of your all plots you owned?

Type of land owned	Number of plots	Total area (ha) of plots the HH owns.	% area titled with red book	During past 12 months, area **rented out** to other households (not cultivated by owner)
Agr land irrigated (not tea)		m^2	%	m^2
Agr land non-irrigated (not tea)		m2	%	m^2
Forestland		m2	%	m^2
Homestead land, garden around house		m2	%	m^2

5. Food Consumption Indicators

5.1. During the past seven days (or the last seven days before the special event), for how many meals were the following foods served in a main meal eaten by the household?

a. Fresh fish ☐

b. Poultry ☐

c. Beef, buffalo ☐ # meals served

d. Pork ☐

5.2. During the last seven days (or the last seven days before the special event), for how many days did a main meal consist of rice and vegetables only? *(i.e. without any animal protein)* ☐ # days

5.3. During the last seven days (or the last seven days before the special event), for how many meals was rice replaced by cassava, or sweet potato? ☐ # days

5.4. Did your household eat outside meal in the past 7 days?
1-yes
2-no ☐

5.5. <u>In the last 30 days,</u> how many times did you buy rice? ☐

5.6. During the last 30 days, was there some days where your household did not have enough to eat? If yes, how many days? ☐ # days
No = 0,
Yes, write # of days

5.7. a. What is the amount of rice that you have currently in the house for your own consumption? ☐ Kg of unhusked rice

b. For how many days will your stock of rice last? ☐ # days

Now I will ask question about the food eaten in your household in the past 12 months

5.8 In the <u>past 12 months</u> were you and your household members worried that your food would run out before you had money to buy more/ or before the harvest?
Yes.....1
No.....2 ☐

5.9. In the <u>past 12 months</u> how often did you have to borrow food from relatives or neighbours to make a meal? ☐
Never..... 1
Rarely (1 to 6 times a year)..... 2
Sometimes (7 to 12 times)..... 3
Often (a few times almost every month)..... 4
Mostly (this happened a lot)..... 5

5.10. a. Did you or another adult in your household skip meals during the past 12 months because you did not have enough money to buy food?

Yes.....1
No.....2 >>go to Section 6

b. How often did that occur during the past 12 months?

More than 180 days..... 1
Less than 180 but more than 30days..... 2
Less than 30 days but more than 10 days..... 3
Less than 10 days last years..... 4

6. Expenditure based indicator

Interviewer: We only ask for expenditures by the household and its members for consumption. Do exclude all expenditures for business, trade or any other micro enterprise (agricultural or non-agricultural). With the following sentences and example, you should be able to make clear the difference. If not, continue the explanation until the difference between household and enterprise expenditures is known to the respondent. Only then begin with this section.

The Interviewer must read the following statement.
We would like to ask you about the expenditures that your household does for consumption, such as food, shelter, clothing, social events, and other living expenses. Rural example: Therefore, expenses such as for *water for irrigation* are excluded, but expenses for your own drinking water are included. Urban example: Therefore, expenses for buying goods and materials for a handicraft or trade micro enterprise are excluded from the following, but expenses for soap or furniture for your own household are included.
Interviewer: Make sure that the respondent did understand the difference between expenditures for living, and expenditures for enterprises. Otherwise, give more examples.

QID	Questions.	Response	Response code
	Interviewer: recall period refers to the average week (6.1b and 6.2b)) during past 12 months (need to prompt accordingly).		
6.1a.	How much did your household spend during the **past seven days** for buying food? *(Interviewer: Value of barter exchange included)*		'000 VND
6.1b.	How much does your household **usually** spend **per week** for buying food? *(Interviewer: Value of barter exchange included) past 12 months!*		'000 VND
6.2a.	What is the value of food that your household produces on your farm or garden, or gathers from the forest and then has consumed during the **past seven days?** Past 12 months!		'000 VND
6.2b.	What is the value of food that your household produces on your farm or garden, or gathers from the forest and then consumes **usuallyper week**?		'000 VND
	Recall refers to Average Month in past 12 months for 6.3 thru 6.6		
6.3.	How much does your household usually spend each month on **Utilities** (e.g. Electricity, phone, water and sanitation, etc.)? MONTH		'000VND
6.4.	How much does your household usually spend each month on **Transport** (including fuel used for transport) (e.g. transport to work or school, transport for leisure, repair for bicycles, etc.)? MONTH		'000VND
6.5.	How much does your household usually spend each month on **Fuel** (excluding fuel used for transport)? (e.g. fuel i.e. paraffin , wood, gas for cooking, , cooling, etc.) MONTH		'000VND
6.6.	What is the value of other **goods** (*not food*, e.g. wood or charcoal for fire/cooking) that your household usually produces on your farm or		'000VND

QID	Questions.	Response	Response code
	garden, or gathers from the forest and then usually consumes? MONTH		
	Recall period is PAST 12 MONTHS for 6.7 thru 6.12.		
6.7.	How much did your household spend in the last 12 months on **School/education (e.g.** *school enrollment fees, books, uniforms and other school supplies)*:		‘000VND
6.8.	How much did your household spend in the last 12 months on **Health (e.g. medicaments, visit to clinics, traditional healers or doctors, etc.)**?		‘000VND
6.9:	How much did your household spend in the last 12 months on **Housing**?		‘000VND
6.10.	How much did your household spend in the last 12 months on **Furniture, appliances etc.**?		‘000VND
6.11.	How much did your household send to your relatives in the last 12 months who do not live in your household (**remittances sent**)? (include both monetary and value the in-kind goods received)		‘000VND
6.12.	How much did your household spend in the last 12 months on **Other expenditures (e.g. social events, leisure, gifts given, and taxes)?**		‘000VND

7. Vulnerability and reliance to network in case of shocks – social capital

7.1.Occurence of positive/negative events in the past five years?

*We want to ask ow about the events that affected your life in the **last five years.***

Enumorators, please be careful to fill the answers which reflect NO, some of them are 0, and others are 2.

7.1.1. Marriages of a first degree relative to household head or spouse?

No = 0

Yes, how many ma

7.1.2. Birth of own child

No = 0

If yes, how many birth ?

7.1.3. Adoption of child

No = 0

If yes, how many adoptions?

7.1.4. We inherited major funds or assets

No = 0

If yes, what is the value? '000 dong

7.1.5 Did your household received dowry?

7.1.9. Occurence of serious chronic illness or major disability (e.g. blindness, loss of arm because of accident, etc.)

Yes..... 1

No..... 2

7.1.10. A major working, income earning adult member left the household forever

Yes..... 1

No..... 2

7.1.11. Death of a dependant member (child or eldery person)

No = 0

If yes, how many deaths ?

7.1.12. Relocation of residence because of a natural disasters (flood, landslide, etc.)

Yes..... 1

No..... 2

7.2. Membership in association, group or organization

We want to ask now questions about the associations in which you or members of your household participate and has membership, including communist party, mass organisation or any other kind of organisation.

(interviewer, ask the question for each member over 15, to be sure to enter in the table below all the organisation the household participates in. If a member has membership in several organizations, then enter his ID several time in the first column and fill a line for each organization he participates in)

7.2.1. ID of hh member (use ID from family roster)	7.2.2. Type of organization (code 1)	7.2.3. Degree of participation 1-Leader 2-Very active (other responsibility than leader 3-Active 4-Give help from time to time 5-Not active	7.2.4. During the past 12 months, did you make contributions to this organization... 0-No Contribution 1-In cash 2-In kind (e.g. labor, etc.) 3-Both in cash, in kind

Code 1 type of organization

Mass organisation		**Agriculture/trade organization**		**Other local groups/organization**	
Farmer Union	1	Extension club	14	Religious group	23
Women Union	2	Cooperative	15	Cultural association	24
Youth Union	3	Traders association	16	Parent group	25
Veteran Union	4	Professional association	17	School committee	26
Fatherland Front	5	Trade union	18	Health committee	27
Eldery Union	6	Hobby club…	19	Sport group	28
NGO, Governmental services		**Political organization**			
NGO	7	Communist Party	20	Other (specify)	29
Vietnamese Governmental Organization …	8	People's committee	21		
ForeignGovernmentalOrganization……..	9	Ethnic committee	22		
VBSP Credit group	10				
Other formal Credit group	11				
Other informal credit/finance group……	12				
Environmental group	13				

7.3. Access to services and safety nets

7.3.1. How would you qualify your access to the services listed below on a scale from 1 to 5 ?
(1= very poor access, 5= very good access)

a. Education/schools	
b. Health services/clinic	
c. Housing assistance	
d. Job training/employement	
e. Credit/finance	
f. Transportation	
g. Drinking water distribution	
h. Water distribution for irrigation	
i. Agricultural extension	
j. Sanitation service	
k. Justice/ conflict resolution	
l. Security/ police services	

7.3.2. Here are listed some services offered by the government to reduce poverty,

Name of the service	7.3.2.1. Do you know about it ? 1= Yes 2= No>> next row	7.3.2.2. If yes, have you received such support in the last 5 years (since 2002)? 1= Yes 2= No>> next row	7.3.2.3. If yes, in which years did you receive it? *(write several years if received more than one)* Year(s)	7.3.2.4. Amount received in the past 12 months? '000 dong
a. Provision of Household Poor Certificate				
b. Access to loan with low interest rate				
c. Free health care/insurance				
d. Education tuition exemption and reduction/ free textbooks				
e. Kids are studying in new schools and classrooms				
f. Receiving support of accommodation or in house repairs/construction				
g. Monetary assistance				

7.3.3. How was your household classified by the commune in…

Hungry..... 1	…2002?	
Poor..... 2	…2003?	
Medium.....3	…2004?	
Better-off.....4	…2005?	
Rich..... 5	…2006?	
Do not know..... 6		

8. LAND USE and SOURCE OF CASH INCOME

Now, I want to ask about your source of CASH INCOME.

8.1 Please List the crops currently cultivated by HH 1- tea, 2-rice 3- maize, 4- cassava, 5- sweet potato, 6- potato, 7- beans, 8- vegetable, 9- other crops (specify) 10- lichi, 11- longan, 12- other fruit (specify)	8.2 What is the total area cultivated by that crop (which period)? **m^2**

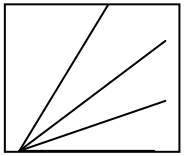
8.3 What are the sources of income to the household in last 12 months? 1- tea, 2-rice 3- maize, 4- cassava, 5- sweet potato, 6- potato, 7- beans, 8- vegetable, 9- other crops (specify), 10- lichi, 11- longan, 12- other fruit (specify) 13- Livestock 14- fisheries 15-forest products 16-agricultural trade 17-agricultural wage 18-non agricultural wage 19-non agricultural business 20-remittances 21-government aid, 22-others(specify)	8.4 In percentage, how much did [source] represent in your total income (i.e. gross revenue-production costs) **in past 12 months?**	8.5 How many people of your HH involved in these activities? Number of people	8.6 **Now I want to ask about the year in 1997(10 years dimension).** **What was theincome [SOURCE]of your HH in 1997?**	8.7 **Estimate please, the proportion of each income [SOURCE] of your HH in 1997.**	8.8 **Has your income of past 12 months increased compare to the income of year 1997?** **1-yes** **2-no**

9. Tea Production
General Information

9.1 Have your Household grown any kinds of tea **for sale?** 1-yes 2-no >> go 9.6	
9.2 In what year did you or your spouse start growing tea?	YEAR
9.3 Since this year, have you regularly (every year) grown tea? 1-yes 2-no	
9.4 Which of the following are benefits you enjoy from tea farming? 1-Timely input provision 2-Lower prices for inputs 3-Higher profit 4-Stable product price 5-Extension advice 6-Easier transportation access to the market 7-Easier processing procedure 8-Other (specify)	
9.5 Are you contracting tea farmer or independent farmer? 1- Contract 2- Independent	
9.6 Why have you not grown tea? 1- Not enough land 2- Not enough labor 3- No credit available 4- No inputs available 5- Inadequate transport 6- Price too poor 7- Tried other cash crop instead 8- Don't prefer 9- Not enough knowledge 10- Other (specify)	**End the interview,here.**

9.7 Plot Information and Land acquisition (land cultivated by tea)

9.7.1
How many tea plots do you plant at present time? Number of Plots

9.7.2 Plot ID	9.7.3 Plot area (m^2)	9.7.4 % area titled with red book in each plot.	9.7.5 During past 12 months, area of planted tea rented out to other households (not cultivated by owner) m^2	9.7.6 During past 12 months, Kg of tea leaves that the HH produced (both for sale and non-sale) in each plot.	9.7.7 Since when these trees are planted in average? YEAR	9.7.8 Variety Code 1-Shan 2-Trung du 3-Trung Quoc 4-Other	9.7.9 What is the slope of this tea plot? 1-Steep, hilly 2-Moderate slope 3-Slight slope 4-Flat 	9.7.10 How long have you plucked tea from this plot? *Exclude vegetation period.* Total YEAR	9.7.11 How long these trees will give leaves? If unlimited, write ∞. YEAR	9.7.12 Name of the company you signed the current contract with. *If its independent farmer, put / in the cell.* **Code: 9.7.12** 1-MCTC 2-Cooperative 3-Private company 4-other (specify)	9.7.13 From when to when do you have contract with that company? If unlimited, write ∞.	
											From YEAR	To YEAR
1	m^2	%	m^2									
2	m^2	%	m^2									
3	m^2	%	m^2									
4	m^2	%	m^2									

Note: 9.7.13
Please fill the year, when the year you got involved in the contract. E.g. the year your village deicide to make contract with MCTC, but not the year you individually signed or make or oral contract.

Plot ID	9.7.14 Is this plot irrigated or not? 1-irrigated 2-non-irrigated	9.7.15 How did you first acquire this plot? >>SEE CODE 9.7.15	9.7.16 When did you acquire this plot? **YEAR**	9.7.17 If you purchased this plot, how much did you have to pay? (or ask purchased price when they acquired this plot) '000VND	9.7.18 If you leased this plot from others (out of HH), how much did you pay for last 12 months? (for 1 year) 1-at once 2-yearly 3-monthly 4-others '000VND		9.7.19 Is currently, possible to rent out your land which is cultivated for tea production? 1-yes 2-no	9.7.20 Suppose you would rent this plot for one year. What price could you get for this plot? '000VND (please ask this question for all plots, including plots not owned by the household). The price of land can be an indicator of quality.
1				'000VND	'000VND			'000VND
2				'000VND	'000VND			'000VND
3				'000VND	'000VND			'000VND
4				'000VND	'000VND			'000VND

CODE 9.7.15

1- from cooperative
2- Allocated by the government with Red Book
3- Inheritance
4- Leased from Moc Chau Tea Company
5- Purchased with title,
6- Purchased with no title,
7- Leasehold,
8- Leased for short term,
9- Converted forestry or wild land into agricultural land,
10- Share tenancy,
11- Other (specify)

Comment: on 9.7.17

If one purchases a plot, one has to pay the price, or at least agree on the price at purchase date. Part of the purchase could be financed by a loan (even from a previous owner). But you should ask here

9.8 Variable Costs

Now I will ask about **last 12 months.**
How much did you pay for following items **in total** last 12 months?

9.8.1 STT Plot ID	**9.8.2 Seeds**		**9.8.3 Manures**		**9.8.4 Fertilizers**		**9.8.5 Insect-Herbicides**	
	1.Self-payment	2.Paid by company through contract	1.Self-payment	2.Paid by company through contract	1.Self-payment	2.Paid by company through contract	1.Self-payment	2.Paid by company through contract
1	‘000VND	‘000VND	‘000VND	‘000VND	‘000VND	‘000VND	‘000VND	‘000VND
2	‘000VND	‘000VND	‘000VND	‘000VND	‘000VND	‘000VND	‘000VND	‘000VND
3	‘000VND	‘000VND	‘000VND	‘000VND	‘000VND	‘000VND	‘000VND	‘000VND
4	‘000VND	‘000VND	‘000VND	‘000VND	‘000VND	‘000VND	‘000VND	‘000VND

9.9 Fixed Costs

Machines and tools used for tea production

9.9.1 Items	9.9.2 Number of tool or machine	9.9.3 How long have you bought it? (Nb. of years)
1Plow		
2 Deep Plow		
3 Hoe		
4 Mattock		
5. Shovel		
6. Sprayer		
7. Cutter		

9.9.4 How much did you pay for that for last 12 months? ***If they don’t pay, write “0”.***	9.9.5 How often did you have extension advice? ***Ask time period in last 12 months.***
_____’000VND/ 12months	Once/_____ / 12months

9.10 Labour Costs

9.10.1

9.10.1.1 HH member code	9.10.1.2 Regular work except plucking			9.10.1.3 Tea Plucking				9.10.1.4 Do you have opportunity to get other occupation?	
	a.Nb of month/last 12months	b.Nb of Days/month	c.Nb of hours/day	a.Nb of terms(6-8days)/year	b.Nb of Days/harvest period	c.Nb of hours/day	d.Experienced year of Plucking	a.During regular working 1-yes, 2-no	b.During plucking 1-yes, 2-no

9.10.2 Did/do you hire wage labour for tea production **last 12 months**?
1-Yes, 2-No (>>go 9.10)

9.10.3 Cost of hired labour **during last 12 months**.

9.10.3.1 Hired Labour ID No.	9.10.3.2 Nb. of days per last l2 months	9.10.3.3 Wage per day '000VND	9.10.3.4 Total '000VND	9.10.3.5 Type of work 1-Tea fostering 2-Tea plucking 3-Other (specify)
1		'000VND/day	'000VND	
2		'000VND/day	'000VND	
3		'000VND/day	'000VND	
4		'000VND/day	'000VND	

9.11 Credit

9.11.1

During the past 3 years, have you borrowed money for tea production?

1-Yes

2-No >>9.12 ☐

9.11.2Details of Loans

9.11.2.1 Items	9.11.2.2 Who lend you? 1- Bank 2- Friends 3- Relatives 4- Farmer's association 5- Women's association 6- Small local lender 7- Others (specify)	9.11.2.3 Amount of loan '000VND	9.10.2.4 When did you borrow? Year /Month MONTH	YEAR	9.11.2.5 When is the loan due (i.e. when must the loan completely be repaid)? Fill 55 if there is no such date Year Month MONTH	YEAR	9.11.2.6 Interest (% per year) ***Interviewer: Note, if borrower does not know interest, ask who the lender is, and write it down.*** %/ YEAR	9.11.2.7 Which frequency you have to pay back your credit? 1-every month 2-every year 3-when you finish harvest 4-whenever you have money 5-other (specify)
1							%	
2							%	
3							%	

9.12 Tea Leaves processing, grading

Now I will ask about **last 12 months.** ***Interviewer, please don't forget the questions to be asked differentiating among each buyers.***

9.12.1 Who grades your tea leaves? 1-By collector 2-By themselves (by household) 3-No grade 4-Others	9.12.2 Did you process fresh tea by yourself? 1-Yes(next row) 2-No (>>9.13)	9.12.3 How many days did you spend to process tea during last 12 months?	9.12.4 How long (much time) did you spend to process tea per day last 12 months? HOURS/Day
		Days	Hours/Day
		Days	Hours/Day
		Days	Hours/Day

9.13 Tea leaves (fresh tea) Selling

Now I will ask about **last 12 months.*Interviewer, please don't forget the questions to be asked differentiating among each buyers.***

9.13.1 To whom did you sell your fresh tea leaves last 12 months? 1-Company you signed contract with 2- Self selling at market 3- Other company 4- Individual trader 5- Other (specify)	9.13.2 Why did you choose to sell this buyer? 1- contract forced 2- closest relationship 3- closest (distance) buyer 4- best price 5- stable price 6- other (specify)	9.13.3 At which location did you sell (passed away) the tea leaves to the buyer/collector? 1- Local collecting point 2-In your field 3- Nearest local market 4- at the contracted company 5- at the non- contracted company 6-Other (specify)	9.13.4 How far is the distance to the sales point from where the tea harvested? m	9.13.5 How did you carry there? 1-Walking 2-Bicycle 3-Motorbike 4-Other (specify)
			m	
			m	
			m	
			m	

9.13.6 How much did you sell last 12 months? Quantity Kg	9.13.7 How much did you sell per kg? Average Price per kg with this buyer during past 12 month ('000VND)	9.13.8 How much in total you sell last 12 months? Total ('000VND)
Kg	'000VND	'000VND
Kg	'000VND	'000VND
Kg	'000VND	'000VND
Kg	'000VND	'000VND

Questionnaire for Village survey

1. Identification

1.1. Date of interview : **Day** **Month** **Year**

				0	7	Code

1.2. Commune name :_____ | |

1.3.Village name:_____ | |

1.4. Interviewer: _____

1.5. Repondent name: _____

1.6. Repondent occupation:_____

1.7. *(if not respondant)*
Village head name:_____

Vice village head name:_____

2. Demography:

2.1.Village composition

How many hh in total in this viallge? _____

Ethnic	Number of households	Proportion %
a.Thai		
b.H'mong		
c.Kinh		
d. Dao		
e. Muong		
f. Other		

2.2. When was the village created? _____ *(ideally year, or approximative answer if doesn't know exactly)*

2.3. What is the ethnics, and name of the first household in the village (or first village head if there were several households)?_____

2.4. Governance:

2.4.1. Union and organisations

Organisation	2.4.1.1.Number of members
a. Farmers union	
b. Women Union	
c. Youth Union	
d. Veteran Union	
e. Fatherland front union	
f. Eldery Union	
g. Communist party	

2.4.2. Cooperatives:

2.4.2.1. Is there still a cooperative in the village? Yes/ No

2.4.2.2. If no, in which year did the cooperative of this village stop to exist? _____ year >>2.4.2.6

2.4.2.4. How many members are actually in this cooperatives?_____

2.4.2.6. When was the village head first elected?_____year

3. Access to facilities

3.1. Generalities

3.1.1 Services

Is there any [service] available in this village ?	3.1.1. Number (if there is not, write 0)	3.1.2. If the answer is no, how far is the closest [service] km
a. Shops		
b. Post office		

c. Market		
d. Fertilizer depot		
e. Health center/clinic		
f. Kinder garden		
g. Primary school		
h. Secondary school		

3.1.2. Road

3.1.2.1. Is there a paved road passing by your village? Yes / No

3.1.2.2. If no, how far is the closest paved road in walking minutes? _____min

3.1.2.3. For how many months in a normal year is your village accessible….

…by motorbike? _____months/12

…by truck? _____months/12

3.1.3. Electricity

3.1.3.1. Is there electricity accessible in the village? Yes / No

3.1.3.2. How many households(or % of hh) have a private access to electricity?_____

3.1.3.3. How many households have a shared access to electricity?_____

3.1.3.4. How many households do not have electricity?_____

3.2. Agriculture:

3.2.1.5. How many households were rice sufficient (didn't need to buy rice) in 2006?_____in 2005?_____

3.2.1.6. Compared to other villages from this commune how would you say that this village is…?_____

1= …richer 2= …average 3= …poorer

4. Land:

4.1. What is the total area of land that the village (and its inhabitants) dispose of and its current allocation?

	Total area ha	Allocated under individual Red Book ha
Paddy land		
Upland		
Forest		
Residential land		
Perennial crop		
Pond		
Other		

What kind of Red Book are there in this village?

i.e,

-Indivisual, property shared,

4.5. Forestry land

4.5.1. How many households have an individual red book for forestry land? _____hh

4.5.2. How many households share a red book for forestry land? _____hh

5. Access to credit

5.1 Are there some tea household lend money for first investiment of their tea producttion? Yes / No

5.2 How many households are they? _____

5.3 Do you know from which credit sector they lend money?

a. VBARD
b. VBSP
c. Farmer union
d. Woman union
e. Youth union
f. Veteran union
h. Elderly union
i. Village board
i. NGO (specify)_____
k. Government company
l. Private company
m. Other (specify)_____
n. Money lender (where are they? In this village?)
o. Shopkeeper (food, and basic consumption items)
p. Agricultural inputs dealers (shopkeeper, private/ government companies, etc…)
q. Trader
r. Informal credit group (Ho Hui)
s. Other

6. Provision of services :

6.1. Classification

Status	6.1.1. How many households were classified as [status] in…					
	..2002?	..2003?	..2004?	...2005?	…2006?	..2007?
a.Hungry						
b.Poor						
c.Medium						
d.Better off						
e.Rich						
Total households						

6.1.2. How many poor household certificates were delivered in…

	Number of hh who got the **very poor certificate**	Specify in the village list!!	Number of hh who got the **poor certificate**	Specify in the village list!!	Number of hh who got the **poor book**	Specify in the village list!!
...2002?						
...2003?						
...2004?						
...2005?						
...2006?						
...2007?						

6.1.3. What other services are offered by the government/commune/village to reduce poverty?
(list the service and the conditions of access)

Describe the service	Program *(if only in this village write village)*	Targeted population
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		

a. Provision of Household Poor Certificate
b. Access to loan with low interest rate
c. Free health care/insurance
d. Education tuition exemption and reduction/ free textbooks
e. Kids are studying in new schools and classrooms
f. Receiving support of accomodation or in house repairs/construction
g. Monetary assistance
Ask for others

6.2. Process of identification of poor households

6.2.1. Timing of the classification process in 2006: From _____/_____/_____ to _____/_____/_____

Precise the first and the last step: First:_____ Last_____

6.2.2. For the year 2007, does your village has processed yet? Yes / No

6.2.3. If 'Yes', when did it happen?_____/_____/_____

6.2.4. If 'No', when will it happen? _____/_____/_____

6.2.5. Among the following people, who was involved in the collecting information/ and checking information in the last classification?

	Specify occupation?	Collects HH info (X)	Checks HH info (X)	Decision maker (X)
1. Village head				
2. Vice head				
3. Communist party secretary				
4. Commune representant	_____			
	_____			
	_____			
5. Women Union				
6. Farmer Union				
7. Fatherland front union				
8. Veteran union				
9. Youth Union				
10. Eldery Union				
11. HH representatives				
12. Other	_____			

6.2.6. Does your village have a meeting to inform households about their classification? Yes / No
6.2.7. Do the households contest or modify the classification? Yes / No
6.2.8. What are the problems that arise in this process?

Problem	Reason
1._____	_____
2._____	_____
3._____	_____

6.2.9. What is the importance of the following criteria to classify households as poor.
Make order from 1 to 5, 1 is most important criteria.

	Order
1. Family size (or dependent people)	
2. Housing (or condition of house)	
3. Durable goods	
4. Health	
5. Education	
6. Agriculture assets	
7. Livestock possession	
8. Agricultural land	
9. Production capacity (yields)	
10. _____	

6.2.10. Do you know about the new classification of poor households? Yes/No

6.2.11. If yes, do you apply it? Yes/No

6.2.14. If yes, since when?_____year

7. Recents improvements on infrastructures

What recent improvements on infrastructures were made in the village (commune) since 2002? (school, roads, irrigation system, etc.)

	7.1. Description	7.2. Year start	7.3. Year end	7.4. Fund source (if program, write the name of the program – 135, etc.)	7.5. Total cost of this program spent for this village '000 VND	7.6. Nb of beneficiaries in village
1						
2						
3						
4						
5						
6						
7						

8. Prices

8.1. What is in this village the price of…. (S)selling ,(B)buying

1 kg of sticky rice?	(S)	'000 dong	(B)	'000 dong
1 kg of ordinary rice?	(S)	'000 dong	(B)	'000 dong
1 kg of H'mong rice?	(S)	'000 dong	(B)	'000 dong
1 kg of pork?	(S)	'000 dong	(B)	'000 dong
1 kg of chicken?	(S)	'000 dong	(B)	'000 dong
1 kg of Tea leaves?	(S)	'000 dong	(B)	'000 dong
1 kg of maize (dry seeds)?	(S)	'000 dong	(B)	'000 dong

Questionnaire of Organization survey

Questions for Cooperative, private company and key persons.

1. When did your organization established?
2. Which commune, and village do you have contract farmers?
3. What is the distance from your orz to the villages?
4. When was the harvest season during last 12 months?

2.Name of Commune	2.Name of Village		3.Distance to the village (km)
	a.		km
	b.		km
	c.		km
	d.		km
	e.		km
	f.		km

5. Contract scheme
   5.1 What type of contract does your organization supply? E.g. paper contract, oral contract, etc.
   5.2 How many contracts do you have in each type? If possible, village b village.
   5.3 When did your organization start to supply this contract?

5.1 Type of contract	5.2 Number of hhs with contract		5.3 The first year they started this contract
1.	a.		
	b.		
	c.		
	d.		
	e.		
	f.		
2.	a.		
	b.		
	c.		
	d.		
	e.		
	f.		

   5.4 What kind of inputs do you supply to the contract farmers?
   5.5 Which frequency do you supply them?
   5.6 How much do you charge each of inputs to the farmers?
   5.7 Which frequency do the farmer have to pay back them?

5.4 Inputs provision	5.5 Frequency 1-every month 2-every week 3-every harvest season 4-other (specify)	5.6 How much you do you charge? ‘000VND	5.7 frequency of payback 1-every month 2-every year 3-when harvest finished 4-whenever they have money 5-other (specify)
1.Seeds		‘000VND	
2.Fertilizer		‘000VND	

3.Pesticide		‘000VND	
4.Extension Service		‘000VND	
5.Others		‘000VND	

6. Tea leaves collecting
   6.1How do you collect tea leaves from farmers?
      6.1.1 If you collect by tracks, how many employees do you have for collecting tea?
      6.1.2 How many tracks do you have?
   6.2 What can be the costs for collecting tea leaves?
   6.3 How much the each costs per 12 months?
   6.4 How often do you collect the tea leaves? (when the harvest season.)

6.1 1-by tracks 2-by ox-cart >>4.2 3-farmer brings>>4.2 4-other (specify)>>4.2	6.1.1 *If you collect by tracks….* Nb of employees for collecting tea leaves	6.1.2 Nb of tracks	6.2 *Select all…* 1-rent for track 2-purchase for track 3-saraly for employee 4-petrol for tracks 5-others	6.3 Costs/ 12months (total) ‘000VND	6.4 1-every day 2-every week 3-other (specify)
				‘000VND	

7 Tea leaves pricing

7.1 How do you decide your tea price?

7.2 Working and price in each month

Please let us know the price of tea (fresh / Kg) in each month and daily works in the tea field.

M	Price of Fresh tea/Kg	Main Works in tea field
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

Curriculum Vitae

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Education

1996 - 1999	Tsurumaru high school in Kagoshima, Japan
04/2000 – 03/2004	B. Sc. at the Faculty of Agriculture, Department of Agricultural and Resource Economics, University of Kyushu, Japan
04/2004 – 03/2006	M.Sc. at the Faculty of Agriculture, Department of Agricultural and Resource Economics, University of Kyushu, Japan
10/2004 - 03/2005	International exchange student at Hohenheim University under the grant of Baden-Württemberg- Stipendium
Since 06/2006	Ph.D. candidate at Hohenheim University, Department of Agricultural Economics and Social Sciences in the Tropics and Subtropics (490a)

Working Experience

05/2007 - 11/2007	Ph. D. research on the socio-economic impact of contract farming in Vietnamese tea sector in Moc Chau, Vietnam
04/2009 - 04/2010	Research associate in the collaborated research project of agriculture and rural development of Vietnam funded by Japan Society for the Promotion of Science (JSPS)
05/2010 - 05/2011	Consultant at Africa Rice Center, Benin. Conducted applied socio-economic research of Asian-type rice production system; impact analysis of Sawah technology adoption on household economy in Benin and Togo