Livelihood structure changes in the northwestern mountainous region of Vietnam

（ヴェトナム北西山岳地域における生業構造変化）

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June 2019

ACKNOWLEDGEMENTS

Firstly, I would like to express my sincere gratitude to my supervisor Prof. Satoshi YOKOYAMA for the continuous support of my Ph.D. study and related research, for his patience, motivation, and immense knowledge. His guidance helped me in all the time of research and writing of this thesis. I could not have imagined having a better supervisor and mentor for my Ph.D. study.

Besides my supervisor, I would like to thank the other member of my thesis examination committee: Prof. Kohei OKAMOTO, Prof. Yasuhiro SUZUKI, Prof. Makoto TAKAHASHI, Assoc. Prof. Keiichi OKUNUKI, Assoc. Prof. Kazuaki HORI, Assoc. Prof. Masaya IGA for their insightful comments and encouragement, but also for the hard question which incented me to widen my research from various perspectives.

I am indebted to the Ministry of Education and Training, Vietnam International Education Development, who founded the study with 3-years Ph.D. scholarship in Nagoya University, and I want to thank Vietnam National University of Agriculture (VNUA), Department of Environmental Management, Faculty of Environment science, who allowed me to pursue my study.

Special thanks to the JSPS KAKENHI fund (Grant Number JP16H03115), for their support in my research, especially my sincere thanks also goes to the local people and officers in Yen Chau district, Son La province, Vietnam and all the fantastic people that I have met especially in the Department of Geography, for all their great support in my research and living in Japan.

Last but not the least, I must express my very profound gratitude to my parents and to my husband and son for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of researching and writing this dissertation. This accomplishment would not have been possible without them.

Thank you very much.

ABBREVIATIONS

ASEAN	Association of Southeast Asian Nations
AFTA	ASEAN Free Trade Area
CF	Contract Farming
DARD	Department of Agriculture and Rural Development
Decision 80	Decision 80/2002/QD-TTg on 24th June 2002 to encourage the contractual sale of commodity farm products
DUS	Distinctness, Uniformity, Stability
GAP	Good Agricultural Products
GMO	Genetically Modified Organism
HH	Household
MARD	Ministry of Agriculture and Rural Development
NGOs	Non-Governmental Organizations
New mango	A native mango tree was grafted with Taiwan mango species
NMRI	Vietnam Maize Research Institute
NTP	National Test Procedure
Read Book	The certificates of land use right for each household
SMS	Short Message Services
VBARD	Vietnam Bank for Agriculture and Rural Development
VBSP	Vietnam Bank for Social Policies
VCU	Value of Cultivation and Use
WTO	World Trade Organization

ABSTRACT

The aim of this study is to explore the transition process in livelihood structure in the northern upland region of Vietnam under the globalization context. Twenty years of long-term maize monoculture that began in the 1990s have resulted in the heavily maize-dependent economy of the northwestern mountainous region of Vietnam, especially in Yen Chau, the core production area. Being on the way to open the gate toward globalization, Vietnam has joined and signed many international economic conventions which have brought both opportunities and challenges for the local agriculture products, maize is one example. Maize is the most important crop in Vietnam's northern upland region. It is credited with eradicating hunger and alleviating poverty. However, there is a paradox while Vietnam has to import the large amount of maize every year, the farmers living in the maize production cannot live with their income from maize.

In 2010, after five year joined WTO, Vietnam has removed import and value-added taxes as well as restrictions on import quotas for some agro-products, including maize. This period recorded the time when villagers in Yen Chau district started following the cultivation regime of annually changing maize varieties. This goes against the objectives of national test procedures for new seed. Chapter 3 of this dissertation focused on the characteristics of maize trading structure and its consequences to rural livelihoods. For the purpose, we have conducted data collection in three Tai Dam villages named Lac Ken, Suoi Bun, Luong Me and one Hmong village called Keo Bo. The number of interviewed households in 2016 and 2017 were 230 and 252, respectively. We also organized deep interviews with representatives of local authorities as well as 27 local maize traders.

The annually changing seed cultivation regime in Yen Chau is the consequence of the fierce competition between seed multi-national enterprises when Vietnam has joined the global economy. We found that the maize trading structure is centered on a three-level trader network

that plays a crucial role in connecting stakeholders. Strong social relationships along with weak credit/production commitments between farmers and traders have facilitated maize production throughout the region. Seed and supply enterprises target traders to promote their products and are the most important information channel for farmers. The findings of this study suggest that seed selection in Yen Chau has been basing on lack scientific foundation but the result of market factors. This problem has resulted in the increasing difficulties for farmer and forced them to find alternatives sources of income.

The second goal of this research, indicated in Chapter 4, has been set to make clear the changing trends in livelihood structure as well as the driving forces to the formation of new livelihood orientations. Representatives of 198 and 220 households in three Tai Dam villages were randomly selected for interviewing during from August to October in 2016 and September to November in 2017, respectively. Besides, semi-structured, in-depth interviews were also conducted with 30 individuals to better understand their motivations and the difficulties experienced by pioneers or innovative farmers in adopting new livelihoods in the study area. The transition in the structure of Yen Chau livelihood can be clearly seen through land use changes over time. Maize, the staple crop in Yen Chau since 1990s, had is a peak selling price in the period from 2010 to 2013 which resulted in an 8.6% increase in the maize cultivation area from mostly forest land in Yen Chau district. However, the continuous decreasing of global maize price since 2013 has led to the significant changes in major livelihood activities. As the results, the total maize area in study areas had decreased by 28.2% and replaced with grafted mango, sugarcane, and other fruit trees. Besides, the never-before-seen migrant work unexpectedly became a promising livelihood activity for local farmers. The development in livelihood structure in Yen Chau suggests the small differences in cultivated land areas and infrastructure facilities have fostered the transformation of livelihood. Differences in internal and external forces are believed to be the driving factors behind the new forms of livelihood activities.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER I. INTRODUCTION

1.1. Background and motivation of the research

The world population is currently 7.7 billion people and above 3.4 billion people living in rural areas. It is reported that the proportion of poor people in the world today tends to decrease, but it is estimated that about 10% of the population living at extreme poverty with income less than US$1.9/day, and above 1.9 billion poor people have less than the US$3.2/day in terms of income level. The poor often settle in rural areas and in which about one-quarter of the population has a source of income depending on small-scale agriculture (World Bank 2018). Agriculture is considered the major livelihood activities for rural people. Therefore, understanding of livelihoods in general and rural livelihoods, in particular, is immensely important for any country, especially in developing countries. Because only when seeing insightful to the view of rural livelihood, we will find the key to solve poverty that reduces urban pressure due to rural-urban migration phenomenon or international migration, simultaneously contributes to alleviating the imbalance in economic development and leads society towards sustainable development in the trend of current globalization.

One of the regions which are considered the most vulnerable in the globalization process is uplands. The upland areas account approximately one-fifth landscape areas and the lives place for a one-tenth population in the world. The characteristics of upland people are the living places for ethnic people with autonomy society, and farming practices are in self-subsistence style (Sinclair and Ham 2000). The upland in Southeast Asia is one of the examples where locate ten countries and is the home for over 35 million people (Mertz et al. 2009b). In the past, local livelihood condition depended on the indigenous experience formed through centuries (Conklin 1961). In centuries, it has been existing the scope and reaches of the lowland

states and Southeast Asia kingdoms. However, since intensive farming systems have been replaced in many areas where agricultural production was previously swidden cultivation, both society and economy today have been significant changes.

According to some researchers, the cause of this transition was the pressure of population growth, lack of arable land, farmers have to reduce the fallow periods (Boserup 1965). But when the fallow time was shortened, crop yields were also reduced due to soil loss of nutrients and increased turf (Thongmanivong et al. 2009), thus resulting in the eradication of swidden cultivating regime (Boserup 1965). Nowadays, it is thought that this statement is no longer entirely accurate, the root cause of the transition from swidden cultivation to an intensification of agricultural systems is the expansion of the market economy and the political orientation with strong involvement in the internationalization of forest conservation. Many studies show that swidden cultivation is an obvious cause of deforestation and soil degradation (Melillo et al. 1985; Myers 1993). Therefore a series of policy and action programs were designed to force people to limit swidden cultivation, such as forest classification according to the functions and purposes of the forest such as protection forests and special purpose forests and production forests. Each country has its criteria to manage, protect and regulate exploitation for each type of forest, or changes in land law that transferred the land use right of the public/community into the individual ownership so that the land also becomes a commodity, can be traded, exchanged with each other. The result of a series of regulatory, policy and action program adjustments was swidden cultivation has transformed into mono-cultivation such as oil palm, coffee, maize, fruit tree, rubber, sugarcane, and teak (Fox et al. 2014; Rasul and Thapa 2003; Ziegler et al. 2009).

Market factor, on the other hand, also has a vast influence scale while it dramatically speeds up the local livelihood transition. After the green revolution, it was recorded the gradual formation of the sale network, commercial transportation, suitable land-use policies with

transitions of a market (Dressler et al. 2017). The lives of farmers have gradually integrated with modern society, farming systems transferred to intensive agriculture as well as the development of road systems, communication, new equipment, and machines (Scott 2009b). This created a massive transformation in rural livelihoods. The livelihood has a big transition with "boom crops" such as, monoculture cash crops, perennial fruit trees, grass pasture (Ziegler et al. 2009; Schmook et al. 2013; Schmidt-Vogt et al. 2009; Hall 2011; Grogan et al. 2013; Thongmanivong et al. 2009; Mertz et al. 2009a). The importance regarding the over increasingly of cash crops as it has the pioneering role in terms of creating the combination of allied effects.

When the farmers' farming regime is converted from swidden cultivation into an intensification of agricultural systems, it also transforms the economy, creates markets for farm products and goods, and social relations among the communities people in upland areas also change. In addition, when expanding intensification of agricultural systems means increasing the use of chemical fertilizers, herbicides, and pesticides instead of manual labor like before, farmers have more free time. Therefore, it created waves of rural-urban labor (Rigg 2004). Migrants that continue to change their relation of land tenure and property rights, land capturing, simultaneously they increase their agricultural production and livelihood. The income was improved, but the economic and social gap becomes bigger in upland populations (Cramb et al. 2009; Vicol et al. 2018; Fox et al. 2009). Also, uplanders often live in far and remote areas, difficult in road access, inadequate information and markets, though the farming system has been converted to demand-oriented market, they are still limited in proximity to the global markets, such as fluctuating global agro-products price, scarcities natural resources. These are challenges for farmers livelihoods, and even push them to fall in pauperization (Vicol et al. 2018; Aggarwal 2006; Shah 2012).

As the same upland regions of Southeast Asia, upland farmers in Vietnam also have to face those problems. Vietnam has about 60% of the land area is upland regions, and 65% of the country's population with over 61 million people live in rural regions. Agriculture activities of local people, before 1986, was featured with swidden cultivation methods of traditional crops, for instance, upland rice, cassava, maize, along with beans and vegetables. Under the quick increasing population pressure, the land for agricultural production became a scarcity. Forest conservation has become more focused since the government localized conservation areas, which limits farmers from practicing swidden cultivation (Fox and Vogler 2005). Changes in land laws, forest protection, and management regulations forced people to abandon swidden cultivation practices to switch to permanent crops or annual cash-crops. However, they were soon faced with poverty and hunger. The government reacted with the problems by launching many national goal programs to turn around the uplands regions economy. This was followed by the establishment of permanent agricultural fields and efforts to intensify cultivation through the introduction of high-value crops. The farming system has focused on commercial farming systems utilizing additional inputs to intensively grow cash crops such as maize, vegetables, and fruits (Schreinemachers et al. 2013). Commercialization along with market integration has facilitated the diversification of agriculture other than rice, reducing poverty and improving economic conditions among households (HHs) (Minot et al. 2006; Tipraqsa and Schreinemachers 2009). From the province level downwards, the primary function of the national goal programs is to transfer up-to-date agriculture technologies through educating farmers, to build demonstrations, to popularize information, and to support farmers' productions (Minh et al. 2011).

As can be seen, after the 1975 war, Vietnam was under nearly 20 years of United States embargo. After that, Vietnam has officially entered the "open-door" (*Mở cửa*) period to join together and participate in import and export activities of all kinds of goods, including

agricultural products. In 1995, after becoming a member of ASEAN (Association of Southeast Asian Nations) and AFTA (ASEAN Free Trade Area), Vietnam gradually implemented preferential tariff plans for all types of agro-products. Specifically, all of the previous agro-products have a tax rate of over 20%. In 2001, it was reduced to less than 20% and by 2006 only 0-5% (Thang 2005). In 2005, Vietnam continued preparing to join the WTO (World Trade Organization) by issuing decision 46/2005 QD-TTg to remove import and value-added taxes as well as restrictions on import quotas for some agro-products (MOIT 2005). There has helped to diversify external commercial agro-products sources and develop domestic animal husbandry and agriculture production (Hung et al. 2015).

Expanding into new foreign seeds varieties and agricultural materials with supply and distribution networks was expected to bring production to a new peak (Kyeyune and Turner 2016; Spielman and Kennedy 2016). The outcome, however, was very different. According to Ichikawa (2014), when a Third World country like Vietnam, participate in the global playground with the rest of the world, such as WTO, the strong countries, for instance, European Union, often highlight neo-mercantilism for economic development that includes emphasizing agricultural production and export intensifying (Râmniceanu and Ackrill 2007). Neo-mercantilism operates by exporting redundant agrarian products resulting from the farming production programs to the Third World with a low price that protects the agricultural production market by imposing pressure on agriculture of the Third World (Ichikawa 2014). This strongly impacts on agro-production as well as the livelihood structure of local farmers in the upland regions of Vietnam, especially in the context of globalization and liberalization of trade now. Therefore, rural livelihood research always plays an essential role for both local people and government in order to recognize the opportunities as well as challenges.

In order to create a more comprehensive view on the livelihood structure of the poor in the uplands of Southeast Asia in the context of commercialization and globalization, this study

acts as a proof for pressure on the people in the upland regions. The study was conducted in upland areas of Vietnam, which is the main habitat of ethnic minority people, most of them are poor, inadequate facilities and communication. They have a long period of agricultural cultivation in the form of swidden cultivation and are entirely based on traditional experience, so when Vietnam integrates into the world economy, there has been strong impacts on the livelihood structure here. The objective of this dissertation is to clarify the process of changing the livelihood structure of ethnic minorities and the factors affecting the formation and conversion of that livelihood structure in upland areas of Vietnam.

1.2. Definitions and perspectives of rural livelihoods

1.2.1. Livelihoods and sustainable livelihoods

The term "livelihood" has been defined in a variety of ways by various authors. A livelihood, defined by Chamber and Conway (1992), was the most suitable as people's capacity to maintain a living. The term ‘sustainable livelihoods’ was first born in the report by Brundtland in the 1980s that aimed to combine both the concept of sustainable development with the emersion of the variety of livelihoods. The Brundtland study came up with the thinking of how to ensure the security livelihoods for poor people and offer enough long-term sustainable livelihood for poor farmers who are in lack of access to resources. However, the term “sustainable livelihoods” was not yet to be clarified. Therefore, the terms livelihoods and especially the concept of sustainable livelihoods have drawn much attention which considered as another approach to concentrate in for development activities. The research conducted by Chambers and Conway (1992), sustainable livelihoods were expressed: A livelihood includes the competencies, assets including comprising both materials and social sources, and activities served for living medium. The capacity of coping with and overcoming the stresses and shocks,

preserving or improving its competencies and assets, meanwhile not undermining the foundation of natural resources. That contexts can be thought of as sustainable livelihood.

Under the heavy influence by the definition of Chambers and Conway (1992), Ellis (2000) has added more details in this definition by emphasizing the importance of the accessibility to assets and the activities which are impact-able by socials relationship, for instance gender, class, relatives, and social belief; and national means of institutions. Livelihoods include capability, assets, for example, natural, human, social, financial, physical assets; and necessary activities such as livelihoods means. Sustainable livelihoods are often expressed as a result of various interactions between socio-economic, institutional, and ecological dynamics at levels from local to global (Sinclair and Ham 2000). Specifically, Aggarwal (2006) emphasizes that there is a link between local livelihoods and increased vulnerability due to shocks, crises, and changes in internal and external forces such as pressures economics, technology, politics, and society. The various components of livelihood activities include the tangible assets and resources as well as the intangible assets which can be seen as claims and accessibility. Therefore, the definition of livelihood sustainability must consist of the possibility or ability to avoid or to tolerate and recover from direct and indirect impacts including stresses and shocks. Access sustainable development is aimed to eliminate poverty which is very important to precarious farmers.

There are three factors answer the question of why the sustainable livelihood approach has been widely used for poverty reduction. Firstly, even when economic growth is considered as the essential for eliminating poverty, we cannot find any relationship between them as they all base on the potential of the poor to make use of enlarging economic chances. Therefore, it is essential to point out what exactly it is which prohibited or blocks the poor from enhancing their field in given circumstances so that the additional actions could be built accordingly. For the second factor, poverty was recognized by the poor themselves is not only about the low in

income but also containing other aspects like lousy health, incapacity, shortage of public social assistance, and the situation of vulnerability and the thinking of inefficient. Besides, we now understand that there exist many vital connections between different aspects of poverty which can be improved in one to also increase the positive impact to another. Educating people may contribute to the improvement of their health standard, and it inevitably can result in better production yields. Reduce the vulnerability of the poor with regards to their exposure to risk should strengthen their tendency to engage in the new and better economic value activities and other than that (Mclauglin and Dietz 2008). The last factor of the three relates to the recognition by the poor about their economic situation and their needs. This recognition always involved in the importance of the making of long-term and short-term development policies to improve the poor's lot. The design of these policies is often concentrated on implementation. Therefore, the assistant and cooperation of farmers should bring more positive results on the performance of the strategies.

1.2.2. Livelihood strategies and livelihood diversification

Livelihood includes the ability and capitals both material and social, and the necessary activities for lives (Chamber and Conway 1992; Ellis 2000). When connecting activities with the selections making people receive the livelihood goals, we can call that is livelihood activities (DFID 2000). Livelihood strategies can be understood as "different goals from survival to security, and finally for growth, depending on the income level of the HH, the time frame involved in mobilizing resources and the diversity of activities". There are three main types of livelihood strategies in rural people, they consist of (1) the intensive agriculture meaning "using natural resources for agriculture as a livelihood strategy either by intensifying resource use or bringing more land into use", (2) the diversity of livelihood income sources, including temporary or permanent sources to adapt with adverse conditions or store up and re-investment, (3) looking for migrate jobs in order to earn cash and generate remittances

(Scoones 2009). According to the definition of Chamber and Conway (1992), "a livelihood comprises the capabilities, assets, and activities required for a means of living." Hence, the activities term in this definition can be understood in income activities.

Although there have been many documents mentioning about rural livelihoods, however, to understand the motivations and the underlying causes affecting rural livelihoods decisions, it is still not a small challenge (Martin and Lorenzen 2016). Agriculture still maintains its crucial role in the rural community, but today the rural livelihood structure has become much more diverse and complex (Smith et al. 2005). It can be non-farm activities, such as off-farm wage labors, local traders, traditional handicraft, or migrate labors. This diversity depended on many factors, namely history, culture, custom, and geography in both scales of the local and nation (Ellis 2000). On the other hands, the livelihood activities or livelihood structures/livelihood strategies were formed by not only HHs' livelihood assets, the external forces including the particular trend in population, advancement in technologies, regional and global economic changes, fluctuation in price, etc.; political and institutional determination such as legislation, macro policies, regional planning, development orientation, etc.; and shocks, for instance, extreme weather events, diseases, etc. are also contributing to the evolvement of livelihood strategies (Neumann 2009; Zulu 2009; Daur et al. 2016; Green 2016; Ellis 2000). Livelihoods of people living in upland areas of Southeast Asia is one example; after a long time, they are only accustomed to cultivating indigenous plants for self-sufficiency to meet their own needs. Currently, they have moved to cash-crops through contract farming (CF) or instead of just restricting their lives in one area have increased their income through seasonal migration. The processes that rural HHs seek and increase their revenue to survive and develop are thought to be "livelihood diversification" (Ellis 2000).

Livelihood diversification is a prevalent phenomenon, and we can see it in many places from HHs' farming scale to wealth areas, it is not only a prominent feature of livelihood

strategies of rural regions of the developing countries. It can also be seen in urban areas in developing countries as well as in rural areas in rich countries (Ellis 2000). When combining many activities and achieving specific goals and motivations, it can be considered as a forming process of livelihood diversification (Perz 2005). Agricultural production in developing countries has to face many risks, and it is likely that farm HHs cannot meet the minimum needs for life. Therefore, they were forced to seek livelihood solutions to solve this problem (Chianu et al. 2008). As a result, most HHs must combine on-farm and off-farm activities, especially the role of off-farm activities is increasingly highly valued today (Martin and Lorenzen 2016). Some of the reasons why non-farm sectors are getting concerned by more rural people are (1) relatively good profits, (2) farmers need cash to pay for farm inputs investments, (3) help recover agricultural risks as natural resources become gradually exhausted, increasing extreme weather events and the disadvantage positions of poor farmers in the process of globalization (Reardon et al. 2000; Rigg 2006b). Also, off-farm activities also create new opportunities for conditional farmers to apply new advances as well as modern farming methods to increase yields and agricultural productivity (Evans and Ngau 1991).

1.3. Studies of rural livelihoods

1.3.1. Rural livelihoods research in developing countries

Although the theme of rural transformation, as well as the agrarian change in developing countries, is not a new topic, it still attracts the attention of many researchers. In the past, researchers pay attention to the issues of the socio-economic differentiation originating from export-oriented commodity production or speaking more broadly with the entrenchment of capitalism in rural regions (Akram-Lodhi and Kay 2010a, 2010b). Currently, most of the researchers' concerns are focused on the rural livelihood changes being heavily

impacted by commoditization/global market exchanges, and these changes can be continuous on the socio-economic differentiation. Specific case studies often assess the role of liberalization in agricultural production and its impacts on people's lives. This problem is studied in many different levels. When considering the macro level, the authors often analyze socio-economic differentiation associated with the theoretical context. In the community level, the research focuses on the interaction of liberalization policies to local livelihoods and case studies to identify village level dynamics (Gray and Dowd-Uribe 2013; Robbins 2012). The main topics of interest are exploitation related rural livelihoods in upland regions: land and resource dispossession, financial issues related to food and agriculture in the globalization context and rural-urban migration labor (Fairbairn et al. 2014).

In rural areas, there is a change in the structure of traditional crops to cash-crops which is also the beginning of dynamic changes in rural livelihoods. Gray and Down-Uribe (2013) described the agrarian change processing in cotton-growing-smallholders in Africa. The authors recognized that people with better economic conditions state had taken advantage of the current liberalization trend, so their lives have significantly improved. Meanwhile, poor farmers are becoming poorer; they fall into a debt burden. Since then, the differentiation of socio-economic has grown more profound; the financial gap between rich and poor has increased in society (Gray and Dowd-Uribe 2013).

The first cause of adverse impacts in rural livelihoods, it is due to instability in global agro-products price. For example, the cotton price in 2008 was about 30% lower than in 2004-2005 and suddenly increased in 2010 and then dropped sharply from 2011 until now. A part of the reasons for global cotton price declining was due to agricultural subsidies in the First World countries policies (Baffes 2005). Poor farmers are easily in debt because their production is mostly dependent on credit and after harvest they immediately sell harvest-products; the primary income is only income from cotton growing. As for those HHs who have better

economic conditions status, they are self-sufficient in production capital. Hence, they can provide adequate fertilizer and plant protection chemicals, hire more labors to harvest and ship products as well as production machinery that help to increase productivity even twice yields as many as poor HHs. Their production conditions allow them to become members of cooperatives and have the opportunity to access trade policies incentives and reduce market risks than poor farmers (Gray and Down-Uribe 2013). Besides, when all input materials for agricultural production operate according to market rules, it will gradually form the agro-products system, it includes everything from input to final agrarian products as well as stakeholders including local trader networks, retailers due to business, agricultural producers and processors (Isakson 2009). The research of Isakson (2009) in the Guatemalan uplands of Mexico, he has emphasized that the financial process has increased the asymmetric relationship between agribusiness-related stakeholders. Retailers and local traders always belong in financial backers' groups, agricultural producers and small farmers still lie placed in a weak position in this system. Since then, poor farmers often face risks such as increasing raw material prices and post-harvest products, which are difficult to access to formal credit (Isakson 2009; Swift 1989).

Moreover, the big wave changes from the traditional crop into commercial crops has appeared, it leads to the corollary in the ecosystem as well as rural livelihoods. According to Rótolo et al. (2015), under the market competition, there has interaction between seed enterprises which might lead to the manipulation of the seed supply. Argentina is an example, with 94% of its maize area occupied by transgenic (GMO) species, while GMO maize accounts for only 31% of the maize production worldwide. In research on the practices of maize seed supplies, Poku et al. (2018) found a positive correlation between poverty and the adoption of improved maize seed, resulting from intense market competition.

On the other hand, some researchers have pointed out the relationship between the phenomenon of impoverishment and globalization and liberalization processes. For instance, Shah's research (2012) in India found a substantial transformation in the rural area after the green revolution. At first, people believe the cause for the shortage in natural resources was rooted from the broken out of commercial crops. Evidence for this viewpoint was the adopt of high-yielding cotton. Cotton was planted in large scale in the mid-1990s which led to the outbreak of crop disease. After that, people replaced the high-yielding cotton with modified cotton in 2005. Sugarcane was another example, in Iguru village in Davagere of southern India from the mid-1980s to mid-1990s, this was a principal crop, its area was expanded from 15 acres to 800 acres in 1992 and 1995, respectively. Sugarcane farming also occurred for the uncontrollable phenomenon of well digging by local farmers and processing companies. After a short period, farmer fell in hard condition as affected by the fluctuation of global prices when products cannot be sold, depletion of freshwater, and the explosion of newer pests and diseases. Statistics has pointed out that with 3000 acres cultivated the land for sugarcane in Iguru village, 2000 tube wells were dug from the 2000s, but only 10% of those are still usable. Besides, over-cultivation led to the surplus of chemical fertilizer in the soil. In many areas, the soil is unusable for agricultural purpose then led to the lack of cultivation land in the region. Many farmers fell in the poor traps with a vicious circle of death and debt, and they finally found the way out by tragic suicide (Hardiman 1996). The researchers believed that the increasing number of deaths cased in India today is somehow strictly the relationship of the agrarian crisis and the trends of current liberalization, globalization (Münster 2012; Shah 2012; Mohanty 2005).

For the upland region in Southeast Asia, after a long period of swidden, globalization and trade policies have promoted the development of the market, infrastructure improvement. This incentive resulted in the strong alternation in local livelihoods (Glassman 2006; Podhisita 2017). Thailand is an example; the government has implemented programs focusing on

enhancement of transportation that connects remote areas. The promoted areas also included the borderland with Laos and Myanmar. Development of infrastructure will help support trading activities not only exchange for the local people but also for other necessity goods (Thomas et al. 2008). The farmer was encouraged to transfer their cultivated land to commercial crops, and they also realize the benefit from that. Indonesia and Malaysia farmers grew a large area of industrial rubber; Southern China, Thailand mostly grew coffee and tea (Fox et al. 2009). However, some authors argue that when farmers change their crops structure, they also have to change their production along with the requirements of the enterprise or the government. This adjustment might result in adverse impacts such as loss of agricultural land, reduction in soil nutrient and the long term farmers maybe become the hired worker in their land (Nga 2015; Ngidang 2002).

When mentioning the rural livelihood activities, in the past the researchers believe that there is always a boundary between rural and urban and it even required separate management methods for each region (Fairbairn et al. 2014). However, due to globalization and the trend of liberalization in trade, this boundary is gradually being erased. Rural HHs concept in the modern world is not merely the HHs with small production scale with self-contained, self-sufficient and income based on on-farm activities anymore. Today many HHs rural areas operate as the link of agricultural product processing factories when these HHs participate in farming cooperatives and produce with contract farming. Also, the income of rural HHs is now much more diverse. There are many different classes in the agricultural sector, but their people's lives are gradually being less dependent on agrarian sources (Wilson and Rigg 2003). On the other hand, under the pressures like population, land use policy, market issues have pushed farmers into a shortage of productive land, which motivates them to seek for more income opportunities from off-farm activities (Rigg 2006b; Fox et al. 2009).

According to Rigg (2005, 2006), after conducting large data sets in Thailand, Java and partly the Philippines, Rigg believed said that today agricultural activities had not played the core of income source in the lives of rural people. In addition to this, Vandergeest (2003) and Walker (2005) also show their findings on the lives of people living in upland areas. The authors argued that the livelihoods of uplanders in Laos and Thailand had undergone significant changes since the road and market system has been expanded. In particular, the development of small-scale manufactories, processing plants are helping people to find job opportunities in cities, coastal areas, and industrial zones. Next young generations are born later, although they also have upland fields or cultivated land, they still want to find other livelihoods in cities, towns or they even want to work in foreign countries like Hong Kong and Taiwan (Vandergeest 2003; Walker 2005; Rigg 2005, 2006b).

Many researchers also suggested that migration labor itself even impact rural communities. Through the remittances of the migrants, a large amount of funds is transferred from the foreign countries to the home country of the migrants. This money contributes significantly to improving people's lives as well as to speed up the de-agrarian process (Wilson and Rigg 2003). The process of rural-urban migration not only has a substantial impact on rural areas through remittances but also impacts on urban cities. Padoch et al. (2008) have findings in the study area in the Amazon Basin that the urban lifestyle is also affected due to migration processes. Those migrants with their living habits, customs and culture also change the urban lifestyle, gradually increasing the complexity in an urban society much more than it was before. Generally, the scientists have found the implications as well as the potential connections between migration flow, remittances, and market with the formation of a new rural society. Therefore, there is an interaction between rural and urban livelihoods; the boundary between the urban and rural areas will gradually disappear.

In the rural livelihood researches, we cannot forget the role of land resource which is the essential livelihood capitals. Farmers tend to maximize their income using on-farm activities when they have a large cultivation area, with support from authorities. In contrast, those who lack cultivation land prefer to engage in off-farm activities if they have access to information and transportation (Bhandari 2013; Tang et al. 2013). Besides, researches paid much attention to the correlation between rural livelihoods and conflicts in exploitation and use of resources (Blaikie and Brookfield 1987). Studies analyzing the conflicts of interest when developing the building constructions, large-scale projects adversely impact the lives of local people. For example, when developing large hydropower dams besides large-scale economic benefits, it also had negative impacts on residents, including losing land, their houses, their jobs and the right to continue access to common property (Siciliano and Urban 2017; Cernea 1997). Studying in the Yunnan in the south of China is an example of that issue. When the local people had to relocate their residences to the resettlement area, the area of arable land was compensated in a smaller amount. The unemployment rate increase, so people's lives become much more precarious than before (Wang et al. 2013). In Laos, the increasing trend toward migrant work among young people in rural regions is correlated to the management weaknesses of large-scale resource exploitation projects. These weaknesses have led to a lack of agricultural land with an unequal distribution of resources, forcing local people to find alternative livelihoods (Barney 2012).

1.3.2. Rural livelihoods research in the upland region of Vietnam

The topic of rural livelihood activities in the upland region of Vietnam has been studied by many domestic and foreign researchers. The studies are divided into two main phases, including collectivization from the 1960s to beginning 1980s, and the global period from mid-1980s to present (Nga 2016). At the first period, when Vietnam was still in the war, farmers attached their livelihood activities in agricultural cooperatives, from the 1960s to 1980s

to northern area and late 1970s to 1980s in the southern region. The livelihoods of people in upland areas were still self-sufficient, so they were dominated mainly by cultural and historical conditions (Womack 1992; Vien 2007; Donovan et al. 1996; Sadoulet et al. 2002).

Since the economic revolution in 1986, there has dramatically affected the livelihood of ethnic minorities. The traditional livelihood activities have gradually been changed and oriented according to the state development programs. The result of the series of policies supporting programs for people is related to land, financial and technical support, etc. (Sunderlin 2006). In the beginning years after *Doi Moi* 1986, pro-market reforms create diversification of commercial farming, particularly in this period cash crops were core plants; traditional subsistence crops were replaced (Huy 2017). So, it marked a transformation in the agro-products systems of ethnic minorities. The development of a material market for inputs and consumption of agricultural outputs and the establishment of rural financial markets played an essential part in agricultural production. The agrarian productivity has improved and helped to increase the income level simultaneously reducing the poverty rate (Thang 2005). However, this change has also brought negative impacts. The inputs for production are entirely dependent on the market explaining for the fact of accepting the risks of price fluctuations, while in the self-sufficient economy, the dangers of the market price are less likely to be affected the local livelihoods. (Magrini et al. 2018; Zeller et al. 2013).

When referring to the market impact on the livelihood of uplanders, some researchers focus on the issue formation method and activities from local traders and retailers. In difficult economic conditions, infrastructure and information are still limited, but production requires initial capital investment. Hence, it leads farmers in upland regions to fall into poverty because they are dependent on capital for production on informal credit sources (Zeller et al. 2013; Keil et al. 2008; Minot and Goletti 2000). In the study of Hmong people in Dong Van district, Ha Giang province in the northeastern upland region, Kyeyune and Turner (2016) argued that the

expansion of hybrid maize causes a lot of risk for people's livelihood structure. Firstly, to make hybrid maize useful and highly productive, it is necessary to cultivate on flat land, this is the first obstacle for the local people. Secondly, to develop hybrid varieties means spending much cost for seed, fertilizer, and annual herbicide plus the cost of post-harvest (Kerkvliet 2006). Thirdly, to cause a lack of diversity in agricultural products of HHs. Previously when cultivating traditionally, the Hmong cultivated intercrops between traditional maize with bean, pumpkin, hence, this not only helped to diversify food but also contributed to the enhancement of soil nutrients (Cassman et al. 2002). Additionally, with the cultivating of traditional maize method in the past, people can be used as HHs food, but hybrid maize is only consumed for animal feed or alcohol production. Therefore, only 20% of the respondents in the study thought that their life was better when developing maize monoculture, the majority of the local farmers were more difficult lives than before (Kyeyune and Turner 2016; Turner 2012).

On the other hand, Henin (2002), with case study of Nung people living in Lang Son province of northeastern upland regions, indicated that the process of commercialization in agricultural production in the uplands of Vietnam has led to social differentiation, and the financial gap is getting bigger and more significant in the community of ethnic minorities. The cause of this income gap is due to differences in land ownership. In contrast to Nung people in the northeastern, the reason for the difference in income of Tai Dam in the northwestern upland region stems from commodity markets. Commodity markets are considered the main springboard for livelihood transformation, as well as changing landscapes of Tai Dam people (Sikor and Vi 2005). Another factor impact on the rural livelihood of ethnic people living in upland regions is the national programs and new policies. Although all programs and policies aimed at giving prioritizing poverty reduction from central to local levels are implemented in the upland of Vietnam (Nielsen et al. 2018), the effect sometimes is not good. Study of Bonnin and Turner (2012) in Hoang Su Phi district, Ha Giang province is one example. In order to

solve the poverty of ethnic, the local government encourages the farmer to grow hybrid crops. However, in many cases, the programs or policies hurt people's livelihoods, because of the imposed top-down approach. Therefore, many places severely affected people's lives while being applied, making them more and more hungry and difficult. Although the ethnic minority poverty rate has decreased, this is only a number based on the economic income compared to the poverty line regulated. Actually, people's lives are thought to be riskier and vulnerable to the effects of externalities than the previous self-sufficiency period (Scott 2002).

Among the livelihood assets, cultivation land is considered to be the vital factor affecting the livelihood choices of farmers in Vietnam (Kono and Rambo 2004). The land is a unique asset that has value; thus, HHs that have large cultivation land holdings have a significant advantage in agricultural production (Saint-Macary et al. 2013). However, some have argued that, in special situations, the increasing shortage of land may create the opportunity for a positive trend toward diversifying livelihood strategies and reducing dependence on on-farm activity sources of income (Tuyen 2014; Neef et al. 2006). In research on livelihoods at the community level in Bac Kan province in the northern upland region of Vietnam, Pinyopusarerk et al. (2014) indicated that even when the area of the community land budget for public purposes had been stipulated under the Land Law, in many regions this type of land was no longer kept. Community land budget in Vietnam is understood the land based on the average amount of agricultural land per capita, the characteristics of the soil, and the needs for local development, every village and ward can reserve a proportion of their agricultural land fund for public purposes, as long as it does not exceed 5 % of the total land area. The public purposes land budget can be rented for no longer than five years for growing annual crops and perennial crops, and for aquaculture production. However, any village or commune whose community land budget was still available would provide both monetary and non-monetary value for the local people.

Besides the role of arable land affecting the livelihoods of people in upland areas of Vietnam, many researchers are also interested in forests lands. Despite the provisions in land law in Vietnam, there is an obvious distinction between agriculture and forest land use. In terms of HH livelihoods, these two land types will be overlapped to each other (Alther et al. 2002). Trædal and Vedeld (2018), when having studied in Bac Kan province in the northern upland region of Vietnam, indicated that for poor HHs, the values from the non-forest products do a role not only as a kind of livelihood asset but also are an indispensable source of income for people. Moreover, thanks to policies and changes in forest land management, it has brought benefits to local livelihoods. HHs not only receive forest land tenure but also participate in forest protection in the form of contracts with state forest management, which also aids farmers for financial status (Thuy and Masuda 2018; Lambini and Trung 2014; Trung et al. 2010; Lua et al. 2017). Besides, soil factors also have a significant impact on the livelihood of uplanders. Under the topography condition, cultivation methods and the pressure of population growth now, these factors can lead to reducing the fertility of the surface layer (Karl et al. 2013). In particular, the maize monoculture system can cause to lose annually up to 174 tons/ha, and this number is even higher in the heavy rainfall years. Therefore, this is directly reducing crop productivity, increase input costs for production, reduce cultivated area, and in the long run, will threaten sustainability in people's livelihoods (Tuan et al. 2014; Dung et al. 2008; Schweizer et al. 2017; Saint-Macary et al. 2010).

Other factors such as culture, education, and customs also contribute to indirect impacts on land use and alter the crop structure farmers (Vien 2003). Ethnic minorities in Vietnam always live in upland regions which are geographical isolation, underdevelopment of traffic, infrastructure (Alther et al. 2002). Hence, it is difficult for ethnic people farmers to acquire new knowledge, training programs, and extension programs, promoting agrarian transformation. The national language, or called Vietnamese, is also the significant barriers

prevent people from livelihoods diversification (Hoa et al. 2017). On the other hand, mostly the national programs of rural livelihood improving in the upland region were approached in a one-way direction from top to bottom, the culture, manner and customs factors were not deep mindful. Hence, the effects will undoubtedly be low (Minh et al. 2011).

In the northwestern region, when the national road number 6 was finished, the connection between the upland provinces and delta areas have created. There is a dramatic alternation in land use and brought many opportunities for local rural development. People find it easy in the way of accessibility to the market system, health care facilities, schools. They gradually shifted to producing market-based agricultural products, resulting in changes in crop structure, continuously forming innovation and appearing new livelihood activities (Castella et al. 2005; Walle 2002). The market transformation and development of the road network, the movement of people has been loosened and more liberal than before. The process of rural-urban migration has reformed the structure of rural labor, as in the past, HHs formed labor exchange groups and supported each other, but right now they use the earned money from migration labor to hire labor. After that, it led to the formation of land redistribution, the HHs who lacked employment in the countryside would transfer the land to the remaining HHs in the locality (Anh et al. 2012). On the topic of rural-urban migration in Vietnam, the authors focus on exploiting the related issues with gendered networks, gendered house-holding (Anh 2011a, 2011b; Khue et al. 2018; Minh and Locke 2014) and only concentrate on many remoted jobs of people in rural areas in the Red River delta or the Mekong River delta (Paris et al. 2009; Giang 2018). Some researchers argued that one of the consequences of changing farming systems in the uplands when switching from the subsistence system to commercial farming system that increases the number of people working off-farm work (Schreinemachers et al. 2013). Also, one of the driving forces for ethnic minorities is determined to work far away is

because they are falling in debt-poverty and migration-related debt considered one of the livelihood solutions (Saint- Macary et al. 2013).

In sum up, making livelihood decisions for HHs is a crucial matter especially in rural areas of developing countries, that is usually shaped by the willingness of farmers, existing livelihood asset, monetary cost, time consumption, risk level, familiarity, and experience (Ellis 2000; Small 2007; Radel et al. 2018). These factors are all mediated by personal confidence, social status, and standardized beliefs associated with important people such as parents, spouses, and leaders (Singh et al. 2016). Previous studies of the upland regions of Vietnam have focused on the influenced of HHs' livelihood assets on the formation of livelihood activities. However, apart from livelihood assets as an internal factor, other external factors, including cultivation land shortages, the extension of the market system, the development of a local significant, and the promotion of policies also have a significant influence on livelihood choices (Kono and Rambo 2004; Neumann 2009; Zulu 2009; Daur et al. 2016; Green 2016; Ellis 2000).

CHAPTER 2. STUDY AREA AND METHODOLOGY OF RESEARCH

2.1. The basic characteristics of natural, economic and social conditions in major regions of Vietnam

Vietnam belongs in the Southeast Asia region, bordering China to the north, Laos, and Cambodia to the west, east to the South China Sea or called *Bien Dong* in Vietnamese. The Vietnamese mainland extends 1,650 km length from north to south, the widest part on the mainland about 500 km, the narrowest place is nearly 50 km. Vietnam has about 332,000 km^2 land area and 63 provinces. The population in 2018 was 94.66 million people, and the number of people living in the rural area is 61.03 million people. Vietnam is a country with a diversity of 54 ethnic groups, of which the Kinh majority and the remaining 53 make up less than 15% of the country's total population (General Statistics Office 2017). Fifty-four ethnic groups of Vietnam are classified into main groups such as Viet-Muong, Tai-Kadai, Kra, Mon - Khmer, Hmong - Mien, Malayo-Polynesian, Chinese or *Hoa* in Vietnamese, Tibeto - Burman. Actually, this way of dividing into eight groups is not yet finalized, some documents are broken down into groups or combined. For example, according to Keyes (2002), the Tai-Kadai group includes the Kra group. However, according to Ostapirat (2000), although Kra and Tai-Kadai groups have a similarity in Tai language, Kra is an entirely independent group with Tai – Kadai.

From the time of the Nguyen Dynasty in 1834, according to the instructions of King Minh Mang, Vietnam at that time named Dai Nam was divided into three major regions, namely the North (also known as *Bac Ky*), Central (*Trung Ky*) and the South (*Nam Ky*) (Woodside 1989). Today, to make it easier for the socio-economic development strategies, each North, Central, South is divided into two smaller regions. The North including Northern

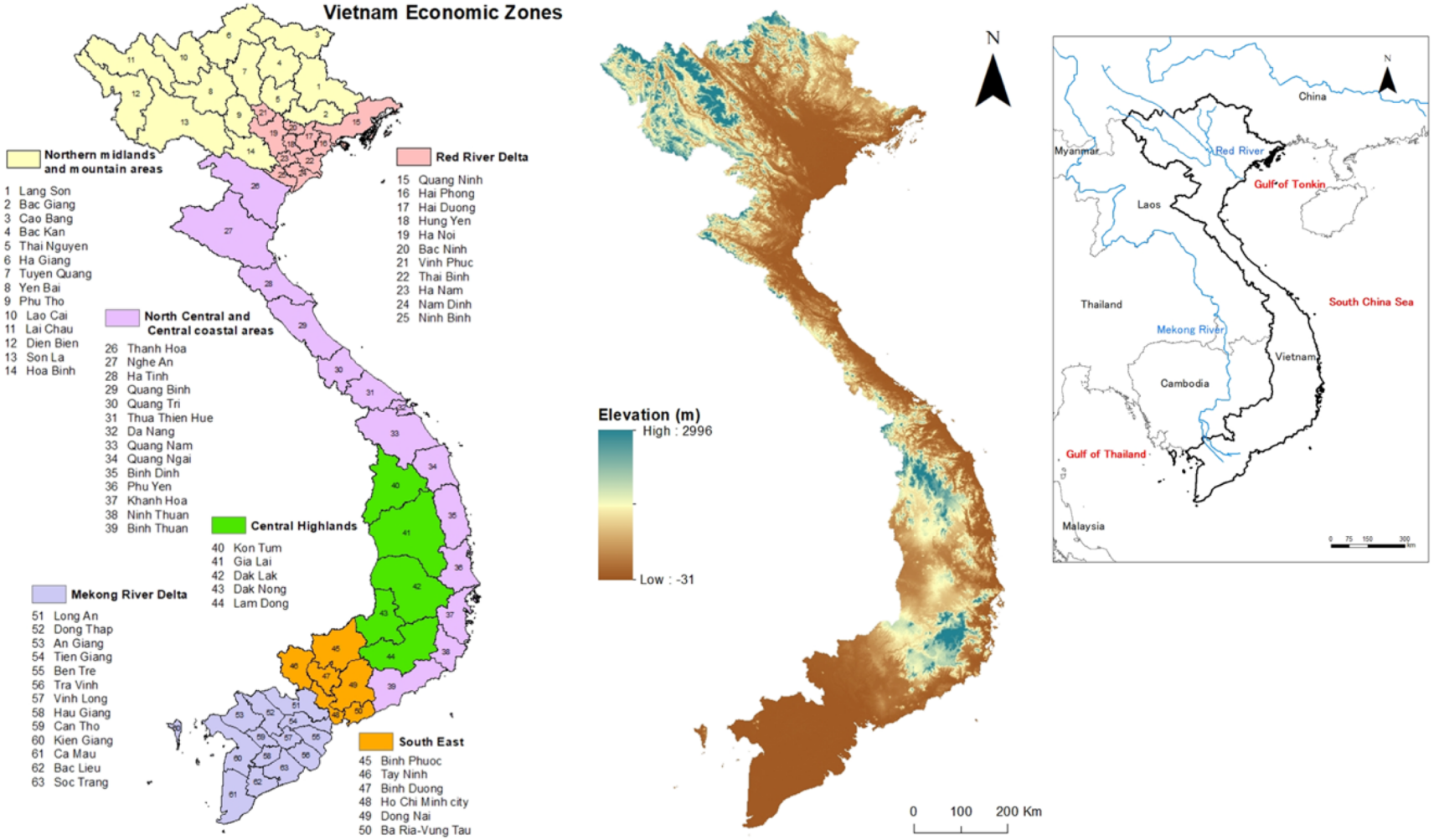


Figure 2.1 Six main economic regions and elevation map of Vietnam

midlands and Mountain areas, and Red River delta. The Central region including North central and Central coastal areas, Central Highlands and the South including South East, and Mekong River delta (Figure 2.1). Among these six regions, the mountainous northern and Central Highlands areas have high and rugged topography, and these two regions are also the primary habitat of 53 ethnic minority groups of Vietnam (Appendix 1).

In these six socio-economic regions, South East is considered a leading dynamic economy of the country. Next is the Red River and Mekong River deltas. These two lowlands deltas regions have fertile soil, thanks to a large volume of annually sediment deposition which favorable for agricultural production. Red River delta is located in the North of Vietnam, in the western coastal area of the Gulf of Tonkin with an area of over 21,000 km^2 and a population in 2017 of over 21 million people. The area of Mekong River delta is over 40,000 km^2, having the borders with the north-west of Cambodia, the southeast of the South China Sea and the South-West of the Gulf of Thailand. In particular, Mekong River delta plays a significant role in food security for not only Vietnam but also Southeast Asia. It provides 90% of rice production and 50% of food for both Vietnam and helps Vietnam become the second largest rice export country in the world and contributes 60% of seafood products exports (Liu et al. 2017; Anthony et al. 2015; Bui et al. 2018; Niculescu and Lam 2019).

North Central and Central coastal areas have the largest area with 95,872 km^2 of the six economic regions (Table 2.1), covering 14 provinces on the narrow strip of land between Annamite Range (*Truong Son* mountains) and the South China Sea. This region is usually divided into two sub-regions (1) North Central, consists of Thanh Hoa, Nghe An, Ha Tinh, Quang Binh, Quang Tri, and Thua Thien - Hue provinces, and (2) the central coast, concluding Da Nang, Quang Nam, Quang Ngai, Binh Dinh, Phu Yen, Khanh Hoa, Ninh Thuan, Binh Thuan provinces. North central sub-region terrain is complex and fragmented, so it does not form large-scale intensive farming areas such as Red River and Mekong River deltas. The

Table 2.1 General information on the six main economic regions in Vietnam

	Area (km^2)	**Population density (person/ km^2)**	**Average income (vnd/capita/ month)**	**Living expenditure (vnd/capita/ month)**	**Poverty rate (%)**	**Percentage of HHs hygienic water (%)**
Red River delta	21,260	1,004	3,883,000	2,364,000	3.1	99.4
Northern midlands and mountain areas	95,222	128	1,963,000	1,551,000	23.0	81.3
North Central and Central coastal areas	95,872	208	2,358,000	1,685,000	11.6	93.1
Central Highlands	54,508	106	2,366,000	1,620,000	18.5	87.5
South East	23,553	711	4,662,000	2,846,000	1.0	98.9
Mekong River delta	40,816	435	2,778,000	1,741,000	8.6	91.5

Source: General Statistics Office 2017.

Central coastal area has a favorable economic position; the largest resource of the sub-region is the marine economy. The ethnic composition of North central and Central coastal areas is Kinh, and a small part of ethnic minorities such as Cham, Katu, Cadong (Le et al. 2013).

As illustrated in Table 2.1, we can see that between the main economic regions of Vietnam there is a relatively big difference between regions. Specifically, Red River delta and South East are the two smallest areas, but having the highest population density and the highest per capita income in the country. There is also the central living place of the Kinh people. In contrast, Northern Midlands and Mountain areas and Central Highlands where almost minority ethnic people live in, are the two most under-population density areas and poorest living standard in the country. The Central Highlands is an area with highland terrain, with the west bordering Laos and Cambodia. The area consists of five provinces with an area of 54,508km^2 accounting for about 17% of the country area and has 14 ethnic minority groups such as Jarai, Ede, Mnong, Kohor, Bahnar, Bru. According to general statistics office (2017), the poverty rate in the Central Highlands is the second highest in the country, the number of poor HHs accounts for 18.5% in the whole region. With soil characteristics of basalt soil at an altitude of about 500-600 m above sea level, Central Highlands is suitable for industrial crops such as coffee, pepper, cashew, and rubber (Minh et al. 2015, 2016; Evans 2018).

Midlands and Northern mountainous areas have an area of about 95,222 km^2, accounts for about 28% of the whole country area. This place is diverse in terrain, ecosystem, and culture. The climate in this region is divided into two seasons, the cold season from November to April of the year with the hot season from May to October. The climate is characterized by a tropical monsoon with an average annual rainfall of 1,600 to 2,500 mm, and most of the rain accumulates from April to October. Therefore, the agricultural production of people mainly takes place in six months during the hot season. Many places have steep slopes, high mountains, mixed with streams and deep rivers. More than 50% of this area has a slope of over

20 degrees (Minh 2009). The northern upland region, was located for more than 12 million people belonging to 31 ethnic minority groups, is the most diverse place of ethnicity and culture, such as Tai, Hmong, Yao, Khmu. The agricultural sector is the major economy of the regions which accounts for more than one-third of the region's total income. Industry and construction sectors are weak, accounting for only about one-fifth of the region's Gross Domestic Product (GDP). The economic development of the region is very slow; people still face annual food shortages. Poverty in the northern upland region has resulted from the difficulties in a geographical location which is remote, isolated, lack of infrastructure and cultural diversity (Tuyen 2015). The northern upland region is divided into two sub-regions, northeast and northwest. The northeastern region extends from the coastline along the China border to the Red River delta, and the terrain is predominantly medium and low. In the northwest, the region consists mainly of medium and high mountains. This is considered the place with the highest and most dangerous terrain in Vietnam (Donovan et al. 1996; Minh 2009).

On the other hand, according to General Statistics Office (2015), the economic structure of Vietnam has three significant sectors which are (1) agriculture, forestry, and fishery contributing to GDP of about 17.4%, (2) industry, including mineral exploitation, processing, construction, construction materials, processing industry, gas production and distribution, electricity and water, accounting for 38.8% and (3) trade, services, finance, tourism, culture, education and health accounted for 43.7% of GDP. Although the GDP in the agricultural sector is the lowest, the dominant economy in rural and upland areas is mainly dependent on agricultural production. Rice, maize, sweet potato, cassava are still stapled food crops for agriculture (Figure 2.2). According to General Statistics of Office (2016), while the Red River and Mekong River deltas are the main rice bowl of the whole country, accounting for 69% of the national rice area, the Northern Midlands and northern mountainous regions, and Central

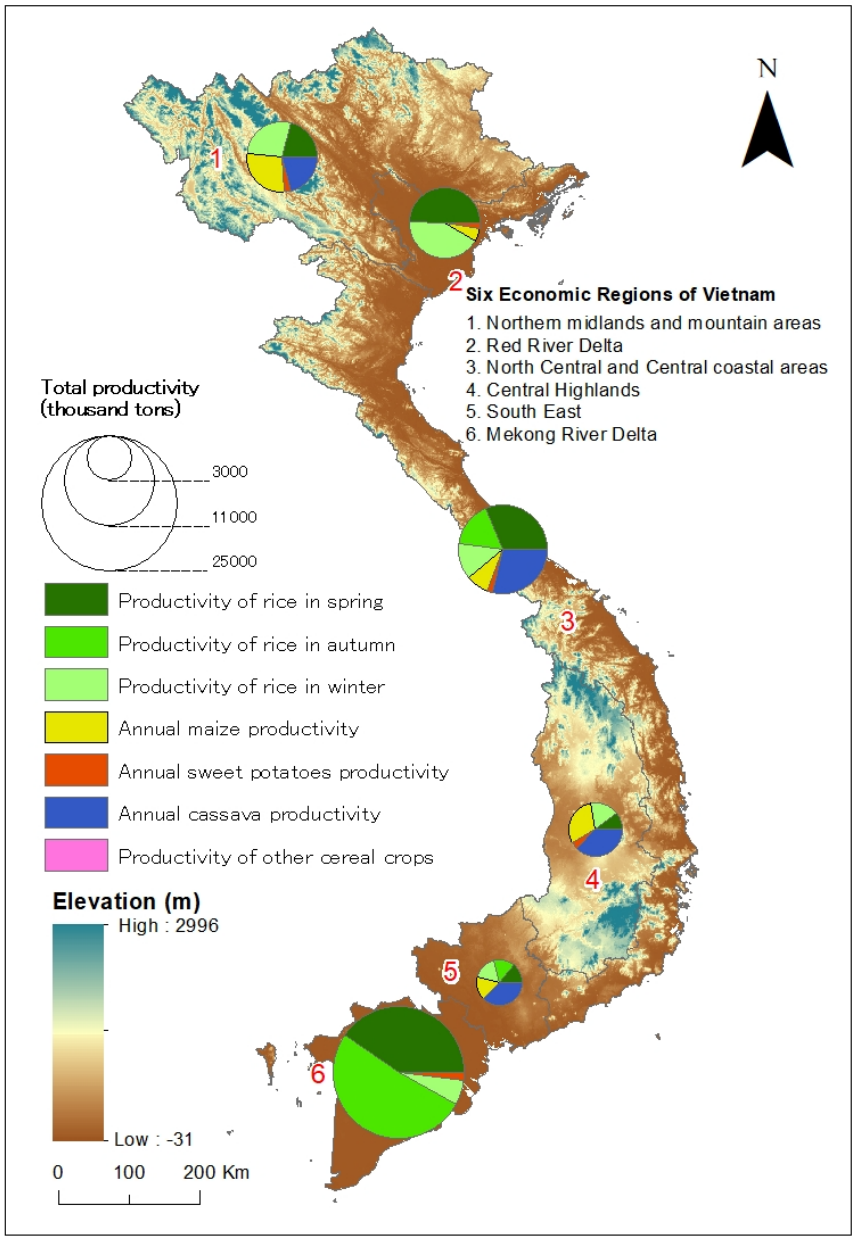


Figure 2.2 Productivity of major crops in six economic regions in 2016

Source: General Statistics Office 2016.

Highlands are the main areas of maize production for Vietnam, covering up to 65% of the national maize area in 2016 (Figure 2.3).

In sum up, among the six main socio-economic regions of Vietnam, the upland areas, especially the northern upland areas, are facing many difficulties. The northern uplands where has rugged terrain, barren land, limited transportation, and lack of communication information, has the poorest living standard in the country. This is the place with the highest ethnic diversity, cover about 60% of ethnic people groups, in the country. Their main livelihood activity is agriculture, mostly depending on the maize production. However, the local people are familiar with agricultural activities according to local experience and knowledge for a long time (Ha et al. 2004). Therefore, in the context of Vietnam's current global economic integration, this region will face many new challenges.

2.2. Land-holding system

Vietnam's territory has about 74% or approximately 24.4 million hectares, is considered "highland", of which 20 million hectares have a slope of over 15^0. This is the habitat of most ethnic minorities in Vietnam. Before 1986, about 50 out of 54 ethnic groups in Vietnam swidden cultivation (Donovan et al. 1996). Site selection for swidden farming is influenced by many factors; the distance to the residential areas and soil fertility are highly concerned (Neef et al. 2006). To estimate soil fertility, farmers usually judge through various indicators from the saturation of surface soil layers to the nature of vegetation coverage (Karl et al. 2013). Each HH often seizes three to four and occasionally five swidden plots at different places depending on the number of labors and the demand for food. A general swidden plot is often small of less than two ha (Bass and Morrison 1994).

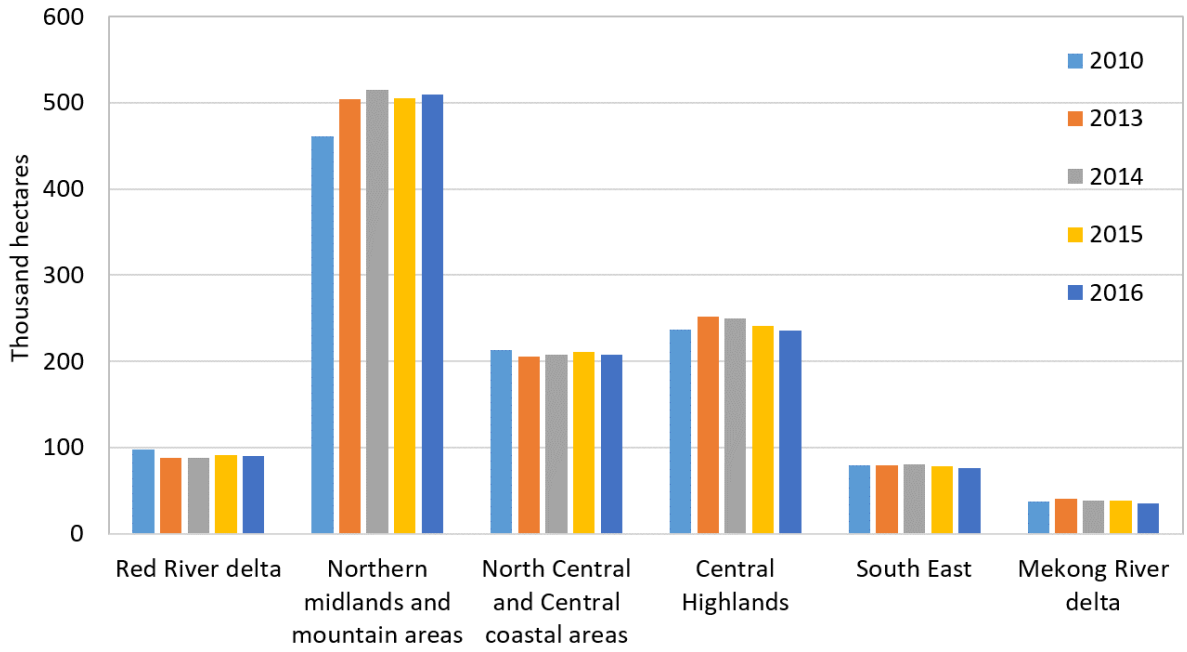


Figure 2.3 Maize area in six major regions of Vietnam

Source: General Statistics Office 2016.

Since the 1960s, there were some migration movements from the New Economic Zone program by the government that encouraged Kinh people, majority people in Vietnam, in Red River delta region to help local people learning the national language and establish permanent cropping (Hoa et al. 2017). Because the period of 1961-1965 was the period of north Vietnam implementing the first 5-year plan and coping with the first US air force sabotage war. At that time, people in the north Vietnam carried out two major tasks of building and fighting the enemy while supporting the south people. In that context, the 3rd National Party Congress of the Communist Party of Vietnam held a resolution on mountainous agricultural development which affirms the determination of "Making the mountainous region catch up with the lowland, the ethnic minorities keep up with the majority people". Implementing a policy of bringing people from the lowlands to the northern mountains, through many waves from the 1960s to the 1980s, many people went to the mountains to settle their living. Through these new waves of economic construction, not only did it improve the relationship between the mountainous people and the plain, but it also helped to maintain the border area of the country.

At that time, farmers tried to consolidate their subsistence life by over-expanding cultivation area for growing food crops such as rice, cassava, and maize. The land which favorable to transportation and irrigation was preferred to reclamation, and other difficult lands come after (Sikor and Truong 2002; Sadoulet et al. 2002). Under the pressure of population growth and migration, upland people have to shorten the fallow time of their land. According to Vien (2007), people can maintain a minimum living standard based on swidden cultivation, only when the population density is 5-10 people/km^2. When studying the Dao of the Hmong-Mien group living in Son La province in northwestern Vietnam, before 1986 the swidden cultivation cycle was usually two to four years of upland rice and followed by two years of cassava and then continue with the fallow period of approximately ten years (Bass and Morrison 1994). However, until the 1990s their farming cycle was shortened, upland rice was

planted for one to two years, then one to two years for cassava cultivation and finally land fallow just only three years. At that time, researchers on the Southeast Asia region such as Phillippines, Thailand, Indonesia, Laos, and Vietnam argue that swidden cultivation is a significant cause of deforestation and leads to serious soil erosion. They argue that swidden cultivation in the uplands is a form of traditional agriculture and it is estimated that each person needs about 1.8 ha for agricultural purposes. Therefore, the reason for a large area of forest loss and irreversible in Southeast Asia is due to swidden cultivation (Lanly and Rao 1981). After these studies were published, policymakers and local governments all considered this as a basis to set regulations and the national programs to encourage uplanders to switch from swidden cultivation to settled farming.

The economic system of Vietnam, at that time, was replaced by a socialist-oriented market economy. When the country began the comprehensive “Doi Moi” (Renovation) program in late 1986 that brought quite many significant modifications to the agricultural sector. Specifically, Vietnam 's first Land Law, which was established in 1987 and took effective from 1988, stipulates that even when land is still owned by the people and managed by the state, land use rights have been transferred from the cooperative farms to HHs with a shelf life of 15 years for agricultural land (Trung et al. 2010). Through a short time of distribution of land use rights, the revised 1993 land law added more detail regulations about land use rights with long-term tenure security had been given to farmers (Henin 2002). The certificates of land use right or so-called Red Book were issued for people. Red Books are considered as HHs’ properties which can be used for exchange, transfer, inherit, mortgage, and for lease. Farmers were eligible to self-determination of which tree to grow and which animal to raise. The Red Book also states the land use duration for annual crops is 20 years and 50 years for perennial trees. The state through local government maintains the control of transactions, land leases and local land use plans (Saint-Macary 2010; Thuy and Masuda 2018).

Since the land law came into effect in 1993, it came with the end of the swidden cultivation period in the uplands. However, the process of issuing Red Books at the uplands has encountered many difficulties, causing prolonged implementation time. Barriers such as culture, custom (Sikor and Truong 2002) plus administrative costs related to land measurement, issuance, and registration of land use certificates and lack of qualified personnel should wait until 1998, less than half of the northern upland area was granted a Red Book. Specifically, the villages of Tai Dam and Hmong of Yen Chau district, Son La province, until the 1999 people received a Red Book (Sant-Macary 2010).

By 2003, the Land Law continued to have amendments and supplements to agricultural land allocation limits for people. Specifically, for each HHs, individuals are assigned no more than three hectares of annual crop-land, land for salt production and aquaculture; not more than 10 hectares of land for perennial crops in the plains areas and 30 hectares in the mountainous and midland regions. Based on the land area in each locality, the provinces will have specific regulations on the minimum area for each type of agricultural land. However, Vietnam is currently in the context of integration with the regional economy and in the world, the production of general and agro-products, in particular, needs to be done on a larger area. Land restrictions have become a barrier to expanding production. Therefore, in 2013, the prime minister of the government has approved the decision 62/2013 QD-TTg on the policy of "promote development, cooperation, production integration by the consumption of agriculture products on large fields". After that, local authorities based on the specific local conditions to list out the requirements for the large fields. For instance, Son La People's Committee has released the decision 3551/QD-UBND in 2014 on "issuing the criteria on large fields in Son La province toward 2020" for each specific crop. For example, maize, mango, and sugarcane required the minimum area for a large field of 100 ha, 50 ha and 100 ha, respectively.

Table 2.2 Area and productions of maize by province in Northern midlands and mountain areas of Vietnam

Province	2010		2013		2014		2015		2016	
	Area[a]	Production[b]	Area	Production	Area	Production	Area	Production	Area	Production
Ha Giang	47.6	136.3	52.6	176.9	54.2	178.4	54.8	186.5	53.5	185.1
Cao Bang	38.5	116.2	38.8	131.3	39.0	128.1	39.9	133.5	40.1	136.7
Bac Kan	15.9	57.3	16.4	66.9	16.6	64.1	16.4	67.7	16.4	66.5
Tuyen Quang	16.7	70.7	16.2	71.0	15.9	68.0	4.6	81.0	18.4	80.4
Lao Cai	31.1	101.6	34.7	122.2	39.1	117.7	36.8	133.2	37.6	138.4
Yen Bai	22.6	64.7	26.7	84.5	28.5	83.6	28.2	93.0	28.6	95.4
Thai Nguyen	17.9	75.2	19.0	81.6	19.5	79.2	21.0	88.0	20.1	86.3
Lang Son	20.2	97.2	22.0	105.4	21.6	98.4	22.1	104.4	22.2	108.1
Bac Giang	12.3	44.9	9.3	35.3	10.1	39.4	10.7	42.3	10.7	43.0
Phu Tho	20.7	90.4	18.6	84.4	18.7	85.8	19.2	89.5	18.7	87.2
Dien Bien	29.1	67.4	29.3	74.2	29.9	76.1	29.7	76.2	30.0	78.5
Lai Chau	19.4	50.1	21.2	57.3	22.1	62.1	22.7	66.0	22.8	69.6
Son La	132.7	417.4	162.8	654.7	162.5	657.7	159.9	588.7	152.4	593.2
Hoa Binh	35.9	146.0	36.9	153.4	37.6	152.2	38.9	162.6	38.0	163.9

[a]: Unit for area is thousand ha, and b: unit for production is thousand tons.

Source: General Statistics Office 2016.

2.3. Study areas

Midlands and northern mountainous areas were selected as the target research. This region has the largest percentage of poverty, difficulty in accessing the market, access to general education and lack of clean water (Table 2.1). The northern upland region consists of 14 provinces and according to decision number 1064/QD-TTg dated July 8, 2013, of the Prime Minister, this region is divided into two sub-regions, the North West sub-region, including four provinces, consists of Hoa Binh, Son La, Dien Bien, and Lai Chau provinces; Northeast sub-region, including eight provinces Lao Cai, Yen Bai, Cao Bang, Bac Can, Thai Nguyen, Phu Tho, Lang Son, Tuyen Quang, Ha Giang, Bac Giang provinces. Compared to the Northeast, the Northwest region has more difficult terrain, poorer transportation condition, and a poorer life (Minh 2009). This total area of the northwestern region is about 36,101 km^2, extend from the northwest of the Red River delta region along the border with China and Laos. The economy of the northwest is mostly dependent on agriculture, self-sufficient. Agriculture accounts for one-third of the region's GDP, industry and construction are still weak areas. This area has the largest area of maize cultivation and production in the country (Figure 2.3). Son La province can be considered an excellent example of maize cultivation. According to Table 2.2, Son La is the core area of maize production, the area, and production of maize here is the largest national wide. Therefore, every movement related to maize in Son La will impact strongly on both the lives of people in the region and agriculture sector of Vietnam.

Son La province consists of 11 districts, and Yen Chau district is positioned in the most important economic area in Son La. With the National Road No. 6 running the middle of the district, it connects Yen Chau district with Moc Chau district in the southeast and Mai Son district in the northwest. Yen Chau is 66 km far from Son La city and having 47 km borderline with Laos. Among the major sectors of Yen Chau economics structure, the agriculture, forestry and fishery activities hold the most important for the farmers and among them the agriculture

Table 2.3 Agricultural production value in Yen Chau district (2010-2015)

Unit: million VND

	2011	**2012**	**2013**	**2014**	**2015**
Crop	475,107	554,989	598,688	664,198	690,997
Animal husbandry	61,288	86,629	86,587	113,751	143,266
Agricultural service	9,654	11,727	12,380	13,416	14,757
Total	546,049	653,345	697,655	791,365	849,020

Source: Yen Chau statistical yearbook in 2016.

Table 2.4 Production value in Yen Chau district (2011-2015)

Unit: million VND

Major crop groups	**2011**	**2012**	**2013**	**2014**	**2015**
Cereal crops	308,401	382,074	374,462	432,479	448,104
Starchy root crops	18,189	13,194	15,651	18,452	16,778
Industrial crops	19,599	24,387	56,789	66,087	62,987
Fruit tree	71,298	77,743	80,527	79,595	86,851
Vegetables and spices	54,661	54,499	67,886	63,336	71,644
Other crops	2,959	3,092	3,373	4,249	4,633
Total value	475,107	554,989	598,688	664,198	690,997

Source: Yen Chau statistical yearbook in 2016.

field covered over four-fifths in the total value (Table 2.3) (Yen Chau statistical yearbook 2016). The agricultural activity consists of the crop, animal husbandry, and agricultural service, in 2015 only crop activity covered over 80% total agricultural production value with VND690,997 million (Table 2.3). The agro-products in Yen Chau district, for example, cereal, starchy root, industrial, fruit trees, vegetable, spices crops, and others, only cereal crop occupied just under three-fourth total value (Table 2.4). According to Yen Chau Statistical Office (2016), maize is in the outstanding crops which are considered the staple crop and accounts for over 90% of the annual agricultural value (Figure 2.4). Therefore, Yen Chau district is a representative example of a maize production area in Son La province because it is the core of maize production.

In fact, to form the geographical boundaries as it is today, Yen Chau district people in particular and the people of the northern upland region, in general, have experienced the ups and downs of history. After 1945, Vietnam gained independence from the French colony and had become the Social Republic of Vietnam. From 1953 to 1955, the Yen Chau district in Son La province belonged to the northern Vietnam inter-zone, including the whole upland in the northern upland. According to the decree number 143-SL of Prime Minister approved on 28 January 1953, from 1953 to 1955, the northwestern region had been established with Son La, Yen Bai, Lao Cai, and Lai Chau provinces and departed from the northern Vietnam Inter-zone. At the time, the Yen Chau district belonged to the Northwestern. After the meeting of the National assembly on 29 April 1955, a decree number 233-SL was passed out on the formation of the municipality Tai-Meo. The Tai-Meo municipality borders with China in the north, with Laos in the west and south, with the Muong ethnic group in Hoa Binh province in the southeast. The Phan Xi Pang mountain ridge in the east of the municipality separated the region with the people in the red river basin.

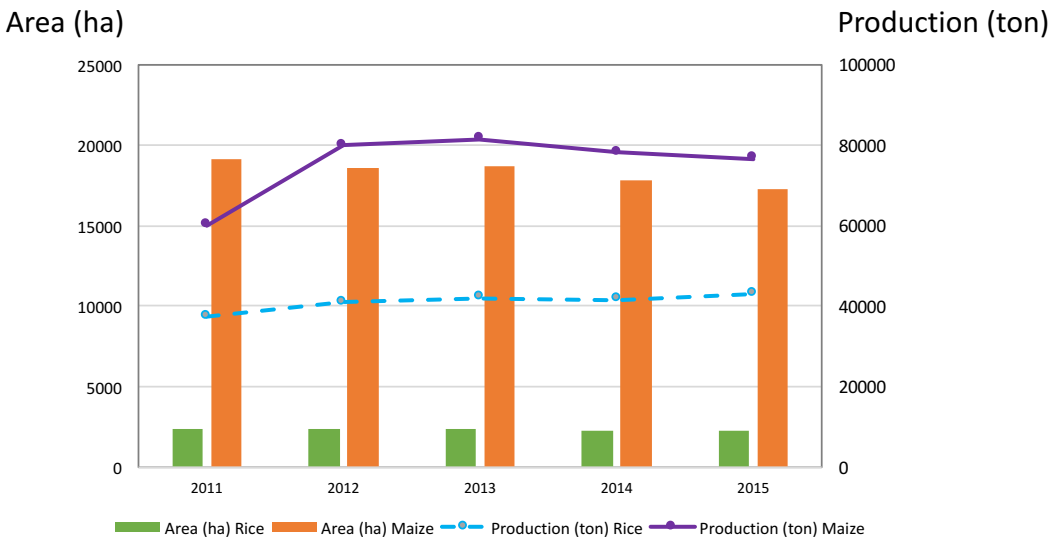


Figure 2.4 Area and production of rice and maize in Yen Chau district

Source: Yen Chau statistical yearbook 2016.

From 1962 to 1975, the Yen Chau district was a part of the northwestern municipality or so-call the Tai-Meo municipality, which already included three provinces. Lai Chau provinces composed of seven districts, Nghia Lo, had four districts and Son La included seven districts. The Tai-Meo municipality borders with China in the north, with Laos in the west and south, with the Muong ethnic people group in Hoa Binh province in the southeast (ECYC 2001). At that time, agricultural-operative was established including some characteristics, such as collection land, capital assets and property of individual farmers. The government required all farmers to join the agricultural cooperative, assigned duties to farmers and equally distributed profits to each farmer. The agricultural cooperative played an important role in food security (Vien 2003). From 1962 to 1975, the Yen Chau district was a part of the northwestern municipality. After 1975, the northwestern municipality had been dissolved. At that time, Yen Chau district included 13 communes (Henin 2002; Castella et al. 2005). At the end of the war in Vietnam with American in 1975, between 1975 and 1986, the agricultural cooperative was in the trend "the large-scale size of agricultural cooperatives, the lower the efficiency" (Sikor and Truong 2002). Since 13th March 1979, the Tu Nang, Long Phieng and Chieng Tuong of Moc Chau district officially became as parts of Yen Chau district with the Ta Khoa, Muong Khoa, Chieng Sai and Phieng Con communes in Yen Chau were separated to Bac Yen district. The timeline shows that up to 1979 the Tu Nang commune has officially belonged to Yen Chau district of Son La province, before 1979, it was in Moc Chau district (Alther et al. 2002; Da and Tuan 2009). Since 1979 to present, Yen Chau district has 14 communes, and one town with the area and density are 859.37 km^2 and 88 people/km^2, respectively (Yen Chau statistical yearbook 2017).

Although, according to the Land Law 1993, people have officially granted land use rights (Red Book), but until 1999 people in Yen Chau district had received Red Books. Red Book of each HH will consist of three different land types for using purposes, including

residential land, land cultivated, forestry land. These three types of land are permanent, 20 years and 50 years, respectively. There are no general regulations on the specific use area for each type of land for all HHs in the whole district. In particular, the Tai Dam HHs with a residential area of 400 m^2 / HH receive a cultivated land of between 900 and 3,900 m^2 /capita, and for Hmong villages, the average residential area per HH is 100 m^2 /HH, maximum area of cultivated land is 10,000 m^2 /capita. Each village will base on the actual land area and the population of each village at the time of 1999 to conduct an uniform allocation of land use area to all members of the village. Therefore, Luong Me village has no forest land from that time. In addition to the land allocated to the HHs in the village, each village retains a land fund of no more than 5% of the total cultivated land of the village, often referred to as 5% land. The purpose of land of 5% is not for general works of the village, this is considered a reserve land fund. Children born from 2000 onwards, or newcomers to the village, such as a bride or groom from other places, who reside from 2000, will be entitled to rent this area for cultivation. This 5% land has a maximum lease term of five years, after this period, it will be recovered and redistributed. This 5% land rent is partly paid to the state budget and a part of it will be retained as a fund for general activities of the whole village.

Yen Chau district now is home to main five groups people, including the Tai with mostly Tai Dam people, Kinh, Hmong, Xinh Mun, and Khmu with the population rate 52.64%, 19.98%, 14.42%, 12.13%, and 0.24% respectively (Yen Chau Statistical Office 2017). Although the Kinh is the majority in Vietnam, they are a minority in Yen Chau. The Kinh people in Son La were migrated from some provinces in Red River delta, such as Thai Binh, Hung Yen, and Ha Tay provinces (since 2008, Ha Tay province was merged with Hanoi city), according to the New Economics Zones development programs of the government. In this research, we focused on four main villages, consists of three Tai Dam villages adjacent to National Road No. 6, namely Lac Ken, Suoi Bun, and Luong Me and one remote Hmong

village is Keo Bo (Figure 2.5). The Tai Dam villages are located near major springs and on land 300 to 400m high, while the Hmong people live at the height of 900 to 1,100 m. These villages are considered “difficult” by the government (CEMA 2017). The living conditions of all study villages are noticeably lower than the national standard. Among them, Keo Bo is the poorest village, with a poverty rate of 100%. The detail information of these villages will be described in chapter 3, and chapter 4 of the thesis.

2.4. Data collections and Methodology

Data for this research were collected through field interviews and surveys. HHs in the targeted villages were investigated through multiple interviewing methods, from semi-structured and structured interviews to group discussion. HH interviews were used to collect quantitative and qualitative data on the basic socio-economic characteristics of farmers. Data on HHs were also collected on three occasions during 2016 and 2017 using field interviews and surveys.

In March 2016, we began the first round of fieldwork to conduct data before the seeding time of the maize season to obtain an overview of outstanding issues. During the first round of fieldwork, a limited number of randomly selected farmers and administrative officers were questioned about the general socio-economic information of the region, the diversification of livelihoods, and problems related to agriculture. HH data were first collected in August 2016 through interviews with the representatives of 230 HHs that were randomly selected from 486 HHs of the four villages Lac Ken, Suoi Bun, Luong Me, and Keo Bo. Of which, 198 were from Tai Dam and 32 from Hmong. The third round of field interviews was held in September 2017. The number of interviewed HHs was extended with 22 new HHs, for a total of 252 in 2017 and the participants were the same 230 participants HHs already interviewed in 2016. During the

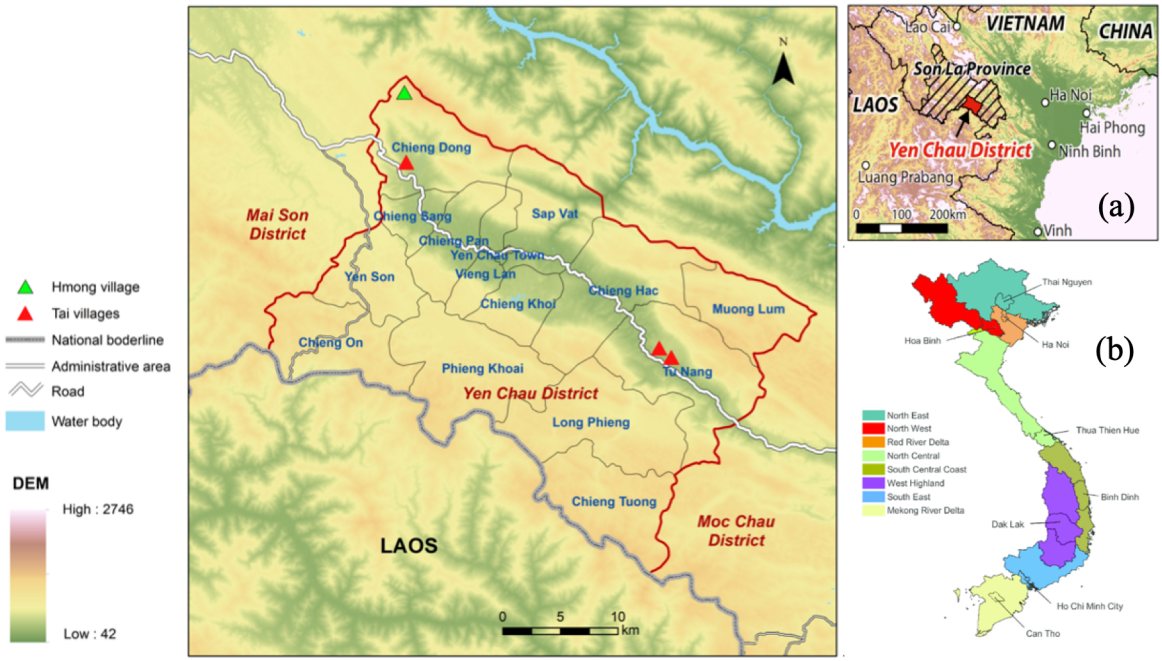


Figure 2.5 Location of Yen Chau district, the small maps indicate (a) location of Son La province and (b) locations of eight major economic regions in Vietnam.

2016 and 2017 surveys, each HH was asked about its agricultural activities, sources of income, land use status, investment funds for production, product purchases after harvesting, the source of information, seeding information, material inputs, and problems related to agriculture. Besides, these semi-structured deep interviews were also conducted with 30 individuals to better understand their motivations and the difficulties that have been experienced by pioneers or innovative farmers in adopting new livelihoods in the study area.

The individual interview was followed by four group interviews with key farmers of the villages, usually the elders, heads of villages, skilled farmers or pioneers/innovative farmers. The group interviews were aimed to provide information about changes in maize cultivation over time and to shed light on the customs and cultural traditions of the local communities. Moreover, to obtain an overview of the maize production and trading practices in Yen Chau, the authors also conducted 27 in-depth individual interviews with local traders in both 2016 and 2017. These interviews focused on the structure of the trading network, as well as the relationships between traders and farmers, between local traders and banks, and between local traders and seed enterprises. On the other hands, data relating to the government management of maize were also collected through interviews with and surveys among the representatives of the Departments of Agriculture and Rural Development (DARD) in Yen Chau district and Son La province.

After conducting data from three field-work occasions, we performed correlation analysis to measure the strength of the relationship between the size of each HH and the area of cultivation land that they own. A one-way analysis of variance (ANOVA) was then applied to investigate the significance of the differences between cultivation areas and the size of the HHs among the HH group that contained migrants and the HH group that did not contain migrants. In order to quantitatively assess land use changes, the distribution of land use types as well as establishment the maps of land use changes in the years 2010, 2013, 2015, and 2017.

The original data was taken from handheld GPS (Garmin GPSMAP64s) and created maps based on in-situ observation with the support of local representatives for major land use objectives including farmlands, residential areas, the road in 2017. Information about land use in 2010, 2013 and 2015 was collected through individual surveying and group discussions with the support of satellite images of Google Earth that help people to recognize the geographical objectives.

2.5. Poverty and criterions of the poor in rural Vietnam

Nowadays, there are many reforms in political, social-economic and environmental fields as well as national goal programs to improve the living standard of local people. Ms. Caitlin Wiesen, the UNDP director of Vietnam, said: "Viet Nam can be proud of its remarkable progress in reducing multi-dimensional poverty, lifting 6 million people out of poverty in only four years between 2012 and 2016.... The challenge now is addressing persistent poverty concentrated among ethnic minorities in geographically challenging environments" (UNDP 2018). The term “poverty” is a general scientific nomenclature which is ambiguous and confusing to define precisely. Because poverty is not mainly to express the shortage in economic, it also implies the multi-aspect problems (Minh et al. 2013; Thanh et al. 2011). Hence, to develop agriculture and reduce poverty, the first necessary action is to clarify who is poor people. One of the methods to know who poor people is to identify through geographical condition when comparing it with the vast surrounding area. However, even if the poverty region has been determined, the poor are rarely equally distributed. There are always HHs having a better economic condition than the others among the community. From that viewpoint, the community itself will build up its factors to define the poor based on their knowledge and experience. This method is usually introduced by Non-Governmental Organizations (NGOs).

In reality, the SIDA (Swedish International Development Cooperation Agency) also applied this method in their development programs in Vietnam (Thanh et al. 2011).

To recognize the poor, the government brings out national poverty-line. The poverty line is defined based on the average monthly income per person. This band has been adjusted according to the national economic development and regulated policies for a specific area. For example VND70,000 month/head, VND100,000 month/head and VND200,000 month/head in 1996-2000, 2001-2005, and 2006-2010 period in rural area (Thanh et al. 2011). In the upland region-one of the poorest regions in Vietnam, Vietnam Prime Minister signed the decision 582/QD-TTg about the "List of villages, particularly difficult communes under decision 582/QD-TTg". Hence, they divided into three groups zone III which is the most difficult, zone II which is quite difficult, and zone I (zone means commune scale). The detail of the criterion to recognize the Zone I, II and, III was showed in Table 2.5. In Yen Chau district except for the Yen Chau town, 100% of HHs in the Hmong village belong to Zone III, and about 20-30% and 70-80% of HHs of Tai Dam village belong to Zone II and Zone III village, respectively (Report of Yen Chau district People's Committee 2018).

According to the Human development report of UNDP (2018), Vietnam was ranked 116th per 189 countries in the world. However, the gap between the geographical region in Vietnam as well as the ethnic people group is too big. In particular, the poverty rate in urban and rural areas are 2.1% and 6.45%, respectively. Besides, while the poverty rate of Kinh people which is the majority of people in Vietnam, was 6.4% in 2016, Hmong people is 76.2% (UNDP 2018). Moreover, the highest poverty HHs ratio is in northern upland with 23%, and the second impoverished region is 18.5% in the Central Highlands (General Statistics Office 2017).

Table 2.5 Criterion the Zone I, II, III in upland region of Vietnam[a]

Criterion	Zone III	Zone II	Zone I
The rate of extremely difficult village	> 35%	< 35%	including another commune does not belong in zone II and zone III.
The percentage of poor HHs	> 45%	20-45%	
Road from commune	Dirt road	Dirt road	
Access the national electricity network	at least one village cannot access electricity network		
Medical station, community house, classroom	under the required standard		
Quantity of HHs lack of clean water	> 30%	< 30%	
Rate of un-trained labor	> 60%	30-60%	
Rate of HHs lack of cultivated land	> 20%	10-20%	
Quantity HHs having off-farm activities	< 10%	<10%	

[a] These criterions based on the decision 582/QD-TTg about the "List of villages, particularly difficult communes" of Vietnam Prime Minister.

2.6. Some characteristics of Tai Dam and Hmong people in Vietnam

2.6.1. Tai Dam people

Vietnam has 53 ethnic minorities groups with the majority is Kinh people. Ethnic people account less than 15% population. Among the ethnic people, Tai people or called *Thái* in Vietnamese, belongs Tai-Kadai group, is the second largest ethnic minority population inhabiting in the area of Vietnam (Appendix 1). Tai people live in Vietnam stretching from Nghe An province to the upland provinces of the Northwest and Northeast, along the border with China. Tai people in Vietnam was divided into two main sub-groups, *Don* meaning white, *Dam* meaning black, each group has separated location (Table 2.6). Between sub-groups of Tai people are often distinguished from each other through women's costumes (Yanchong 1996).

The living center of Tai Dam people is in Son La province, belongs to the northwestern upland region of Vietnam. After World War II, a large number of Tai Dam people migrated to northern Laos. Depending on the land available for cultivation in each place, each Tai Dam village used to have 20 to 50 HHs. Tai Dam people's habit lives in lowland areas, along the river valleys, and in the intermontane basins (Lebar et al. 1964). Tai Dam people often live in stilt houses, and when they get old, their house will be handed over to the oldest son in the family. Their agricultural structure is that growing the wet rice and fruit trees around their houses combined breed livestock and poultry.

The Tai Dam people are considered one of the first groups of people to appear in the northern uplands. They were present in the northern uplands around the beginning of the centuries A.D (Sikor and Truong 2002). So they choose the most convenient places to live, usually in the valleys of lowland and the land is quite fertile. Therefore, Tai Dam people are experienced in wet rice production. However, according to Patpong (2016), the Tai Dam people

Table 2.6 Distribution of Tai ethnic people location in Vietnam

Sub-group of Tai people	Regions	Family name
Tai Don (central)	Lai Chau and northwestern of Son La province	Deo
Tai Don (Northeastern)	Phong Tho	
Tai Dam	Dien Bien Phu central, Son La, Nghia Lo	Lo, Cam (Bac Cam, Cam, and Cam Ngoc)
Tai Daeng (central)	Thanh Hoa	Sa (Ha, Ha Cong) and Hoang
Tai Daeng (northern)	Mai Chau (Hoa Binh) and eastern (Son La)	
Quy Chau (southern Tai Daeng)	Southern Thanh Hoa and Quy Chau, northern Nghe An	No information
Lai Pao	Southern Nghe An	No information

Source: Mukdawijitra 2011.

who live in steep lands and lack of water will also cultivate upland rice in swidden cultivation. After about 3 years of upland rice cultivation, the land will be left fallow for about 8 to 10 years before recultivation. The majority of Tai Dam people will use buffaloes for agricultural production. In addition, they are also experienced in hunting and fishing. Harvest from hunting and fishing are used as supplementary daily food with vegetables and bamboo shoots collected in the forest (Lebar et al. 1964; In 2007). Besides, Tai Dam people in Vietnam often live together and have close relationships with other ethnic groups such as Kinh, Khmu, Xinh Mun. Thanks to this characteristic, Tai Dam people in particular and Tai people, in general, are easily accessible to the outside. As a result, they are the ethnic minority group who is the most fluent in the national language (Trong 2007).

2.6.2. Hmong people

The Hmong are a large group of people in over the world, with an estimated total population of about 12 million people. Hmong are present in China, France, USA, Canada, Australia, Germany, Argentina, and New Zealand and some parts of Southeast Asia, such as Laos, Vietnam, Thailand, and Malaysia (Luong and Nieke 2013). However, in Vietnam, the Hmong are considered to be the minority because they account for only about 1.24% of the country's population. In Vietnam, the Hmong belongs Hmong-Mien or Miao-Yao group, are present in more than 20 provinces, and up to 91% live in the northern uplands. The Hmong are always on the list of ethnic groups with the most poverty and precarious life as well as the lowest education level in Vietnam (Lee 2016; Luong and Nieke 2013).

Hmong in Vietnam, also known as *Mèo* meaning cat, they have a connection with Miáo or Miáo zú people in China. Documents show that the Hmong first appeared in China from 2700 B.C. For long time ups and downs in Chinese history, since about the year of the 1400s, most Hmong established a place where they lived in uplands and the southern uplands of China. The rest migrated along the China border area to find a place to live. The Hmong group is

considered as the first appearance in Vietnam about 300 years ago. They traveled from Guizhou, China to Dong Van and the Meo Vac districts of Ha Giang province, Vietnam (Michaud 2014; Lebar et al. 1964).

When the Hmong migrated to Vietnam, the fertile areas of lowland are occupied by other ethnic groups, such as Tai Dam in the northwestern region. Therefore, the Hmong people were forced to establish the village and live in the uplands and find it difficult to travel. Unlike other groups who can live with other ethnic groups, such as the Tai Dam people can live with Kinh, and Khmu people. Particularly for the Hmong, they often live apart from other ethnic groups. The reason perhaps because the history of Hmong people were tied to the struggle against the Chinese to survive. Hence, the Hmong psychology always wants to be independent and autonomous, and that they can enjoy absolute freedom. This is demonstrated by the evidence of the phenomenon of "proclaiming oneself King" (King of the Hmong, "*vua mèo*") of the Hmong in regions in Vietnam. Ethnographers describe Hmong people often with characteristics like "isolation" and "self-protection" (Michaud 2012). Due to settling isolation with persons from the other groups, Hmong people speak the Vietnamese language weakly. Studies on Hmong all appreciate the role of clan in the Hmong life. Usually, in one village, there are about two to three clans living together (Donovan et al. 1996). There is a strict rule of the Hmong that men and women can only marry each other when they come to different families name.

Besides, Hmong people have the poorest education performance compared with other groups in Vietnam. There was only 14.5%, 5% and 2% of people have the certificate of primary, secondary and upper a secondary degree (Luong and Nieke 2013). Hmong ethnic group in Yen Chau district is divided into three groups, including white Hmong, flowery Hmong, and black Hmong, or so-call *Mông trắng*, *Mông hoa*, and *Mông đỏ* in Vietnamese, respectively (Vien 2003). Yen Chau district is resided by mainly white and flowery Hmong people. In agricultural

production, the Hmong people still apply a lot of indigenous knowledge to farming methods as well as selecting suitable crops. For example, in areas with steep, barren land mixed with large rocks, they often cultivate in a "rock-pocket" style. In February, at the beginning of the first rains of the year, farmers began clearing grass, digging soil holes. They did also not forget the land areas to be cultivated in the next year, for these fields, they increased soil fertility by a mixture of horse manure, rice husk, and ash (Vien 2003).

Compared to other ethnic groups in the uplands of northern Vietnam, the Hmong are the last group to appear. However, if looking at the Hmong people from an innovation point of view, the Hmong are more active than the Tai Dam people, because of they moved to many places, they have a lot of indigenous knowledge in finding food and herb medicine or ingredients that are necessary for life (Minh 2009). In the past, their livelihoods have experienced a long time of slash-and-burn cultivation in the places they have been to. However, from the points of views of policymakers, the Hmong are a "backward" group.

CHAPTER 3. THE CHARACTERISTICS OF MAIZE TRADING STRUCTURE IN YEN CHAU DISTRICT

3.1. Introduction

Maize is the second most important cereal crop in Vietnam after rice, which is being adopted in all significant biological region from the north to the south. Every maize-related production and commercial activity dramatically affects the national economy (Tuan et al. 2014). According to the agriculture industry report of the Ministry of Agriculture and Rural Development (MARD), out of 1,152,400 hectares of national maize area, the northwestern region accounted for about 21% of the total area with 243,200 ha. In the northwest, Son La is the maize production core area of the region. Only Son La province covers 152,400 ha, accounts for over 62% maize growing area of the whole northwestern region (Figure 2.3; Table 2.2).

After a series of government efforts such as decisions, policies to push the agricultural sector especially for maize production, since the 2010s the diversified foreign seeds enterprises have entered the Vietnamese market. At the same time, the smallholders in Son La have begun to change seed varieties after each season and even planted different seed types at the same time. However, the annual alternating seed cultivation regime has no scientific basis and goes against the objectives of the National Test Procedure (NTP) for new seed (Leibman et al. 2014; Gama and Hallauer 1980). Alternating seed cultivation of maize started around the 2010s with the rapid emergence of giant seed enterprises. The contingent appearance of these two phenomena at that time has raised a question about the correlation between the fierce competition and the introduction of alternating seed cultivation in maize production.

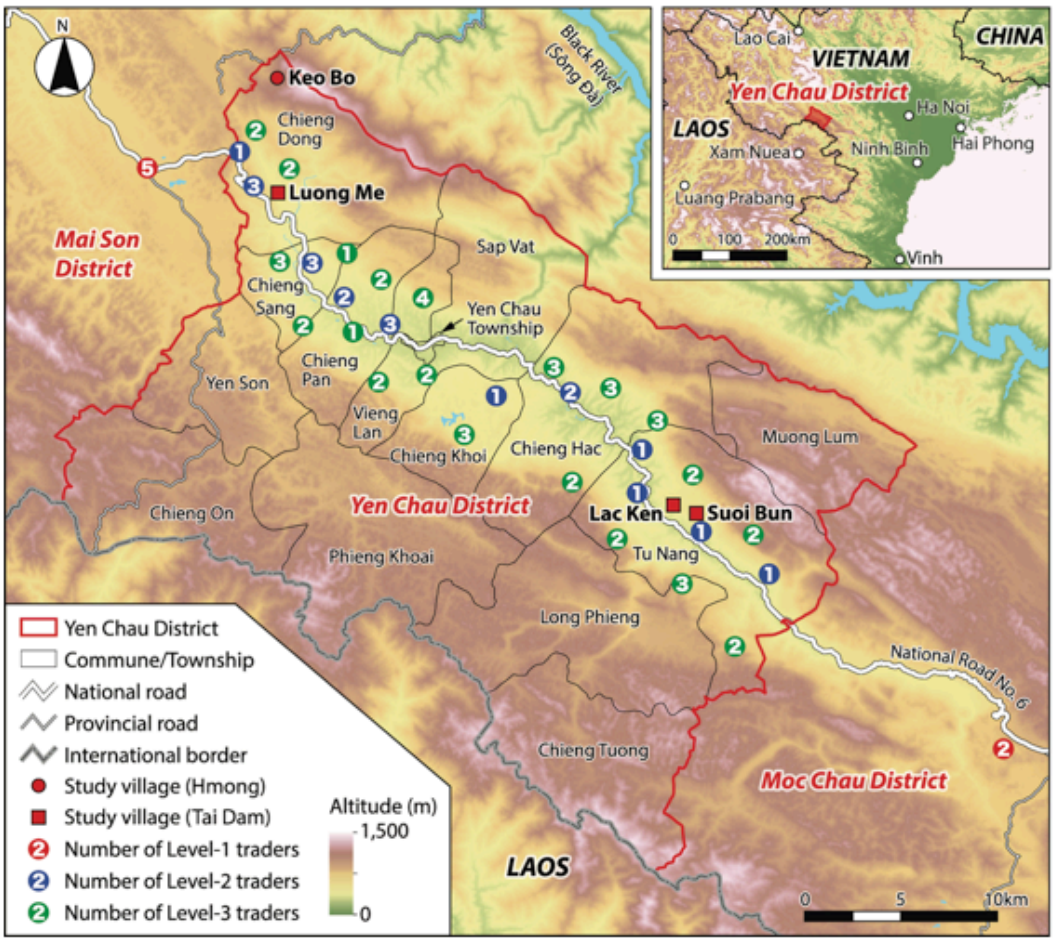


Figure 3.1. Map of the study area. (i) The small map indicates the location of Yen Chau district in northern Vietnam. (ii) The big map roughly estimates the spatial distribution of the study villages and maize traders along the National Road No.6 in Yen Chau district.

Source: Surveyed by the authors.

On the other hand, according to previous studies related the choice of seeds, what seeds should be adopted by farmers is an ambiguous and tricky matter to decide since it is often related to social norms, local characteristics, and the availability of information on the quality and support for seeds (Waldman et al. 2016; Coomes et al. 2015). Seed selection is also greatly affected by market competition (Rótolo et al. 2015) and Poku et al. (2018) found a positive correlation between poverty and adoption of improved maize seed, resulting from intense market competition. In this chapter, we focused on clarifying the maize trading structure as well as the influences of maize trading structure and their risk for stakeholders in Yen Chau district. In order to solve the key question, we focused on the four main villages in Yen Chau (Figure 3.1), including three Tai Dam villages adjacent to National Road No. 6 (Lac Ken, Suoi Bun, and Luong Me) and one remote Hmong village (Keo Bo) (Table 3.1).

3.2. Formation and characteristics of the maize trading network

After 1993, the new economic orientation and pressure from population growth and the prohibition of uncontrolled migration and reclamation. Local people were forced to exploit the potential of productive soil by adopting higher-productivity crops. Hybrid maize was considered the top priority in the northwestern region of Vietnam (Hauswirth et al. 2012). The crop transition process started early in 1995 with initial state support for maize seeds produced by NMRI (Vietnam Maize Research Institute) and guidance with growing techniques (Turner 2013). Besides, smallholders still used traditional maize seed, such as CX5.

The surge in maize production increased the need for supplies, however, the maize market had not yet formed from 1995 to 2000. The only way for local people to buy hybrid maize seeds was through intermediary HHs. These HHs were usually economically better, as

Table 3.1 General information on the study villages

Administrative locations	**Chieng Dong commune**		**Tu Nang commune**	
Village	**Keo Bo**	**Luong Me**	**Lac Ken**	**Suoi Bun**
Ethnic group	Hmong	Tai Dam	Tai Dam	Tai Dam
Total HHs (2017)	42	242	86	116
HHs data used/ Total of interviewed HHs (2016)	32/32	41/77[a]	60/60	61/61
HHs data used/ Total of interviewed HHs (2017)	32/32	41/73[b]	60/77[c]	61/70[d]
Number of poor interviewed HHs[e]	41	150	6	83
Topographical height above sea level (m)	900-1,100	300-400	300-400	300-400
Average upland field (m^2/person)[f]	10,000	900	3,900	2,100
Average paddy field (m^2/person)[g]	0	230	0	138
Distance to nearest Level-1 trader (km)	21	5	45	40

[a,] The Chapter 3 focused only on HHs still grow maize but in Luong Me as time progressing there has been a number of HHs converted their cultivation land from maize to sugarcane. Therefore, not all the data collected from all interviewed HHs was used.

[b, c, d] The field interview conducted in 2017 has extended not only for the previous interviewed HHs in 2016 but also for more HHs. However, the Chapter 3 compare between the HHs in 2016 and 2017 for the changes in livelihood condition so in this section, only the data on the HHs which interviewed in both 2016 and 2017 were used.

[e] Surveyed data from the heads of four villages.

[f, g] This was the maximum allowance for land distribution for Tai Dam and Hmong villages in Yen Chau in 1993 and 2000, respectively.

most had connections with long-distance van drivers who transported consumer and agricultural products between the northwestern regions and the lowland. The NMRI hybrid maize seeds were periodically transported, along with other products, to intermediary HHs before they were sold retail to the local farmers. Harvested maize can be sold back to van drivers for transportation to lowland buyers. Therefore, the intermediary HHs who resided along the main provincial road and long-distance or inter-provincial van drivers together formed the initial supply source, connecting maize products from upland production to the lowland market (Turner and Oswin 2015). Since van drivers connected upland production to the lowland market, maize seeds and harvests, along with other products, were periodically collected at intermediary HHs before they were sold back to farmers and van drivers. Another incentive that has helped northwestern maize increase its reach is the reconstruction and expansion of National Road No. 6 in 2003. The drivers secured their business by cooperating and established a trading network with Kinh people who resided along National Road No. 6 and who had been intermediaries.

Although the Kinh is the majority ethnic group in Vietnam, they are a minority in Yen Chau district; they arrived there due to the permanent migration policy intended to develop new economic regions or through open immigration. The migrant Kinh people were given the same government benefits as local Yen Chau people and cultivated the land to establish a new life. By contrast, the open immigrant arrivals, who sought job opportunities, provided virtually free labor. They worked on construction sites and then stayed after the work was finished (Hoa et al. 2017). Since these migrant people had no land, they earned an income by running various small businesses along the main road. When the demand for agricultural business increased, they became intermediaries between van drivers and local farmers in the collection and selling of both input and output maize products. The beginning of the maize market in Yen Chau involved three main components, van drivers, intermediaries, and local people. However,

supply sources lacked diversity. In 2003, smallholders in Yen Chau district were connected to the national electricity network. These advantages have strongly promoted transportation and commercial activities between the upland and the lowland.

The new National Road No.6, constructed in the 2000s, strongly promoted transportation and commercial activities. Meanwhile, most intermediary HHs has expanded their operations to a scale large enough to transform into "official traders". Official traders both distribute seeds and purchase the harvested maize without the need of inter-provincial van drivers. The number of traders has increased quickly along with the gradually disappearing role of van driver/inter-provincial traders, especially in the communes located along National Road No. 6 (Figure 3.1). The trader network has been built gradually. The specialized maize cultivation has brought huge economic changes to the region. The growth in production drew investment from seed and supply enterprises. From 2001 to 2012, the local traders, together with seed and supply enterprises, experienced rapid and complex development.

Considering the differences in the scale, extent, and influence of local traders, we classified them into three levels, differentiated the scale levels of traders in descending numbered order from Level-1 to Level-3, according to the classification method originally presented by Yokoyama (2010). Level-1 and 2 traders are full-time professional traders. They are Kinh people, similar in general features but different in operational scale. Level-1 traders run the largest businesses in the provinces, while most Level-2 traders operate only at the district level. Both Level-1 and 2 traders require a huge investment in infrastructure, transportation vehicles, hygrometer equipment, and dryers. Many Level-3 traders are part-time operators; they conduct maize-related trading only at the beginning and end of the crop season. Besides running maize businesses at the beginning and end of the crop season, they earn income from other sources during the rest of the year, such as through cultivation, repair services, and grocery stores. Level-3 traders were originally local Tai Dam, Kinh, Khmu, and

Xinh Mun people and thus have close relationships with the villagers. Unlike higher-level traders, Level-3 traders select their harvested products using their experience only, without requiring hygrometer equipment (Table 3.2).

Commercial activities related to hybrid maize were begun among the Kinh people and rapidly expanded district-wide through Level-3 traders. Despite their complex trader network, Level-1 and 2 traders operate only near National Road No. 6 and major maize storage sites. National Road No. 6 is the main line connecting business activities in both Yen Chau district and the northwestern region. Although Level-1 and 2 traders have a wide area of influence, they are limited in number and are geographically scattered across a small region around National Road No. 6, as illustrated in Figure 3.1. Level-3 traders are large in number, and each trader is in charge of a small region, usually smaller than a village. All traders are connected to every corner of the region. As Level-3 traders have the closest social relationships with villagers, they work flexibly, using the social beliefs within their community.

Most Level-1 and 2 traders are Kinh people, whose mother tongue is the national language; this gives them an advantage in connecting with lowland markets. Although there are no Level-1 traders in Yen Chau, the district has several large-scale Level-2 traders. These traders have the same characteristics as Level-1 traders but conduct their business only inside Son La region. The study area, therefore, features both large-scale Level-2 traders in Yen Chau and Level-1 traders in the surrounding Moc Chau and Mai Son districts, which are also the two largest maize production areas in Son La province. Level-1 and large-scale Level-2 traders usually have strong relationships with seed and agricultural material companies, serving as the link between them and farmers. In Yen Chau, there are three main channels for bringing supplies to farmers: via traders, the assistance policy of the state, and direct dealing

Table 3.2 Multi-level traders in the northwest region

Trader	Operation Scale	Ethnic group	Location	Characteristic
Level-1	Inter-province (Dien Bien and Son La)	Kinh	Close to Road 6	Heavy vehicles Maize dryer machines Hygrometer equipment
Level-2	Inter-district			Hold major events for new product, promotion programs
Level-3	Inter-village	Kinh, Tai Dam, Khmu, etc.	One or two agencies in a village	Small vehicles Determines products moisture by hand check and by experience[a] Depends on credit from Level-1 and Level-2 traders or bank Other income from farms and small business.

[a] Level-3 traders fixed the price for maize based on the sound of falling maize, the examiner let the maize grains fall on a hard surface to hear the sound; a hard sound indicated low-humidity products.

Source: Surveyed by the authors.

between farmers and supply companies. Among these, the trader network plays the most important role and accounts for most market transactions (Schad et al. 2013). This channel was carried out by agricultural agreements between local traders and farmers.

3.3. The characteristics of maize trading structure

The maize trading structure in Son La formed gradually along with the formation of the trading market. Figure 3.2 depicts the general trading structure in the region. It has five main components, bank system/social welfare associations, seed/supply companies, local traders, farmers, and feed-processing companies. These components are linked together by four flow directions, including the two-way interaction flows of capital and information and the forward flows of input and output. As this study is focused on problems related to maize production, the relationships between the supply and consumption companies and banks were not considered. Since all the impacts and consequences of maize production result from these four flows, each one is discussed in the following sections.

3.3.1. Dependence of stakeholders on credit sources

A capital budget is essential for any production, including agricultural activities. Traders with a stable budget can easily select crop types that are not only suitable for their needs but also meet the needs of the market. Funds for production are particularly crucial to the ethnic minority people in northwestern Vietnam, as maize production is their main livelihood, and it requires a considerable amount of investment. The target area is, however, one of the poorest regions of the country, so capital for local agricultural production must depend on credit.

Before 2010, the maize price was high enough to provide a living for the local people. Maize production met favorable conditions. Bank capital was an easy-access fund when most

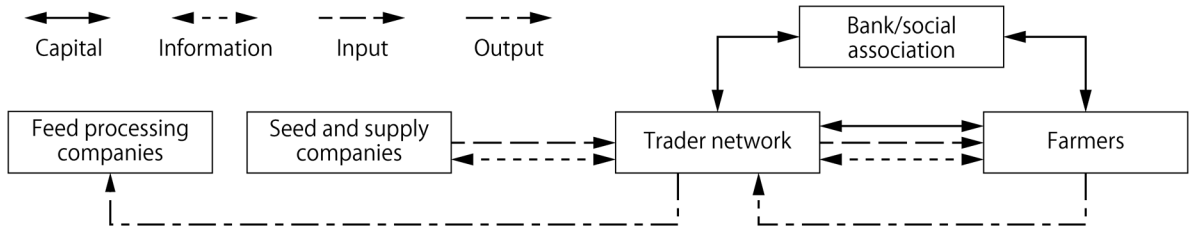


Figure 3.2 Overview of the maize trading structure.

HHs borrowed money from the bank to maintain production (Zeller et al. 2013). The Vietnam Bank for Social Policies (VBSP) and the Vietnam Bank for Agriculture and Rural Development (VBARD) are located in Yen Chau district (Figure 3.3). Both the VBSP and VBARD support local agricultural development but have different targets. The VBSP is a government policy bank established in 2003 after being spun off from the VBARD intended to handle small-scale policies and direct lending programs. The VBSP offers low-interest loans to poor HHs only. On the other hand, the VBARD became a commercial bank after the VBSP was founded. It approves loans for any HH that satisfies its conditions. The continuous decrease in global maize prices since 2013 hit the local economy hard. Production expenditures were rising higher than incomes. The majority of HHs faced difficulties in settle bank debt or pay in time and therefore cannot continue to apply for the new loans. The recent social survey in 2017 indicated less than 50% of the HHs in study villages are eligible to access bank credit. Only rich HHs with mortgage assets and no history of bad debt can ask for the bank loan. Hence, bank credit is limited to rich HHs and traders.

When access to bank capital is limited, trader credit has become the main credit source for smallholders. Trader credit is considered as an informal credit source. It relies on the agricultural agreement between traders and farmers. The agricultural agreements between traders and farmers are very popular in maize production in Yen Chau. However, there are big differences between the agricultural agreements in Yen Chau and CF. CF has the aim to supports the legal foundation for the rights and duties between stakeholders. In general, contractors undertake to fund farmers with agricultural inputs and commit to buy the harvested products with the fixed price or base on the market price of harvesting time (Eaton and Shepherd 2001; Ragasa et al. 2018. According to Key and Runsten (1999) and Kirsten and Sartorius (2002), CF generally helps reduce the risk to the market and brings more benefits to

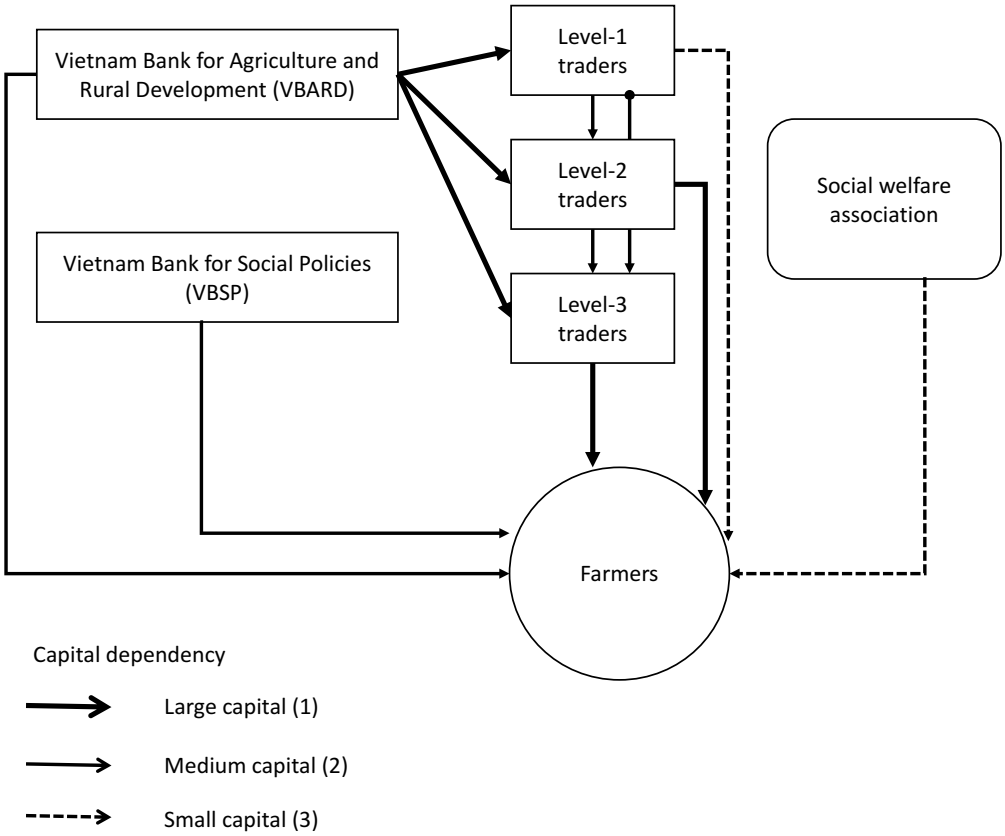


Figure 3.3 The main credit sources for local people in Yen Chau district.

farmers. In Vietnam, although the government issued the decision 80/2002/QD-TTg in 2002 and decision 62/2013/QD-TTg in 2013 (VPM 2002, 2013) to encourage the contractual sale of commodity farm products. However, in the remote areas where mostly poor people located lack of fund for agricultural production, limited communication, education, and weak local government management level. Somewhere, the essence of contract farming has been changed. In particular, the relationship between small investors and farmers is often based on the "belief mechanism," a kind of oral contract without strict constraints and commitments between stakeholders (Nhan and Takeuchi 2012). Lacking a legal basis, oral commitments can be easily violated, especially concerning maize prices in harvesting time (Hoc et al. 2017). The belief mechanism in Vietnam's agricultural production can be understood concerning the concept of "shared risk" mentioned in Devereux (2001) to describe the vulnerability of a group of people exposed to risk factors.

In Yen Chau district, agricultural agreements, which is one of the informal CF, are often made based on the strong trusting relationship between traders and farmers. Level-1 and 2 traders sometimes make direct purchases or conclude agricultural agreements with farmers but to a much smaller degree than Level-3 traders. Since Level-3 traders having the closest social relationships with villagers, the agricultural agreements are often made between Level-3 traders and farmers. The three trader levels differ in operation scale and characteristics but use the same work methods. Level-3 traders depend on Level-1 and 2 traders for both supplies and credit, and all levels focus on maintaining agricultural agreements with smallholders. Through these agreements, traders lend seeds and supplies to farmers and they have the privilege to purchase all harvested products, but loanees can freely sell their harvests to other buyers if they accept the penalty of an interest rate of 5% instead of the normal 3% per month. Such agreements are flexible without strict terms and mortgages. Therefore, the agricultural agreement in Yen Chau contains many risks for both farmers and local traders. In fact, the

Table 3.3 Amount of bank loan of some respondent traders in 2016

Trader	Level	Place of resident	Places of activity	Bank loan per household	
				mil. VND	US$
A	Level-3	Chieng Dong	Chieng Dong, Chieng Sang, Chieng Pan communes	1,000	44,100
B	Level-3	Chieng Dong	Chieng Dong, Chieng Hac, Chieng Khoi communes	500	22,000
C	Level-3	Tu Nang	Tu Nang, Muong Lum commune	300	13,200
D	Level-3	Tu Nang	Tu Nang, Long Phieng communes	300	13,200
E	Level-3	Chieng Hac	Chieng Hac, Phieng Khoai, Long Phieng communes	600	26,400
F	Level-3	Chieng Pan	Chieng Pan, Yen Son, Chieng On communes	1,000	44,100
G	Level-2	Sap Vat	Yen Chau, Mai Son districts	1,300	57,300
H	Level-1	Co Noi	Son La, Dien Bien, Hoa Binh provinces	2,000	88,100

Source: Surveyed by the authors.

agreements in Yen Chau were rarely made between Level-1 or Level-2 traders and farmers. Hence, among the three-level traders, Level-1 and 2 traders are more stable and have less risk than Level-3 traders. The maize price has decreased sharply since 2013, farmers fell into deeper dependence on traders because they could not afford the interest and profits from the harvest were small. The more dependent they become, the more heavily influenced by investors they are (Kyeyune and Turner 2016). This strong interconnection has bound stakeholders together in the distribution and consumption network of maize supplies and products.

When conditions for maize production are not favorable, traders' investments in farmer HHs under the agricultural agreement face high risk. Respondent traders' D and B (Table 3.3) are two examples. Trader B was an experienced Level-3 trader who started a maize business in 1998. Since 2012, she has not been able to recover her investments in 47 HHs in Chieng Hac commune. She failed to settle her bank loan (US$22,000) and credit from the Level-2 traders (US$17,590) and was declared bankrupt in 2016. Trader D is a husband-and-wife couple trading at Level-3. They began their business in 2010 around Suoi Bun village, Tu Nang commune, with a bank loan of US$13,200 plus a Level-2 trader's credit of US$17,590. They were also driven into a desperate condition as they could not recover their money from the HHs they had funded. The trader couple lost their house after the distraint process, and the husband committed suicide in 2015. Level-1 and Level-2 traders do not directly enter into agricultural agreements with farmers, so they take less of a risk, and most of them can survive and adapt to the new situation. The cause of the risk lay in the agricultural agreement, which was made without any guarantee assets for the lender and only built on the social relationship between traders and farmers. Level-3 traders deal directly with smallholders; they are caught between a bank loan/higher-level trader debt and their original investment in smallholders. Many Level-3 traders default on their bank loans, and then face a hopeless situation; they are the most vulnerable to risk and come under extreme pressure.

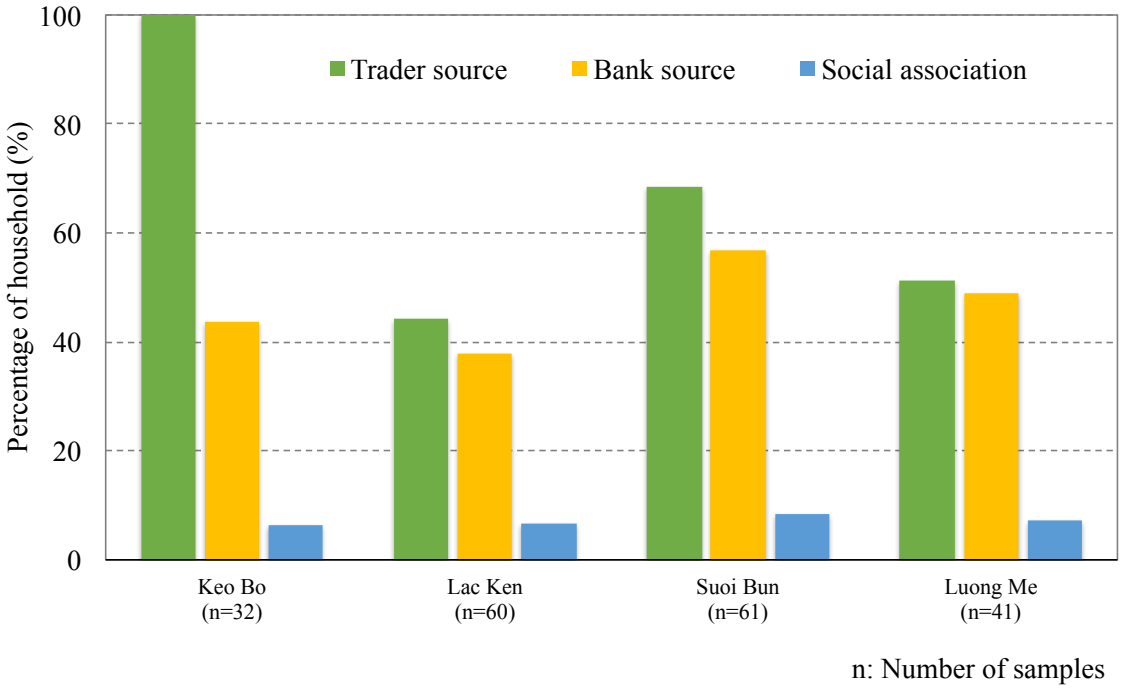


Figure 3.4 Percentage of HHs depending on different sources of credit in 2017.

Source: Surveyed by the authors.

Among study villages, difficulties in economic and transportation reflected the higher the rate of credit dependence. As illustrated in Figure 3.4, farmers in Lac Ken, Suoi Bun, and Luong Me villages had lower credit dependence rate than Keo Bo village. Keo Bo is classified as an exceptionally difficult village, and it locates in the high upland region. All respondents in Keo Bo depend on trader credit source for production. There are big gaps in loan interest rates among different credit sources. Though the trader credit interest rate is higher than commercial bank loan with 36%/year against 7%/year (as of October 2017), this is still the only accessible source for many smallholders. Besides, Level-3 traders cannot always access official credit sources, so they must depend on higher level traders concerning credit capacity, which is beneficial for both sides.

Apart from bank and trader credit sources, social associations serve as another source. Social associations are governmental and NGOs such as farmer associations, woman associations, agriculture development funds, clean water, and sanitation funds. These can provide small credit amounts to farmers at very low interest. This credit source is, however, usually not sufficient, ranging from VND5 million to VND8 million (US$220 to US$352), and the number of receivers varies each year. Among the four villages studied, only about 10% of the respondent HHs had received credit from social associations. Funding from social associations is, therefore, the least essential credit source.

3.3.2. Inputs of maize production

The supply chain of maize production in Yen Chau comprises seed and supply companies, local traders, farmers, and feed processing companies (Figure 3.5). The decrease

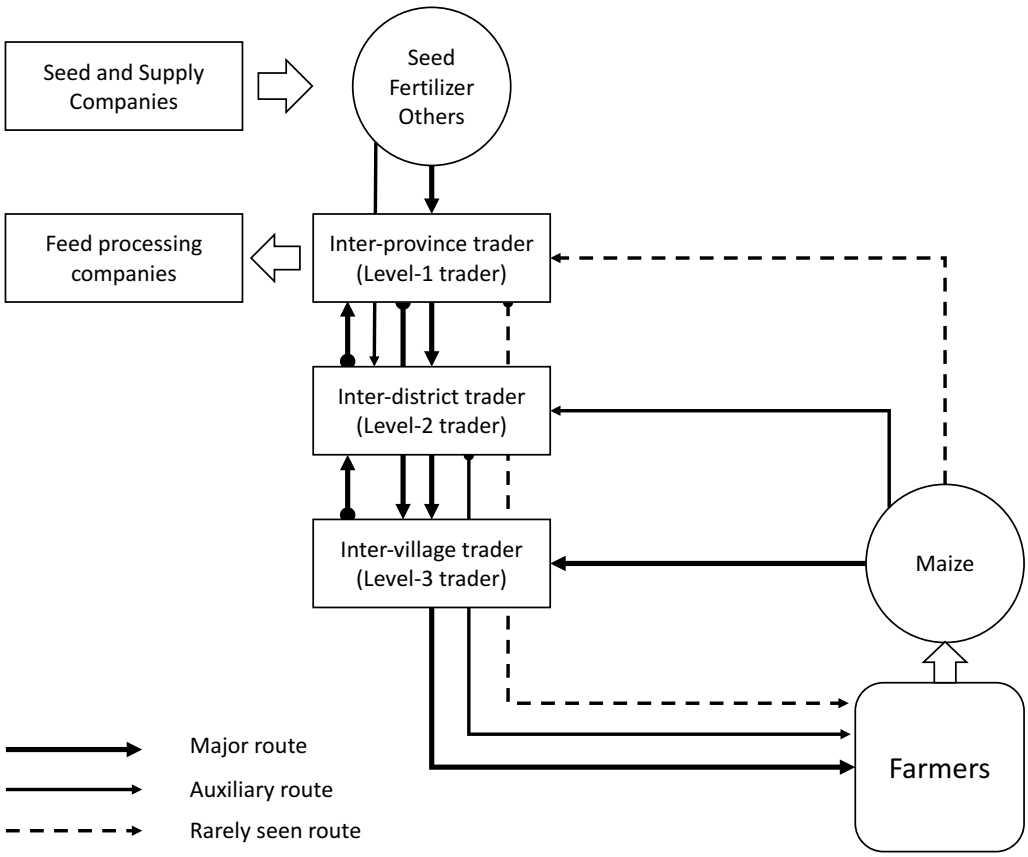


Figure 3.5 Input/output flows of the maize production network.

in maize production value is reflected in the reduced maize area being projected in regional planning, from 160,000 hectares in 2016 down to 80,000 hectares by the end of 2020 (Sonla-PPC 2016). The government is attempting to change the specialized maize regime and facilitate an agricultural transformation to other crops, in order to reduce the economic dependence on maize. This has intensified competition among maize supply companies to maintain sales levels in the market. There are the five giant seed enterprises comprise four foreign seed companies from Switzerland, the United States, Thailand and India; and one domestic company. Each enterprise provides its own products. These enterprises produce five different maize variety group, referred to as M, S, P, BO, and LV, of which LV is the domestic seed.

Since 2010, the distinctive feature of maize production in Yen Chau was the annual variation among the most popular maize varieties. Table 3.4 presents a consistent temporal and spatial distribution among the most popular maize varieties in the period from 2012 to 2015 with S and M variety groups. During this period, the year's best-selling seed was also the most popular variety throughout the region. However, statistic data in 2016 and 2017 recorded the rise of domestic LV variety over the foreign seeds in Lac Ken and Suoi Bun villages. Table 3.4 also shows the contrast between villages regarding the consistency of their most popular maize varieties. In Keo Bo, the M variety group was adopted by most HHs in four consecutive years (2014 to 2017). However, in the other three Tai Dam villages, highest market share obtained by the most popular maize variety was only 62.2%. As Keo Bo is the most impoverished village where all farmers signed agricultural agreements with traders, a high consensus on the adopted maize variety reflects the influence of traders on the selection of seeds. Figure 3.6 illustrates the relationship between the number of HHs depending on trader credit and their compliance with traders' consultancy for seed. In Keo Bo village, 31 of 32 interviewed-HHs received investment from traders following traders' recommendation for seed. The only a HH did not

Table 3.4 Percentage of most popular maize variety groups in Yen Chau from 2012 to 2017

Unit: (%)

Village	2012	2013	2014	2015	2016	2017
Keo Bo	N/A[a]	N/A	100.0 (M)	95.45 (M)	97.56 (M)	96.88 (M)
Luong Me	50.00 (S)	57.58 (S)	57.50 (M)	62.22 (M)	60.00 (M)	60.63 (M)
Lac Ken	58.82 (S)	60.00 (S)	46.39 (M)	42.50 (M)	48.35 (LV)	40.01 (LV)
Suoi Bun	43.86 (S)	49.18 (S)	47.14 (M)	37.76 (M)	50.62 (LV)	43.21 (LV)

[a] N/A: Not available

Source: Surveyed by the authors.

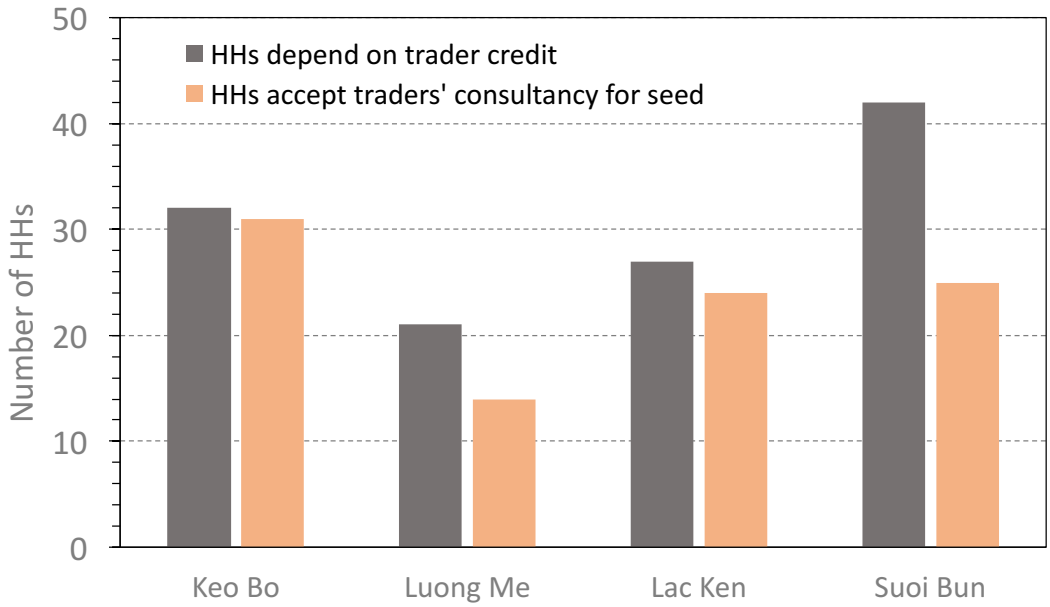


Figure 3.6 The number of HHs depending on traders' credit and their compliance with traders' consultancy for seed in 2017.

Source: Surveyed by the authors.

ask for trader' credit in 2017 was received seed support from the government's special social program for poor HHs.

In other Tai Dam villages whose economic conditions were better, the percentage of HHs depending on traders' credit and accepting their recommendation on seed was smaller than in Keo Bo. Even for Tai Dam villages with relatively similar economic conditions, the most adopted varieties tended to be different. Luong Me had the highest adoption percentage for the M variety group why LV seeds were more popular in Lac Ken and Suoi Bun. About 70% of Suoi Bun's HHs depended on traders' credit but with large cultivation lands forced them to adopt much cheaper seeds to reduce the cost. By doing that, they also want to avoid the risk of adopting only the expensive seeds. Since 2016, foreign seeds were adopted for only a small portion of farms, for the majority of farm, it was replaced by the domestic LV varieties (Table 3.4). Lac Ken village also had a large area under maize, but its adaptation strategy differed from that of Suoi Bun village. Most HHs in Lac Ken has begun to step by step replace their maize farms with fruit trees. When waiting for the fruit trees to fully grown, maize was inter-cropped with fruit trees for the first three-year period. The majority of HHs in Lac Ken cannot effort both fruit tree and maize at the same time, so they prefer the cheaper domestic LV seed variety groups.

With poor economic conditions, the short geographical distance has greatly influence farmers' seed preferences. Since Keo Bo is the poorest village, all of the Hmong HHs depended on local traders for agricultural inputs. Traders also influenced seed selection in the Tai Dam villages, which generally enjoy better economic conditions. However, the extent of influence varies according to the geographical distance between the villages and the Level-1 traders. Indeed, when the Luong Me village is closer to Level-1 trader (5 km) than Lac Ken and Suoi Bun villages (about 50 km), its HHs tend to select foreign instead of domestic seed in contrast to the finding just mentioned.

3.3.3. Purchasing maize after harvesting

Although agriculture agreement often includes terms related to the loaner's privilege to buy the harvest, loanees can freely sell their harvests to other buyers. Besides, boundaries between traders are often defined implicitly according to their area of operation to avoid conflict. In addition to the agricultural agreement with farmers, traders also make deals with the local community to collect maize. Traders are willing to invest in an access road in difficult areas so that farmers can go to their farms on a motorbike. In return, the harvest is sold exclusively to the investors. Such commitments were made between traders, farmers, and representatives of local government. All of these activities were carefully logged in the villages' annual reports, which indicate the terms regarding the rights and duty of the traders to buy the harvest and make/maintain the road. Traders have also had the duty to pay a management fee of VND2 million per year (US$88.14). Farmers who benefited from the roads, on the other hand, were compelled to sell their harvest to the investors. Figure 3.7 (a) shows a 7 km road for heavy vehicles, a typical access road constructed by Level-3 traders in Luong Me village. These activities strengthened the bonds between traders and local people not only in agricultural activities but also in daily life. With those positive activities, the connection between farmers and traders has become even stronger.

Among the three levels of traders in Yen Chau, Level-3 traders accounted for most of the maize collection. Although, the prices Level-3 traders offered for maize were lower than what Level-1 and 2 traders offered, they had the advantages of an agricultural agreement and they collected the products at the farm. Level-3 traders fixed the price for maize using a simple hand check method based on the sound of falling maize: the examiner let the maize grains fall on a hard surface to hear the sound; a hard sound indicated low-humidity products. Meanwhile, Level-1 and Level-2 traders use hygrometers to determine the price of maize collected by

Figure 3.7 (a) Dirt road constructed by trader and (b) farmers are rebuying corncobs from trader.

Source: Taken by author in 2016.

Level-3 trader. The type of maize seed adopted was irrelevant to the evaluation process. The fluctuation of maize prices depended only on the level of scarcity and market demand.

Maize purchased by traders is transported to Hanoi city, where the finest products are often sold to the foreign feed-processing company at a high price. Lower-quality maize is sold to other buyers in the surrounding provinces, such as Bac Giang and Hai Duong provinces. Though maize is the second-most popular crop, demand for maize as feed is still much greater than the capacity of Vietnam's domestic production. The total import quota in Vietnam was 7.6, 8.44, and 7.86 million tons in 2015, 2016, and 2017, respectively. Since the removal of the maize product import quota, standard maize prices in the domestic market have changed daily along with global maize prices, which are determined by the purchasing price offered by the foreign feed processing company. Maize price is decided only according to the level of humidity, and not according to the variety of maize seed. Prices usually ranged from VND2,000 to VND5,000 per kilogram (US$0.081 to US$0.22). Hence, annually changing seed varieties do not benefit the farmer, regardless of the price paid.

Besides, corncob is a by-product of maize production. It has low economic value but serves an indispensable role in local daily life as cooking firewood. The total amount of corncob is usually enough for a family's need until the next crop. Before 2014, almost all smallholders sold only maize grains to traders and kept their corncobs. Now, they sell the whole maize cob, at about VND400 to VND500 per kilogram (US$0.018 to US$0.022) lower than the price of maize grains alone. Farmers then re-purchase the corncob from the traders. The average yearly family expenditure on corncob is about VND500,000 (US$21.9). The tough situation has caused smallholders to reduce their maize-production efforts, as it cannot guarantee a living. Selling the whole cob instead of separating the grains helps save the time of hired labor and allows more time for off-farm work such as picking mango, collecting maize,

or even working paid jobs. An example of a farmer who bought corncobs to a trader's store is presented in Figure 3.7 (b).

In sum up, the supply and distribution chain for maize products in Son La is based on the strong credit connection between stakeholders. Agricultural inputs begin from seed and supply companies to Level-1 trader then from Level-1 trader to lower scale Level-2 and 3. Level-3 traders are the smallest component of the three-level traders, play the main role in connecting the suppliers with farmers. They received both supplies from higher level traders and yield from farmers then distribute it back to the stakeholders. Feed processing companies receive maize products from Level-1 traders; they are the last stop in the supply chain.

3.3.4. The flow of information structure

a. The flow of information structure

A timely and accurate flow of information is one of the decisive factors in the success or failure of any product, including maize (Miyata et al. 2009). It is important for the farmer to decide which type of maize seed to grow after the season begins. In Yen Chau, the information on seeding and crop calendar can be accessed from various sources (Table 3.5).

Table 3.5 shows the feedbacks of interviewed HHs regarding the information sources they referenced during the 2016 and 2017 crop seasons. The first source is the state's top-down agricultural promotion network. The Yen Chau Department of Agriculture and Rural Development (DARD) annually publishes the Guidelines on Seeds and Crop Calendar, which provide essential information related to seeds and timing. However, only 6 out of 194 respondents of this study have referred to DARD guidelines to find the necessary information before seeding in 2017. These guidelines have proven ineffective in reality and failed to

Table 3.5 Information sources used by interviewed HHs in 2016–2017

Unit: (%)

Village	Year	DARD guideline	Key farmer	Trader	Communication media
Keo Bo (n=32)	2016	0.0	62.5	100.0	15.6
	2017	0.0	65.6	96.9	21.9
Luong Me (n= 41)	2016	4.9	73.2	75.6	24.4
	2017	7.3	75.6	70.7	22.0
Lac Ken (n=60)	2016	0.0	75.0	73.3	30.0
	2017	1.7	70.0	66.7	35.0
Suoi Bun (n=61)	2016	3.3	73.8	68.9	32.8
	2017	3.3	75.4	67.2	39.3

Source: Surveyed by the authors.

provide instructions to farmers. The two maize varieties belong to P, and BO variety groups are examples, we symbolized them as P-X and BO-X, respectively. The P-X was un-recommended by DARD but can easily be bought in Lac Ken village while the BO-X variety has stayed in the list since 2010 but difficult to find on the market (Yen Chau DARD 2010-2016). In 2015, the P-X variety was provided by a number of traders, but it was rejected or was bought at very low prices even when the yield was good. The humidity level of P-X maize grains was too high, which led to rot and mold. In case of BO-X variety, it has stayed on the list since 2010 but is difficult to find on the market. This suggests that the supply chain has governed its information channels in a different way, without interacting with DARD.

Beside the DARD guidelines, traders' recommendations are reliable information source that farmers use when purchasing seeds and supplies. Originating in seed enterprises, it passes through the information transmitting unit and then passes on to farmers (see Figure 3.8). The information transmitting unit is a complex of three main components, including the trader network, key farmers, and communication media. The information transmitting unit plays a vital role in connecting not only input-output products but also agriculture information provided to the farmers.

Among the information transmitting unit, the trader is the most important component and it is positioned at the center of the maize supply and consumption chain. As with seeds and supplies, information is transmitted top-down from Level-1 and 2 traders to Level-3 traders, and then to farmers. In this informative interaction channel, traders can directly consult farmers or indirectly transmit information through intermediaries such as key farmers and consultant farmers. The limited transportation and communication infrastructure lead to access to information sources difficultly for smallholders in the upland region. Hence, the trader network seems to be an effective source of information. Its information is updated and broadcast quickly, and it incorporates the social credit relationship between farmers and traders, which magnifies

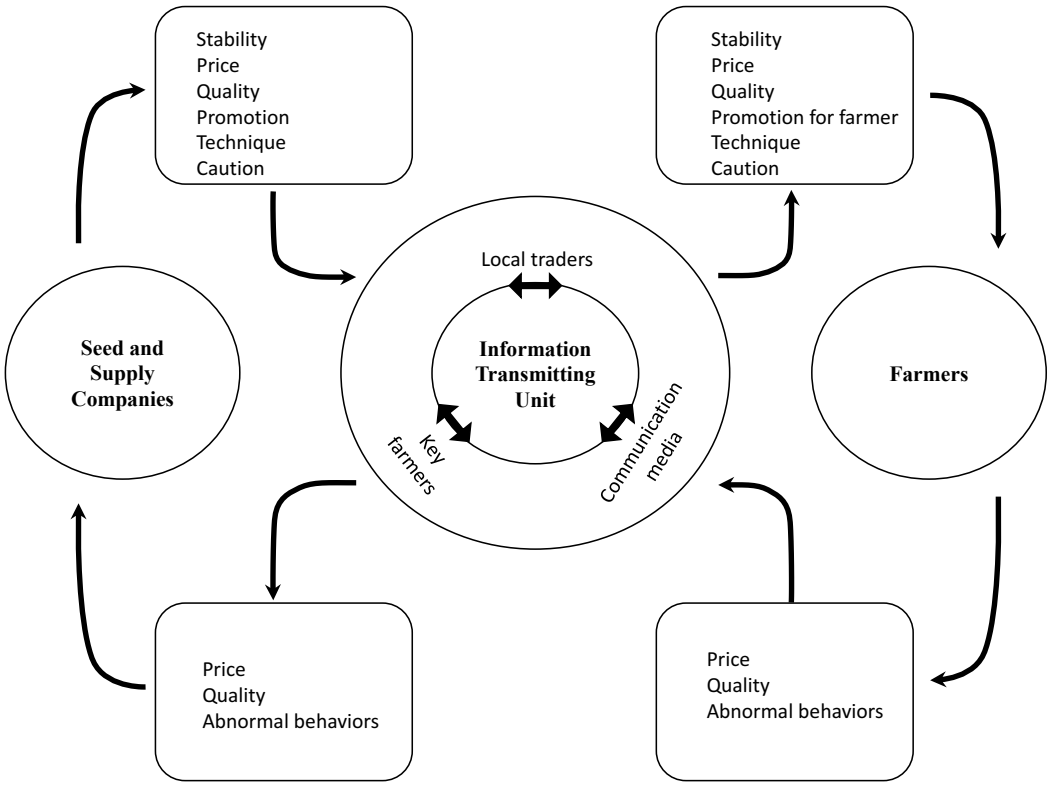


Figure 3.8 Information flow in the maize seed trading network.

its influence. Traders can easily use this channel to bring them benefits and turn it into an objective source of information. Traders can consult farmers directly or indirectly through intermediaries, such as key farmers.

The key farmers are local people, usually elders, heads of villages, or skilled farmers who often hold an important position in the local community. While the heads and secretaries of the villages are respected people who represent local government, skilled farmers have long experience in production (Donovan et al. 1996). Key farmers are known to be the informative sources from whom farmers obtain reliable information as well as effective agricultural techniques. Their opinions and skills strongly influence the community (Vien 2003). Seed enterprises and traders often focus on those people when promoting new products and related businesses. Key farmers are often the targets of agriculture conferences, new products introduction meetings, and pilot projects. Even when a seed is approved to enter the market through passing the NTP, its producer will continue to adopt it in several pilot farms to demonstrate its quality to farmers. The farms selected for pilot farming would be fully funded by the seed enterprise. This is one of the strategies used by seed enterprise to market their products. The local traders usually recommend key farmers who already have some influence in the community to seed enterprises for pilot farming.

To further popularize the product, the agriculture workshop will be held after pilot farming with the attendance of key farmers and farmers. They are usually given cash or promotional products for attending events. One unique characteristic of rural society in Vietnam is the strong bonds between villagers; people are interdependent, fight against hardships together, and share all benefits (Donovan et al. 1996). This factor speeds up information circulation. Seed enterprises use the influence of key farmers on their communities to develop their businesses. Table 3.5 illustrates how farmers in Yen Chau trust key farmers' views on seed selection. In 2016 and 2017, about 62.5% - 75.6% of the respondent HHs

consulted key farmers before making their decision. Hence, information on seeds is updated and broadcast quickly, and it incorporates the social-credit relationship between farmers and traders, which magnifies the key farmers' influence. Key farmers are often the targets of pilot fields, and seed enterprises use their influence of key farmers in the local communities to develop business.

Communication media is another information source for farmers but less important than traders and key farmers. Communication media constitute the most often-used channel of agricultural information. Communication media, including mass and print media, constitute the most often-used channels of agricultural information. Mass media, including electronic communication media, including television, radio broadcasts, and local speakers, seems ineffective as the information. It is often diverse and multi-purpose but lacks detail. For many smallholders, electronic equipment is costly to either own or use as well. The printed poster is the most popular form of agricultural advertising. These are also a favorited tool by which seed and supply enterprises and traders advertise their products through flyers, print advertising, packaging, and posters (Figure 3.9). In Yen Chau, advertising posters are replaced annually with the most prevalent variety, which is usually the variety recommended by traders and key farmers. SMS (Short Message Services) is a new means of media communication in Son La. It has been used only by the seed enterprise come from the United States since 2013. Via SMS, this enterprise delivers essential information on seed types, prices, and guidelines on seeding times to its customers. The value of the SMS approach is shown by the fact that the M variety has had the highest share of the maize market since 2014 (Table 3.4).

When the information from state management agencies is ineffective, the market information flow provides the main agriculture information for the region. The center of this

Figure 3.9 Commercial poster for (a) Syngenta Co. and (b) Charoen Pokphand.

Source: Taken by author in 2016.

flow is the information transmission unit which can be divided into three distinct channels, key farmers, the trader network, and communication media. Although the information sources from traders, key farmers, and communication media differ in appearance, they are actually similar in content. Key farmers and communication media are tools that traders use to sell products. According to the trader respondents, their business strategy and marketing direction change annually or seasonally depending on the promotion campaigns of the seed enterprises. This finding supports our assumption on the major role of traders in the development of maize production in Yen Chau. The trader is the most important factor in seed enterprises' efforts to advertise their products and maintain their sales.

b. Operation and feature of maize seed information flow

Figure 3.8 illustrates the flow of information transmitted through each component of the maize seed trading network in the study area. The flow structure is similar to that for any commercial product. It involves producers, distributors, and consumers. Information is forwarded from seed enterprises through the information transmitting unit to farmers, then again back from farmers to seed enterprises following the same direction. The information contained in the forward and backward flows are different: the forward flow delivers essential details on maize seed to farmers with respect to types of seed, prices, potential productivity, agronomic characteristics, techniques, and available promotion programs for stakeholders. In contrast, the backward flow consists of feedback from farmers about seed-related matters after each crop. This feedback usually focuses on what farmers pay attention to, including the cost-effectiveness of the seed, comparisons between different cultivars, the quality of the harvest, and factors affecting selling prices such as humidity level, productivity, and corncob size. Meanwhile, seed enterprises pay special attention to feedback from farmers about any abnormal species behaviors during their growing experience so that they can improve their services and products by amending the guidance and support they provide. Information flow

plays a vital role in the development of maize production. It can improve both the connection and quality of the services seed enterprises provide to farmers.

As many seed enterprises have entered the market, the role of local traders has gradually become more important. Despite the fierce competition between seed enterprises in terms of product and service quality as well as support for the local traders, the traders are still the most important targets of marketing strategies. The traditional cultivation techniques in Yen Chau have remained virtually unchanged over the past 20 years (Ha et al. 2004); they cannot fully exploit the potential of even the best maize seeds and thus generate similar productivity levels each year (Saint-Macary et al. 2013; Kyeyune and Turner 2016). Since product and service quality cannot lead to clear advantages for maize producers, they are competing most intensely to use the local traders. The main method seed enterprises are using to win trader support is to offer higher discount sales. Competition between enterprises had resulted in chaos in the maize seed market, as traders have focused on the products that benefit them the most.

Table 3.6 illustrates the benefits that seed enterprises have given traders and the promotion programs that they have conducted for the sale of some popular groups of maize varieties in 2017. Among all varieties, the M variety groups benefited traders the most. The varieties that most benefited traders are consistent with the most popular maize variety groups indicated in Table 3.4. This coincidence has raised concerns about the motivation of traders when persuading farmer. The business strategies and marketing direction of traders change annually depending on the promotion campaigns of the seed enterprises. Competition between enterprises resulted in chaos in the maize seed market, as traders focused on the products that benefit them the most. They tend to provide information to and encourage farmers producing the cultivars that most benefit them, even if they are more expensive than existing cultivars. This kind of competitive race between seed enterprises using traders

Table 3.6 Promotion programs for different maize variety groups and benefits for the trader when selling it in 2017

Variety group	Date entered the Yen Chau market	Capital	Benefits [a] for traders (VND/kg)			Retail price [b] (VND/kg)	Promotion programs	
			Level-1	Level-2	Level-3		For traders	For farmers
M	2011	Foreign	1,000	1,000	3,000	120,000	An all-expenses abroad/domestic tour [c]	A lucky draw ticket [d]
S	2009	Foreign	500	500	1,000	120,000		N/A
P	2004	Foreign	1,000	1,000	3,000	95,000	N/A	N/A
BO	2000	Foreign	N/A[e]	N/A	N/A	N/A	N/A	N/A
LV	1995	Domestic	1,000	1,000	2,000	37,000	N/A	N/A

[a] The benefits for Level-1 traders are calculated as the differences between their buying price and the price they sell to Level-2 trader. Benefits for Level-2 traders are the differences between the Level-1 traders' price and the selling price to Level-3 traders. Benefits for Level-3 traders are determined from their retail price to farmers.

[b] Retail prices are the prices fixed for farmers by seed enterprises. Farmer can buy seeds from any trader but the price is unchanged.

[c] An all-expenses abroad/domestic tour will be rewarded for a trader having total sale higher than 3 tons of seed per year

[d] Farmer purchasing over 20 kilograms of the M variety group in Level-1 trader is given a lucky draw ticket. In May, a public event for drawing lots will be held by the seed enterprise which producing M variety group. All farmers named in the purchasing list are invited to the event. The awards from the drawing lots are usually valuable item for farmer, from a cow to agriculture equipment.

[e] N/A: Not available

Source: Surveyed by the authors.

requires good strategy making and a huge economic foundation. Weak companies who cannot follow the race are discarded. The BO variety group is an example; it entered the Vietnam market very early in 1992 and was widely adopted in Yen Chau. According to local traders, the famous BO seeds have gradually disappeared from the market since 2012. This evidence supports the doubt about the fierce competition between seed enterprises.

3.4. Competition between seed enterprises and the annually changing seed variety cultivation regime

3.4.1. The competition of seed enterprises in Yen Chau district

The explosion in the maize market in 2010 has led to fierce competition between seed enterprises. The fight for market domination has grown even stronger after the peak period of maize production. Figure 3.10 indicates the number of workshops for different maize variety groups held by three seed enterprises in Yen Chau from 2015 to 2017; their locations are shown in Figure 3.11. Although the total maize area has reduced continuously since 2013, the number of maize seed workshops and the number of invited farmers seem to remain stable each year (Yen Chau Statistical Office 2017). This shows the efforts of seed enterprises to extend their influence in the market. When domestic seeds could not position themselves in the market, foreign seeds, especially S, M, and P variety groups, competed in the market.

The huge investments of seed enterprises for the S and M variety groups have shown their effectiveness as these two groups have occupied the lion's share of the market since 2012 (Table 3.4). Although all 15 administrative regions of Yen Chau district were targeted by seed workshops (Figure 3.11), the majority of the workshops were concentrated in the northeastern part of the province where is not only closer to Level-1 traders in Mai Son

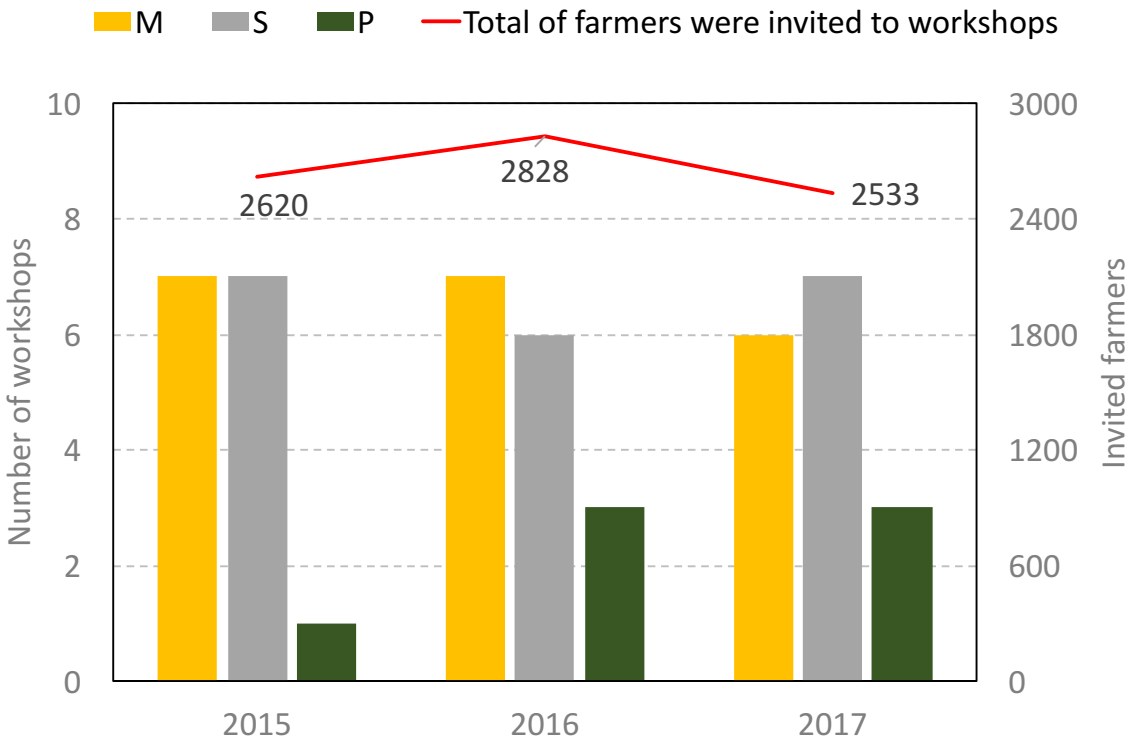


Figure 3.10 Number of workshops for different maize variety groups held in Yen Chau from 2015 to 2017.

Note: in 2017 data was recorded up to October

Source: Surveyed by the authors.

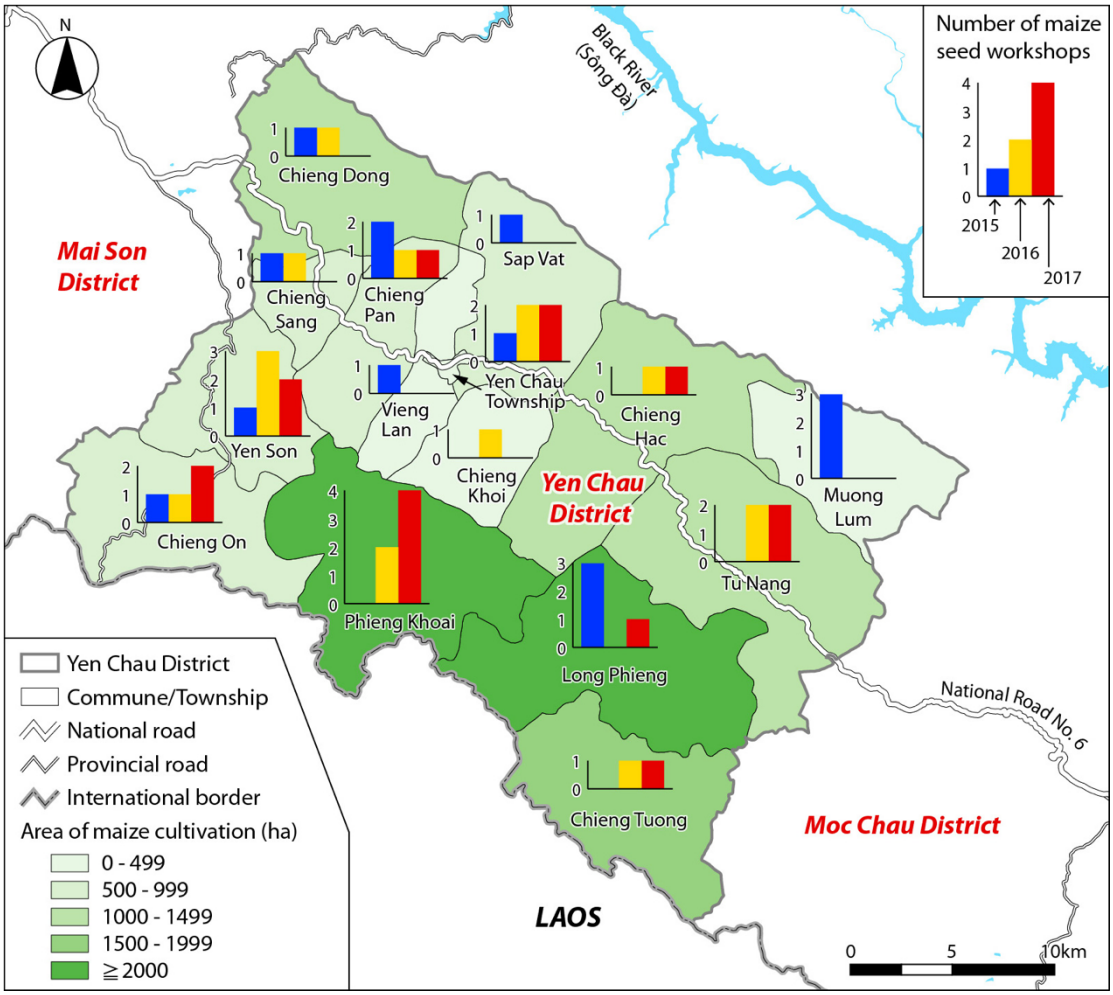


Figure 3.11 Location and scale of maize seed workshops held from 2015 to 2017.

Source: Surveyed by the authors using GPS; Yen Chau statistical Office (2007) and an internal report of the Yen Chau district agricultural extension Centre.

district but also has more Level-2 traders. Besides, the communes having large maize cultivation area were also the main targets of the workshops. This finding also justifies the vital role of traders in the business strategies of seed enterprises. Opposed to the findings of this study, Waldman et al. (2017) discussed the different factors on maize seed choices in his recent research in Africa. Waldman et al. (2017) have pointed out the importance of information flow in the choice of maize seed, as well as the influence of the increasing trend in extreme weather events. Maize seed choices in Africa changed after the flow of information on seed quality between seed companies, and farmers were discontinued. The information content in this flow is often conflicting. It led to wrong seed selection and seriously affected the economic condition and food security of the vast region. However, unlike the discontinued information flow in Africa, the two-way information flows in Yen Chau connects seed companies, local traders, and farmers.

3.4.2. The consequences of the maize trading structure in Yen Chau district

a. The National Test Procedure for new seed

Constitutional provisions in Vietnam provide the legal basis for granting the commercial release of plant varieties as well as protected rights. The registration of any newly introduced seed, however, is subject to the requirements of the Seed Ordinance. Only seeds from an authorized list can be marketed. A new seed variety must undergo the NTP to become officially certified (details on the NTP procedure are presented in Figure 3.12). The testing council performs preliminary experiments through VCU (Value of Cultivation and Use) and DUS (Distinctness, Uniformity, Stability) trials for several consecutive crops in a specific growing environment. The VCU and DUS tests aim to optimize the evaluation standards for seed permission. The screening of hybrid varieties with high yield and considerable genotype stability, when used in different environments, is important to any commercial maize production (Gama and Hallauer 1980). Vietnam's national standards for maize seed are

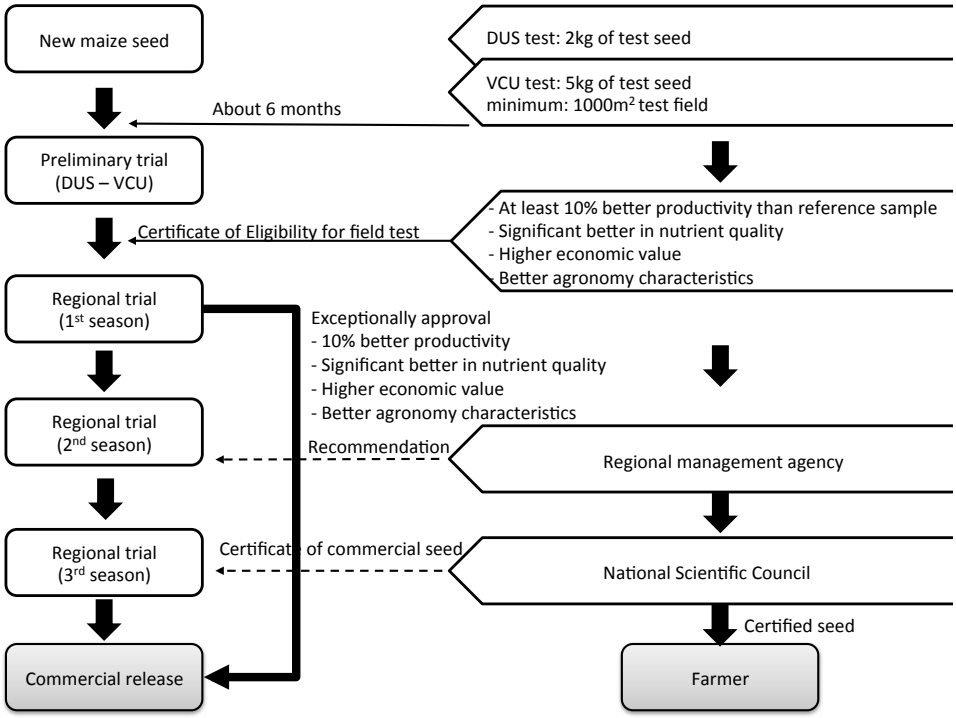


Figure 3.12 National Test Procedure (NTP) for new maize variety.

Source: MARD 2011b, 2011c.

stipulated in the QCVN01-56:2011/BNNPTNT (VCU) and QCVN01-66:2011/BNNPTNT (DUS), which focus on productivity, quality, economic value, and agronomic characteristics (MARD 2011b, 2011c). Any qualified maize seed that has passed the preliminary trial must show a significant improvement over existing cultivars. Further regional testing on 500 to 2,000 ha is then permitted. The regional test requires at least one season to obtain exceptional permission for commercial release, which is granted only for an identifiably better variety. Generally, the seed candidates must show stable quality throughout three continuous crops to qualify for a license. The assessment of the genotype performance of hybrid maize candidates examines their adaptation and stability (Crossa 1990). Maize cultivar selection based only on yield proved inadequate in many actual cases when gene-environment interaction was significant (Kang et al. 1991). The NTP is a complicated two- to three-year process under the strict supervision of the local government and a national scientific council. It guarantees the stability of maize genotype behaviors in different environments. The measurement process requires not only high time and testing expenditures but also much effort and attention from investors and seed enterprises.

According to respondents who were randomly selected from among smallholders and Yen Chau Department of Rural and Agriculture Development (DARD) staff, testing farms for NTP were designated through consultation with the DARD office. The selected test HHs were, accidentally or by design, all experienced, skilled farmers, while the selected farms were fertile, had level soil, and were reasonably flat. These HHs were strongly assisted by the investor's technicians in cultivation techniques, fertilizer, and pest and disease control. The test farms were divided into two groups in order to compare quality between the new seeds and the existing varieties. No NTP test has failed in Yen Chau district. After completing the NTP test, the new variety is officially eligible for commercial release. Currently, national regulations provide no convention for seed certificate withdrawal under any circumstances.

b. The influences on cultivation regime and local farmers' livelihoods

The heavy competition between seed enterprises for the support of traders has brought the abnormal effect in maize production. It has contributed to the formation of the annual alternating seed cultivation regime in Yen Chau. Cultivation regime can be understood to refer to the cultivation system or cultivation practice followed. The phenomenon of annual changing seed varieties in Yen Chau started in 2010. Farmers believe that they need to change seed variety in order to maintain productivity. This has resulted from the interaction between farmers and the trader network. However, the annually alternating seed cultivation regime is antithetic to the purpose of the NTP. This view has no scientific basis, and it goes against the purposes of the DUS test in NTP for new seed, in which every certified seed must be able to maintain its genotype and agronomic stability over time. Furthermore, the NTP trial also includes a regional trial, which requires any maize seed to consistently perform better than other cultivars for at least two to three consecutive years. The NTP test identifies when a suitable maize seed has been found; it guarantees stable productivity for a long time absent abnormal weather events (Leibman et al. 2014). LVN, for example, was the most popular maize seed in Yen Chau for many years before 2010. It was adopted by almost all farmers each year and consistency output 3.5 to 4.5 tons of maize per hectare (Ha et al. 2004; MARD 2011a). This important input information has been hidden or falsified by seed enterprises and the local trader. The NTP can generally determine seed quality at a mesoscale region, but it sometimes cannot cover all the micro-climate areas that appear alternately between complex topographic regions. Even an authorized seed when adopted in an unfavorable micro-climate area, can lead to a failed crop. For example, the P-X variety has delivered high productivity and quality harvest in the northeastern region but it provided mediocre quality in Yen Chau in 2015.

Alternating seed varieties have carried more risks for farmers. In Yen Chau, the domestic LVN race costs VND37,000 (US$1.6) per kilogram; the average price of the foreign seed ranges from VND95,000 to VND120,000 (US$4.1 to US$5.3) per kilogram. It means the price of LV is usually a third to half the price of foreign products (Table 3.6). As neither foreign nor LV maize had significantly better nutrients (Son et al. 2009), the advantage of the costly seeds is thus only the potential for higher productivity. Table 3.7 compares the actual and potential yields of the most popular maize seeds in the four study villages in 2017. Local Yen Chau farmers adopted the same pesticides, chemical fertilizers, and herbicides for different seeds and still used the same underdeveloped agricultural techniques for all seeds. This kind of cultivation method thus ignores the special considerations associated with the use of different seeds, such as resistance to pests or the higher percentage of germination. This cultivation method is considered inadequate for modern agriculture and supposedly cannot make the best use of any seed, whether domestic or foreign.

The average actual yields of all maize varieties were lower than expectation, reaching only 25% to 50% of potential yield. The productivity of LV (3,400 to 4,000 kg/ha) was comparable to that of other seeds (3,500 to 4,800 kg/ha). Even when foreign seeds had a higher potential yield (12,000 to 14,000 kg/ha) compared to LVN (8,000 to 12,000 kg/ha), their productivity was consistently similar among villages. The same maize yield range was found for all seed types at all locations. This result indicates that, in the same meteorological and soil conditions, the traditional cultivation methods of the local people cannot make the best use of any maize seed.

Annually changing seed varieties has brought no benefits so far, and even carries more risk for local farmers. For example, the hybrid maize seed P-X (mentioned in part 3.3.4

Table 3.7 Actual and potential yields of some maize variety groups in villages in 2017

Maize variety group	Average of actual yield (ton/ha)[a]				Potential yield (ton/ha)
	Keo Bo	Lac Ken	Suoi Bun	Luong Me	
M	4.4	4.8	3.9	4.5	12-14
S	N/A[b]	3.9	4.4	4.8	12-14
P	N/A	4.8	3.5	4.2	12-14
LV	N/A	N/A	4.0	3.4	8-12

[a] The average actual maize yield statistic taken from respondent HHs who adopted only one maize variety in 2017. HHs that adopted more than one variety often collected the harvest together and could not distinguish between the yields of different seeds.

[b] N/A: not available; this indicates that the data cannot be calculated due to the limited number of total HHs that satisfy criterion (a) or because the number of HHs that adopted the seed was too small for reliable statistics.

Source: Surveyed by the authors.

above) (certificate number 1005.10.00) has a vast authorized scale that includes the Red River delta, the northern highlands and mountainous regions, the north central region, southeastern regions, and the central highlands (MARD 2016). This seed was mentioned earlier regarding its mediocre quality when adopted in Yen Chau region. However, the same seed has been grown in Nguyen Binh district, Cao Bang province, northeastern Vietnam, with high productivity and quality. The NTP test can generally determine seed quality at a mesoscale region, but it sometimes cannot cover all the micro-climate areas that appear alternately between complex topographic regions. As climatic conditions are often related to thermal-humidity characteristics, which are vital for the growth of any species, even an authorized seed, when adopted in an unfavorable micro-climate area, can lead to a failed crop. Alternating seeds can, therefore, lead to poor results.

The alternating seeds cultivation regime, potentially increasing the seed varieties in the market rapidly, benefits the seed enterprises (Robbins 2012; Howard 2009). The more seeds available in the market, the better the companies' chances of increasing their reputation, operating scale, and competitive advantages. So, traders consider based on not only product quality but also their trademark. The second advantage of having a diverse seed bank is the ability to circulate the seeds among biological regions. This facilitates improvements in climate variability adaptation and guarantees sales figures. The rapid changes in the most popular maize seed varieties, as illustrated in Table 3.4, reflects the fierce competition between seed enterprises in their efforts to dominate the market. For example, foreign companies tried to dominate the maize market through GMO seeds. In late 2014, Vietnam officially became the 29th country to permit GMO species, and giant multinational corporations like S and M seed enterprises from Switzerland and United States instantly realized the potential and began investing in the Vietnamese market. According to our survey, two out of 194 respondent HHs had received investments from a foreign seed company to grow GMO seed in 2017. In the first

year, they got four kg of GMO seed free along with technical support and 30 kg of fertilizer and herbicide. The GMO seed delivered considerably better productivity than the other available seeds, but it requires specific agricultural supplies from the seed providers. The expansion of GMO seed might lead to a dependence on foreign inputs of seed, fertilizer, and other agricultural materials for maize production. When domestic productive materials cannot meet the needs of production, foreign companies will seize the market.

When domestic productive materials cannot meet the needs of production, foreign companies will seize the market. The annually alternating seed cultivation regime had provided the lion's share of benefits to sellers rather than farmers (Sheridan 2009). Farmers are worse off when they gradually become more dependent on traders for production. The changing seed variety regime has resulted from the influence of traders and seed enterprises. A similar finding was reported in Le Buanec's study (2007) on the situation of seed companies occupying the market in the world. Several decades ago, the ten biggest companies had taken over 13% of the global seed market. The remaining 87% was controlled by small companies and farmers (Dalle Mulle and Ruppanner 2010). Today, only five seed giants control 35% of the global share (Le Buanec 2007). The findings of this study make clear our concern, there has been a fierce competition between seed enterprises, which has resulted in the annual changing seed cultivation regime in maize production in Yen Chau. This regime is both unnecessary and a risk to farmers.

3.5. Chapter summaries

Maize is by far the most important cash crop in northwestern Vietnam, but currently, maize production is risks for local farmers. This chapter describes the characteristics of maize trading structure in Yen Chau district. The maize trading structure comprises five main interconnected components, (1) seed and supply enterprises provide materials for maize

production; (2) the local traders deliver both productive materials and information from agricultural producers to (3) farmers; the harvested maize is collected by the local traders and then transported to the (4) feed enterprises in the lowland; and the (5) bank system constitutes the major credit source for the operation of maize production and businesses. Furthermore, maize production has been heavily influenced by the strong credit dependence between stakeholders, in which traders depend on the bank system for operational funding, Level-3 traders rely on Level-1 and Level-2 traders for credit sources, and most of the farmers borrow money from traders for maize production. Level-3 traders work on the smallest scale but have the greatest influence on farmers since most are district natives and have close social relationships with them. These relationships along with the agriculture agreement are the methods used by traders to maintain their influence on farm production.

In Yen Chau district, there has been fierce competition between seed enterprises for market share, with five giant seed enterprises and over 35 varieties available in the market. However, the quality of seed and services cannot bring competitive advantages to producers, as farmers' outdated traditional cultivation methods can achieve only 25–50% of the potential yield of any seed. The three-level trader network is not only the main target of seed enterprises but also the core of the maize-trading structure and plays the most important role in connecting all the stakeholders. Hence, seed enterprises have focused their business strategies on the local traders, utilizing their influence over farmer production. Traders' concentration on products that bring them the greatest benefits has resulted in a cultivation regime of alternating seed varieties in Yen Chau. This regime is both unnecessary and a risk to farmers. Farmers gradually become more dependent on local traders in both selection maize seeds decision and credit for production as well as local traders also face many risks.

CHAPTER 4. DRIVING FORCES FOR LIVELIHOOD STRUCTURE CHANGES IN YEN CHAU DISTRICT

4.1. Introduction

Since Vietnam officially joined in globalization processes and commercial liberalization, except for the benefits, they need to deal with fierce competition as well. The formation of maize trading structure in Yen Chau district currently is the typical example of this issue. This particularly maize trading structure has heavily impacted on the farmers' livelihood activities. Maize has gone from the “money crop” to the “burden” of local people. So far, finding adaptation livelihood activities after maize is the urgent need for the region. This chapter aims to investigate the determinants of the transition in livelihood structure in the northwestern region of Vietnam.

On the other hand, Tai Dam people are the majority in the northern upland region in Vietnam, and Son La province is considered the center municipal of Tai Dam people (Lebar et al. 1964). They are generally sharing the similarities in culture, social features, and adopting the same agricultural systems (Vien 2003). As the same other regions of Vietnam, local people in the northern upland region started to reform their livelihood activities after the birth of the 1993 Land Law as well as the Decision No. 140/1999 QD-BNN dated 1999 by the MARD, the Decision No. 140 aimed to ban swidden cultivation and supporting hunger eradication & poverty reduction, forest and environment protection. Before 2013, maize accounted for over 70% of agricultural areas and became a cash crop for the northwestern upland region and accounted for over 90% of the income of the local people (Ha et al. 2004). Since 2013, the global maize price has continuously decreased, leading to a significant drop in the local maize selling price. Over five years, the global maize price lost over 46.3% of its value, decreasing from US$321.24 per ton in 2012 to US$148.62 per ton in 2017.

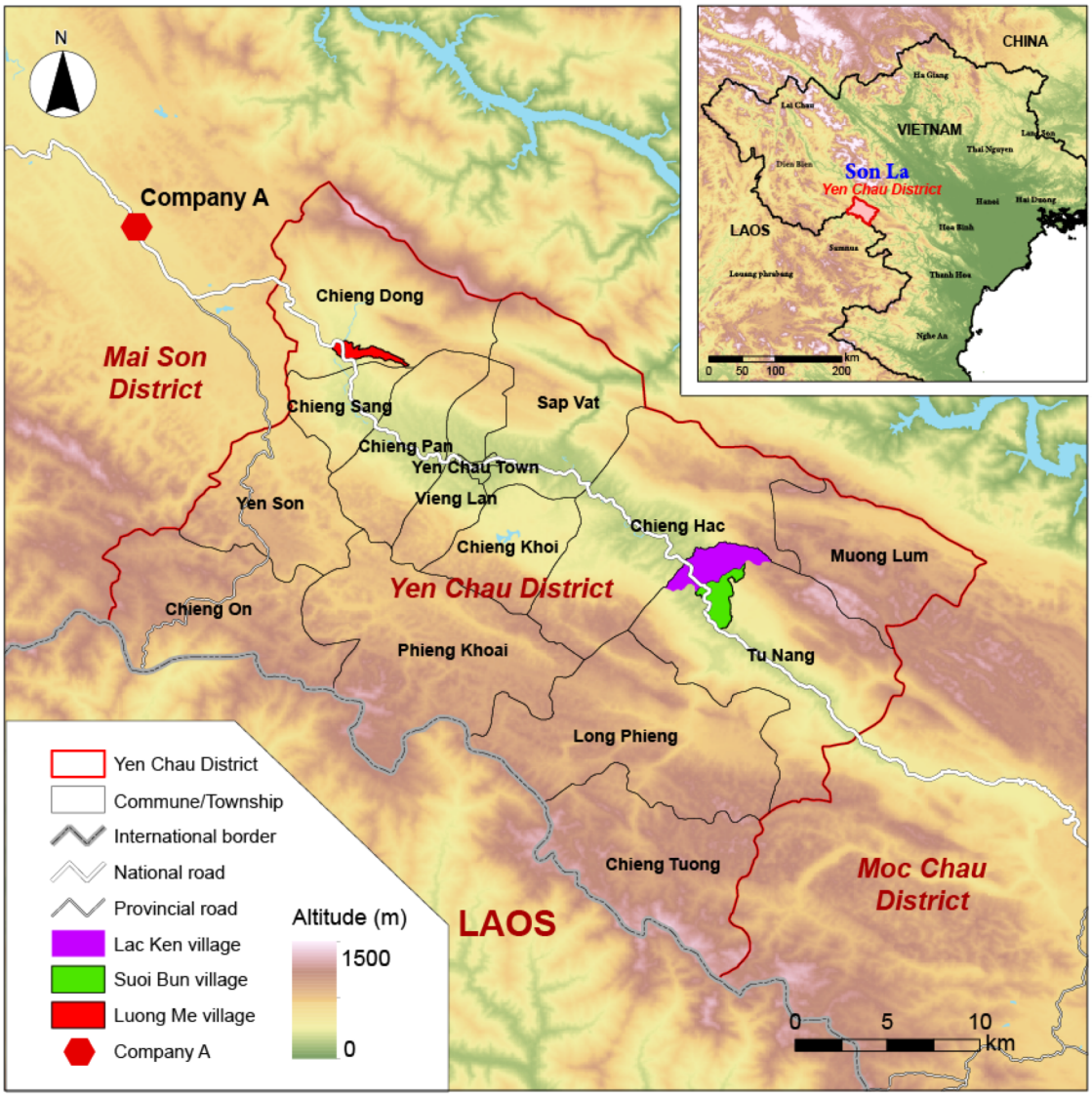


Figure 4.1 Administrative locations of study villages.

(a) The small map indicates the location of Yen Chau district in northwestern Vietnam.
Source: GADM (http://gadm.org/) and ALOS World 3D (30 m) made by JAXA.

Therefore, to discover the determinants of the new livelihood structure in Yen Chau district, we focused on three Tai Dam villages: Lac Ken, Suoi Bun, and Luong Me (Figure 4.1). These villages were purposefully selected for this study, as they originated in the same geographical conditions, culture, and customs. Lac Ken, Suoi Bun, and Luong Me villages are mainly populated by Tai Dam people with over 90 % of the population living adjacent to National Road No. 6. Workers in the villages over the age of 18 also have an average educational period of six years, which is significantly lower than the national average (Imai et al. 2011) (Table 4.1). Luong Me was originally located in Yen Chau, but Lac Ken and Suoi Bun belonged to the Moc Chau district. Since 1979, Lac Ken and Suoi Bun have been separated from Moc Chau and placed under the management of the Yen Chau administration (ECYC 2001). Among the three villages, Lac Ken has the largest area with the lowest population, and Luong Me has the highest population density. The population density in 2017 of Lac Ken, Suoi Bun, and Luong Me was 57.6, 120.7, and 497.3 person/km^2, respectively (Yen Chau statistical office 2017). Luong Me is the only village with an adequate irrigation system to maintain the production of double-cropping wet rice. In Lac Ken and Suoi Bun, a gravity water system is the main source of water for agricultural production.

4.2. Land use changes during the 2010-2017 period

Livelihood was made of five components natural resources, human, financial, social and physical assets, among which the most important asset for farmers was natural resources, especially cultivation land. According to Kamwi et al. (2015), any changes in land use and land cover might have resulted in serious impacts on the environment, economics, and society. Land use change is considered to be the most important manifestation of change in rural livelihoods. To understand the driving forces behind the formation of livelihoods, it is important to thoroughly investigate changes in land use.

Table 4.1 General information on study villages.

Administrative locations	**Tu Nang commune**		**Chieng Dong commune**
Village	**Lac Ken**	**Suoi Bun**	**Luong Me**
Total HHs (2017)	86	116	242
Population (2017)[a]	385	459	1,007
Population density (2017) (people per km^2)[a]	57.6	120.7	497.3
Total interviewed HHs in 2016	60	61	77
Total interviewed HHs in 2017	77	70	73
Topographical height above sea level (m)	300-400	300-400	300-400
Total area (ha)	668.1	380.3	202.5
Land distribution norm in 1993 (m^2/capita)[b]	3,900	2,100	900
Average years of education[c]	6.3	6.3	6.0

[a] Data was taken from Yen Chau statistical office 2017.

[b] This was the maximum allowance for land distribution for Tai Dam villages in Yen Chau in 1993.

[c] Average years of education for laborers over the age of 18, calculated for 249, 218, and 278 people in Lac Ken, Suoi Bun, and Luong Me, respectively.

Source: Field surveys, 2016 and 2017.

4.2.1. Intensive maize monoculture cultivation regime

Hybrid maize was first introduced in Yen Chau in 1995 through an effort of the government to reform the upland economy. Maize soon became the most important staple crop in the vast agricultural land of Yen Chau. Until 2010, the maize area in Lac Ken, Luong Me, and Suoi Bun villages accounted for 32.7%, 47.1%, and 51.6% of the total area of each village, respectively. The period from 2010 to 2013 recorded the highest maize selling price, with an increase from US$235.81 per ton in 2010 to US$321.24 per ton in 2012, resulting in an 8.6% increase in the maize cultivation area in Yen Chau district. The increase in the maize area was achieved by the transfer of previously forested land to increase the total area of cultivation land, which led to a decrement of 9.0 % of the total forest area in Lac Ken and Suoi Bun. In addition to forested land, in Suoi Bun village, a part of the fruit tree area of 6.8 ha was also removed for the extension of maize cultivation (Table 4.2)

The sudden decrease in the local maize selling price in 2013 (US$199.13/ton) greatly influenced the region's economic condition, as maize was the staple crop and had accounted for over 90% of the total income in Yen Chau since the 1990s (Yen Chau Statistical Office 2017). For local farmers, maize was the most important crop and, thus, irreplaceable. Hence, farmers were determined to increase their income from maize by further intensifying the use of herbicides and pesticides, using expensive and purportedly better foreign varieties, and even adopting Genetically Modified Organism (GMO) species. However, the intensification of maize monoculture on steep slopes led to the permanent loss of soil nutrients, which resulted in a considerable amount of soil resources becoming incapable of generating income (Schweizer et al. 2017). All the local farmers in Yen Chau are still loyal to the old cultivation methods that have been applied for over 20 years. These outdated and inefficient methods cannot make the most of the productivity of modern seeds that have high-yield potential but require demanding agricultural techniques (Kyeyune and Turner 2016).

Table 4.1 Areal changes in major crops compared to the total area of Lac Ken, Luong Me, and Suoi Bun villages.

	Year	Forest		Maize		Fruit tree		Sugarcane		Wet rice		Others	
		%	ha	%	ha	%	ha	%	ha	%	ha	%	ha
Lac Ken	2010	53.8	359.4	32.7	218.5	10.3	69.1	0.0	0.0	0.6	3.9	2.6	17.2
	2013	51.6	344.7	36.1	241.2	10.3	69.1	0.0	0.0	0.7	4.4	1.3	8.7
	2015	50.9	340.1	32.1	214.2	14.6	97.6	0.0	0.0	0.7	4.4	1.8	11.8
	2017	50.9	340.1	25.6	170.7	21.3	142.5	0.0	0.0	0.7	4.4	1.6	10.4
Luong Me	2010	0.0	0.0	47.1	95.3	22.7	45.9	1.0	2.1	16.0	32.4	13.2	26.8
	2013	0.0	0.0	47.1	95.3	22.7	45.9	1.0	2.1	16.0	32.4	13.2	26.8
	2015	0.0	0.0	36.0	72.9	22.7	45.9	12.1	24.5	16.0	32.4	13.2	26.8
	2017	0.0	0.0	17.2	34.9	22.7	45.9	30.9	62.5	16.0	32.4	13.2	26.8
Suoi Bun	2010	34.7	132.0	51.6	196.3	8.6	32.7	0.0	0.0	2.8	10.7	2.3	8.6
	2013	26.9	102.3	57.2	217.7	6.8	25.7	0.0	0.0	6.4	24.2	2.7	10.4
	2015	26.9	102.3	56.8	215.9	6.8	25.7	0.0	0.0	6.4	24.2	3.2	12.2
	2017	24.1	91.5	50.6	192.5	16.1	61.4	0.0	0.0	6.4	24.2	2.8	10.7

Note: Percentage may not total 100% due to rounding.

Sources: Field survey, 2017, and in-situ measurements taken by the authors.

Moreover, after removing import and value-added taxes, as well as restrictions on import quotas for maize products (MOIT 2005), it led to the introduction of various foreign imported maize products. Along with the fall in maize selling prices, farmers' effort resulted in very little, as domestic maize products could not compete with imported foreign products owing to the high expense. Besides, most of HHs have fallen into bad bank debt, only 40% of HHs can assess to bank credit to maintain production. The majority of HHs is now depending on traders' credit with the very high-interest rate for maintaining maize production (Figure 3.4). This unfavorable condition continues, and has gradually worn out the economy and the efforts of HHs related to maize cultivation; it has forced them to accept and adapt to the new situation.

4.2.2. Diversified cropping system

Rice is the subsistence crop of local people not only in Yen Chau district but also in Vietnam. The general characteristics of the Tai Dam people are living in the lowlands along streams and experienced in wet rice cultivation (Lebar et al. 1964; In 2007). However, in the three study villages of Tai Dam, only Luong Me has the most abundant of water and is favourable for cultivation of wet rice. The other two villages are difficult in irrigation due to lack of water, especially Lac Ken villages. Therefore, before 1993, the time before granting land use rights to farmers, Lac Ken villagers and Suoi Bun were forced to adopt swidden cultivation. Upland rice, cassava, sweet potatoes are their main food source. Since the local government encouraged people to switch from swidden cultivation to hybrid maize, the villagers of Lac Ken and Suoi Bun have to use money to buy rice for their daily food.

Since the primary source of income from maize was threatened, Yen Chau farmers tried to maximize the expansion of their wet rice areas. Their initial activity was to make the best use of irrigable land by using excavator machines to prepare the flat fields. However, the shortage of irrigation water hindered the expansion of wet rice in most areas. Most of the wet rice area depends on gravity water, which is only enough for one crop per season per year.

Some particular areas benefited from irrigation systems have enough water for double-cropping. In the three study villages, only Luong Me benefited from irrigation systems that provided enough water for double-cropping. However, rice production was only sufficient for the demand of local people. The total area of wet rice in Luong Me has remained stable without change since 2010.

In contrast, the total area of wet rice in Lac Ken and Suoi Bun villages has slightly increased. Compare to 2010, wet rice area in 2017 has increased by 1.2 and 2.3 times in Lac Ken and Suoi Bun, respectively (Table 4.2). The disappointed maize price has encouraged HHs to expand wet rice area in the favorable land for irrigation which was previously used for growing maize. The main irrigation water source comes from the same stream that flows westward from Suoi Bun to Lac Ken. In 2013, farmers in Suoi Bun dammed up this stream and redirected its flow to develop their wet rice fields. Hence, the total area of wet rice in Suoi Bun has been rapidly increased when Lac Ken farmers have been facing difficulties in maintaining the water sources for their wet rice. Consequently, the total area of wet rice in Suoi Bun expanded faster than it did in Lac Ken (Figure 4.2; Figure 4.3).

From 2013 to 2017, the total maize area in all three villages fell from 554.2 ha to 398.1 ha, a decrease of 28.2%. In Lac Ken village, in particular, a considerable amount of the maize area (11.0% of the Lac Ken area; Table 4.2) was transferred in just five years to a fruit tree area that included mainly mango trees intercropped with mixed fruits such as longan, pomelo, avocado, and jujube. During this period, the total fruit tree area increased by 106.2% from 69.1 ha to 142.5 ha. The preferential expansion of fruit trees in previous maize fields took place in favorable areas for transportation and irrigation. The initial preference maize fields were converted to fruit trees in Lac Ken are close to transportation roads that could support small- and medium-sized motor vehicles. These roads have been upgraded and repaired annually since 2006 through the contribution of local people and local maize traders. After upgrades, these

Figure 4.2 Irrigation system for wet rice in Luong Me village.

Source: Taken by author in 2017.

Figure 4.3 Gravity water source for wet rice in Suoi Bun village.

Source: Taken by author in 2017.

roads are now approximately three-meter-wide, making them suitable for motor vehicles and trucks with capacities of three to four tons. Among the fruit trees grown in Lac Ken, mango trees account for the largest area. Mangoes are the most popular native fruit tree in Yen Chau district. For decades, mango trees were grown by all local people in their gardens around residential areas. In 2010, the total area of native mango trees in Lac Ken village was calculated to be 69.1 ha, accounting for 10.3% area of the total area (Figure 4.4).

Differing from the fast crop structure transformation that occurred in Lac Ken village, no significant transformation was recorded in Suoi Bun village, not even in 2015, apart from the decrease in maize areas (Table 4.2). In fact, the decreased maize area in Suoi Bun accounted for the abandoned maize areas planted in public purposes in the land budget; farmers needed to pay an annual tax to be eligible to use it. Based on the average amount of agriculture land per capita, the characteristics of the soil, and the needs for local development, every village and ward can reserve a proportion of their agricultural land fund for public purposes, as long as it does not exceed 5% of the total land area. The public purposes land budget can be rented for no longer than five years for growing annual crops and perennial crops, and for aquaculture production. 70% of revenue sources from public purposes land funds are for the payment of duties, and the remaining 30% will be used for the general development of the local region. Although these abandoned areas were small in the area of less than 2 ha and belonging to nine HHs, this phenomenon was not seen in the over 20-year historical development of the maize crop in Yen Chau. In early 2016, HHs in Suoi Bun began switching from maize to mango and other fruit trees. Suoi Bun and Lac Ken are the two neighboring villages and also had about 20 years under the same agricultural cooperative farm management from 1968 to 1988 (ECYC 2001). Thanks to the close relationship between these two villages, upon seeing the promising results of grafted mango trees, Suoi Bun villagers soon followed Lac Ken villagers to grow

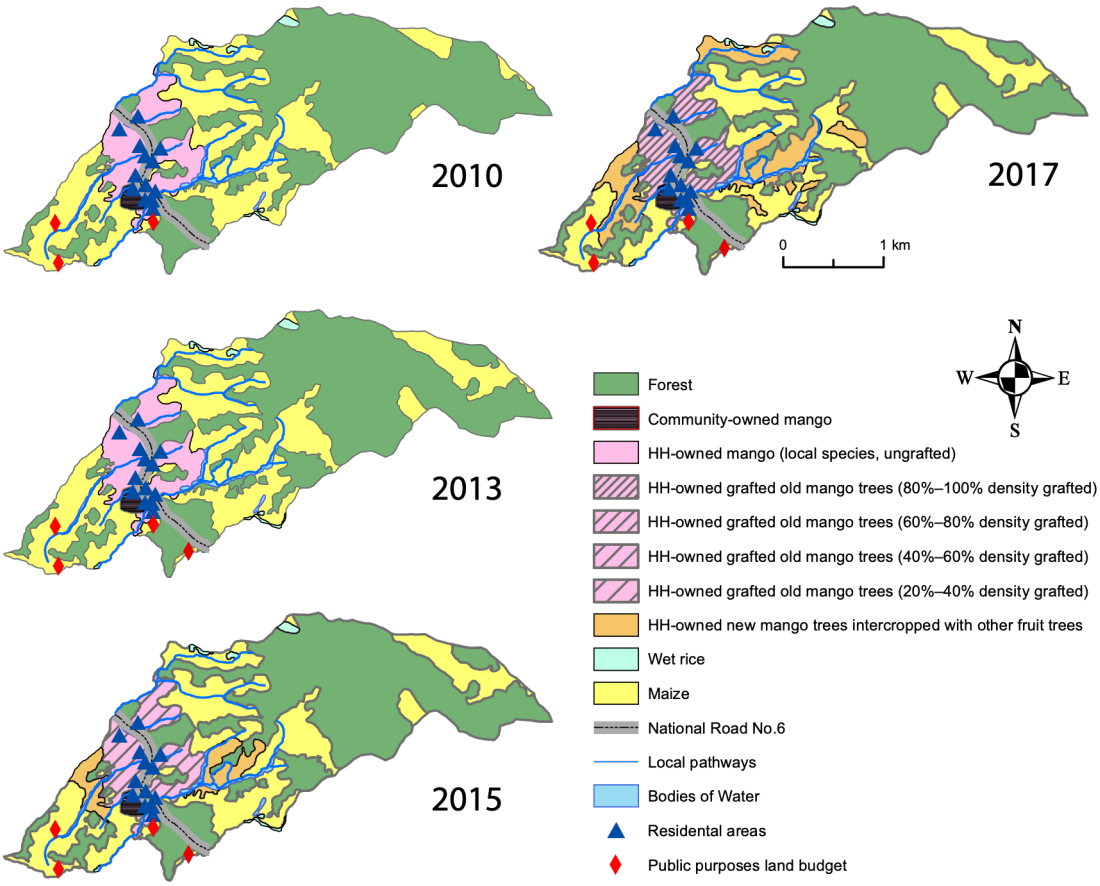


Figure 4.4 The development of land use change in Lac Ken village.

grafted mango. In 2017, the total fruit tree area in Suoi Bun reached 61.4 ha, an increase of 138.9% compared to 25.7 ha in 2013 (Table 4.2). The process of transferring maize to fruit trees in Suoi Bun is proceeding faster than in Lac Ken, even though it started about three years later.

Unlike other villages, HHs in Luong Me village focus on growing sugarcane instead of fruit trees. Although Luong Me has a large area of native mango trees of 45.9 ha, which accounts for 22.7% of the total area, there has been no change on Luong Me's mango area since 2010. However, there has been no change in its mango area since 2010. Since maize price has decreased sharply, the largest decrease rate in maize areas from 2013 to 2017 was seen with a 60.4 ha reduction which is equivalent to a 29.8% reduction of the Luong Me village. The eastern areas of the village where previously maize fields and are rapidly being transformed into sugarcane fields. The transition began in early 2014 with the expansion of old sugarcane fields. And then, the transition appeared in the fields near residential areas where convenient to transportation routes and the irrigation system. In 2013, the sugarcane area in Luong Me was only 2.1 ha, and it increased 1,125.0% to 24.5 ha in 2015. By 2017, 60.4 ha of maize area had been replaced by sugarcane (Table 4.2). The transformation of maize to sugarcane in Luong Me was direct and simple since this village has no forest reserves.

4.3. Changes in livelihood activities

4.3.1. Lac Ken village

The breakdown of maize monoculture has facilitated the changes and diversification of the livelihoods of the local Tai Dam people. As illustrated in Figure 4.4, Lac Ken was the first village started grafting experiment in local mango species with foreign species (hereafter new mango). At the beginning of 2014, almost the areas of HHs-owned mango gardens where close

to farmers' houses were grafted with sparse density from 20 - 40%. Up to 2017, about 80 - 100% of previous existing mango area has been grafted. A considerable amount of maize area (10.5%, Table 4.2) was transferred to grafted fruit tree area of the main mango intercropped with mixed fruits including longan, pomelo, avocado, and jujube. The expansion of fruit trees was taken placed in the favorable soil for transportation and irrigation. In the five years from 2013 to 2017, the total fruit tree area has increased by 106.8% from 68.8 ha to 142.3 ha.

Mango is the most famous native fruit tree of Yen Chau region. For decades, the mango was grown by all local people in their gardens around the residential areas. In 2010, the total area of native mango in Lac Ken village was calculated of 68.8 ha, accounting for 10.3% of Lac Ken natural area. Although Yen Chau native mango is famous for its flavor, the low productivity and unsightly appearance made it difficult to become a staple cash-crop. The experiment of grafting technique was a big jump as foreign mango species grafted with native species have resulted in the high-quality mango with superior productivity. However, new mango is not only a demanding technique that requires guidelines and training; it includes a series of time-consuming experiments of trials and errors. Usually, a grafted tree needs at least two to three years to demonstrate the experimental results. The rapid expansion of grafted mango trees to all HHs garden in Lac Ken right in 2014 (Figure 4.4), just one year after the decrease of maize price, has indicated the strong confidence and determination of Lac Ken HHs in transferring maize to mango.

In order to deeply understand the strong confidence and determination of Lac Ken HHs, we can give an example with mango or longan trees. According to the survey, even if mango and longan are xerophytes, farmers still keep an eye on irrigation. Besides the two to three months' dry period necessary for flowering and development, the trees need to water every five to seven days. Growing new mango and longan cost more time for pruning and leaf formation. With the young tree, in the first year after grafting, it requires efforts to pinch off

buds to fasten up the side buds' developments. Later, the buds will again be sparsely cut off and keep only four to five of them which are evenly scattered, and its hosted branch must not have the same origin in the main tree body. With experienced farmer, when the branches become stronger, they have to tie with a heavy thing to straighten horizontal development; after that, the buds on small branches are pinched again to three to four equally development units.

For farmers who are familiar with maize production for over 20 years, the sudden conversion to mango has been considered as an abnormal change. This problem in Lac Ken was further investigated through detailed surveys conducted with 60 HHs in 2016 and 77 HHs in 2017. Findings from the surveys showed that Lac Ken farmers developing grafted mango was not a sudden or reckless decision. They are not either more active farmers or having more advantages than Tai Dam people in other villages. Actually, in 2010, a lowland businessman sought for business opportunities in Yen Chau by hiring the community-owned mango farm.

In the 1970s, mango trees were grown by co-operative agriculture gardens over a vast area throughout Yen Chau to provide the raw materials for an agricultural processing company. When this company dissolved in the late 1970s, the mango farms were returned to the management of the community and productivity has been shared equally between all HHs. Based on the distribution of land use rights as stipulated by the Land Law 1993, farmers in Lac Ken, with its large natural area, were granted the maximum allowance of the land norm (3,900 m^2 per capita), which was significantly higher than that granted to the people of Suoi Bun and Luong Me (2,100 m^2 and 900 m^2 per capita, respectively) (Figure 4.5). The native mango species were grafted with foreign species from Taiwan, Thailand, and Australia for testing and grafted mango soon exhibited better quality, productivity, and significantly better economic value than maize. With the support from the farm's owner for grafting technique and output market, Lac Ken HHs have rapidly foreseen the future success of grafted mango (Figure 4.6). Consequently, new mango trees were popularized in the vast gardens of all HHs and continued

Figure 4.5 Community-owned mango garden in Lac Ken village.

Source: Taken by author in 2017.

Figure 4.6 Native mango (left) and grafted mango (right)

Source: Taken by author in 2016 and 2017.

to grow in other maize fields (Figure 4.4). Thus, Lac Ken villagers quickly expanded the area of grafted mango on their maize field because they had seen an obvious economic effect on the common land area (community own mango garden), from that they felt completely assured and confident to deploy on their own land.

The land use map of Lac Ken in 2017 indicates that mango trees now account for the majority of newly grown trees, but the newly created fruit fields include different types of fruit trees (Figure 4.4). Although mangoes are currently a high-benefit product, diversifying fruit trees instead of relying on mango monoculture have indicated the fearful psychology of farmers after maize mono-cultivation. The diversification in agricultural products not only reduces the farmers' dependence on mangoes but also meets the needs of various markets. This action is a strategic solution to reduce the risk for poor farmers. The same finding was indicated in the research of Betcherman and Marschke (2016) on the livelihoods of the fisherman in Vietnam coastal areas. The diversification of livelihoods besides aquaculture since fishermen have become engaged in wage employment and self-employment activities has contributed to much better living conditions compared to aquaculture dependence. Although aquaculture, encouraged by governmental policies, has assumed an increasingly dominant position in fish production in Vietnam, aquaculture has not generated high incomes for most fishermen. Therefore, some people are considering it a less important income of their livelihood portfolio.

4.3.2. Suoi Bun village

The transition from maize to mango and other fruit trees has started slower in Suoi Bun village even when they are adjacent to each other (Figure 4.1). Similar to Lac Ken, Suoi Bun village has a large local species mango area of 25.7 ha which is equivalent to 6.8% of its total natural area (Figure 4.7). While several Lac Ken HHs began to graft their mango gardens in

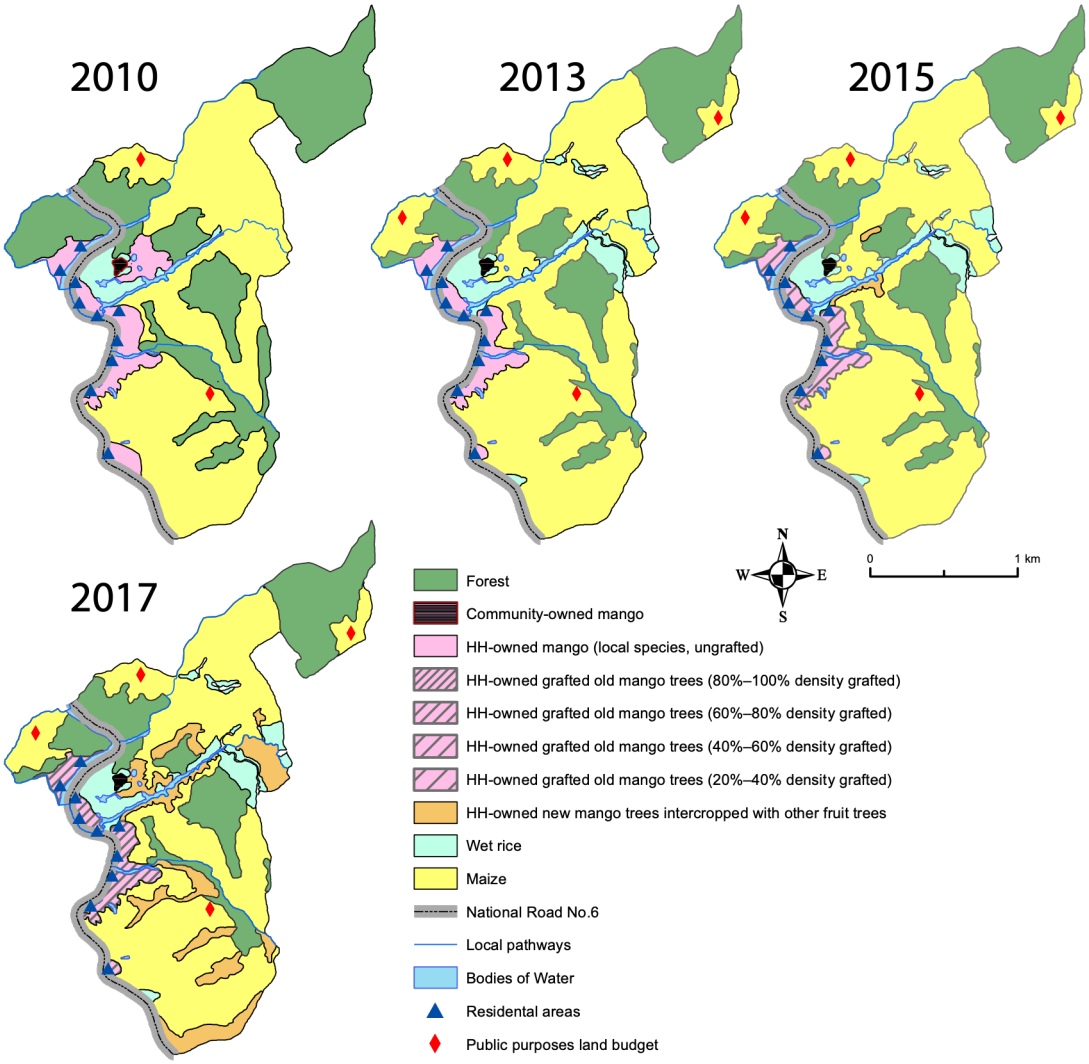


Figure 4.7 The development of land use change in Suoi Bun village.

2012, the total mango area of Suoi Bun was even shrunk due to the expansion of maize. A proportion of smallholders may not be able to satisfy their basic living requirements.

According to Chianu et al. (2008), when farmers faced the risks associated with an agriculture income source, and a proportion of smallholders may not be able to satisfy their basic living requirements; thus, family members are used to looking for an alternative means to support their livelihoods. Consequently, the majority of rural HHs in Suoi Bun village have to depend on the coupling of various agricultural and non-agricultural livelihoods to meet their living requirements. In this context, one of the best ways to quickly increase income is by doing seasonal paid jobs during the gap between crop seasons (Radel et al. 2018). In the three study villages, migrant work was found only in Suoi Bun. Popular migrant jobs included harvesting, raising livestock, construction, or working in industrial zones. Migrant workers seek jobs mostly in the lowland areas where there was a high demand for laborers. The migrants knew the labor demand information through their friends, relatives living in other villages, communes or through the leaflets, posters sticking in the street sides. Among the 61 interviewed HHs in Suoi Bun village, 27 used migrant workers in 2016, and this number increased to 45 HHs in late 2017. Investigation results indicated the faster increasing number of migrant workers in recent years.

Since early 2016, the movement of growing grafted mango has begun to spread out in Suoi Bun village. It started from the HHs' garden then continued to grow to replace maize fields (Figure 4.7). The investigation results indicated that 42 out of 45 families worked as migrant workers in 2017, spending the money they earned from such work to develop mango and other fruit farms. However, their first motivation for them to find migration works is only to diversify their income sources to support families. This change in direction of the Suoi Bun people reflects that migrant work is considered to be a merely short-term livelihood solution on which they can rely on while waiting for a more stable long-term agricultural solution. This

finding supports the viewpoint of research conducted by Hull (2007) in northeastern Thailand, where a vast number of migrants from rural areas work in urban areas because their income from agricultural production is insufficient. Although HHs with migrant workers lack labor in the agricultural sector, they have significantly higher incomes than other HHs, since they can use migrant remittances to hire labor, as well as to invest in better machines and equipment.

4.3.3. Luong Me village

One of the advantages of Luong Me village is reflected through the largest average paddy area per HH (Figure 4.8). Thanks to the stable water supply source, the productivity of rice enough for Luong Me's HHs daily demand. It significantly contributed to the better position of Luong Me compared to Lac Ken and Suoi Bun villages. Luong Me's HHs can, therefore, carefully chose the safe and suitable livelihood solutions for them. Similar to Lac Ken and Suoi Bun, Luong Me also has a broad area of native mango garden which accounts for over 1/5 (22.7%) of total area (Table 4.2). However, Luong Me HHs preferred sugarcane to new mango trees.

As we can see in Figure 4.8, sugarcane has soon become the staple crop since 2014 for Luong Me people. Growing sugarcane brought about the benefit for the development of livestock, since by-products. By-products from sugarcane production are used as high-quality livestock feed. For this reason, while the total livestock in Lac Ken and Suoi Bun remained stable from 2013 to 2017, there was an increasing trend in the total livestock size in Luong Me village. The total livestock in Luong Me village continued to increase from 120 units in 2013 to 194 units and 219 units in 2015 and 2017, respectively (Table 4.3).

Moreover, owing to the strict timeframe and storage requirements of sugarcane after harvesting which is less than 24 hours, the development of sugarcane has also been accompanied by the need for day laborers. Due to the strict requirements of transporting

sugarcane products after harvest to ensure the fructose level in sugarcane, HHs themselves had to collect and transport sugarcane from their fields to the gathering place of the product. Hence,

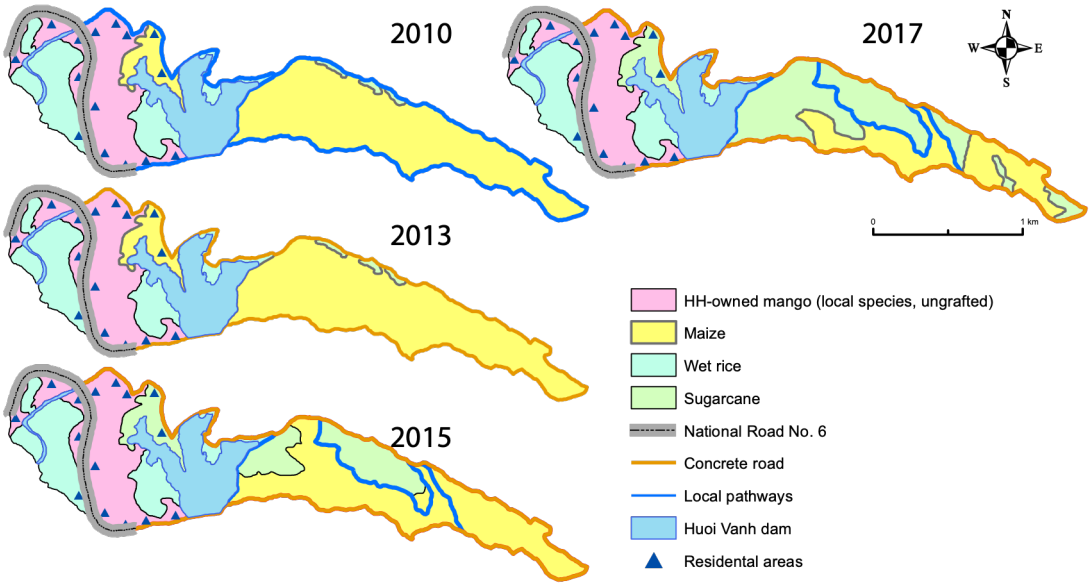


Figure 4.8 The development of land use change in Luong Me village.

Table 4.2 Total livestock in Lac Ken, Luong Me, and Suoi Bun villages

	Year	Buffalo	Animal	Total
Lac Ken (77 HHs)	2013	87	34	121
	2015	86	37	123
	2017	85	41	126
Luong Me (77 HHs)	2013	81	39	120
	2015	111	83	194
	2017	117	102	219
Suoi Bun (70 HHs)	2013	80	29	109
	2015	79	31	110
	2017	74	20	94

Source: In-situ survey data collected by the authors.

besides the income from sugarcane, taking daily paid jobs during the four-month sugarcane harvesting season is also an effective way for farmers to increase their stable earnings. Compare to other villages, Luong Me has the most stable economic status when the main income from maize decreased. They are not only having the guarantee from subsistent crops but also having the income from sugarcane and daily paid jobs related sugarcane.

Five years after the fall of the maize price, Lac Ken, Suoi Bun, and Luong Me villages have not only greatly transformed the status of land use but have not only greatly transformed the status of land use but have also diversified their livelihood activities. While the three villages were nearly identical in every aspect for over 30 years (Vien 2003), they have adopted different economic directions. As the people of Lac Ken and Luong Me focus on on-farm activities with staple crops of mango, fruit trees, and sugarcane, Suoi Bun village is trying to solve short-term economic matters through migrant work.

4.4. Determinants of the main livelihoods

4.4.1. Grafting mango trees in Lac Ken village

The effective early transition from maize to new mango trees in Lac Ken partly benefited from the community-owned mango garden. However, Lac Ken is not the only village in Yen Chau that has a community-owned mango garden; other villages in Yen Chau, including Suoi Bun, also have one. Although they do have a community-owned mango garden, the garden in Suoi Bun (0.7 ha) is much smaller than the one in Lac Ken (5 ha). The areal shortage makes the community-owned mango garden in Suoi Bun inadequate for the needs of renters. This finding suggests that the small difference in the size of the community-owned mango gardens resulted in significant differences in the current economic conditions of the two villages. The root cause of this difference originated in the larger land resource of Lac Ken.

Human resources are major internal forces that heavily affect socio-economic development. Five innovative farmers in Lac Ken began grafting mango trees in late 2012 and early 2013, approximately three years before other Lac Ken farmers (Table 4.4). These innovative farmers are also local people who are respectable and skilled farmers with long experience in agricultural production (Donovan et al. 1996). They are known to be informative sources from whom farmers may obtain reliable information, as well as effective agricultural techniques. Their opinions and skills strongly influence the community (Vien 2003). Innovative farmers are different with village patriarch, while village patriarch are the elders of the villages – who know the most about the traditional rituals such as marriage, funeral, or agricultural worshiping spells. Innovative farmers are those who having innovations on agriculture production so their yield are usually higher than other farmers. Innovative farmers are, therefore, having better living condition with higher income. Thus, innovative farmers were usually trusted and admired by local people and they were selected to be the next leaders of the village. For this reason, innovative farmers are usually well reputed by other farmers and hold important positions in the local community such as heads and secretaries of the village.

One example is Mr. L (60 years old) who was the first pioneer in developing and experimenting with mango tree grafting in Lac Ken. Mr. L was the secretary of the village for years and enjoyed significant influence in the community. After observing the initial success of the community-owned mango garden, Mr. L managed to learn the grafting technique and experimented in his 20 ancient native mango trees using three foreign mango species from Taiwan, Thailand, and Australia. One year after grafting, 17 out of the 20 trees has survived, and Mr. L determined that the native mango trees grafted with the Taiwanese species demonstrated the highest productivity and quality. Ancient trees of similar sizes, approximately 20 cm in truck diameter, were used for the experiment; each grafted Taiwanese species produced 200 to 300 kg of fruits, while Thai and Australian grafted species only yielded 80 to

Table 4.4 Innovative in agricultural field

Farmer	Age	Years of education	Position/status	Village	Livelihood activities	Year adopted
H	45	12	Village head	Lac Ken	Grafted mango	2013
I	46	9	Village secretary			2013
K	53	12	Experienced trader			2013
L	60	9	Ex. Village secretary			2012
M	52	5	Ex. Village head			2013
N	56	5	Ex. Village head	Suoi Bun	Grafted mango	early 2015
O	61	6	Ex. Village secretary			early 2015
P	55	7	Experienced trader			early 2015
9	50	7	Ex. Village head	Luong Me	Sugarcane	1997
10	56	6	Experienced trader			1997

Source: Field surveys, 2016 and 2017.

100 kg product per tree. In addition to the community-owned mango garden, Mr. L's experiment continued to strengthen the beliefs of local farmers and encouraged them to popularize the new mango trees in their gardens.

The new mango products also received substantial support from external forces. Although Yen Chau native mango area has a delicious flavor, limitations to its introduction and advertising made it difficult to find a market for it until 2013, when the native Yen Chau mango was certified by a geographical indicator with number 00034. This brought about substantial opportunities for the popularization of both the native mango and the new mango products, far from the Son La market. This reflects the significant contribution of the Yen Chau Department of Agriculture and Rural Development (DARD) with their efforts in registering the geographical indicator of Yen Chau native mango. A geographical indicator is an official name or sign issued by the National Office of Intellectual Property of Vietnam under the Vietnam Ministry of Science and Technology. A geographical indicator assigns identified goods with the specific location of geographical origin, the confirmation of processing technique, the notification of product quality, or the specific distinctive characteristics of the products from that place where the product was made. After that, the demand for mango products from Yen Chau continuously increased and led to the need to find a stable supply source. The establishment of the Huong Xoai cooperative farm in Lac Ken village in late 2015 was directed by the Yen Chau DARD to deal with large-scale production and collection.

The grafted mango agricultural model in Lac Ken was soon learned and copied by the surrounding villages in Yen Chau district. As mango supply sources became more abundant, mango products in Lac Ken faced strong competition from other villages. Statistic results indicated that the selling price for a kilogram of mangoes in 2017 was US$0.66, about 75% of the US$0.88 price in 2016. The drop in selling price has reflected the fierce competition of mango products in the traditional market in Son La and other close provinces. Hence, it was

necessary to extend mangoes to larger but more fastidious markets in the lowlands. The new mango products from Huong Xoai cooperative farms quickly received the VietGAP (Vietnam Good Agricultural Products) certificate for 17.8 ha in mid-2017. VietGAP represents a collection of guidelines issued by the MARD for agricultural products to ensure quality in terms of growing techniques, food safety, indicators of origin, environmental protection, and health. The new mangoes produced by the Huong Xoai cooperative farm were sold at a stable price and quantity in some of the biggest supermarkets in Hanoi city and other provinces (Figure 4.9).

In late 2017, 7.4 ha of new mango trees belonging to the Huong Xoai cooperative farm received the Production Unit Code which is required for fruit exportation to strict markets including the United States of America, Australia, New Zealand, Japan, South Korea, Taiwan, England, and some of the countries in the European Zone. A Production Unit Code is granted according to the Import Phytosanitary Requirement and controlled by the Plant Protection Department of Vietnam. When a product is eligible to receive the Production Unit Code, the Code will be sent to the relevant management agencies of the importing countries. The VietGAP certificate is the necessity to apply for a Production Unit Code. This was a giant step, especially when the first five tons of new mangoes were exported to Australia, one of the most fastidious international markets.

The successful of mango products from Lac Ken today has resulted from the careful step by step long-term planning. Building the high-quality production process followed VietGAP's standard was the time-consuming process which took Huong Xoai cooperative farm almost three years to receive the VietGAP certificate. The series of progress for the development of mango products from Lac Ken village from registering geographical indicator to establishment the Huong Xoai cooperative, VietGAP certificate and finally the Production Unit Code was having the contribution from Yen Chau DARD (Figure 4.9).

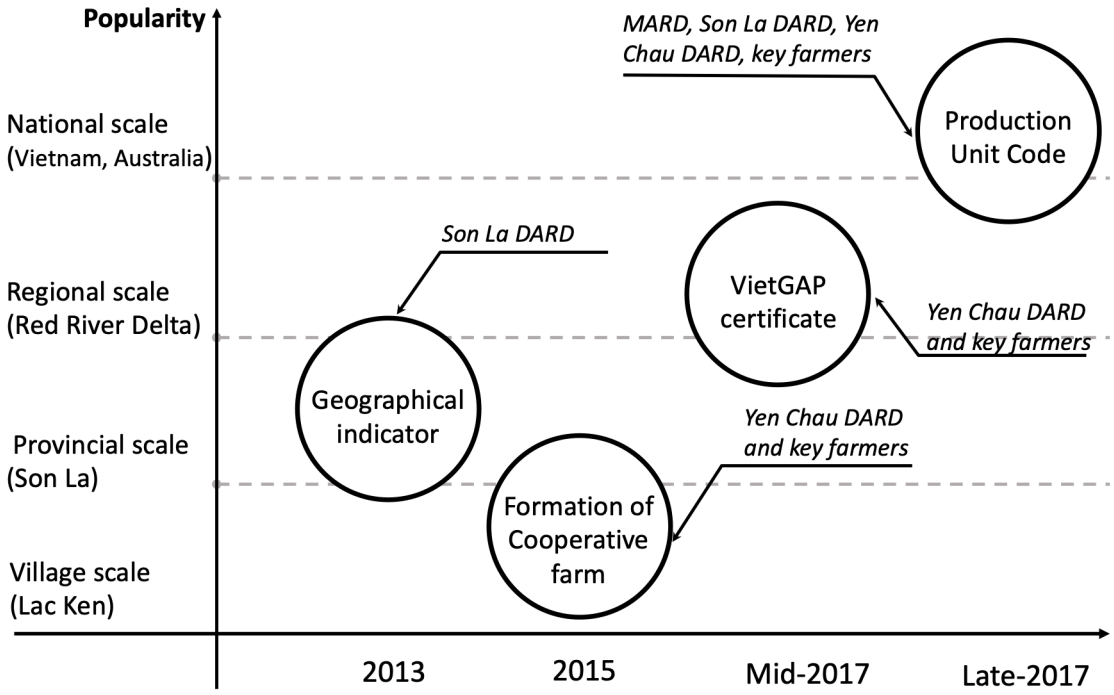


Figure 4.9 Driving forces for mango production development in Lac Ken village, Yen Chau district.

4.4.2. Sugarcane farming in Luong Me village

Sugarcane is a short-term industrial crop. It is easy to grow sugarcane, as there is no need for complicated agricultural techniques. However, sugarcane farming is considered to be one of the most difficult livelihood activities undertaken in Yen Chau. As indicated in Table 4.5, growing sugarcane requires some specific conditions in terms of transportation infrastructure, investment, and storage. Other than the major initial investment required including seeds, fertilizers, and pesticides, sugarcane can only be stored for less than 24 hours after harvesting. According to Larrahondo et al. (2006), the sugar level will decrease from 0.01 - 0.023% units per hour after harvesting (Table 4.5). In order to meet the requirements in initial investment and signed bulk purchasing contract since sugarcane cannot be stored for a long time after harvesting, it must satisfy the difficult-to-meet requirements on infrastructure facilities.

The problems related to the investment and purchasing of sugarcane harvests were managed through CF with the sugarcane processing company in Mai Son district, Son La province (hereafter Company A), that is located 20 km from Luong Me village (Figure 4.1). Through CF, farmers agree to grow sugarcane by following the production regulations, and in return, Company A provides them with all the input productive materials and the promise to purchase all the products after harvesting. Realizing the huge benefit that CF could bring to the region, the local government encouraged farmers to grow sugarcane when Company A started their business in 1997. The establishment of CF between HHs and Company A was certified by representatives of local government and villagers, which greatly increased the confidence of farmers in the future of sugarcane. However, even when farming through CF can satisfy the requirements of funding and product purchasing, sugarcane farming areas cannot be further extended holding to the limitations of infrastructure facilities for transportation and collection. Prior to 2014, the total sugarcane area in Luong Me was only two hectares. Limitations of

Table 4.5 Requirements for developing different crops in the study villages

	Maize	Grafted mango	Sugarcane	Wet rice
Crop type	Cash crop	Cash crop	Cash crop	Subsistent crop
Temperature	18-27°C	5-45°C	20-26°C	High temperature
Irrigation	Rainfed	Rainfed	Rainfed	Irrigation - demanding
Soil range	Wide range	Wide range	Wide range	Clay soil
Topography	Leveled soil to steep slopes	Leveled soil to steep slopes	Leveled soil	Leveled soil
Fertilizer	Heavy feeder	Heavy feeder	Heavy feeder	Normal feeder
Transportation requirements for harvesting	Any type of access road/ small vehicles/ normal care	Roads without rough tracks[a]/ small vehicles/ extreme care	Wide roads/ 10-ton trucks/ normal care	Any type of access road/ small vehicles/ normal care
Storage after harvesting	Long time	Maximum 3-5 days	Less than 24 hours	Long time
Growing investments	Small capital	Huge initial investment	None[b]	Very small capital

[a] Mango products require extreme care, as the fruits can be easily damaged during transportation. Although mangoes are mainly transported using small vehicles suitable for any type of roads, levelled and non-steep roads are essential to keep the fruit safe.

[b] Sugarcane was grown with contract farming, so Company A was fully invested in the farmers.

Source: In-situ survey data collected by the authors.

infrastructure conditions, especially the road system, meant that Yen Chau could not fully exploit the advantages of CF in agriculture development.

The difficult-to-meet infrastructure requirements for sugarcane development were unexpectedly met with the completed construction of the Huoi Vanh dam. The Huoi Vanh dam is a strategic construction investment by the Vietnam Ministry of Rural Development (MARD) for wet rice development in the Yen Chau region. It took eight years to complete the dam with its auxiliary constructions; a 3.5-meter-wide concrete road surrounds the area. The long construction period ended in 2013, which coincided with the start of the decrease in maize prices. The road allowed Company A to expand its raw material fields in Luong Me and thus promoted the benefits of CF. The dam and its auxiliary construction have facilitated the rapid expansion of sugarcane. The development of sugarcane as alternative livelihoods for Luong Me HHs came purely from the right time support by external forces. Thanks to these advantages, even though Luong Me village has the largest rate native mango garden, accounting for over 20% of the total area, HHs preferred sugarcane to new mango trees.

Among the new forms of livelihood activities in study villages, sugarcane farming has received the biggest support from the external forces. Although the initial aims of these external supports were not especially for the development of sugarcane, it has brought the benefit to Luong Me people which beyond expectations. The success of the conversion from maize to sugarcane in Luong Me village has reflected the vital role of the government in regional economic development.

4.4.3. Expansion of migrant work in Suoi Bun village

Before 2013, the phenomenon of Tai Dam people in Suoi Bun village searching for migrant work was unheard of in Yen Chau district. There existed only a one-way labor flow from lowland to highland areas, and most of the laborers came there following the New

Economic Zone development policies that were in place from the 1960s to the 1990s (Hoa et al. 2017; Sikor and Vi 2005). The movement of migrant workers in Suoi Bun village started with the first seven migrants in 2013. The number of migrants in Suoi Bun village soon spread and became something akin to a large wave in the community.

The first seven migrants can also be considered pioneer farmers; however, unlike pioneer farmers in the agricultural field, they were young people with better education compared to the village average. Table 4.6 shows the average period of education of all migrants in 2017 of 6.7 years, while the pioneer migrants in 2013 had at least eight educated years. Compared to the standard education period in Suoi Bun village (6.0 years), migrants, in general, had a better educational status. In research on labor relations in South East Asia, Rigg (2004) demonstrated that there is no gap in education level between rural migrants and their hometown communities. Hence, the fact that the first seven migrants had a higher educational level than Suoi Bun's average defied common trends.

One of the migrant work pioneers in Suoi Bun village, Mr. A (Table 4.6), had a high school education and lived with his parents, wife, and two children. Six members of his family depended on the income from 800 m^2 one-season rice fields and 9,000 m^2 upland fields. In 2010, Mr. A's father was diagnosed with a serious disease, and they had to borrow VND100 million (US$1 is about VND23,280) from a local trader at an annual interest rate of 24%. His family's efforts were only enough for the interest amount over the next few years (approximately VND24 million). When the maize price dropped in 2013, they had no choice but to sell their only buffalo for VND25 million and felt into a desperate situation. In late 2013, while at a part-time job near Yen Chau town, Mr. A saw recruitment information from a polyethylene manufacturing company in the Hung Yen industrial zone. The position required a junior high school qualification with earnings of VND60 million per year. Mr. A invited B, C, and F (Table 4.6), who are his relatives, to go with him to apply for the position. F was

Table 4.6 List of the first migrants in Suoi Bun village in 2013.

Migrant	Age[a]	Years of education	Temporary migration province	Job	Place
A	23	12	Hung Yen	Worker	Industrial zone
B	18	11	Hung Yen	Worker	Industrial zone
C	18	10	Hung Yen	Worker	Industrial zone
D	18	9	Thai Nguyen	Worker	Industrial zone
E	19	10	Thai Nguyen	Worker	Industrial zone
F	22	8	Hung Yen	Waiter	Local restaurant
G	24	11	Hanoi	Construction worker	Hanoi

- Average educated years for 67 migrants in 2017 in Suoi Bun village was 6.7.

- Average educated years for laborers over the age of 18 calculated for 218 people in Suoi Bun was 6.0.

[a] Age recorded at the time of starting migrant work.

Source: Field surveys, 2016 and 2017.

rejected for the job, as he had not yet received the required qualification. Lately, F worked as a waiter in a local restaurant in Hung Yen province. One distinguishes characteristic of the minority groups in the northern upland region of Vietnam is their self-contained lifestyle as they afraid of going outside of their familiar habitat (Donovan et al. 1996). This finding of migrant work movement in Suoi Bun emphasizes that an improved educational background not only improves confidence when taking on challenges but has also helped farmers to find other jobs more easily.

The investigation results for 27 HH containing migrant workers in Suoi Bun in 2016 indicated a negative correlation coefficient (-0.389, p-value < 0.05) between the number of migrants in a family and the upland land areas that they own (Table 4.7). This finding suggests that people tend to find temporary jobs when they have insufficient cultivation land. This is also the main reason why the migration working phenomenon happened only in Suoi Bun village. Compared to the two Lac Ken and Luong Me villages, Suoi Bun has many disadvantages. Specifically, although Luong Me village is the most populated village and has the smallest cultivated land area but they have advantages in irrigation system, so villagers in Luong Me can temporarily afford rice to meet their living needs. For Lac Ken village, even there is no land for wet rice cultivation, there is an advantageous that the villager here have the largest area of upland land (Table 3.1). With a large cultivation area, their income from maize also helps Lac Ken people to cover the food expense for their lives.

Hence, the phenomena of local farmers in Suoi Bun village were forced to migrate to another place looking for economic opportunities has reflected the shortfall in resources at the local level. The same conclusion was reached in the research of Rigg (2006a) on the relationship between migration and poverty in Laos. However, in 2017, this significant correlation between the number of migrant workers and the upland land area becomes insignificant. Although the new migrants in 2017 had larger cultivation lands, they followed

Table 4.7 Pearson's r correlation between the number of migrants in each HH and other factors in Suoi Bun village.

	2016		**2017**	
	Pearson's r	p-value	Pearson's r	p-value
Average upland area/capita	-0.389*	0.045	-0.289	0.055
Average paddy area/capita	0.041	0.838	-0.091	0.553
Size of HH	0.327* [(a)]	0.048	0.328*	0.028

[a] Test one-tailed, for positive correlation.

* p-value < 0.05

Source: Field survey, 2016 and 2017.

experienced migrants to make the most of their free time between crop seasons. The average upland per capita for migrants in 2017 and migrants in 2016 was 2914.3 m^2 and 2655.4 m^2, respectively (Table 4.8). Besides, the percentage of seasonal migrant workers in 2017 was higher than in 2016 (67% and 56%, respectively). Since 2013, no migrant worker has quit his or her migrant job. This illustrates the effect of migrant workers on the people of Suoi Bun (Table 4.8).

On the other hand, the number of migrant workers and the size of their HHs also exhibited a positive correlation coefficient (0.327 and 0.328, p-value < 0.05, in 2016 and 2017, respectively) (Table 4.7). When a family, usually consisting of three generations, has more laborers, the senior members can take care of the children as well as develop grafting fruit trees so that their sons/daughters can commit themselves to migrant work. Hence, migration networks between migrants and non-migrants have gradually formed in Suoi Bun. A key insight supported by migration networks is that the chain of migrants strengthens migrants' livelihoods, as it reduces the related costs and risks. Through the networks, potential migrants can find information, jobs, and accommodation, as well as numerous forms of assistance for various concerns, from financial problems to traveling issues. These networks of experienced migrants demonstrate the effectiveness of migration, encouraging non-migrants to seek employment outside, based on their observations of the actions and successes of network members (de Haas 2010; Massey et al. 1993). Hence, among preferred destinations in 2017 for Suoi Bun migrants, including Hung Yen, Thai Nguyen, and Bac Ninh provinces, Hung Yen and Thai Nguyen were the working destinations of the first seven migrants in 2013 (Figure 4.10). This information suggests that all the workers who followed came to these locations thanks to a migration network already formed by previous workers. This migration network has brought many advantages to the Suoi Bun community.

Table 4.8 Status of migrant workers in Suoi Bun village.

	Unit	2016		2017	
		Migration	**Non-migration**	**Migration**	**Non-migration**
Average upland	m^2/capita	2655.4	2848.8	2914.3	3232.4
Average paddy	m^2/capita	178.2	226.4	180.7	251.5
Number of HHs	HH	27	33	45	15
Number of migrants going in pair[a]	Pair	9	N/A	22	N/A
Seasonal migration workers	People	20	N/A	45	N/A
Full-time migration workers	People	16	N/A	22	N/A
Number of migrants quit their jobs	People	0	N/A	0	N/A
Destination of migrants					
Hung Yen province	People	19	N/A	28	N/A
Thai Nguyen province	People	10	N/A	22	N/A
Bac Ninh province	People	5	N/A	15	N/A
Other provinces	People	2	N/A	2	N/A

[a] Some farmers adopted migration work with other member of their families

N/A: No applicable

Source: Surveyed by the authors.

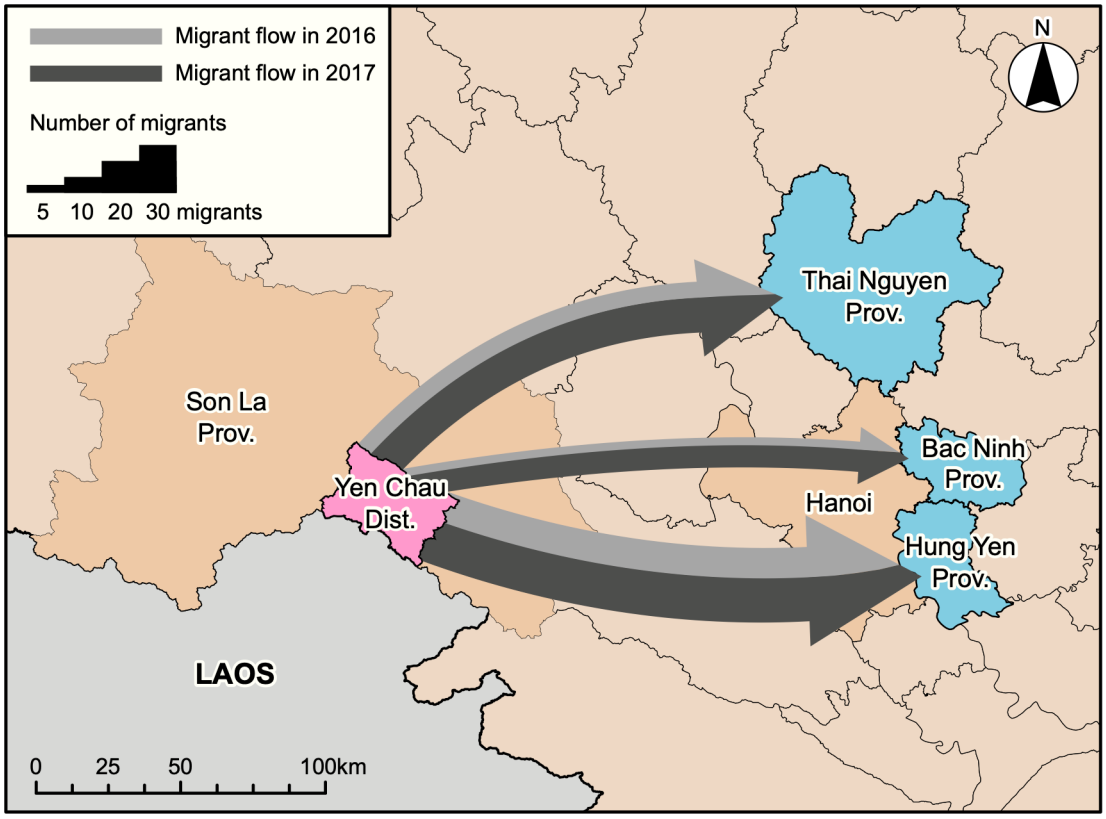


Figure 4.10 Working locations of Suoi Bun migrants in 2016 and 2017.

Moreover, the number of migrant workers has also increased quickly, as workers tend to engage their wives/husbands, relatives, and friends in migrant work. In 2016, the number of migrants pairs who left to work was only nine pairs; this number increased to 22 pairs in 2017 (Table 4.8). According to de Hass (2010), migration chains and networks are social assets that are precious adaptive resources in an unfamiliar environment, as they help to reduce the costs of migration and increase the success rate of employment at the destination.

The role of administrative management in connecting economic regions is not only expressed in the flows of goods but also in the flow of labors (Barney 2012). The long period from 1993 to 2013 recorded the period for the free labor migration which operated under the needs of the market. Although no significant movement was found in this period, most of the labor transition cases were still lowland people migrated to Yen Chau seeking economic opportunities. The newly formed labor transition flow from Suoi Bun to the lowland area, even in modest quantities, indicates important changes in the northern upland region, with the expansion of regional connections, improved supply capacity and access to information, and the convenience of improved transportation. This dynamic movement has resulted from the efforts of the Vietnamese government to promote the economic development of the uplands. The economic transition in Yen Chau with diversified livelihood activities has also reflected the change in the management approach of the government, from guidance and imposition to support and promotion.

4.5. Chapter summaries

Maize has been a staple crop in Yen Chau for over 20 years and holds the crucial position in the economic development of the region. However, from 2012 to 2017, the value of maize has decreased by 46.3% which significantly damaged the financial condition of local people. Various livelihood activities have been adopted to replace maize mono-cultivation in

Yen Chau. This study investigated the motivation and causes of the rapid changes in land use as well as the current alternative livelihood activities in Suoi Bun, Lac Ken, and Luong Me villages in Yen Chau district.

Detailed social and statistical survey for 198 HHs in 2016 and 220 HHs in 2017 this these study villages have indicated the significant changes in agricultural land use. Compared to 2013, the total maize area in 2017 has shrunk 28.1% to give land for the development of new crops. The rapid growth of fruit tree especially new mango and sugarcane has resulted from the areal expansion 77.3% (from 140.7 ha in 2013 to 249.5 ha in 2017) and 3,030% (from 2.1 ha in 2013 to 62.5 ha in 2017), respectively. While Lac Ken and Suoi Bun concentrated their economic resources on growing mango and fruit trees, sugarcane was developed in Luong Me village. Besides the development of the alternative crop, migration working is also one to the livelihood trend for the region. Although Suoi Bun people started growing mango three years later than Lac Ken, it has the robustness movement of migration work.

The decrease of global maize production value was the driven force for all the changes in livelihood activities in Yen Chau. Even when the study villages having many similarities in various social-economic characteristics, their differences in internal and external forces are the causes for the development of different livelihood trends. Concerning internal forces, the inequality in natural resources especially related to land and irrigation water have led to the differences in agricultural activities. The abundant of soil found in Lac Ken village compared to Suoi Bun in 1993 has resulted in the areal larger of community-owned mango garden then led to the advantages of Lac Ken's HHs in growing new mango trees. This is the most advantageous factor and also the root cause for Lac Ken to quickly convert its livelihood activities. Moreover, the better position of Luong Me's HHs compared to other villages in the decreasing maize price period was contributed to its richness in irrigation. The local human factors are also the key to the determinants of all new forms' livelihood. Since innovative

farmers played the vital part in popularizing the movement of all activities, better educational level of seven first young migrants have contributed to the expansion of migration working in Suoi Bun village. Besides, the shortage in economic condition, as well as cultivated land area, has become the driving force for Suoi Bun HHs to adopt migration working.

Besides, local farmers have also received great support from external forces. Yen Chau DARD was acknowledged for their contribution to popularizing mango products. Their long-term development plan reflected through the registration of geographical indicator, VietGAP certificate and Production Unit Code for mango products, has brought Yen Chau mango to the outside of the domestic market. On the other hand, the large-scale government development plan for Yen Chau region has born the opportunities for Luong Me people to develop sugarcane. Findings of this study indicated the function of livelihood activities has begun to follow the principal of market demands. The role of administrative management levels has gradually changed from guidance and imposition to support and promotion.

CHAPTER 5. CONCLUSION

The purpose of this study is to investigate the transition process in livelihood structure of the minorities in the northern uplands of Vietnam after the country made the strong conversion in national economics since *Doi Moi* 1986 as well as significant changes in land management by the Land Law 1993.

5.1. Main milestones marking the livelihood activities changes of uplanders

The upland region of Vietnam is the primary habitat of ethnic minorities; especially the northern upland region accounts for 31 out of 54 ethnic groups of the country. This area has mountainous terrain, difficult for travel and communication and is always classified as the region with the most difficult economic conditions and living standards in the country. After 1993, when land use right was allocated to the people and swidden cultivation was banned for forest protection, people were forced to adopt secondary cultivation. Maize was selected by the state for regional economic development and was greatly contributes to poverty reduction. This period records the golden time of maize.

Maize is the second most important cereal crops after rice and is the most crucial staple crop in upland areas. Son La is the maize production key area of the northern upland region. The area for growing maize in Son La alone accounts for over 60% with 133,700 ha of the whole northwest region. Yen Chau district is the center of Son La province, and also the main habitat of Tai Dam and Hmong people, 90% of HHs income depend on maize. We have approached and collected social and economic information of Tai Dam and Hmong people in Yen Chau district. Data collection was carried out during the three times field-works in March 2016, August 2016 and September 2017.

Beside direct interview with HHs, we also conducted deep interviews were conducted for local maize traders as well as key farmers and representatives of Yen Chau DARD.

The milestones marking the significant change in production activities of uplanders can be summarized in Figure 5.1. From Figure 5.1 we can see the transition from swidden cultivation to settled cultivation, the crop also moves from traditional crops to cash-crops. At first, it was only maize-monoculture, and after that, the crops became more diverse, accompanied by a change in agricultural labor.

5.2. The relationship between local livelihoods and market factors

As the same other upland regions in Southeast Asia, after the long period of swidden cultivation, globalization, and trade policies have promoted the development of the market, infrastructure such as electricity, transportation system, communication. Especially, under market competition, there have created undesirable effects on local people, such as the manipulation of agro-products supplies or even the phenomenon of impoverishment (Rótolo et al. 2015; Shah 2012; Poku et al. 2018). Nowadays, Vietnam has to import a massive amount of maize from other countries in the world, every year, mostly from Argentina and Brazil. According to the Ministry of Industry and Trader (2019), more than 7.8 million tons were imported in 2017 and 8.2 million tons in 2018. It is estimated that about nine million tons will be imported by 2020. While maize was the staple crop and is grown from the North to the South in Vietnam, the demand for maize has been increasing rapidly in Vietnam. However, the state still has to import a large amount of foreign maize product every year. After a series of government efforts such as decisions, policies to push the agricultural sector especially for maize production. The diversified foreign seeds enterprises with supply and distribution

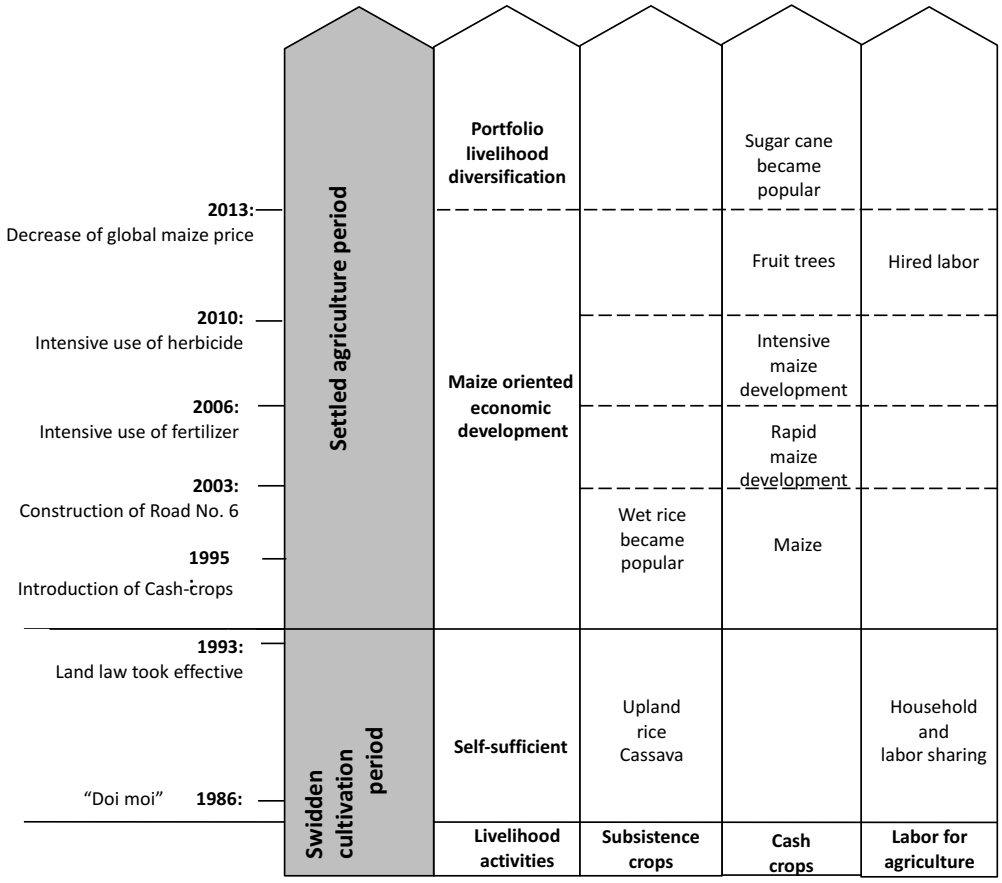


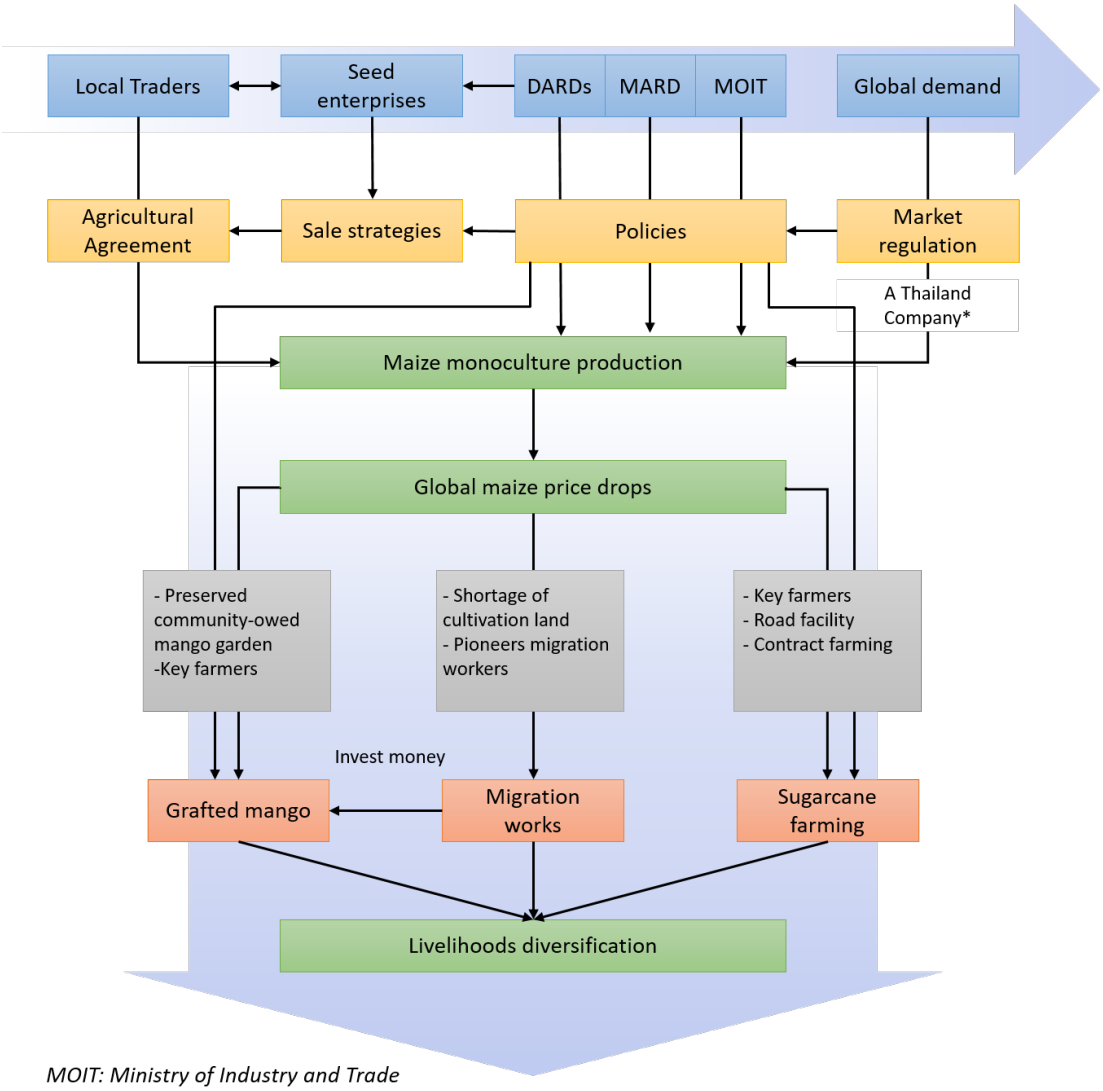
Figure 5.1 Milestones in local agricultural productions.

networks have entered the market and created fierce competition among the foreign seeds enterprises. The result of fierce competition forms the specific maize trading structure and gradually negative affect the lives of local people.

The particular characteristics of maize trading structure in Yen Chau district have strongly influenced the economics of the region, the related parties, as well as the traditional cultivation regime. The maize trading structure is centered on a three-level trader network that plays a crucial role in connecting stakeholders. Key farmers and communication media are tools that traders use to sell products. Hence, the trader is the most important factor in seed enterprises' efforts to advertise their products and maintain their sales. Besides, strong social relationships along with weak credit/production commitments between farmers and traders have facilitated maize production throughout the region. Seed and supply enterprises target traders to promote their products and are the most important information channel for farmers. The annually alternating seed cultivation regime, that has no scientific basis and goes against the objectives of the National Test Procedure for new seed, has provided the lion's share of the benefits to sellers rather than farmers. Farmers are worse off when they gradually become more dependent on traders for production. The changing seed variety cultivation regime has resulted from the influence of traders and seed enterprises. Therefore, local farmers living in the center of maize production are facing difficulties and cannot survive with maize production.

5.3. The findings of the determinants of livelihood structure formation

The key factors facilitating the transformation of livelihood structure from maize monoculture to livelihoods diversification of farmers in upland Vietnam is summarized in Figure 5.2. This conversion process is formed under the combined



MOIT: Ministry of Industry and Trade
MARD: Ministry of Agriculture and Rural Development
DARDs: Son La and Yen Chau Department of Agriculture and Rural Development
** The Thailand feed processing company deciding the maize price in Vietnam*

Figure 5.2 Key factors facilitating the transformation of livelihood structure in Yen Chau district.

effect of internal and external forces. The external force factor plays a central role; it exerts a strong impact on the transition through the impact on the commercial structure of the products and the maize trading structure in Yen Chau district is a good example.

During the post maize mono-cultivation period, the findings have indicated that the small differences in the cultivated land areas and infrastructure facilities have fostered the formation and changes in livelihood structures. The areal withdrawal of maize occurred at the same time with the increasing trend of cultivating fruit trees and sugarcane. Never-before-seen migrant work has unexpectedly become a promising livelihood activity for local farmers. In particular, among two villages Lac Ken and Suoi Bun, the areal shortage makes the community-owned mango garden in Suoi Bun inadequate for the needs of the renters. This finding suggests that the small difference in the size of the community-owned mango gardens resulted in the significant differences in the current economic conditions of the two villages. The root cause for this difference originated from the larger land resources of Lac Ken. Therefore, while Lac Ken has developed grafting fruit trees sooner three years as Suoi Bun, local people in Suoi Bun village prefer increasing income by migrating labor. This finding suggests that people tend to find a part-time job when they have insufficient cultivation land. The change in the direction of the Suoi Bun people reflects that migrant work is merely considered a short-term livelihood solution while they are waiting for a more stable long-term agricultural solution. In addition, the study also showed that the groups of migrants tend to be young people, they have higher education compared to the average level of the local and often fall into big families of over three generations. This finding of migrant work movement in Suoi Bun emphasizes that an improved educational background not only improves confidence when taking on challenges but has also helped farmers to find jobs more easily.

Besides the internal factors of livelihood assets such as cultivated land resource, including upland areas, paddy fields, community own mango garden, irrigation system, human resources, consist of education background, migration networks and chains, and HH size, livelihood structure also be affected by the external forces. Despite sharing the similar cultural, social, and geographical characteristics, the very external forces were contributed to the formation of the preference livelihood in each village. The findings of this study indicate that the function of livelihood activities has begun to follow the principal of market demands. The role of governmental management levels has gradually changed from guidance and imposition to support and promotion.

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(V) written in Vietnamese.

APPENDICES

Appendix 1. The list of 54 people groups in Vietnam in 2009

Group	People	Population	Distribution	Note/Other name
Viet-Muong	Kinh	85,846,997	All regions in Vietnam	Majority in Vietnam (can call Viet)
	Mường	1,268,963	Hoa Binh, Thanh Hoa, Phu Tho, Son La, Ninh Binh	Main part of Viet-Muong
	Thổ	74,458	Nghe An, Thanh Hoa	Tho
	Chứt	6,022	Quang Binh	Cheut
Tai-Kadai	Tày	1,626,392	Northern Vietnam	The highest minority in Vietnam
	Thái	1,550,423	Northern Vietnam	Consist of Tai Dam, Tai Don, Tai Daeng
	Nùng	968,800	Lang Son, Cao Bang, Bac Giang	
	Sán Chay	169,410	Tuyen Quang, Thai Nguyen, Bac Giang	San Chay, Cao Lan
	Giáy	58,617	Lao Cai, Ha Giang, Lai Chau, Yen Bai	
	Lao	14,928	Lai Chau, Dien Bien, Son La	
	Lự	5,601	Lai Chau	Lu
	Bố Y	2,273	Lao Cai, Ha Giang	Bouyei
Kra	La Chí	13,158	Ha Giang, Lao Cai, Tuyen Quang	Lachi
	La Ha	8,177	Son La	Laha
	Cờ Lao	2,636	Ha Giang	Galeo

	Pu Péo	687	Ha Giang, Tuyen Quang	Pubiao
Mon-Khmer	Khmer Krom	1,260,640	Soc Trang, Tra Vinh, Kien Giang, An Giang, Bac Lieu, Ca Mau	
	Ba Na	227,716	Gia Lai, Kon Tum, Phu Yen	Bahnar
	Xơ Đăng	169,501	Kon Tum, Quang Nam, Quang Ngai	Sedang, Xo Dang
	Cờ Ho	166,112	Lam Dong	Koho
	Hrê	127,420	Quang Ngai	H’re
	Mnông	102,741	Daklak, Dak Nong	Mnong
	X’tiêng	85,436	Binh Phuoc	Stieng
	Bru	74,506	Quang Tri, Quang Binh, Daklak	Bru
	Khơ Mú	72,929	Nghe An, Dien Bien, Son La, Lai Chau	Khmu
	Cơ Tu	61,588	Quang Nam, Thua Thien Hue	
	Giẻ Triêng	50,962	Kon Tum, Quang Nam	
	Tà Ôi	43,886	Thua Thien Hue, Quang Tri	Ta Oi
	Mạ	41,405	Lam Dong, Dak Nong, Dong Nai	
	Co	33,817	Quang Ngai, Quang Nam	
	Chơ Ro	26,855	Dong Nai, Ba Ria-Vung Tau, Binh Thuan	
	Xinh Mun	23,278	Son La, Dien Bien	Xinh-mun
	Kháng	13,840	Son La, Dien Bien	
	Mảng	3,700	Lai Chau	
	Rơ Măm	436	Kon Tum	

	Brau	397	Kon Tum	Brau
	Ơ Đu	376	Nghe An	
Hmong - Mien	Hmong	1,068,189	Northern Vietnam	Or call Mèo in Vietnam
	Dao	751,067	Northern Vietnam	Yao
	Pà Thẻn	6,811	Ha Giang, Tuyen Quang	Pa-Hng
Malayo – Polynesian	Gia Rai	411,275	Gia Lai, Kon Tum, Daklak	Jarai
	Ê Đê	331,194	Daklak, Phu Yen	Rade
	Chăm	161,729	Ninh Thuan, Binh Thuan, Phu Yen, An Giang	Cham
	Ra Glai	122,245	Ninh Thuan, Khanh Hoa, Binh Thuan	Roglai
	Chu Ru	19,314	Lam Dong	Chru
Chinese	Hoa	823,071	Ho Chi Minh city, Dong Nai, Soc Trang, Kien Giang, Bac Lieu, Binh Duong, Bac Giang	
	Sán Dìu	146,821	Thai Nguyen, Vinh Phuc, Bac Giang, Quang Ninh, Tuyen Quang	San Diu
	Ngái	1,035	Thai Nguyen, Binh Thuan	Hakka Chinese
Tibeto – Burman	Hà Nhì	21,725	Lai Chau, Lao Cai, Dien Bien	Hani
	Phù Lá	10,944	Lao Cai, Yen Bai, Ha Giang, Dien Bien	
	La Hủ	9,651	Lai Chau	Lahu
	Lô Lô	4,541	Cao Bang, Ha Giang, Lai Chau	Yi
	Phunoi	2,029	Lai Chau, Dien Bien	Cống
	Si La	709	Lai Chau, Dien Bien	

Source: General Statistics Office 2009; Ostapirat 2000; Keyes 2002; Lebar et al. 196

Appendix 2. Sampled Households data in Suoi Bun village in 2016

HH name	HH size	Interviewee			Total area (m^2)	Main income source in 2016 (million VND)						Expenditure (million VND)
		Gender	Age	Years of education		Maize	Fruit tree	Off-farm	Outside work	Livestock	Rice	
SB4	3	male	36	9	9,393	4.00	-2.10	2.40	33.00	0.00	0.00	26.88
SB5	6	male	47	7	6,450	-1.77	1.02	0.00	0.00	1.95	6.00	18.82
SB7	4	male	45	0	19,950	2.80	5.02	0.00	0.00	5.48	0.00	20.61
SB8	3	male	41	5	21,290	0.50	-3.64	4.20	21.00	8.50	0.00	25.85
SB9	4	male	33	7	10,450	7.78	-0.38	15.00	0.00	0.00	0.00	20.62
SB10	4	male	35	2	11,100	1.03	-0.20	1.20	32.50	0.00	0.00	9.31
SB11	4	male	45	6	13,000	16.64	0.35	3.00	9.00	0.00	0.00	13.27
SB12	5	female	29	12	18,400	10.42	0.51	12.00	0.00	4.80	0.00	23.29
SB13	6	male	45	0	18,600	10.56	24.10	0.00	0.00	23.90	0.00	33.87
SB14	6	male	32	10	21,400	23.56	13.25	0.00	0.00	14.00	0.00	27.35
SB15	4	female	53	0	32,000	0.63	-0.53	0.55	48.00	-12.66	0.00	30.89
SB16	3	male	30	9	12,340	23.11	0.86	0.00	0.00	4.98	0.00	27.55

SB17	3	female	36	0	2,500	1.48	0.00	9.00	0.00	0.00	0.00	41.24
SB18	5	male	58	7	12,700	-4.29	4.80	0.00	0.00	3.90	0.00	20.86
SB19	3	male	27	7	9,600	17.58	1.97	2.00	6.00	-0.09	0.00	24.71
SB20	6	male	32	9	21,890	25.21	22.23	0.00	0.00	12.80	0.00	40.45
SB21	5	female	7	5	12,500	13.06	-0.26	0.00	0.00	8.91	0.00	24.21
SB22	5	male	25	6	33,000	1.30	5.58	4.50	0.00	19.90	0.00	22.81
SB23	4	male	41	4	10,700	6.07	16.50	0.00	0.00	68.00	0.00	43.75
SB24	5	female	39	5	17,000	10.56	0.83	0.00	33.60	-2.06	0.00	58.52
SB25	4	female	39	5	12,150	7.42	0.50	12.00	5.00	12.12	0.00	48.05
SB26	3	female	44	6	11,300	2.00	-0.60	0.90	14.40	0.00	0.00	42.40
SB27	5	female	33	5	11,450	16.96	2.00	2.46	0.00	-2.14	0.00	41.28
SB28	4	male	34	11	3,000	-1.13	-0.30	1.30	0.00	0.00	0.00	29.70
SB29	5	female	47	5	15,800	39.62	7.20	0.00	0.00	9.10	0.00	28.25
SB31	4	male	30	12	6,300	2.08	-3.32	4.50	0.00	0.00	0.00	29.08
SB32	7	male	31	10	13,000	17.19	5.92	4.00	0.00	22.45	0.00	35.91
SB33	4	female	34	12	5,600	8.22	-0.55	0.00	0.00	-2.50	0.00	29.90

SB34	4	male	42	3	12,100	10.57	4.97	1.00	5.00	1.40	0.00	43.15
SB35	6	male	49	7	19,000	25.72	1.71	0.00	0.00	0.00	0.00	22.76
SB36	5	male	33	8	18,100	36.83	3.45	0.00	0.00	11.16	6.25	22.02
SB37	5	male	51	6	26,200	19.61	1.80	0.00	0.00	8.25	0.00	33.09
SB38	6	male	45	5	18,600	18.41	0.65	3.00	0.00	2.00	0.00	26.40
SB39	4	male	46	6	27,650	15.57	12.81	0.00	22.50	15.04	0.00	32.10
SB40	7	female	53	3	22,000	11.47	5.28	0.00	0.00	2.70	0.00	51.04
SB41	4	male	61	6	51,695	9.42	3.65	0.00	24.00	8.67	0.00	72.32
SB42	6	male	38	9	12,400	35.74	29.56	7.00	0.00	30.84	0.00	32.46
SB43	4	female	59	4	7,000	1.41	3.64	0.00	0.00	2.00	0.00	20.69
SB44	4	male	45	4	11,400	9.22	-0.50	0.00	0.00	0.00	0.00	41.53
SB45	6	male	53	5	9,700	5.70	4.11	0.00	12.00	0.00	0.00	25.55
SB46	6	male	52	5	19,200	24.50	5.60	18.00	0.00	-7.00	0.00	45.09
SB47	5	female	56	0	17,000	7.12	0.00	4.00	36.00	-1.20	0.00	69.27
SB48	5	male	43	5	30,400	22.89	2.11	12.00	0.00	11.00	8.50	46.89
SB49	3	male	52	6	10,600	21.37	3.50	0.00	10.00	-1.55	0.00	13.46

SB50	5	male	33	9	21,400	22.56	9.75	3.00	0.00	44.00	0.00	29.42
SB51	4	female	43	2	35,000	13.44	-2.16	0.00	0.00	5.65	0.00	15.19
SB52	3	male	53	5	20,000	14.84	12.30	0.00	0.00	5.00	0.00	19.44
SB53	3	male	53	3	16,000	11.99	14.20	0.00	0.00	-0.20	0.00	40.74
SB54	4	female	48	5	21,500	13.51	3.00	0.50	6.00	9.90	0.00	14.12
SB55	3	female	63	2	31,300	13.64	2.87	0.00	0.00	9.97	0.00	20.79
SB56	5	male	22	8	35,000	14.17	0.00	0.00	5.00	7.00	0.00	26.53
SB57	6	female	51	6	12,400	10.53	1.10	2.00	3.00	0.00	0.00	9.79
SB58	4	female	40	0	11,500	0.60	0.90	0.00	72.00	-3.00	3.50	42.00
SB59	3	female	53	1	11,200	1.49	1.94	0.00	36.00	-5.00	0.00	43.58
SB60	5	male	60	5	11,300	9.34	5.00	1.70	10.00	27.19	7.20	49.21
SB61	4	female	34	7	2,500	0.66	0.20	2.50	0.00	0.00	0.00	34.44
SB62	6	male	57	0	19,584	18.56	3.75	0.00	38.50	12.00	15.00	56.90
SB63	6	male	49	7	15,720	15.13	1.80	4.00	4.00	3.25	0.00	15.77
SB64	6	male	58	5	81,650	9.85	1.94	0.50	24.00	1.70	0.00	96.31
SB65	3	male	42	0	12,160	8.92	-1.60	0.90	12.00	14.00	4.50	35.25

Appendix 3. Sampled Households data in Lac Ken village in 2016

HH name	HH size	Interviewee			Total area (m^2)	Main income source in 2016 (million VND)						Expenditure (million VND)
		Gender	Age	Years of education		Maize	Fruit tree	Off-farm	Outside work	Livestock	Rice	
LK1	6	male	50	7	31,000	38.38	38.52	3.60	0.00	20.00	0.00	36.45
LK2	3	male	55	4	22,890	47.55	2.61	0.00	0.00	12.83	0.00	18.39
LK3	6	male	32	12	42,300	37.80	43.31	3.00	0.00	-2.30	0.00	60.00
LK4	4	male	25	12	17,500	17.27	73.75	0.00	0.00	9.87	0.00	43.87
LK5	4	male	33	5	19,340	28.51	-4.73	9.00	0.00	-2.30	0.00	21.32
LK6	5	male	34	9	27,600	14.20	17.05	0.00	0.00	38.88	0.00	91.79
LK7	6	male	49	7	48,150	47.73	18.53	3.00	0.00	20.30	0.00	30.05
LK8	7	male	31	9	45,120	6.15	40.39	3.00	0.00	17.96	0.00	55.14
LK9	6	female	33	5	18,150	13.22	11.80	0.00	0.00	-3.50	0.00	24.42
LK10	7	male	53	5	44,200	17.00	66.41	5.00	0.00	19.50	0.00	55.41
LK11	8	male	39	0	36,088	42.75	49.83	0.00	0.00	88.00	0.00	45.24
LK12	4	male	43	5	22,500	-0.41	5.35	0.00	4.00	0.00	0.00	50.39
LK13	5	male	45	2	44,300	18.44	19.50	0.00	0.00	38.92	0.00	41.47

LK14	5	male	41	7	40,500	33.82	21.33	10.00	31.50	2.00	0.00	33.99
LK15	7	male	23	9	21,700	45.36	3.45	0.00	9.00	4.40	0.00	21.42
LK16	3	male	26	6	15,300	0.00	1.07	0.00	50.00	0.00	0.00	41.42
LK17	4	male	54	6	40,300	-0.68	15.27	9.00	0.00	4.30	0.00	32.84
LK18	3	male	34	0	14,000	18.61	11.05	11.00	0.00	17.55	0.00	49.04
LK19	3	male	46	4	28,000	13.04	1.33	7.00	0.00	22.78	0.00	33.99
LK20	3	male	47	5	25,800	17.29	9.32	0.60	0.00	-2.00	0.00	37.55
LK21	6	female	48	4	48,000	35.44	14.87	0.00	0.00	7.50	0.00	40.99
LK22	5	female	36	5	25,300	45.05	8.88	7.00	0.00	-8.00	0.00	49.76
LK23	6	female	33	12	30,000	79.20	8.20	20.00	0.00	6.86	0.00	49.13
LK24	6	male	31	9	16,300	24.97	4.32	0.00	0.00	5.80	0.00	46.34
LK25	4	male	42	6	16,300	25.24	7.33	0.00	0.00	-2.28	0.00	26.81
LK26	4	male	34	0	23,150	26.93	19.40	7.00	0.00	3.00	0.00	56.79
LK27	5	male	46	4	25,000	16.40	17.06	0.40	28.00	3.10	0.00	63.51
LK28	5	male	31	8	26,000	32.81	0.67	9.00	0.00	9.80	0.00	33.78
LK29	6	male	51	4	36,600	12.33	6.91	15.00	0.00	13.00	0.00	29.74
LK30	6	male	38	0	27,700	26.77	8.64	3.00	0.00	25.00	0.00	36.99

LK31	6	male	47	7	52,600	35.63	9.94	15.00	0.00	8.00	0.00	105.76
LK32	6	female	28	12	22,800	32.94	17.99	20.00	0.00	6.90	0.00	39.71
LK33	4	male	36	8	12,300	15.66	12.89	1.50	0.00	-0.15	0.00	24.25
LK34	4	male	33	9	17,200	16.91	7.01	20.10	0.00	10.00	0.00	42.98
LK35	4	male	31	8	31,170	14.30	14.20	0.90	0.00	-2.00	3.20	25.27
LK36	6	male	31	9	18,200	28.96	16.32	15.00	0.00	16.60	0.00	57.50
LK37	4	male	50	7	24,400	15.56	2.98	9.00	0.00	-0.08	0.00	57.42
LK38	3	male	26	9	11,600	13.29	4.25	21.05	24.00	0.00	0.00	52.57
LK39	6	male	51	6	29,500	37.34	19.74	15.00	0.00	13.62	0.00	59.11
LK40	3	male	41	5	15,300	11.40	3.22	3.00	5.00	0.00	0.00	31.63
LK41	5	male	29	9	27,300	14.30	6.40	2.50	0.00	-0.04	0.00	28.08
LK42	4	male	26	9	23,240	12.79	7.76	16.00	0.00	-0.10	0.00	46.62
LK43	5	female	26	12	30,150	27.29	5.43	10.00	14.00	5.10	0.00	29.91
LK44	3	male	25	9	15,800	14.47	18.96	3.50	0.00	0.00	0.00	41.32
LK45	5	male	58	10	37,500	2.65	44.77	0.00	0.00	28.44	0.00	59.09
LK46	4	male	38	4	13,100	12.85	2.54	3.60	0.00	2.30	0.00	39.52
LK47	4	male	50	5	18,000	17.40	53.97	0.00	0.00	5.00	0.00	87.15

LK48	5	male	43	4	30,100	30.33	46.57	6.20	0.00	0.00	0.00	35.01
LK49	4	male	37	0	15,330	24.12	-2.35	0.24	0.00	3.05	0.00	47.30
LK50	4	male	32	9	17,000	4.19	-0.30	0.00	0.00	21.60	0.00	35.67
LK51	3	male	46	0	46,900	17.16	2.30	0.00	0.00	10.00	2.40	53.44
LK52	6	male	52	6	14,130	25.33	5.57	12.00	0.00	4.54	0.00	45.55
LK53	3	male	61	2	21,100	9.75	6.09	2.00	0.00	-8.20	0.00	21.61
LK54	5	male	50	7	10,000	-0.07	5.09	18.00	0.00	0.00	0.00	22.81
LK55	6	male	41	5	41,900	34.01	8.40	54.00	0.00	48.10	0.00	90.64
LK56	7	male	48	7	25,900	37.37	21.93	0.00	0.00	7.45	0.00	47.79
LK57	6	male	31	0	20,400	21.92	3.07	2.00	30.00	8.00	0.00	43.41
LK58	5	male	33	9	20,600	34.41	59.96	36.00	0.00	-6.40	0.00	41.86
LK59	4	female	32	9	21,000	21.96	-3.38	0.00	0.00	12.51	0.00	42.25
LK60	3	male	31	6	14,070	13.07	2.00	8.40	4.00	3.00	0.00	28.04
LK61	4	male	33	9	15,520	34.17	-1.18	0.00	0.00	2.80	0.00	27.49

Appendix 4. Sampled Households data in Luong Me village in 2016

HH name	HH size	Interviewee			Total area (m^2)	Main income source in 2016 (million VND)							Expenditure (million VND)
		Gender	Age	Years of education		Maize	Fruit tree	Off-farm	Livestock	Rice	Sugar-cane	Winter season	
LM1	4	male	35	9	5,000	8.18	0.00	0.00	33.68	0.00	21.94	0.00	36.71
LM3	3	female	44	4	15,000	4.49	0.00	3.20	7.00	4.49	0.00	0.67	21.62
LM5	5	male	59	12	16,000	14.70	22.16	13.50	10.00	29.60	0.00	19.60	22.60
LM6	3	male	33	5	8,000	6.35	0.00	0.00	5.00	0.00	-8.91	0.00	15.56
LM77	5	male	44	9	13,700	14.24	0.35	7.20	203.00	20.00	0.00	19.00	46.84
LM2	5	male	42	62	21,700	55.39	0.00	0.00	51.73	0.00	0.00	10.50	12.06
LM4	4	male	50	8	8,900	3.45	0.00	36.00	5.40	0.00	-0.68	0.00	38.01
LM7	4	male	58	5	5,000	5.38	0.00	20.00	4.20	0.00	0.00	7.20	41.88
LM9	4	female	37	0	6,000	1.50	0.00	12.21	0.00	0.00	0.00	0.00	11.49
LM11	6	male	60	4	25,900	17.67	0.00	0.00	8.40	0.00	0.00	6.76	12.94
LM14	5	male	40	0	9,700	1.17	0.00	0.00	2.80	0.00	0.00	0.30	18.52
LM16	4	male	36	7	3,000	0.00	0.00	0.00	0.00	0.00	24.72	0.00	23.48
LM17	6	female	47	3	6,200	10.22	0.00	81.00	20.00	0.00	0.00	0.20	34.52

LM19	9	female	29	9	14,700	24.01	0.00	6.25	4.72	0.00	-4.05	6.00	61.90
LM20	4	male	38	0	10,500	10.36	0.00	13.00	0.00	0.00	-2.49	1.05	26.50
LM22	6	female	44	3	6,300	0.42	0.00	18.40	5.00	0.00	-4.13	1.10	23.91
LM25	6	male	35	9	18,500	19.10	3.60	3.00	7.03	0.00	22.28	3.50	28.57
LM26	7	female	28	9	12,000	16.80	0.00	12.00	-3.00	0.00	0.00	10.00	26.70
LM28	7	female	60	4	9,300	1.35	2.20	10.38	1.87	0.00	0.00	1.00	17.00
LM30	4	female	34	9	12,600	12.29	5.00	26.00	3.00	0.00	0.00	1.10	12.17
LM32	6	male	54	7	11,500	19.75	0.00	77.50	0.00	0.00	0.00	5.27	22.13
LM34	7	female	32	7	26,500	14.71	1.70	24.00	13.09	0.00	9.22	3.09	60.00
LM36	4	female	51	6	7,000	7.23	1.00	78.00	2.76	0.00	0.00	2.50	12.70
LM38	5	female	30	9	6,300	4.57	0.00	12.00	4.80	0.00	0.00	7.80	13.44
LM40	4	female	52	3	15,300	15.40	1.40	6.00	0.00	0.00	0.00	0.00	20.46
LM42	4	female	26	9	13,800	20.55	0.00	14.64	3.92	0.00	0.00	2.40	14.45
LM44	5	female	52	7	12,800	11.76	0.00	12.00	10.22	0.00	0.00	4.80	21.86
LM46	5	male	40	0	10,000	7.54	0.40	9.00	1.52	0.00	-1.31	0.40	22.87
LM48	4	male	27	9	13,000	0.00	1.00	4.00	0.00	0.00	25.69	0.00	22.37
LM52	6	male	49	6	13,800	13.79	3.40	0.00	4.80	0.00	-5.14	3.60	22.62

LM54	4	male	38	4	5,000	0.00	0.00	11.00	6.00	0.00	5.25	0.09	21.92
LM56	5	male	28	9	6,000	5.92	2.25	4.20	7.44	0.00	0.00	4.50	21.27
LM58	4	male	24	0	10,000	6.57	0.00	11.60	4.98	0.00	-8.45	1.30	16.53
LM60	6	female	29	4	15,000	2.79	6.00	0.00	0.00	0.00	2.68	0.34	21.88
LM61	7	male	48	7	10,700	0.60	1.80	71.52	19.42	0.00	2.70	0.00	39.64
LM63	4	male	47	4	11,700	5.95	0.00	81.50	8.00	0.00	12.06	3.92	16.79
LM67	4	female	22	12	11,000	15.09	0.00	6.00	5.81	0.00	1.85	7.00	18.60
LM70	6	female	27	12	15,000	8.66	0.00	18.00	0.00	0.00	21.07	14.20	24.85
LM71	4	female	23	9	8,100	8.11	0.00	0.00	4.18	0.00	3.97	1.12	19.66
LM73	4	female	40	2	8,200	7.80	0.00	0.00	0.00	0.00	0.00	0.00	10.70
LM75	4	female	39	3	15,100	24.51	0.00	4.80	11.80	0.00	0.00	17.00	20.90

Appendix 5. Sampled Households data in Keo Bo village in 2016

HH name	HH size	Interviewee			Upland area (m^2)	Main income source in 2016 (million VND)					Expenditure (million VND)
		Gender	Age	Years of education		Maize	Fruit tree	Off-farm	Livestock	Rice	
KB1	6	male	38	2	40,300	61.74	0.45	4.60	0.00	0.00	51.27
KB2	6	female	34	5	22,100	41.97	0.00	15.00	1.00	0.00	63.57
KB3	5	female	24	7	15,000	27.53	0.00	2.50	7.20	0.00	14.54
KB4	5	female	29	0	25,000	4.40	0.00	26.50	0.00	0.00	33.88
KB5	4	male	33	5	40,400	40.70	19.00	3.00	-1.00	0.00	37.90
KB6	7	male	32	9	56,000	23.40	5.00	20.00	-2.30	0.00	31.89
KB7	5	male	33	2	40,000	11.60	0.00	0.50	7.00	0.00	20.20
KB8	7	male	18	0	30,000	9.73	1.00	2.50	0.00	0.00	29.96
KB9	6	male	30	6	27,000	11.26	6.80	3.00	1.00	0.00	14.59
KB10	5	male	28	5	20,000	3.30	4.00	3.00	3.10	0.00	18.80
KB11	5	male	36	0	17,000	4.90	0.15	1.30	-1.00	0.00	14.21
KB12	4	male	48	0	35,000	25.11	6.50	3.00	0.50	0.00	18.06
KB13	5	male	38	2	60,100	37.75	6.00	0.00	4.70	0.00	25.88
KB14	5	male	41	0	30,000	14.97	0.00	17.00	0.00	0.00	18.47
KB15	4	female	34	5	20,000	27.55	1.80	2.56	6.00	0.00	23.50

KB16	8	male	46	0	35,100	33.88	3.70	6.00	5.66	0.00	49.04
KB17	5	male	24	12	20,000	56.74	0.00	2.00	4.20	0.00	26.70
KB18	6	male	48	0	40,000	80.80	3.00	1.50	0.00	0.00	29.55
KB19	6	male	66	0	20,000	18.42	0.24	2.40	2.40	0.00	26.32
KB20	5	male	54	0	10,000	0.30	0.00	24.00	0.00	0.00	29.01
KB21	5	male	41	9	20,000	22.91	4.50	0.00	18.00	10.00	69.94
KB22	3	male	25	6	7,000	-0.50	3.66	5.40	0.00	0.00	11.96
KB23	8	male	43	9	25,000	12.90	5.00	6.60	25.27	0.00	59.77
KB24	5	male	38	3	24,000	36.37	0.49	5.00	0.53	0.00	38.77
KB25	6	male	42	0	25,000	13.06	0.00	14.35	5.00	0.00	38.75
KB26	7	male	17	8	20,000	19.60	0.00	2.00	10.00	0.00	27.36
KB27	4	male	17	5	15,000	19.45	0.00	6.20	0.00	0.00	23.31
KB28	2	female	35	0	5,000	11.10	0.00	0.00	3.00	0.00	19.86
KB29	4	male	19	6	10,000	4.46	1.50	7.42	0.00	0.00	23.38
KB30	6	female	25	0	35,000	22.90	0.00	4.70	3.00	0.00	34.14
KB31	7	male	54	0	15,000	23.05	0.00	0.00	0.55	0.00	13.95
KB32	7	male	39	3	17,500	16.34	0.00	30.00	0.00	0.00	47.48