Driving forces for livelihood structure changes in Vietnam’s northwestern mountainous region: A case study on Yen Chau district, Son La province

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ABSTRACT

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. Before 2014, maize accounted for over 70% of the agricultural area. The continuous decrease in maize production value has strongly affected the Tai Dam community in Yen Chau and led to the replacement of various livelihood activities. This contributed to a major shrinkage of the maize area by 28.2% by the end of 2017. This study aims to investigate the determinants of the rapid development of different livelihood trends in Lac Ken, Suoi Bun, and Luong Me villages. A detailed social and statistical investigation was conducted of 198 households in 2016 and 220 households in 2017. The findings of this study indicate that small differences in cultivated land areas and infrastructure facilities have fostered the formation of and changes in livelihood structures. The areal withdrawal of maize occurred concurrently with the increasing trend of fruit tree and sugarcane cultivation. Never-before-seen migrant work unexpectedly became a promising livelihood activity for local farmers. Differences in internal and external forces are believed to be the driving factors behind the new forms of livelihood activities.

Key words: Vietnam, livelihood structure, land use change, migration labor, Tai Dam people

INTRODUCTION

The livelihoods of ethnic people living in the mountainous regions of Mainland Southeast Asia are undergoing a comprehensive transformation as a result of market integration, transformations of land use, and trends of globalization. Scott (2009) proposes that since 1945, the upland areas have encouraged the forward movement of modern states by incorporating a development program related to economic progress, literacy, and social integration. As a result of these processes, for the majority of farmers, these changes have brought about the replacement of public property by private land-use rights, the introduction of new cash crops, and the motivation to revolutionize swidden cultivation through permanent cropping, including maize, tea, rubber, and palm oil, especially (Podhisita 2017; Turner and Hien 2015; van Vliet et al. 2012). Evidence of these problems can be found in the northwestern mountainous region of Vietnam, one of the poorest regions in the country (Tuyen 2015).

Local people in the northern mountainous region of Vietnam began to reform their livelihood activities after the enactment of the 1993 Land Law and the prohibition of swidden agriculture. They were not only given long-term land-use rights but were also handed the freedom of a self-developing household (HH) economy (Alther et al. 2002; Lambini and Trung 2014). Although swidden agriculture has been banned, farmers still maintain traditional subsistence crops without the use of chemical fertilizers, pesticides, and herbicides, and store seeds for the coming seasons (Alther et al. 2002; Castella et al. 2005; Donovan et al. 1996; Ha et al. 2004). Rapid population growth has led to an increasing scarcity of arable land for agricultural production; hence, farmers were soon faced with poverty and hunger (Sikor and Vi 2005). This was followed by the establishment of permanent agricultural fields and efforts to intensify cultivation through the introduction of high-value crops (Bonnin and Turner 2012). From the provincial level downwards, the main function of national goal programs is to transfer up-to-date agricultural technologies by educating farmers, building demonstrations, popularizing information, and supporting farmers’ own production (Minh et al. 2011). As a result, considerable promotional efforts have been expended for some directions of production, especially hybrid maize. Maize became a cash crop for the northwestern mountainous region and covered almost cultivated areas of
the local people (Ha et al. 2004). The over-extension of maize monoculture over a long period of time has weakened soil nutrients and increased risk exposure (Schweizer et al. 2017). 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. In this context, it is necessary for local people to find new livelihoods and to decide to reform their livelihood structures.

Generally, 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 assets, monetary cost, time consumption, risk level, familiarity, and experience (Ellis 2000; Radel et al. 2018; Small 2007). 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). Farmers tend to maximize their income by means of 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). Moreover, working-age children are an important factor in adults’ consideration of migrant work. In rural communities, working-age children play an important role in sharing the agricultural burden (Bhandari 2013). The research of Jiao et al. (2017) in Cambodia has demonstrated that while internal factors such as access to resources and educational standards contribute to the motivation to change one’s livelihood, the dynamic is also heavily influenced by land policy changes. 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).

The driving forces behind the livelihood activities of minority people in the northern mountainous region of Vietnam have been studied by many domestic and foreign researchers. They have noted a close relationship between livelihoods and accessibility, distribution, and management methods of natural resources such as soil, water, and forests (Alther et al. 2002; Bonnin and Turner 2012; Castella et al. 2005; Lambini and Trung 2014; Tøra and Vedeld 2018). Cultivation land is considered to be the vital factor affecting the livelihood choices of farmers (Kono and Rambo 2004). Land is a unique asset that has value; thus, HHs that have large cultivation land holdings have a big advantage in agricultural production. 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 (Neef et al. 2006; Tuyen 2014). In research on livelihoods at the community level in Bac Kan province in northern Vietnam, Phuyopusarerk 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. However, any village or commune whose community land budget was still available would provide both monetary and non-monetary value for the local people. Moreover, improvements in infrastructure facilities, especially related to marketplaces, schools, power supplies, and medical services could potentially determine the changes in land use and the livelihood opportunities that would be available for local development (Hoa et al. 2017; Phuong et al. 2016; Sikor and Truong 2002; Tuan et al. 2017; Tuyen 2015; Tuyen et al. 2013).

Previous studies of the northern mountainous region of Vietnam have focused mainly on the influence 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 infrastructure, and the promotion of policies also have a significant influence on livelihood choices (Daur et al. 2016; Green 2016; Ellis 2000; Kono and Rambo 2004; Neumann 2009; Zulu 2009). The combination of both internal and external factors can affect HHs in the same area differently (Tuyen et al. 2013). In this study, we aim to investigate the determinants of the transition in livelihood structure in the northwestern region of Vietnam.

**STUDY SITE AND METHODS**

**Study area**

This study was conducted in Son La province, which is where most of the Tai Dam people live in the northwestern region of Vietnam (Lebar et al. 1964). Son La province consists of 11 districts, and Yen Chau district is positioned in the most important economic area in Son La, as this district is the center of maize production. National Road No. 6 runs through the middle of the province and connects Yen Chau district with Moc Chau district in the southeast and Mai Son district in the northwest. Yen Chau
is 66 km from Son La city and shares 47 km of border with Laos. To discover the determinants of the new livelihood structure in the northwestern region of Vietnam, we focused on three villages: Lac Ken, Suoi Bun, and Luong Me (Fig. 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 (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 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/km², 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.

Data collection and analysis

For this study, data on HHs were collected on three occasions in 2016 and 2017 by means of field interviews and surveys. Multiple interview methods, namely, semi-structured and structured interviews and group discussions, were employed for HHs in the targeted villages. While the interview methods aimed to collect quantitative and qualitative data and to assess the basic socio-economic condition of the local farmers, group discussions focused on the collection of information on the historical development of the villages, land use changes, and the customs and habits of local people related to their livelihood conversion.

The first round of fieldwork was conducted in March...
2016, prior to the seeding time of the maize season, to obtain an overview of noteworthy issues. During the first round of fieldwork, a limited number of randomly selected farmers and administrative officers were questioned about general socio-economic information on the region, the diversification of livelihoods, and problems related to agriculture. Specified and detailed field interviews and surveys were collected during the second and third rounds of fieldwork, conducted during harvesting time from August to October in 2016 and September to November in 2017. Representatives of 198 HHs were randomly selected from 444 HHs in the three villages of Lac Ken, Suoi Bun, and Luong Me for interviewing in 2016. The number of interviewed HHs was extended with 22 new HHs, for a total of 220 in 2017. During these rounds, each HH was asked about its economic condition, family status, livelihood activities, sources of income, land use status, and problems related to agriculture. After individual HH interviews, three group discussions were organized with key farmers in the villages such as elders, village heads, and experienced farmers.

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. Moreover, data relating to the government management of maize were also collected through interviews and surveys of representatives of the Departments of Agriculture and Rural Development (DARD) in Yen Chau district and Son La province.

We performed correlation analysis to measure the strength of the relationship between the size of each HH and the area of cultivation land owned. 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 HH groups that contained migrants and HH groups that did not contain migrants. To quantitatively assess land use changes, the distribution of land use types, the maps of land use change in the years 2010, 2013, 2015, and 2017 were established. 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, road in 2017. Information about land use in 2010, 2013 and 2015 were collected through individual surveying and group discussions with the support of satellite images of Google Earth that help people to recognize the geographical objectives.

**RESULTS AND DISCUSSION**

**Land use changes in the study villages during the 2010–2017 period**

Livelihood was made up of five components: natural resources and 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

| Administrative locations | Tu Nang commune | Chieng Dong commune |
|--------------------------|-----------------|---------------------|
| Village                  | Lac Ken         | Suoi Bun            | Luong Me            |
| Total HHs (2017)         | 86              | 116                 | 242                 |
| Population (2017)        | 385             | 459                 | 1,007               |
| Population density (2017) (people per km²) | 57.6       | 120.7               | 497.3               |
| Total interviewed HHs in 2016 | 60         | 61                  | 77                  |
| Total interviewed HHs in 2017 | 77          | 70                  | 73                  |
| Total area (ha)          | 668.1           | 380.3               | 202.5               |
| Topographical height above sea level (m) | 300–400      | 300–400             | 300–400             |
| Land distribution norm in 1993 (m²/capita) | 3,900      | 2,100               | 900                 |
| Average years of education | 6.3          | 6.0                 | 6.3                 |

1 Data was taken from Yen Chau statistical office 2017.
2 This was the maximum allowance for land distribution for Tai Dam villages in Yen Chau in 1993.
3 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
considered to be the most important manifestation of change behind rural livelihoods. To understand the driving forces behind the formation of livelihoods, it is important to thoroughly investigate changes in land use.

**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. 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 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). Additionally, in order to join the World Trade Organization (WTO) in 2007, the Vietnamese government issued Decision 46/2005 QD-TTg to remove import and value-added taxes, as well as restrictions on import quotas for maize products (MOIT 2005) to promote animal husbandry. Such incentives led to the introduction of various foreign imported maize products. Along with the drop in maize selling prices, farmers’ efforts resulted in very little, as domestic maize products could not compete with imported foreign products owing to the high expense. 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.

**Diversified cropping system**

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

| Year | Forest % | Maize ha | Fruit tree % | Sugarcane ha | Wet rice % | Others ha |
|------|----------|----------|--------------|-------------|----------|----------|
| 2010 | 53.8     | 359.4    | 103          | 69.1        | 0.0      | 0.6      |
| 2013 | 51.6     | 344.7    | 103          | 69.1        | 0.0      | 0.7      |
| 2015 | 50.9     | 340.1    | 14.6         | 97.6        | 0.0      | 0.7      |
| 2017 | 50.9     | 340.1    | 21.3         | 142.5       | 0.0      | 0.7      |

| Year | Forest % | Maize ha | Fruit tree % | Sugarcane ha | Wet rice % | Others ha |
|------|----------|----------|--------------|-------------|----------|----------|
| 2010 | 0.0      | 0.0      | 22.7         | 45.9        | 1.0      |
| 2013 | 0.0      | 0.0      | 22.7         | 45.9        | 1.0      |
| 2015 | 0.0      | 0.0      | 22.7         | 45.9        | 1.0      |
| 2017 | 0.0      | 0.0      | 22.7         | 45.9        | 1.0      |

| Year | Forest % | Maize ha | Fruit tree % | Sugarcane ha | Wet rice % | Others ha |
|------|----------|----------|--------------|-------------|----------|----------|
| 2010 | 34.7     | 132.0    | 8.6          | 32.7        | 0.0      |
| 2013 | 26.9     | 102.3    | 6.8          | 25.7        | 0.0      |
| 2015 | 26.9     | 102.3    | 6.8          | 25.7        | 0.0      |
| 2017 | 24.1     | 91.5     | 16.1         | 61.4        | 0.0      |

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

Sources: Field survey, 2017, and in-situ measurements taken by the authors.
to make the best use of irrigable land by using excavator
machines to prepare the flat fields. However, the shortage in
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. 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 use of the local people; the total area of wet rice in Luong
Me has remained stable without change since 2010. In con-
trast, the wet rice areas in Lac Ken and Suoi Bun villages in
2017 increased by 1.2 and 2.3 times, respectively, compared
to 2010 (Table 2). This 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. Consequently, the total area of wet rice in Suoi Bun
expanded faster than it did in Lac Ken.

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 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 areas that had been
converted to fruit trees in Lac Ken and which were close to
roads that could support small- and medium-sized motor
vehicles with a carrying capacity of less than four tons. 2
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 % of the total area (Fig. 2).

Differing from the fast crop structure transformation
that occurred in Lac Ken village, no significant trans-
formation was recorded in Suoi Bun village, not even in
2015, apart from the decrease in maize areas (Table 2). In
fact, the decreased maize area in Suoi Bun accounted for
the abandoned maize areas planted for public purposes in
the land budget; farmers needed to pay an annual tax to be
eligible to use it. Although these abandoned areas were
small (less than two hectares belonging to nine HHs), this
phenomenon was not seen in the over 20-year historical

Fig. 2. The development of land use change in Lac Ken village.
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 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 (Fig. 3). 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.

The largest decrease rate in maize areas from 2013 to 2017 was seen in Luong Me village, with a 60.4 ha reduction, which is equivalent to a 29.8% reduction of the village area. The retreat of the maize cultivation area can be clearly seen in Fig. 4. Luong Me also has a large area of native mango trees of 45.9 ha, which accounts for 22.7% of the total area. However, there has been no change in its mango area since 2010. The eastern areas of the village were 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 was followed up by new fields near residential areas that were close to transportation routes and the irrigation system. In 2013, the sugarcane area in Luong Me was only 2.1 ha, and it increased to 24.5 ha in 2015. By 2017, 60.4 ha of maize area had been replaced by sugarcane (Table 2). The transformation of maize to sugarcane in Luong Me was direct and simple, since this village has no forest reserves.

**Changes in livelihoods**

The breakdown of maize monoculture has facilitated the changes and diversification of the livelihoods of the
local Tai Dam people. In particular, the land use maps of Lac Ken and Suoi Bun 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. Although mangoes are currently a high-benefit product, diversifying fruit trees instead of relying on mango monoculture not only reduces farmers’ dependence on mangoes but also meets the needs of various markets. This action is a strategic solution to reduce risk for poor farmers. The same finding was indicated in the research of Betcherman and Marschke (2016) on the livelihoods of fishermen 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.

In the case of Luong Me village, sugarcane cultivation brought about benefits for the development of livestock, since 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 3). Moreover, owing to the strict timeframe and storage requirements of sugarcane after harvesting, the development of sugarcane has also been accompanied by the need for day laborers. Hence, taking daily paid jobs during the four-month sugarcane harvesting season is also an effective way for farmers to increase their stable earnings.

However, various risks are associated with agriculture, and a proportion of smallholders may not be able to satisfy their basic living requirements; thus, family members are used to looking for alternative means to support their livelihoods (Chianu et al. 2008). Consequently, the majority of rural HHs must 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. Among the 61 interviewed HHs in Suoi Bun

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**Table 3. Total livestock in Lac Ken, Luong Me, and Suoi Bun villages.**

| Year | Buffalo | Cattle | Total |
|------|---------|--------|-------|
| 2013 | 87      | 34     | 121   |
| 2015 | 86      | 37     | 123   |
| 2017 | 85      | 41     | 126   |
| 2013 | 81      | 39     | 120   |
| 2015 | 111     | 83     | 194   |
| 2017 | 117     | 102    | 219   |
| 2013 | 80      | 29     | 109   |
| 2015 | 79      | 31     | 110   |
| 2017 | 74      | 20     | 94    |

Source: In-situ survey data collected by the authors.
Driving forces for livelihood structure changes

Village, 27 used migrant workers in 2016, and this number increased to 45 HHs in late 2017 (Table 4). Popular migrant jobs included harvesting, raising livestock, construction, or working in industrial zones in lowland areas where there was a high demand for laborers.

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. 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 lean 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.

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 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.

### Determinants of the main livelihoods

#### Grafting mango trees in Lac Ken village

Although mango is the traditional fruit tree of Yen Chau, the areal expansion of mango trees in maize fields since 2014 in Lac Ken was not from the native species but rather from grafted mango trees (hereinafter, new mango trees). The native mango species was grafted with foreign species from Taiwan, Thailand, and Australia for testing, and the yields formed a new mango tree that soon exhibited better quality, productivity, and significantly better economic value than maize. The experimental grafting technique was a great advancement for the ethnic people in northwestern Vietnam. Grafting trees is a demanding technique that requires guidelines and training, as well as a series of time-consuming experiments of trial and error. Typically, a grafted fruit tree, for example, a new mango tree, needs at least two to three years to demonstrate the experimental results. The rapid expansion of new mango trees to all HH gardens in Lac Ken in 2014, just over one year after the fall of the maize price, indicates the strong confidence and determination of Lac Ken HHs in transforming maize production to mango production.

The reason for Lac Ken HHs’ quick decision to move from maize to mangoes can be traced to 2010, when a lowland businessman sought business opportunities in Yen Chau, engaged the community-owned mango garden in Lac Ken for support from the farm’s owner for the grafting technique and output market, Lac Ken HHs quickly foresaw the future success of the new mango trees. Consequently, new mango trees were popularized in the vast gardens of all HHs and continued to grow in others’ maize fields (Fig. 2). The effective early transition from maize to new mango trees in Lac Ken partly benefited from

| Table 4. Status of migrant workers in Suoi Bun village. |
|-------------------------------------------------------|
| Unit | 2016 | 2017 |
|------|------|------|
|      | Migrant | Non-migrant | Migrant | Non-migrant |
| Average upland | m²/capita | 2655.4 | 2848.8 | 2914.3 | 3232.4 |
| Average paddy  | m²/capita | 178.2 | 226.4 | 180.7 | 251.5 |
| Number of HHs   | HH   | 27 | 33 | 45 | 15 |
| Number of migrants going in pairs¹ | Pair | 9 | N/A² | 22 | N/A |
| Seasonal migrant workers | People | 20 | N/A | 45 | N/A |
| Full-time migrant workers | People | 16 | N/A | 22 | N/A |
| Number of migrants who quit their jobs | People | 0 | N/A | 0 | N/A |

¹ Some farmers, along with other members of their families, adopted migrant work.
² N/A: Not applicable.
Source: Field surveys, 2016 and 2017.
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). This 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 resources of Lac Ken.

Human resources are a major internal force that heavily affects 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 5). These innovative farmers are also local people who are respectable and skilled farmers with a 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). 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 on his 20 ancient native mango trees using three foreign mango species from Taiwan, Thailand, and Australia. One year after the grafting, 17 of the 20 trees had survived, and Mr. L determined that the native mango tree grafted with the Taiwanese species demonstrated the highest productivity and quality. Ancient trees of similar sizes, approximately 20 cm in trunk diameter, were used for the experiment; each grafted Taiwanese species produced 200 to 300 kg of fruit, while the Thai and Australian grafted species only yielded 80 to 100 kg of 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 the Yen Chau native mango has 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. This brought about substantial opportunities for the popularization of both the native mango and the new mango product, far from the Son La market. This reflects the significant contribution of the Yen Chau DARD. After this, 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 province. As mango supply sources became more abundant, mango products in Lac Ken faced strong competition from other villages. Statistical results indicated that the selling price for a kilogram of mangoes in 2017 was US$0.66, about

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

Source: Field surveys, 2016 and 2017.
75% of the US$0.88 price in 2016. 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 certificate for 17.8 ha in mid-2017. 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 and other provinces. In late 2017, 7.4 ha of new mango trees belonging to the Huong Xoai cooperative farm received the 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.

**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 6, 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 (Table 6). The problems related to the investment and purchasing of sugarcane harvests were managed through contract farming (CF) with the sugarcane processing company in Mai Son district, Son La province (hereinafter Company A) that is located 20 km from Luong Me village. 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, 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 owing 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 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 Agriculture and 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

| Crop type | Maize | Grafted mango | Sugarcane | Wet rice |
|-----------|-------|---------------|-----------|---------|
| 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/ 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 3–5 days | None | Very small capital |

1 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 road, levelled and non-steep roads are essential to keep the fruit safe.
2 Sugarcane was grown with contract farming, so Company A was fully invested in the farmers.

Source: In-situ survey data collected by the authors.
in Luong Me and thus promoted the benefits of CF. 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. 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.

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. There were 67 migrant workers in 2017, an approximately ten-fold increase compared to the seven migrant workers in 2013. 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 7 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 7), had a high school education and lived with his parents, wife, and two children. Six members of his family depended on the income from his 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 fell 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 7), who are his relatives, to go with him to apply for the position. F was rejected for the job, as he had not yet received the required qualification. Later, F worked as a waiter in a local restaurant in Hung Yen province. 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 HHs 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 they own (Table 8). This finding suggests that people tend to find temporary jobs when they have insufficient resources.

| Migrant | Age $^1$ | 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.

$^1$ Age recorded at the time of starting migrant work.
Source: Field surveys, 2016 and 2017.
Driving forces for livelihood structure changes

The same conclusion was reached in the research of Rigg (2006) on the relationship between migration and poverty in Laos. However, in 2017, this significant correlation between the number of migrant workers and upland land area became insignificant. Although the new migrants in 2017 had larger cultivation lands, they followed 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). 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 work on the people of Suoi Bun (Table 4).

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 8). When a family, usually consisting of three generations, has more laborers, the senior members can take care of the children, 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 travelling 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). Hence, among the 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 (Fig. 5).

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

|                      | 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*      | 0.048     | 0.328*       | 0.028     |

1 Test one-tailed, for positive correlation.
* p-value < 0.05

Source: Field surveys, 2016 and 2017.

![Fig. 5. Working locations of Suoi Bun migrants in 2016 and 2017.](image-url)
community. 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 migrant pairs who left to work was only nine pairs; this number increased to 22 pairs in 2017 (Table 4). According to de Haas (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 newly formed labor transition flow from Suoi Bun to the lowland area, even in modest quantities, indicates important changes in the northern mountainous 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 mountainous regions.

CONCLUSIONS

Maize has been a staple crop in Yen Chau for over 20 years and has played a vital role in the economic development of the region. However, from 2012 to 2017, the value of maize decreased by 46.3%, which significantly damaged the economic prospects of the local people. This decrease in global maize production value was also the driving force behind the changes in the livelihood activities in Yen Chau. Even though the study villages had many similarities in terms of culture, social features, and educational background, various livelihood activities have been adopted to replace maize monoculture in the Yen Chau district. While Lac Ken and Suoi Bun concentrated their economic resources on growing mango and fruit trees, sugarcane was developed in Luong Me village. In addition to the development of alternative crops, migrant work has also become a livelihood trend in the region. This study aimed to investigate the determinants of the transition in livelihood structure in the northwestern region of Vietnam.

Differences in internal and external forces are the reasons for the development of different livelihood trends in Lac Ken, Suoi Bun, and Luong Me village. Concerning internal forces, the inequality in cultivation land was the root cause of the different developments in current livelihood activities. The large average land area per capita in Lac Ken village provided the inhabitants with enough food to meet their basic demands and allowed them to maintain a proportion of the community-owned mango garden. This small advantage played an insignificant role in the centralized maize production economy but yielded significant promise for the development of new agricultural techniques on fruit trees. Although Suoi Bun village is adjacent to Lac Ken village, their farmers have focused on taking on migrant work. A negative correlation was found between the number of migrants in a family and the area of upland fields that they own. The increasing number of migrants reflects the shortage of cultivation land. The cultivation land budget was the decisive factor in the formation of the new livelihoods in Lac Ken and Suoi Bun, but it did not affect the selection of livelihoods in Luong Me village.

Local farmers also received substantial support from external forces. The Yen Chau DARD has been acknowledged for its contribution to the popularization of mango products. Its long-term development plan, reflected through the registration of the geographical indicator, VietGAP certificate, and Production Unit Code for mango products, has brought Yen Chau mangoes to international markets. Furthermore, the large-scale government development plan for the Yen Chau region has brought about opportunities for the people of Luong Me to develop sugarcane. The findings of this study indicate that the function of livelihood activities has begun to follow the principle of market demand. The role of governmental management levels has gradually changed from guidance and imposition to support and promotion.

ACKNOWLEDGEMENTS This study was funded by the JSPS KAKENHI, Grant Number JP16H03115. We would like to express our deepest appreciation to the local people and government officers in the Yen Chau district, Son La province, for their kindness and enthusiastic cooperation.

NOTES

1 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. Seventy percent 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
Driving forces for livelihood structure changes

2 Some roads in Lac Ken have been upgraded and repaired annually since 2006 through contributions of local people and local maize traders. After the upgrades, these roads are now approximately three meters wide, making them suitable for motor vehicles and trucks with capacities of three to four tons.

3 In the 1970s, mango trees were grown by co-operative agricultural 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 of 1993, farmers in Lac Ken, with its large natural area, were granted the maximum allowance of the land norm (3,900 m² per capita), which was significantly higher than that granted to the people of Suoi Bun and Luong Me (2,100 m² and 900 m² per capita, respectively).

4 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 the place where the product was made. Yen Chau native mango products were granted the certificate of geographical indicators number 00034.

5 VietGAP represents a collection of guidelines issued by the Vietnam Ministry of Agriculture and Rural Development (MARD) for agricultural products to ensure quality in terms of growing techniques, food safety, indicators of origin, environmental protection, and health.

6 A Production Unit Code 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 a Production Unit Code, the Code will be sent to the relevant management agencies of the importing countries. The VietGAP certificate is necessary to apply for a Production Unit Code.

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