



Rural livelihood diversification of Dzao farmers in response to unpredictable risks associated with agriculture in Vietnamese Northern Mountains today

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Abstract

Vietnamese rural mountains are undergoing a significant transformation process in agriculture-based economy nowadays. A challenge facing ethnic minorities is identifying more appropriate way of life to cope with unpredictable risks associated with agriculture. This paper deals with livelihood diversification by the Dzao, an indigenous ethnic minority group in the Vietnamese Northern Mountains. One hundred and six Dzao households from 11 villages are surveyed with a systematic random sampling. The Simpson diversity index and the Average Agricultural Livelihood Diversification Index are used to measure the livelihood diversification of villages. Eighteen survey questions are developed from six determinants of livelihood diversification such as seasonality, risk strategies, labor markets, credit market failures, asset strategies and coping behavior and adaptation. The results show that livelihood diversification aligns Dzao farmers' goals to the short-term economic feasibility and long-term sustainability. Farmers diversify their livelihood by combining livelihood strategies for agricultural intensification, agricultural extensification and migration. Diversification should range from a temporary change in the household livelihood portfolio (occasional diversification) to a deliberate attempt to optimize the household capacity taking advantage of opportunities and coping with unexpected constraints (strategic diversification).

Keywords Livelihood diversification · Livelihood capitals · Dzao farmers · Cinnamon production · Unpredictable risks · Vietnamese Northern Mountains

1 Introduction

Livelihood diversification is considered as one of the most significant aspects of rural livelihoods (Gautam and Andersen 2016). The diversity of rural livelihoods, particularly in developing countries, attracted the attention and interest from both the academic

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professionals and practitioners because of its likely contribution to poverty alleviation (Ellis 2000a, b). Two-third of the poor and food insecure population worldwide are subsistence producers and small-farm households (IFAD 2010; FAO, IFAD and WFP 2015). Farmers often look for alternative means of livelihoods in response to unpredictable risks associated with agriculture, for example, uncertainties of weather, prices and disease (Chianu et al. 2008). Most rural households pursue a portfolio of agricultural and non-agricultural activities. Scoones (1998) pointed out three main livelihood strategies pursued by farm households: agricultural intensification, agricultural extensification and migration. Livelihood diversification is a combination of above strategies (Turner 2017). In the case of rural development, the diversification supports on-farm development with a mix of agricultural activities or rural-based non-farm industry development (Ellis 2000a, b). Income from non-farm enterprises is also being invested in the intensification and extensification of agriculture (Tiffen 2003; Holden et al. 2004).

Previous studies provided evidence on the contribution of livelihood diversification to the increasing income of rural households and livelihood security. Ellis (2000a, b) proposed six determinants of rural livelihood diversification: seasonality, risk, labor markets, credit markets, asset strategies and coping strategies. Block and Webb (2001) concluded that livelihood diversification increases the accessibility and availability of food products, food storage and consumption. Martin and Lorenzen (2016) argued that livelihood diversification at household level accompanies a higher wealth status and wider range of assets. For example, in the Nepalese upland, local farmers diversified their livelihood options in response to shocks and stresses from settlements. They switched between on-farm production (crops, fruit trees) and off-farm activities (migration and tourism) (Gautam and Andersen 2016; Subedi 2017). Sustainable livelihoods and livelihood diversification respond to the reversal of the persistent state of rural household deprivation (DFID 1999; Devereux et al. 2005). Livelihood diversification is often driven by two major considerations: necessity and choice (Ellis 2000a, b). Survival and choice (Davies and Hossain 1997) or survival and accumulation (Hart 1994) are mentioned. Also the role of livelihood diversification for the poor in rural areas was considered from two opposite sides: livelihood distress and progressive success (Ellis 1998, 2000a, b; Anderson and Deshingkar 2005; Martin and Lorenzen 2016).

This paper deals with livelihood diversification by the Dzao, an indigenous ethnic minority group in the Northern Mountains of Vietnam. Vietnam has 54 ethnic groups, among which 53 are ethnic minorities. While the Kinh majority lives in the river plains and along the coasts, other minorities live on steep slopes and in remote areas with limited access ability to infrastructure, healthcare services and education (Imai et al. 2011). In total, 49 ethnic inhabit the uplands (Michaud et al. 2016). In the Vietnamese Northern Mountains, the Dzao population makes up 85% of these groups in Vietnam. They live between 700 and 1000 meters high. The household economy of this ethnic minority is characterized by subsistence farming, and they depend on crop and livestock yields. Agricultural systems as multi-cultivation and intercropping are used to maintain food security. In the past, the Dzao depended on traditional shifting cultivation, forests and livestock. At present, the Dzao moved from traditional shifting cultivation to sedentary cultivation. Income is raised by cinnamon trees, paddy rice and livestock (Le et al. 2012). The cinnamon production is beneficial; however, limitations arise from the surface of arable land and water shortage on the steep slopes. Similar to other ethnic minorities living in the Vietnamese Northern Mountains, the Dzao face a national economic transition, wave of mass emigration from lowlands, and an existing transition to more intensive farming on uplands. Also soil erosion and climate-induced natural hazards such as heavy rains, floods, flash

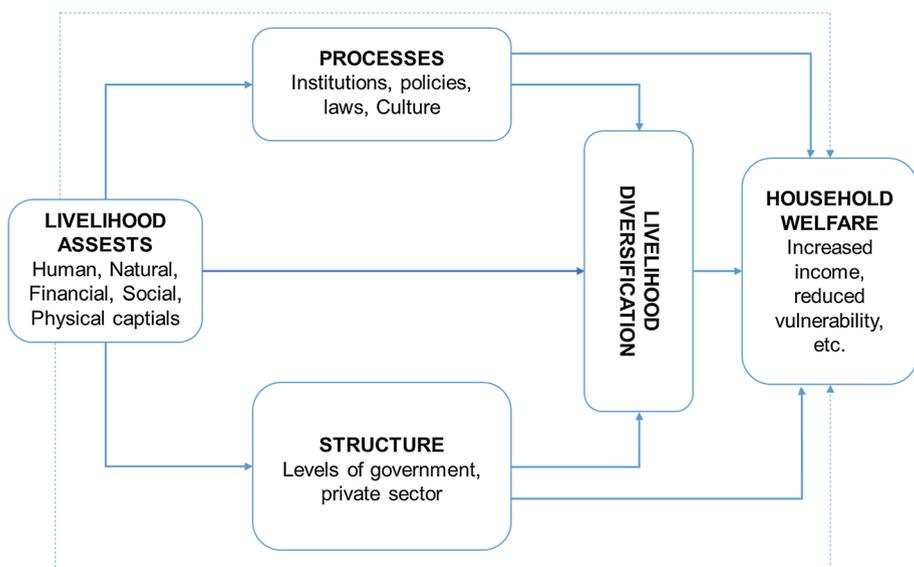


Fig. 1 Conceptual framework of livelihood diversification

floods and landslide damage their fields. This is why some Dzao households diversify their livelihood as a strategy both to cope with risks and to increase their wealth.

2 Livelihood diversification framework and determinants

The theory on determinants of rural livelihood diversification suggested by Ellis (2000a, b) is used to understand the nature of livelihood diversification in the Vietnamese Northern Mountains. Livelihood diversification is defined as “*the process by which rural families construct a diverse portfolio of activities and social support capabilities in order to survive and to improve their standards of living*” (Ellis 1998, p. 1), or “*attempts by individuals and households to find new ways to raise incomes and reduce risk (economic, environmental and social), which sharply differs by the degree of freedom of choice (to diversify or not) and the reversibility of the outcome*” (Hussein and Nelson 1998, p. 3). Rural households adopt a highly diverse livelihood portfolio to generate income and enterprises that is able to cope with and recover from stress and shocks. In this way, they stabilized and enhanced their capacities and assets at present and the future (Ellis and Bahiigwa 2003). The conceptual framework is based on the Sustainable Development Framework (DFID 1999) (Fig. 1). The framework addresses five capital assets (natural, social, financial, human and physical), which affect directly the livelihood strategy of the households. Also, these undergo the influence of external factor (i.e., institutions, policies, level of government and private sector) which affects the livelihood diversification.

Six determinants of livelihood diversification are recognized:

- **Seasonality** Seasonality is an inherent to rural livelihoods (Chambers et al. 1981; Sahn 1989; Agarwal 1990). Rural livelihood activities are cyclic as the growth and harvest seasons (Ellis 2000a, b).

- *Risk strategies* Risks are considered as the fundamental motive for livelihood diversification (Bryceson 1996). Income diversification as a risk strategy often implies a trade-off between a higher total income and a lower one (Ellis 2000a, b).
- *Labor markets* Labor markets play an important role in reducing the cyclical insecurity threats to establish viable rural livelihoods. It offers non-farm opportunities which vary according to skills, education and by gender, for income generation (Ellis 2000a, b).
- *Credit market failures* The availability of money for timely purchases of input in agriculture and to buy equipment has been considered as one of the critical constraints of rising productivity in small-farm agriculture in a long time (Ellis 2000a, b). It motivates the diversification of livelihoods (Binswanger 1983; Reardon 1997) to generate funds outside agriculture which is invested in the farming activities.
- *Asset strategies* An important motive for diversification is investments to increase income in the future (Ellis 2000a, b). The asset categories are natural, physical, human, financial and social capitals.
- *Coping behavior and adaptation* Coping refers to the methods used by households to survive when confronted with unanticipated livelihood failure (Ellis 2000a, b). Livelihood adaptation is a continuous process of “changes to livelihoods” which either enhance the existing security or wealth or try to reduce vulnerability and poverty (Davies and Hossain 1997).

3 Methodology

3.1 Study area

Selected Mo Vang commune is in southern Van Yen district, Yen Bai province of the Vietnamese Northern Mountains (Fig. 2). The Dzaos account for 61.5% of the total population. Other ethnic minorities include Hmong (29.5%), Tay (7.5%), Kinh (1.1%) and Thai (0.4%). Mo Vang is a traditional cinnamon production area. Cinnamon in the Vietnamese Northern Mountains originates from Mo Vang and the surrounding areas, where local Dzaos introduced this tree. In 2016, the commune has approximately 1340 hectares of cinnamon forest, covering 13.4% of the total commune area. Livelihoods of locals rely on a mix of on-farm and off-farm activities. Next to cinnamon, rice, maize and cassava are grown, however, with limited yields (162 hectares for 832 households). The crops maintain the food security of the families and provide animal feeds. The ratio of poor households is high in this commune (64.7%). Mo Vang is classified among the least developed communes of Vietnam: Nine out of the 11 villages are among the least developed villages of Vietnam in the period 2012–2015 (MVG 2017). Besides, Table 1 shows that the Mo Vang commune is vulnerable to climate-induced natural hazards such as heavy rain, floods and landslides. In 2017, the commune was damaged by five storms combined with heavy rain, floods and landslides.

3.2 Household questionnaire

Data were collected from both residents (by the questionnaire survey) and local officials (by official meetings). One hundred and six households (desired sample size $n = 106$) from 11 villages were selected using a systematic random sampling, which provides an unbiased coverage of the population within the sampling frame and is easy to administer on the field

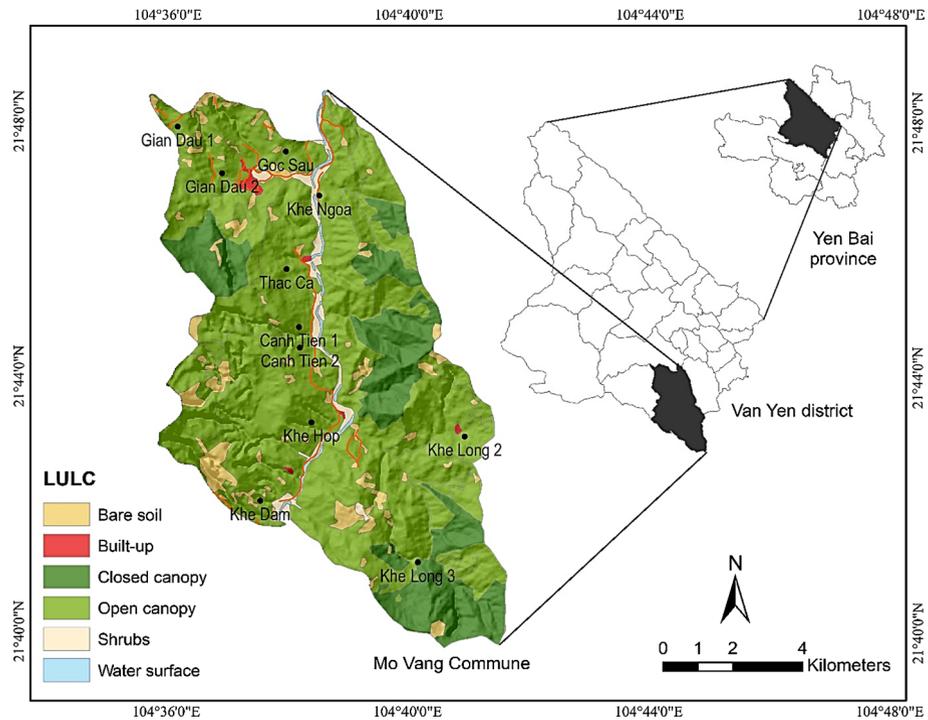


Fig. 2 Location of the Mo Vang commune in the Van Yen district, Yen Bai province, Vietnam

(McLafferty 2003; Henry and Valliant 2009). Samples were randomly selected with a starting point and a sampling interval k , which is calculated by dividing the population size (N) by the desired sample size ($n = 106$). The population size (N) is total number of households. The starting point (r) is selected randomly between the first sample and the sampling interval. In each household, any adult male or female member who was at home and knew about the livelihood of the household was interviewed. A face-to-face interview was organized during a field trip study in December 2017. A household questionnaire was designed to collect information on restructured determinants of livelihood diversification (Table 2). Official statistic data are collected from local government during official meetings including general socioeconomic, agricultural production and disaster damage statistics. Interviewers, who are researchers from Vietnam National University (VNU), Hanoi and Hanoi University of Natural Resources and Environment (HUNRE), were trained on maintaining the confidentiality of the respondents.

3.3 Socio-demographic profile of surveyed households

Male-headed households account for 61.3% of the sample households. The number of male-headed households is not reported by the local authorities; the 61% figure might be over estimated. In terms of educational status, dropout school are common in the Mo Vang commune. One-third of the respondents attended elementary school (33.3%), while only a half of them finished middle school (16.7%). Most of them drop out before high school,

Table 1 Cases of natural disasters in the Mo Vang commune in 2017

| Date | Article headline | Natural hazards | Damage statistics |
|--------------|---|-----------------------------------|---|
| 4–5 Jul 2017 | “Extreme heavy rain in Yen Bai, Lai Chau, Lao Cai” (http://www.nhandan.com.vn/xahoi/tin-tuc/item/33370502-mua-lon-gay-thiet-hai-tai-yen-bai-lai-chau-lao-cai.html , retrieved in 20 Dec 2017) | Heavy rain, landslide | 20 landslide sites; traffic suspended |
| 5–6 Aug | “Yan Yen (Yen Bai): An active mitigation in response to floods” (https://vov.vn/tin-24h/yan-bai-sat-lo-dai-lam-5-nguoi-thuong-vong-656000.vov , retrieved in 20 Dec 2017) | Floods, landslide | In the Mo Vang commune, ten houses collapsed. 11,881 ha of rice land was destroyed. 34,675 ha of cinnamon was damaged. Traffic was damaged due to 17 landslides |
| 2 Oct | “Yan Yen (Yen Bai): Severe traffic jams due to landslides” (https://vov.vn/tin-24h/anh-tac-duong-nghiem-trong-do-sat-lo-o-van-yen-yen-bai-677841.vov , retrieved in 20 Dec 2017) | Heavy rainfall, floods, landslide | At km 6+900 of the provincial road 164, landslides isolate the communes of Lam Giang and Lang Thip |
| 10–11 Oct | “An active response to Ngoi Thia flood in Van Yen, Yen Bai” (https://baotintuc.vn/thoi-su/chu-dong-ung-pho-voi-lh-ngo-i-thia-dang-cao-tai-van-yen-yen-bai-20171011140859742.htm , retrieved in 20 Dec 2017). “Yen Bai: Severe flooding, 8 residences flooded away, 4 family members still missing” (http://soha.vn/yan-bai-nuoc-lu-ve-cuon-cuon-8-ngo-i-nha-bi-cuon-troi-4-nguoi-trong-mot-gia-dinh-mat-tich-20171011082855641.htm , retrieved in 20 Dec 2017) | Floods, landslide | The water level of Ngoi Thia was 5–6 m above normal. Fast flowing has washed away and flooded fields. Many households have to relocate. Local traffic suspended due to floods |

Table 2 Survey questions developed from six determinants of livelihood diversification

| Determinants | Survey questions |
|--------------------------------|--|
| Seasonality | What kind of crops do you plant? Please provide the farming schedule of each crop? What animals do you feed on your family farm? Does the family have any other sources of income? |
| Risk strategies | Which are the difficulties experienced by agricultural production? Was your farm been damaged by any risk lately? How did you deal with these difficulties? Do you do any other job because you couldn't meet your family's basic needs? (They are limited in the work they did and in the time they spent for each job.) |
| Labor markets | What would you do to if you couldn't meet your family's basic needs from your farm income? (They are limited in the work they did and in the time they spent for each job.) Who hired you? Does this work require special skills or qualifications? |
| Credit market failures | What are the difficulties the family face when borrowing capital? Where does the family borrow from? At which interest rate? |
| Asset strategies | Please rank priority according to the investments for the following purposes: savings, children's education, healthcare services, other purpose? Did you ever donate to build public works? Which type of public works you donated for? Do you participate in social organizations? What support does the family receive from these organizations? |
| Coping behavior and adaptation | Do you have any other job because you could not meet your family's basic needs from your farm income? (They are limited in the work they did and in the time they spent for each job.) How much you earn from these jobs? Do you want to change your job on the farming? |

and the number of illiterate people is the majority (41.2%). The total poor and near poor account nearly 64.7% of the population. Agriculture is the main source of income (94.5%). Relative to the number of family members, there is 0.14 hectares of agricultural land per person on average. Agricultural land use certificates have not been issued for the whole commune. Four hundred and fifty-four households (49.5%) have granted land use right certificates. Three hundred and twenty-seven households (35.1%) were granted agricultural land use right certificates for a total the area of 729.49 ha (Table 3).

3.4 Analytical set up

The most common measure of livelihood diversification is the income share related with the different income sources. Livelihood diversification is measured using different indicators and indices, such as Simpson index, Herfindahl index, Ogive index, Entropy index, Modified Entropy index and Composite Entropy index (Khatun and Roy 2012; Datta and Sing 2011). In this study, the Simpson diversity index (SDI) and the Average Agricultural Livelihood Diversification Index (ALDI) were used to measure the livelihood diversification among the village because of its simplicity, robustness and wider applicability.

The Simpson diversity index (SDI) is calculated as:

Table 3 Socio-demographic profile of surveyed households

| Themes | Items | Unit | Statistic figure | Sources |
|------------------------|--------------------------------|-------------|------------------|-----------------|
| Gender | Male-headed households | % | 61.3 | Residents |
| | Female-headed households | % | 31 | Residents |
| Educational attainment | Elementary school | % | 33.3 | Residents |
| | Middle school | % | 16.7 | Residents |
| | High school | % | 5.88 | Residents |
| | Bachelor's or higher degree | % | 2.94 | Residents |
| | Illiteracy | % | 41.2 | Residents |
| Land ownership | Forestry land (for production) | % | 35.1 | Local officials |
| | Agricultural land | % | 0 | Local officials |
| | Residential land | % | 49.5 | Local officials |
| Land-person ratio | Forestry land (for production) | ha/person | 0.49 | Local officials |
| | Agricultural land | ha/person | 0.14 | Local officials |
| | Residential land | sq.m/person | 42.4 | Local officials |
| | Average household size | people | 4.6 | Local officials |
| | Dependence ratio | % | 2.5 | Local officials |
| Income distribution | Agricultural production | % | 94.5 | Local officials |
| | Non-agricultural production | % | 4.5 | Local officials |
| | Poor households | % | 44.6 | Local officials |
| | Near-poor households | % | 20.1 | Local officials |

$$SDI = 1 - \sum_{i=1}^n P_i^2$$

where n is the total number of income sources; P_i is the income proportion of i th income source.

The value of SDI ranges between 0 and 1. Households with the most diversified income sources have the largest SDI value, and those with the least diversified income have the smallest SDI value. The higher the number of income sources and the more evenly distributed the income shares, the higher the value of SDI. The Simpson index of diversity is affected both by the number of income sources as well as by the distribution of the income among the different sources.

The ALDI is the inverse of the number of agricultural livelihood activities reported by a household (Hahn et al. 2009). For example, a household that grows cinnamon raises animals has a $ALDI = 1/(2 + 1) = 0.33$. Only agricultural activities are counted. Non-agricultural livelihoods such as wage labor and vendor are not included.

Livelihood diversification consists of five levels: Limited (≤ 0.01), Low (0.01–0.25), Medium (0.26–0.50), High (0.51–0.75) and very high (≥ 0.75) (Khatun and Roy 2012; Datta and Sing 2011). The ALDI values range between 0.2 and 1.0. They are ranked in four levels of diversification: No diversification (0.81–1.0), Low diversification (0.61–0.80), Medium diversification (0.41–0.60), High diversification (0.20–0.40) (Hahn et al. 2009).

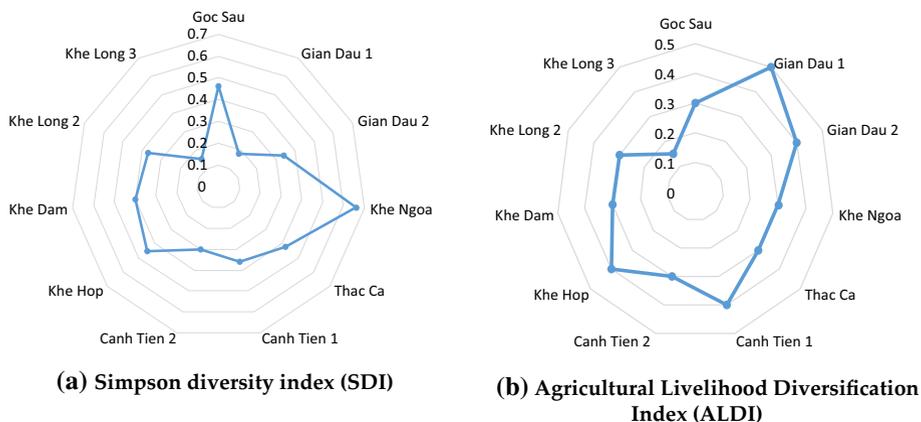


Fig. 3 Values of SDI and ALDI by villages in the Mo Vang commune

4 Results

4.1 Ranking livelihood diversification

The survey asked about the three primary sources of income: forestry, crop farming, and animal husbandry. Figure 3 shows that households of Khe Ngoa village have the highest value of SDI (0.66) and households of Khe Long have the lowest (0.15). Eight villages have medium SDI values (0.26–0.50): Goc Sau, Gian Dau 2, Thac Ca, Canh Tien 1, Canh Tien 2, Khe Hop, Khe Dam and Khe Long 2. ALDI values range between 0.3 and 0.5, which indicates levels of agricultural livelihood diversification from high (seven villages: Goc Sau, Khe Ngoa, Thac Ca, Canh Tien 2, Khe Dam, Khe Long 2 and Khe Long 3) to medium (four villages: Gian Dau 1, Gian Dau 2, Canh Tien 1 and Khe Hop). This shows that the majority of the villages have a high level of agricultural livelihood diversification. In particular, Goc Sau village has a low level of livelihood diversity, but a high level of agricultural livelihood diversification which is explained by their dependence on agricultural crops. The result shows a relationship between SDI and ALDI of a Dzao farming household. SDI is based on income, while ALDI is centered to agricultural livelihood activities. A household assessed a high SDI mean that they have relatively many non-agricultural income activities, and also have less time and resources to devote for farming, thus the low ALDI. In contrast, a household will probably diversify and intensify their farming activities (high ALDI), while their opportunities to engage in non-agricultural income activities are limited (low SDI).

4.2 Seasonality

In the Mo Vang, seasonality is an inherent feature of rural livelihoods; the main livelihood activities are related to rice, cassava, maize and cinnamon. There are 1,972 laborers, of which 1,034 are males and 938 females, working in agriculture (MVG 2017). They all grow cinnamon. The outer bark is mostly peeled off during two main seasons: “the March season” (from March to April) and “the August season” (from August to September). The whole family is involved in the cinnamon bark harvest or hired as harvesters. They work

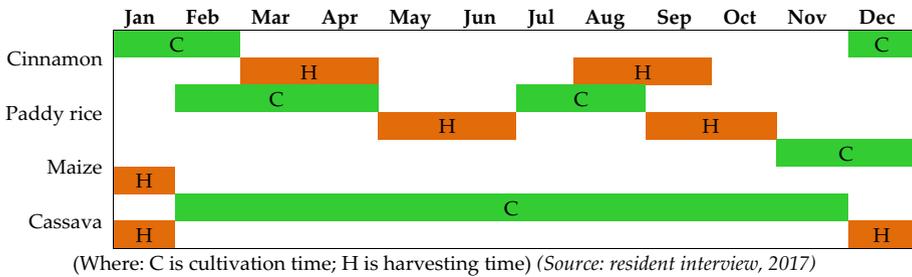


Fig. 4 Calendar of farming seasons in the Mo Vang mountain (where C is cultivation time; H is harvesting time). (Source: resident interview 2017)

for an income of 6.6–8.8 US\$ per day. The employment time is not scheduled and depends on the need of the employers. For residents with less land with cinnamon trees, the harvest workers provide an important source of income. Hoang Thi Trieu (Khe Ngon village) answered that “*she and her husband worked as hired laborers in June, July and August, for a total income of 874 US\$.*” In comparison, the Vietnam Living Standards Survey in 2010 showed that the ethnic minorities in the Northern Mountains have an average income of 300 US\$/year/person (Nguyen et al. 2017). Four family members (two dependents) earn three times as much income as the average income of ethnic minorities in Northern Mountains.

Most of the rice (70 hectares on a total of 120 ha) grown in the Mo Vang commune is wet paddy rice (MVG 2017). Agricultural land is allocated to local people according to Land Law. Each household is entitled to less than 0.1 hectare of crop land area. The vegetation season starts twice a year as the Summer–Autumn season and the Winter–Spring season (Fig. 4).

4.3 Risk strategies

During the Summer–Autumn season 2017, the local agricultural production was affected by flood hazards. Storms hit the area several times in July and August, and floods swept away more than 15 hectares of rice, corn and other cash crops; five fish ponds; over 34 ha of forest trees (Table 4). As the Mo Vang commune is annually damaged by natural disasters, residents depend on the Government’s fund and external resources from charity institutions and donors.

During the most recent 3 years (2015–2017), immature cinnamons regularly died due to pests and fungal diseases. People use pesticides available on the market (i.e., pesticides for rice) or manual to protect the trees. The root-damaged trees are not recognized until the leaves wither and the tree is dead. Most of the respondents expressed their concerns about cinnamon pests on the question: “which problems that they encountered during agricultural production and product sales.” As shown in Fig. 5, cinnamon farmers were suffering the most from pests and natural disasters.

4.4 Labor markets

Residents often look for temporary work during uncultivated periods. They find additional income through relatives or acquaintances. Cinnamon cultivation consumes a lot

Table 4 Damages caused by natural disasters in 2017 (MVC) (Source: local official interview 2017)

| Villages | Damaged crops (ha) | Damaged houses | | |
|-------------|--------------------|----------------|--------|--------|
| | | > 70% | 30–50% | 50–70% |
| Goc Sau | 0.2 | 2 | 0 | 0 |
| Gian Dau 1 | 1.6 | 1 | 0 | 0 |
| Gian Dau 2 | 8.9 | 13 | 0 | 1 |
| Khe Ngoa | 0.9 | 0 | 0 | 0 |
| Thac Ca | 0.9 | 0 | 0 | 0 |
| Canh Tien 1 | 7.5 | 0 | 0 | 1 |
| Canh Tien 2 | 8.1 | 0 | 0 | 0 |
| Khe Hop | 16.1 | 4 | 0 | 2 |
| Khe Dam | 2.8 | 0 | 1 | 0 |
| Khe Long 2 | 6.1 | 0 | 0 | 0 |
| Khe Long 3 | 0.1 | 0 | 0 | 0 |
| Total | 53.2 | 20 | 1 | 4 |

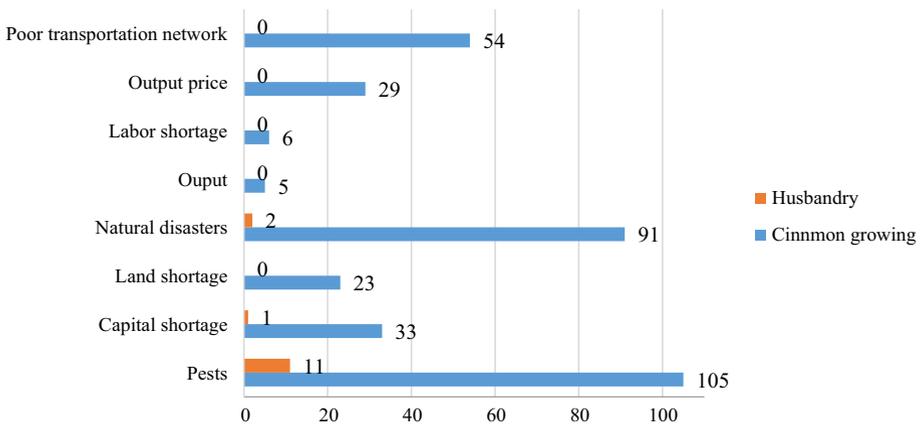


Fig. 5 Respondent's answers on the difficulties in production. (Source: resident interview 2017)

of labor to growing trees, caring, pruning and harvesting. As a result, most seasonal laborers involve in cinnamon cultivation. Cinnamon is a very popular crop among the local laborers. Most of the time, the employers are their neighbors or relatives. Local laborers are not competitive on labor market as a result of their low educational background. People who drop out from the secondary school are common in Mo Vang. Middle-aged residents and the elderly barely finish primary school are illiterate (36.8% of the respondents). This confines most of their work opportunities. Official data for newly employed laborers with stable incomes in 2017 show that the new incomes were mostly from forestry production (75%), next to small vendor (23%), oversea exported labor (1%) and other (1%).

4.5 Credit market failures

4.5.1 Credit markets

Agricultural credit plays an important role in improving the quality and quantity of farm products, increasing income of farmers and limiting rural migration (Kohansal et al. 2008). Vietnamese Government established preferential loan programs to reduce poverty and increase the welfare of poor households. Table 5 shows the available preferential loans at Vietnam Bank for Social Policies (VBSP)¹ which are mostly targeted to the poor and near poor. VBSP provides loans with an interest rate of 0.6% per year for poor households borrowing at the first time (the volume of the loan is lower than US\$ 2184). For business loans, the interest rate is 9% per annum (by VBSP). The preferential loans are easily provided when it comes to procedures and information. VBSP wants to assist the poor by providing services at the commune transaction office, which is located in the premises of the Commune People's Committees.

4.5.2 Credit fund management

Communal and village authorities reviewed poor households in need of loans. The beneficiaries have to be eligible in the framework of Decision No. 59/2015/QĐ-TTg of the Vietnamese Government defining multidimensional poverty levels for the period 2016–2020. The lists of poor and near-poor households are determined by a participatory process under Circular 17/2016/TT-BLĐTBXH. Local associations and unions participated in announcing the credit programs and persuaded people to comply with the program's regulations. There are 14 saving and loan groups in the commune (1–2 groups per village) with an average of 40 households/group. The average outstanding balance is US\$ 34,952/group. The group managers are the prestigious people in the village, elected and approved by the Communal People's Committee (CPC). Credit quality in the commune is relatively good. There is no overdue or "bad" debt or bad debts. Monthly payments are fulfilled properly. The transaction office of the VBSP is located in the CPC building, which facilitates bank transactions and information access about household's loans. Guideline boards and policy information boards are announced at convenient places. Commune leaders attend briefings at the transaction office to indicate activities of the associations and loan groups.

4.5.3 Beneficiaries

Decision No. 59/2015/QĐ-TTg of the Vietnamese Government defines the norms for multidimensional poverty applicable during 2016–2020. In total, 444 poor households earn less than US\$ 31/person/month. The vast majority of them failed to meet the standards of educational level (94.85%). Criteria poor households do not achieve include housing quality (24.8%), housing area (24.8%) and sanitary toilet/latrine (26.8%) (Table 6). By February 2017, the preferential credit programs provide US\$ 497,181.620 of loans for 455 poor and near-poor households. The policy-based credit in the past few years contributed an important support to the socioeconomic development which resulted in improved living standards, and reduced the

¹ Vietnam Bank for Social Policies (VBSP) is a state-owned bank and operating as a non-profit credit institution by providing policy credit and preferential credit to the poor households and other beneficiaries.

Table 5 Preferential loan programs of the VBSP implementing government regulations

| Program | Beneficiaries | Interest (%/month) | Maximum loan (US\$) | Purpose | Maximum tenure (years) |
|---|--|--|---------------------|---|-----------------------------------|
| Decree 78/2002/ND-CP | Poor households* | 0.55 | 2184 | Among others agricultural production, trading | 5 |
| Resolution 30a/2008/NQ-CP | Poor households* | 0.275 | 437 | Among others agricultural production, trading | 3 |
| Decision 755/QĐ-TTg | Poor households* | 0.1 | 655 | Reclaiming production land (for banana cultivation), career change, expenses for labor export | 5 |
| Decision 54/2012/QĐ-TTg | Ethnic minorities under extreme conditions* | 0.1 | 350 | Agricultural production | 5 |
| Resolution 120/HĐBT | Poor, near-poor, poverty-escaped households*, business | 0.55 | 2184 | Agricultural production, trading | 5 |
| Decision 71/2009/QĐ-TTg (solely for poor districts) | Poor households, poor ethnic minority households* | 0.275 (Ethnic minorities) 0.55 (Poor HHs) | Depend on employers | Labor export | By the time in the labor contract |
| Decision 33/2015/QĐ-TTg | Houseless household* | 0.25 | 1092 | Housing expenses | 15 |
| Decision 157/2007/QĐ-TTg | Students from poor households* | 0.55 | US\$ 48/semester | Tuition fees | Two times during school period |
| Decision 48/2014/QĐ-TTg | Poor households to build storm-resistant homes** | 0.25 | 655 | Housing expenses | 10 |
| Decision 15/2013/QĐ-TTg | Near-poor households* | 0.66 | 2184 | Agricultural production | 5 |
| Decision 28/2015/QĐ-TTg | Poverty-escaped households* within 3 years | 0.6875 | 2184 | Agricultural production | 5 |
| Decision 31/2007/QĐ-TTg | Business households (non-poor) | 0.75 | 1310 | Agricultural production, businesses, etc. | 5 |

*The list is approved and submitted by DPC

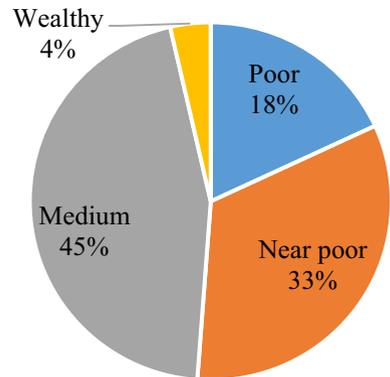
**The list is approved and submitted by PPC

Table 6 Poor households by their access to basic social services *Source* local official interview

| Village | Number of poor households | Number of poor households have limited access to basic social services | | | | | | | | | |
|-------------|---------------------------|--|----|----|----|-----|----|----|-----|----|----|
| | | HS | HI | EA | SA | HQ | HA | DW | ST | TS | AI |
| Goc Sau | 14 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 3 | 0 | 0 |
| Gian Dau 1 | 66 | 0 | 0 | 5 | 0 | 23 | 16 | 0 | 17 | 0 | 5 |
| Gian Dau 2 | 55 | 0 | 0 | 3 | 0 | 12 | 6 | 0 | 10 | 0 | 2 |
| Khe Ngoa | 26 | 0 | 0 | 1 | 0 | 3 | 2 | 0 | 4 | 0 | 0 |
| Thac Ca | 8 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Canh Tien 1 | 31 | 0 | 0 | 4 | 0 | 5 | 4 | 0 | 10 | 0 | 0 |
| Canh Tien 2 | 31 | 0 | 0 | 2 | 1 | 4 | 2 | 0 | 5 | 0 | 0 |
| Khe Hop | 55 | 0 | 0 | 2 | 0 | 10 | 9 | 0 | 10 | 0 | 0 |
| Khe Dam | 50 | 0 | 0 | 5 | 0 | 8 | 5 | 2 | 10 | 0 | 0 |
| Khe Long 2 | 37 | 0 | 0 | 3 | 0 | 20 | 19 | 3 | 15 | 0 | 0 |
| Khe Long 3 | 71 | 0 | 0 | 10 | 0 | 24 | 17 | 2 | 35 | 0 | 0 |
| Total | 444 | 0 | 0 | 38 | 1 | 110 | 80 | 7 | 119 | 0 | 7 |

HS Health services; *I* Health insurance; *EA* Educational attainment of adults; *SA* School attendance of school-age children; *HQ* Housing quality; *HA* Housing area; *DW* Domestic water use; *ST* Sanitary toilet/latrine; *TS* Telecommunications services; *AI* Assets for information access

Fig. 6 Rate of people by degree of poverty who want to borrow capital to invest in production. (*Source*: local official survey 2017)



poverty rate by 14.6% per year. In 2016, 82 poor households and six near-poor households had escaped from poverty. The middle income households account for 45% of people in need of loans (Fig. 6). This is a group interested in business loans in disadvantaged areas, at interest rates of 9.0% per annum. The poor and near-poor households are beneficiaries of several preferential credit programs from the government (see more in Sect. 4).

4.6 Asset strategies

4.6.1 Natural capital

*Land: Natural capital is an important factor affecting the livelihoods of the poor. Natural capital resources directly affect people's daily live. Agricultural land accounts for 5.3% of

Table 7 Area of land by production type in the Mo Vang Commune in 2017 (*Source:* local official interview 2017)

| No. | Type of land | Area (ha) | Purpose of use |
|-----------------|-----------------------|-----------|---|
| 1 | Residential land | 18.3 | For housing only |
| 2 | Agricultural land | 528.68 | Growing rice, maize, and cash crops |
| 3 | Forestry land | 8903.4 | Natural and protective forests account for 26.5%, production forests account for 48.6% of total land area |
| 4 | Aquaculture land | 2.78 | Fish farming |
| 5 | Non-agricultural land | 196.74 | Building local government offices, public works, and cemeteries, etc.; streams, surface water; others. |
| 6 | Unused land | 306.6 | Uncultivated soils |
| Total land area | | 9956.5 | |

the total natural area. Forestry land occupies 8903.4 ha, which is equivalent to 89.4% of production forest. The total area of production forest covers 4843.8 ha, which the natural forest land is 1252.7 ha (accounting for 12.58%). The production forest land is 1908.6 ha (accounting for 19.1%); the area allocated to households is 1908.6 ha (Table 7). Dzao farmers planted mainly cinnamon and chinaberry trees. Local livelihoods merely depend on cinnamon. Over 1300 hectares of cinnamon have been planted in Mo Vang. Many Dzao households have tens of hectares each with a yield of over 500 tons of cinnamon bark per year on average. At an average price of over US\$ 0.9 per kilogram, it is worth US\$ 436,900 per year for the whole commune.

*Water resources: The surface water in the Mo Vang commune is mainly supplied by rivers flowing through the commune, such as the Ngoi Thia stream, Ngoi Thim rivers and rainfall. In total, 663 households (80% of the commune) are provided drinking water from four water plants.

4.6.2 Physical capital

Physical capital falls outside individual or rural household's investment in Mo Vang. Basic infrastructure is still lacking in the community and its development merely depends on the government. Table 8 shows that transportation system is the most limited physical capital, next to electricity system, whereas a good system of healthcare stations and good schools support effectively economy and livelihoods at local.

4.6.3 Human capital

Article 4 of Joint Circular No. 09/2016/TTLT-BGDDT-BTC-BLDTB-XH defines the Government's Decree No. 86/2015/ND-CP on mechanism for collection and management of tuition fees for educational institutions in the national education system and outlining the policies on tuition fee exemption and reduction and financial support for the academic years 2015–2016 to 2020–2021. According to this regulation, the tuition fee exemption for students of ethnic minorities ranks under the poor households. Among the 102 respondents of the survey in Mo Vang, the majority of respondents dropped out after the middle

Table 8 Characteristics of physical capitals in Mo Vang Mountain (Source: residents and local official interview, 2017)

| No. | Physical capitals | Characteristics |
|-----|---|--|
| 1 | Transportation system | The land road network in Mo Vang experiences difficulties. Inter-district roads of An Luong—Mo Vang have a total length of 18 km. The inter-village road is 26 km long and 1–3.5 meters in width. The road to the commune center is still unpaved. Access to the villages is difficult. Roads expand continuously by 4–5 km per year on average |
| 2 | Irrigation system | Nine irrigation works are ready to use; 9,520 meters of canals, of which 6,769 meters are concreted. The target set by the commune is to invest in solidifying the dam and newly build Pua Tao ditch in Khe Long 3, with the length of 2,000 km and 500 meters of inner field canal in Gian Dau 1 and Gian Dau 2 |
| 3 | Electricity system | Electricity is provided for 251 households, accounting for 29.9% of the commune. The Commune People's Committee (CPC) coordinates with the investor and the specialized office of the district People's Committee to implement the Thac Ca 2 Hydropower Project |
| 4 | Schools | One secondary school and one primary school are available in the commune center. Seven sub-schools exist in 11 villages, one kindergarten in Thac Ca village and six sub-schools in 11 villages |
| 5 | Clean water and rural environmental sanitation system | Four clean water plants invested by the government are currently operational and more seven plants that have need to be built to cover all villages |
| 6 | Sanitary facilities | Six hundred and seventy-seven households (accounting for 87.2%) have standard bathrooms, 484 households (62.3%) have hygienic latrines. In general, sanitation facilities do not have wastewater and waste treatment systems to ensure health and environmental sanitation |
| 7 | Healthcare stations | The grade IV healthcare station is available in the commune. This covers the immediate health care needs; The station performs medical examination and treatment, and prepares adequate equipment and medicines to serve the people; coordinate with the sectors to inspection of the trading establishments, food processing, food safety and hygiene, vaccination for children are fully covered |

Table 9 Educational attainment of interviewees in 2017 (*Source*: local official interview, 2017)

| Village | Interviewees | Educational attainment | | | | |
|-------------|--------------|------------------------|---------------|-------------|-----------------------------|------------|
| | | Primary school | Middle school | High school | Bachelor's or higher degree | Illiteracy |
| Goc Sau | 9 | 3 | 1 | 1 | 0 | 4 |
| Gian Dau 1 | 10 | 3 | 1 | 1 | 2 | 3 |
| Gian Dau 2 | 10 | 3 | 2 | 0 | 1 | 4 |
| Khe Ngoa | 9 | 4 | 1 | 0 | 0 | 4 |
| Thac Ca | 9 | 2 | 2 | 0 | 0 | 5 |
| Canh Tien 1 | 10 | 3 | 2 | 2 | 0 | 3 |
| Canh Tien 2 | 9 | 2 | 1 | 2 | 0 | 4 |
| Khe Hop | 9 | 2 | 2 | 0 | 0 | 5 |
| Khe Dam | 9 | 3 | 2 | 0 | 0 | 4 |
| Khe Long 2 | 9 | 4 | 2 | 0 | 0 | 3 |
| Khe Long 3 | 9 | 5 | 1 | 0 | 0 | 3 |
| Total | 102 | 34 | 17 | 6 | 3 | 42 |

school. 33.3% of people went to primary school; 16.6% to the middle school, and 41.2% did not attend school. Only some (9.8%) of the respondents graduated from high school and college (Table 9). The commune development plan in 2016–2020 highlighted the school enrollment for all school-age children, more participation in the middle school and increased rate of secondary school graduates to continue high school, vocational or professional training.

For health services, in remote areas, the majority of ethnic minorities are beneficiaries of the policies, supported by the state in an effort reducing national poverty. Under the Law on Health Insurance, the poor and ethnic minorities living in disadvantaged areas are supported with a system which makes health services free of charge.

4.6.4 Financial capital

The income of local people is mainly raised by agriculture and forestry. In 2017, the income structure in agro-forestry production accounts for 94.5%, services and trade for 5.5%. The average income per capita/year is US\$ 415/person/year. During the survey, people were asked about their investment plans or how they use their idle money to improve their livelihood in the future. Cinnamon production has the first priority and includes new planting, production inputs, caring and labor hiring. Basic services such as health care and education are supported by the government.

4.6.5 Social capital

In the Mo Vang, social capital has a significant impact on the ability of the household to escape poverty. It determines the planning and development strategies of poor households. Social competence is affected by factors such as gender, ethnicity and social relationships. Local social organizations actively participate in the organization of society and come up for the legitimate interests of their members. Socio-political organizations are structured at different levels of operation nationwide. They include the Fatherland Front, which is a

Table 10 Summary of coping with and adapting to natural disaster by Dzao farmers. (*Source*: surveying farmers, 2017)

| Strategies | Specific activities |
|----------------------------------|---|
| Drought coping strategies | Planting of crops that require less water. Crop diversification Adjustment of fertilizer inputs Use of local climate indicators, for example cloud formation, wind formation, etc. |
| Heavy rainfall coping strategies | Prepare sandbags, drainage supplies Early harvesting Use of local indicators, for example cloud formation, some of certainly animal behaviors include white storks, hawks, frog, red ants, etc. |

political alliance and voluntary association, demonstrating the national unity. Its members are social organizations and individuals who voluntarily join the Front; the Youth Union; the Women's Union; the Farmers' Association, etc. By defining the rights and obligations of social organization (confirming their legal status and capability), the State creates favorable conditions to participate in the organization of the society. At the same time, the State established legal guarantees to prevent hindering activities by social organizations.

In practice, local organizations support the local government on information and implementation of state policies. Members of social organizations are likely more accessible to their neighbors.

4.7 Coping behavior and adaptation

Coping behavior is often confused with household risk strategies because coping is widely treated as an aspect of risk behavior. In contrast to the developed countries, the majority of rural populations in Northern Vietnam are engaged in farming. The crops of these farmers are based on their local experiences and knowledge developed over the years. Table 10 summarizes how the Dzao farmers cope with and adapt to natural disaster coping and adaptation strategies used by Dzao farmers.

5 Conclusion and discussion

The paper deals with a quantitative approach combined with the theory of six determinants of livelihood diversification and surveyed data to describe rural livelihood diversification of Dzao farmers in Vietnam. Livelihood diversification is analyzed based on six determinants: seasonality, risk strategies, labor markets, credit market failures, asset strategies, coping behavior and adaptation. An initial description of the qualitative assessment of livelihood diversification is provided by Ellis (2000a, b). Many producers focused on one plant (i.e., cinnamon) that generates high income; however, this strategy is not sustainable. It was commonly accepted that livelihood diversification strategies resulted in increasing household's welfare and assets (Block and Webb 2001, Martin and Lorenzen (2016)). This copes with stress and shocks, and results in stabilized and enhanced capacity and assets at present and in the future (Ellis et al. 2003; Gautam and Andersen 2016; Subedi 2017). This means the more diverse the income, the better livelihood.

The study results mention a specific case for rural livelihood diversification in the tropical mountainous environment. The main livelihood income activity of Dzao in Mo Vang commune is farming. The entire population is involved in agriculture and 94.5% of local economy depends on it, in particular, through cinnamon growing. Cinnamon provides income to all households in the villages. Other crops are rice, maize and cassava. These generate a fourth of the income of the interviewed households varying between 22 and 305 US\$ per year. Moreover, Dzao residents are unable to rely on the limited arable land surface on slopes for their food security. They are disadvantaged on labor markets as a result of their limited education. Most of employees finished secondary school or below.

In Vietnam nowadays, the rural mountainous areas are undergoing a significant transformation process in agriculture-based economy. Self-sufficiency has been gradually converted into market-oriented agriculture. In the Mo Vang commune, the restructuring of the agricultural sector and the shift of economy toward intensive farming, applications of scientific and technical techniques and high-yielding varieties are the most advanced in the area. Especially for cinnamon, the National Office of Intellectual Property of the Ministry of Science and Technology issued a decision on registration of the geographical indications for Van Yen cinnamon products. Since January 2010, the value of Van Yen's cinnamon products on domestic and foreign markets increased. Currently, 12 factories produce and process cinnamon oil; 16 cooperative enterprises process and trade the products. Thousands of households purchase and process cinnamon products. The expansion of the local cinnamon trees and the increase in cinnamon products generate jobs especially for the poor and landless households.

The existence data and study results show that how farmers response to unpredictable risks and how they can adapt or access the supports or possibility to policy implementation. However, the study has some limitations. The first one is local officials' participation. During interviews, local officials play the role of the head of farming households. Another limitation of this study is the disaggregation of data along gender lines. Based on a systematic random sampling, either a man or woman is interviewed depending on who was found at home. However, several authors pointed out men and women might respond to questions such as farm income or risks in agriculture in different ways (Masud et al. 2008; Molua 2011; Quisumbing et al. 2015). It would seem important to address whether there are any differences in responses by gender.

Overall, livelihood diversification in the Mo Vang commune is considered according to the combination of three common livelihood strategies: agricultural intensification, agricultural extensification and migration. Agricultural intensification does not only dealing with higher cinnamon yields and more cinnamon lands, but also an increase in value of other agricultural products per unit of inputs. The expansion of the cinnamon trees gives higher income for cinnamon farmers; however, they are likely to be challenged by main risks in agriculture such as price, yield, regulatory, financial or personnel risks. Risks of weather events, pests and diseases affect cinnamon production. Also Dzao farmers necessitate familiarizing traditional agricultural products to modern market and new commercial structures. Rural livelihoods diversification occurred as a result of increase in off-farm wage labor for the household livelihood portfolio or through new on-farm products. Diversification should range from a temporary change in the household livelihood portfolio (occasional diversification) to a deliberate attempt to optimize the household capacity taking advantage of opportunities and coping with unexpected constraints (strategic diversification).

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