1. GENERAL

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2. RESEARCH

2.1. Abstract

The social group's research aims to understanding bio-ecological nature conservation in northern Vietnam from social perspectives. Desk study, key informant interviews and household surveys were conducted to collect secondary and primary data. Field observations and participatory mapping were also employed during the field research. During the process of data collection gender and ethnicity were given special attention and data was systematically disaggregated by sex and age and disaggregated by disability, migratory status and other contextually-relevant markers of equity. Based on the data analysis of 04 study sites, we have discovered following important trends in the limestone Northern Mountain Region of Vietnam. These findings have important implications for biodiversity conservation and development policies in the region.

The data analysis shows that on average, income from forest resources contributed a significant proportion to the total household income. However, this source of income varies among the 4 study sites. More specifically, the Tay ethnic group Cham Chu Nature Reserve in Tuyen Quang province earned the least from forest making up 1% of the total household income and the Mong ethnic minority group of people in Du Gia National Park, Cao Bang province earned the next least from forest resources, accounting for 10% of the total household income. Meanwhile the Dao ethnic group in Nam Xuan Lac Species and Habitat Reserve earned the most from forest resources, but accounting for 16% of the total household income and the Dao ethnic group of people in Phia Oac - Phia Den National Park, Cao Bang province earned the next most from forest resources making up 17% of the total household income

The data analysis demonstrates that income from forests correlated very well with poverty rate. The higher the poverty rate exists the higher the income villagers earned from forests. This is true for Phia Oac - Phia Den National Park, Nam Xuan Lac Species and Habitat Reserve and Du Gia National Park where the poverty rate is much higher if compared with that of Cham Chu Nature Reserve.

It is important to note that income earned from forest resources did no correlate with social differentiation within the village. For the Tay ethnic minority group in Cham Chu Nature Reserve, on average, the poor household group earned the least income from forest resources compared with the middle and better-off groups of households. Meanwhile for the Mong ethnic minority group in Du Gia National Park, the poor household group earned the most income from forest resources, followed by the middle group. The better-off households earned the least income from forest resources. For the Dao ethnic minority group in Phia Oac - Phia Den National Park, the poor household group earned the most from forest resources, followed by the group of better-off household; The middle household group earned the least income from forest resources. The data also show an interesting fact that in the Dao ethnic minority group in Nam Xuan Lac Species and Habitat Reserve, the better-off household group earned the most from forests, followed by the middle household group; the poor household group earned the least income from forests resources.

2.2. Background of the study

Research objectives of the social group

> ➢ To better understand the current knowledge about the social, economic, cultural factors and conservation and development policies related to biodiversity conservation in the Northern region of Vietnam.
> ➢ To identify pressures and positive and negative impacts of development on biodiversity conservation, benefits gained from biodiversity and ecosystem services, and short-comings related to biodiversity conservation in the region.
> ➢ To provide policy recommendations to improve livelihoods and enhance biodiversity conservation.

Subjects

Selection of sampled communities based on the following criteria:

- Ethnicity
- Close to protected areas and biodiversity hotspot
- Accessibility to infrastructure
- Livelihoods: focus on species villagers hunted, collected, used, or sold; - Different types of development pressure such as mining, hydropower dam, industrial crops...

Methods of data collection

The following methods were used for data collection:
- *Desk study*: focusing on related project documents/data/maps, national and local plans and policies and other related documents.
- *Semi-structured interview* with key informants; forest rangers, forest protection staff and official of the local government.
- *Focus group discussion* with direct beneficiaries/villagers whose livelihoods were dependent on forest resources and other local stakeholders. Women were interviewed separately from men.
- *Household survey* with the head or spouse of the head of households that were most dependent on biodiversity and ecosystem services to make a living. Questions covered issues such as how much they were engaged in hunting and collecting non-timber forest products; If they were what kind of species; how they used plants and animals collected and hunted from forests and how much they earned from sales of those species of plants and animals.
- Other methods, such as *field observations* and *mapping*, with the assistance and participation of local stakeholders and communities were also employed.

During the process of data collection gender and ethnicity were also given special attention and data was systematically disaggregated by sex and age and, to the extent possible, disaggregated by disability, migratory status and other contextually-relevant markers of equity.

2.3. Literature review of the study sites

The following paragraphs describe briefly the 4 study site and functional zones.

- **Cham Chu Nature Reserve**

Cham Chu Nature Reserve is located within the administrative boundaries of 5 communes: Trung Ha, Ha Lang, Hoa Phu of Chiem Hoa district; Yen Thuan and Phu Luu of Ham Yen district, Tuyen Quang province.

Total area of Cham Chu Nature Reserve is 15,262.3 ha, of which the area located in Ham Yen district is 6,168.4 ha and Chiem Hoa 9,093.9 ha accordingly. Cham Chu Nature Reserve support a total population of 29,703 people, with 6,832 households living around it. The entire region has 8 ethnic minority groups of people living together, of which 3 ethnic minority groups account for the main proportion of the population being Tay, Dao, and Kinh.

Cham Chu Nature Reserve has a high biodiversity density of forest vegetation with endemic species: *Podocarpus neriifolius, Fokienia hodginsii, Excentrodendron tonkinense, Amentotaxus argotaenia, Anoectochilus acalcaratus, Paphiopedilum* spp.... Those are advantages and potentials of Cham Chu Nature Reserve. With an area of natural forest accounting for 99%, Cham Chu Nature Reserve not only plays an important role in ecology and natural environment, but also has the value of protecting the watershed of the river and stream system flowing through Ham Yen and Chiem Hoa districts. They play an important role in regulating water sources for irrigation for agricultural production activities of communes, districts and provinces in the downstream (Cham Chu Nature Reserve, 2019).

Although over the past time, Cham Chu Nature Reserve has made great efforts in conserving biodiversity values and natural landscapes, the natural values of the Nature Reserve have been degraded by impacts from humans and natural disasters, heavy rainfall, strong erosion, if the vegetation layer is destroyed, it will lead to increasingly degraded land. To preserve and promote those values, it requires a synchronous and scientific management plan with the participation and support of many agencies and departments from the central, provincial to local levels and especially the local people in the region.

In the village, people also trapped and shot chipmunks. Because the Forest Protection and Development law restricted weapons and explosives, squirrel trapping was under control. In recent years (2015-2016) the situation of logging to make cutting boards to sell to China. People in the village were hired to cut hard wood for sale. Those who cut wood were not rich or poor. They were from all classes. The price for cutting board for sale here was 150-200,000 VND/piece: 40cm wide; thickness: 6-7cm. So the tree must be very big. The tree must have a diameter of 1.1-1.2m. Tree should be 15-16m tall. This tree must be thousands of years old or more.

- **Du Gia National Park**

Du Gia National Park has a total natural area of 15,006.3 ha, located in 3 communes of 3 districts of Ha Giang province: Tung Ba (Vi Xuyen district); Minh Son (Bac Me district) and Du Gia (Yen Minh district). The buffer zone has an area of 8,850 ha belonging to 6 communes of 4 districts: Du Gia and Duong Thuong comunes (Yen Minh district); Minh Son and Yen Dinh (Bac Me district); Tung Ba (Vi Xuyen district) and Thai An (Quan Ba district). This national park has an area of 14,068 hectares located on Dong Van Karst Plateau Global Geopark, accounting for 93.7% of the natural area of the national park. Du Gia is about 70 km

from Ha Giang city in the direction from National Highway 34, and 100 km in the direction of National Highway 4C.

There are 5 main types of forest vegetation in the National Park: lowland tropical moist evergreen closed forest growing on mountains at altitudes below 700 meters; Semi-tropical humid evergreen closed forest with medium mountains distributed at altitudes above 700 meters; And tropical moist evergreen closed forest on limestone mountains.

The flora here has 1,061 species of higher vascular plants of 6 plant branches (accounting for 85.71% of the number of branches in Vietnam). The most diverse are magnolia species with 950 species (accounting for 89.54%), ferns with 88 species (accounting for 8.29%), pine with 12 species (accounting for 1.13%), *Licopdiophyta* with 9 species (accounting for 0,85%), the rest is *Psilotophyta* and *Equisetum ramosissimum*. There have also been identified 202 plant families (accounting for 53.44% of the whole Vietnam) such as orchids with 65 species (accounting for 6.13%); trivalve has 46 species (accounting for 4.34%); coffee has 45 species (accounting for 4.24%); mulberry has 39 species (accounting for 3.68%); daisy family has 33 species (accounting for 3.11%); *Cinnamomum camphora* family has 26 species (accounting for 2.45%); legume and grass family with 25 species (accounting for 2.36%); the *Araceae* family has 22 species (accounting for 2.07%); Orange family has 17 species (accounting for 1.6%) (Du Gia National Park, 2018).

In terms of fauna, the national park is home to 318 species of terrestrial vertebrates, including 72 species of mammals, 162 species of birds, 84 species of reptiles and amphibians. Among them there are 35 rare species, especially the snub-nosed langur which is one of the 25 most endangered primate species globally. This is a restricted endemic specieendemic species, distributed only in a few provinces in the Northeast of Vietnam. Currently, the population of snub-nosed langurs has about 108-113 individuals, accounting for nearly 50% of the total number of snub-nosed langurs in Vietnam. In addition, among the recorded reptiles and amphibians, there are 13 rare species such as earth dragons, geckos, striped snakes, Impressed Tortoise (*Manouria impressa*), thorn tortoises, common dry snakes, kraits, Chinese cobras, big-headed turtle, striped frog, *Theloderma corticale, Quasipaa verrucospinosa.*

Most of the people's livelihoods still depended on the forest such as logging, hunting and illegal trading of wild animals. Since 2016, the exploitation of forest resources has been less due to the support of the Payment for Forest Environmental Services program. Although the level of support received is not much, the villagers' awareness of forest management and protection has been enhanced. Many species of animals in the forest were still illegally exploited and used by local people. The following species were encountered while the field work was being conducted: birds, wild pigs and dogs, and squirrel, among other.

In addition, the research team also recorded a number of forest products such as timber and non-timber forest products that local people still harvested and used such as bamboo shoots, vegetables, and forest roots for food; all kinds of bamboo, all kinds of wood… for sale and house building.

- **Phia Oac – Phia Den National Park**

Phia Oac - Phia Den National Park is a national park and special-use forest located in 5 communes of Nguyen Binh district, Cao Bang province. This used to be a resort discovered and built by the French from the early 20th century. Established on January 11, 2018 on the basis of the entire area of the former nature reserve. The national park has an area of 10,245.6 ha, of which 4,035.5 ha is a strictly protected area. Phia Oac - Phia Den is home to 352 species of plants, 58 species of rare and endangered animals. It is also home to 66 species of butterflies (Phia Oac Phia Den National Park , 2019).

Phia Oac - Phia Den National Park has a total natural area of 10,593.5 ha, including 8,146.6 ha of natural forest in 5 communes of Nguyen Binh district, Cao Bang province: Thanh Cong, Quang Thanh, and Phan Thanh, Hung Dao and Tinh Tuc town. The entire area of the national park is located in Non Nuoc Cao Bang Geopark which was recognized by UNESCO as a Global Geopark on April 12, 2018. Located 240 km from Hanoi capital along provincial road 212 and 76 km from Bac Kan city along provincial road 212 and national highway 3, 73 km from Cao Bang city along provincial road 212 and national highway 34, and 30 km from Nguyen Binh town along provincial road 212 (Phia Oac Phia Den, 2020).

The national park is divided into 3 main subdivisions which are strictly protected zone; ecological restoration and administrative service zones. The strictly protected zone covers an area of 4,035.5 ha, in sub-zones 338 and 352 in Thanh Cong commune; sub-zone 333, 334 Quang Thanh commune; sub-zones 327, 337 in Phan Thanh commune; and sub-zones 321 and 322 in Tinh Tuc town.

There is an ecosystem of closed evergreen tropical forests and a medium mountain subtropical forest ecosystem; dwarf forest ecosystem, also known as "moss forest", a type of forest of temperate climate typical of North Vietnam with many endemic, endangered and rare species of flora and fauna. In addition, the buffer zone has an area of 8,276.1 ha located in 6 communes and 1 town. The highest peak in the nature reserve is the 1931 m high Phia Oac peak, also the highest mountain in the Ngan Son-Yen Lac arc.

Every year, there are still a number of violations of deforestation, clearing and shifting cultivation. In the past two years, there have been about 10 violations of the practice of slash-and-burn cultivation, expanding the area planted with trees such as tobacco and galangal. In the cases of violations, the most violating households encroached 2000m2 and the least violating hosueholds 500m2. When an incident occurred, the commune cooperated with the Special-use Forest Management Board to consider and handle the case. In 2020 2-3 cases were procecuted.

- **Nam Xuan Lac Nature Reserve**

Nam Xuan Lac Species and Habitat Reserve was approved by the People's Committee of Bac Kan province according to Decision No. 342/QD-UB dated March 17, 2004 with a total natural

area of 1,788 ha located in the two villages of Na Da and Ban Khang, Xuan Lac commune, Cho Don district, Bac Kan province.

On January 14, 2014, the People's Committee of Bac Kan province issued Decision No. 109/QD-UBND approving the planning for conservation and sustainable development of Nam Xuan Lac Species and Habitat Reserve, Bac Kan province for the period 2013- 2020. According to the decision, the Nature Reserve has an area of 4,155.67 ha, of which the Strict Protection Zone is 2,552.50 ha; Ecological restoration zone 1,586.12 ha; Service - administrative zone 9.04 ha; The inner buffer zone is 8.01 ha, located in communes: Xuan Lac, Ban Thi and Dong Lac, Cho Don district. The outer buffer zone is 16,371.53 ha located in 4 communes: Xuan Lac, Ban Thi, Dong Lac and Yen Thinh, Cho Don district (Nam Xuan Lac Nature Reserve, 2019).

Nam Xuan Lac Species and Habitat Reserve has 653 species of higher vascular plants belonging to 440 genera, 142 families, and 5 phyla, of which 54 rare and precious species are recorded in Decree No. 32/2006/ND-CP; 50 species are recorded in the Red Book of Vietnam in five years; 9 species are listed in the IUCN Red List. Some rare plant species such as *Burretiodendron hsienmu*, *Garcinia fragraeoides*, *Fernandoa* spp... *Paphiopedilum* spp. and some other precious medicinal species such as: *Codonopsis javanica, Morinda officinalis, Spatholobus suberectus* (Nam Xuan Lac Nature Reserve, 2016).

According to the survey results, the fauna has recorded the presence of 29 species of mammals belonging to 04 orders, 12 families; 47 species of birds belonging to 09 orders, 21 families and 12 species of reptiles belonging to 2 orders, 06 families, especially some species are recorded in the Red Book of Vietnam and the IUCN Red List. Some species are especially rare and precious such as: Black monkey, Assam Macaque (*Macaca assamensis*) Bengal Slow Loris (*Nycticebus bengalensis*), Pygmy Slow Loris (*Nycticebus pygmaeus*), Sun Bear (*Helarctos malayanus*), White-eared Night Heron (*Gorsachius magnificus*).

The PFES program starts from 2019 for protection and production forests and community forests. People here lived by cutting wood. In the past, they lived on the forest. Now young people go to work in the factories. Now, the relationship between a boy and a girl was very complicated. Trucks transported all kinds of things: firewood, construction materials; forest products and plows and harrows.

This year, there was a case of forest law violation. There were 5 young men belonging to poor households and even middle-class households. There has been no notification of how it will be handled. If villagers wanted to cut wood to build a house, he/she must ask for permission. In recent times, there has been a conflict in the community because the boundary of the household's forest land was not clear. The cadastral officer brought the machine to measure to redefine the boundary and resolved the conflict. There was 1 case in 2021. In the past, there was not any case.

2.4. Group's purpose and subjects

Brief description of purpose/objective and subjects of research group

> ➢ Objective 1: To better understand the current knowledge about the social, economic, cultural factors and conservation and development policies related to biodiversity

conservation in the Northern region of Vietnam.

> ➢ Objective 2**:** To identify pressures/threats as well as positive and negative impacts of development policies on biodiversity conservation.

> ➢ Objective 3**:** To provide policy recommendations to improve livelihoods and enhance biodiversity conservation.

2.5. Materials and methods

Detailed description of methods and materials used for the study of research group. Additional information can be presented in Annexes.

Key informant interviews

07 key informant interviews were conducted in Tuyen Quang province.

08 key informant interviews were conducted in Ha Giang province.

20 key informant interviews were conducted in Cao Bang province.

12 key informant interviews were conducted in Bac Kan province.

Focus group discussions

02 focus group discussions (14 participants) were conducted in Tuyen Quang province, and 02 focus group discussions (18 participants) were conducted in Ha Giang province

02 focus group discussions (14 participants) were conducted in Cao Bang province and 02 focus group discussions (18 participants) were conducted in Bac Kan province.

The topics covered by focus group discussions were about the history of socio-economic development and natural resources management and exploitation in the study sites, key milestones of socio-economic development, changes in forest resources/species and impacts on biodiversity conservation.

Household interviews
   ✓ A sample of 51 households (Tay ethnic minority group) in Nam Luong village, Phu Luu commune, at the Cham Chu Nature Reserve, Tuyen Quang province were selected for household interviews. The data entry from the interviews into the SPSS database was completed. The team is presently in the process of analyzing the data.
   ✓ A sample of 50 households (Mong ethnic minority group) in Lung Cang village, Ngoc Minh commune, at the Du Gia National Park site, Ha Giang province were selected for household interviews. The social team is now in the process of entering the data from the household interviews into the SPSS program.
   ✓ A sample of 50 households (Dao ethnic minority group) Bang Tong Village, Thanh Cong commune, Nguyen Binh District, Cao Bang Province were selected for household interviews. The data entry from the interviews into the SPSS database is being done.
   ✓ A sample of 46 households (Dao ethnic minority group) in Keo Nang Village, Ban Thi commune, Cho Don district, Bac Kan Province were selected for household interviews. It is important to note that the entire village has 46 households and all of the village's households were included into the sample.
   ✓ After the primary data were collected the social team entered the data into the SPSS program for analysis.

2.6. Results and discussions

2.6.1. Overview of the socio-economic data in 04 study sites

This summary provides key socio-economic development and conservation data collected from the 4 study sites.

Table 1. Key socio-economic development and conservation data collected from the 4 study sites.

Criteria	Cham Chu Nature Reserve	Du Gia National Park	Phia Oac – Phia Den National Park	Nam Xuan Lac Species & Habitat Reserve
	Nam Luong Village (n=51)	**Lung Cang (n=50)**	**Ban Tong (n=50)**	**Ban Thi (n=46)**
Ethnicity	Tay	Mong	Dao	Dao
Average number of persons per household	4.9 persons/household	5.54 persons/household	4.7 persons/household	4.0 persons/household
Education level of the household head				
Not go to school	15.70%	14%	36%	41.30%
Elementary school	41.20%	46%	24%	33%
Secondary school	31.40%	24%	20%	23.90%
High school	9.80%	6%	10%	2.20%
Cultivation land (ha/household)	1.66 ha/household	3.68 ha/household	0.62 ha/household	0.58 ha/household
Forest area under household management	0.0027 ha/household	0.00032 ha/household	19.13 ha/household	4.76 ha/household
Average income of household per year	VND 161,000,000/household/year	VND 14,229,400/household/year	VND 41,149,641/household/year	VND 71,696,804/household/year
Poverty rate (%)	15%	58%	80%	56.50%
Number of households facing food shortage (%)				
1 month	11.80%	28%	12%	21.70%
1-2 months	2%	8%	2%	2.20%
2-3 months	3.90%	16%	10%	10.90%
4-5 months	2%	2%	0%	8.70%
more than 6 months	3.90%	2%	0%	0%
Income from forest (VND/household)	VND 2,057,353/household	VND 6,501,680/household	VND 10,073,480/household	VND 11,539,630/household
Income from forest out of total	1%	10%	17%	16.16%

Criteria	Cham Chu Nature Reserve	Du Gia National Park	Phia Oac – Phia Den National Park	Nam Xuan Lac Species & Habitat Reserve
	Nam Luong Village (n=51)	Lung Cang (n=50)	Ban Tong (n=50)	Ban Thi (n=46)
household income (%)				
Income from PFES (VND/household)	0VND/household	VND 1,800,000/household	VND 80,440/household	VND 1,152,413/household
Income from PFES out of total household income (%)	0%	3%	0.10%	1.60%
Closed canopy forest cover (%) in 2017	64%	46.70%		
Bush, low grass cover (%) in 2017	3.70%	16.10%		
Number of cases breaching the forest protection law in 2017	13	28		
Diversification of livelihood (occupations/jobs create incomes)	30	26	43	37
Number of females headed households	14	4	6	12
Number of people living in the female headed household	68	16	26	46
Diversification of livelihood (occupations/jobs create incomes) of the female headed households	23	17	20	17
Total income of all females headed households (VND/year)	2,450,335,000	285,900,000	426,940,000	454,276,075
Average income of households with female heads (VND/year)	36,034,338	17,868,750	16,420,769	9,875,567

2.6.1. Key findings/trends in the Northern mountainous region
Based on analyzed data collected at 04 study sites, we have discovered following important trends in the limestone Northern Mountain Region of Vietnam. These findings will have

several important implications for biodiversity conservation and development policies in the region.

❖ The data analysis shows that on average, income from forest resources contributed a significant proportion to the total household income. However, this source of income varies among the 4 study sites. More specifically, the Tay ethnic group Cham Chu Nature Reserve in Tuyen Quang province earned the least from forest making up 1% of the total household income and the Mong ethnic minority group of people in Du Gia National Park, Cao Bang province earned the next least from forest resources, accounting for 10% of the total household income. Meanwhile the Dao ethnic group in Nam Xuan Lac Species and Habitat Reserve earned the most from forest resources, but accounting for 16% of the total household income and the Dao ethnic group of people in Phia Oac - Phia Den National Park, Cao Bang province earned the next most from forest resources making up 17% of the total household income (See Figure 1 and 2 below).

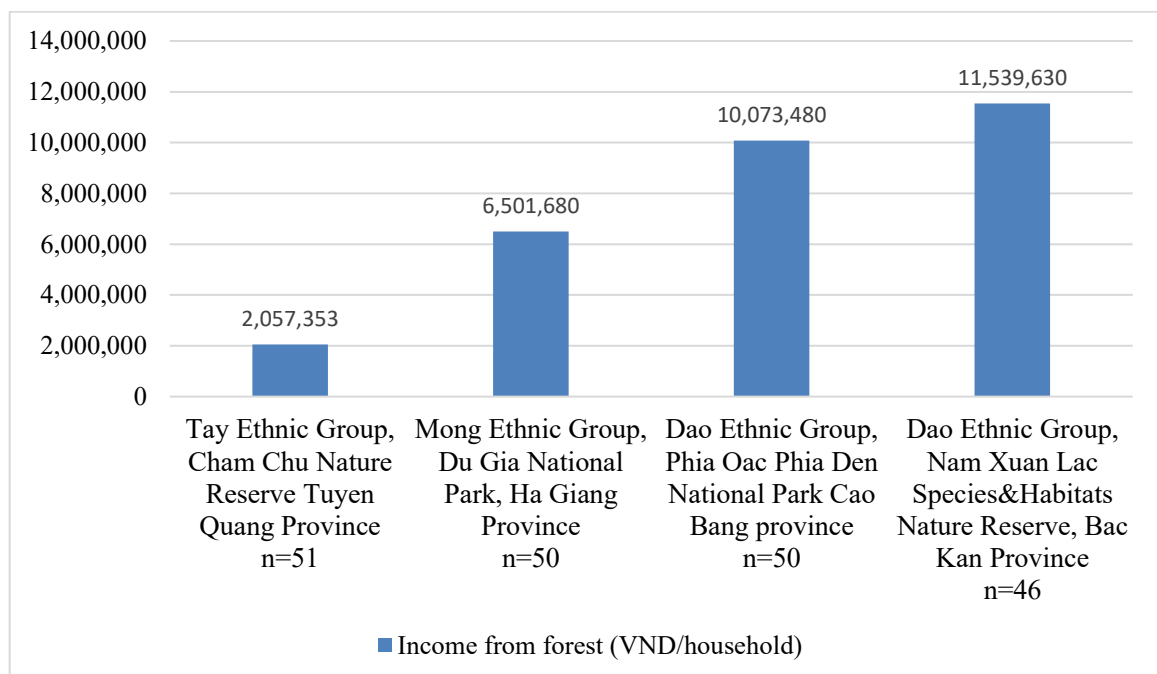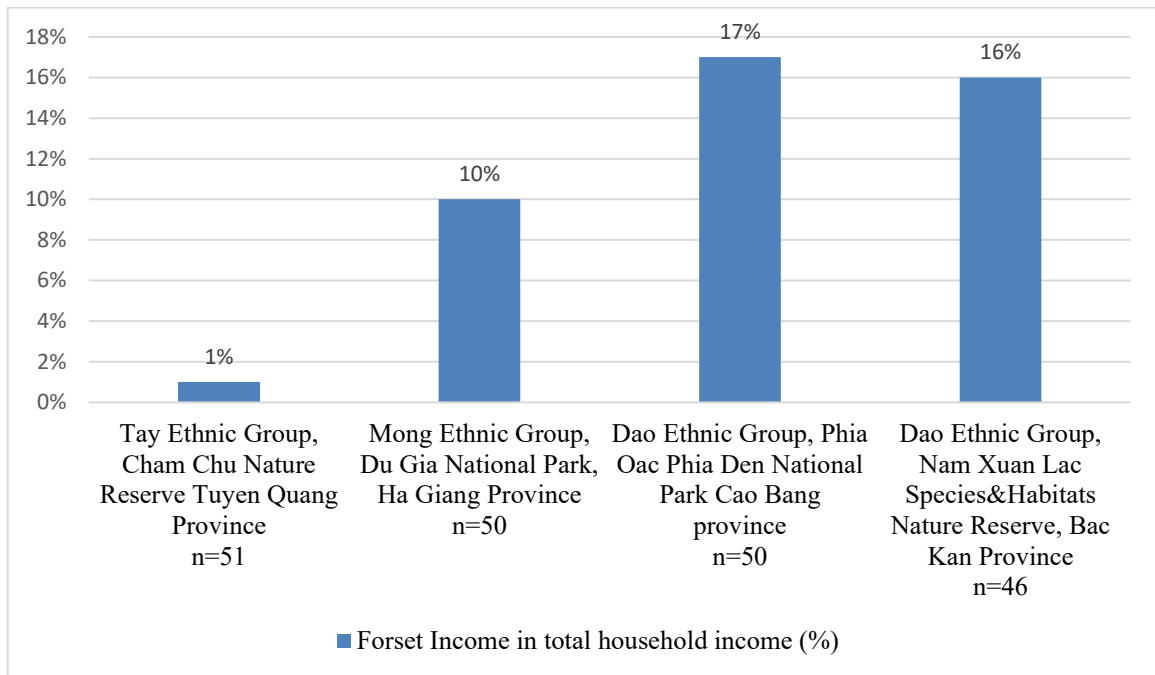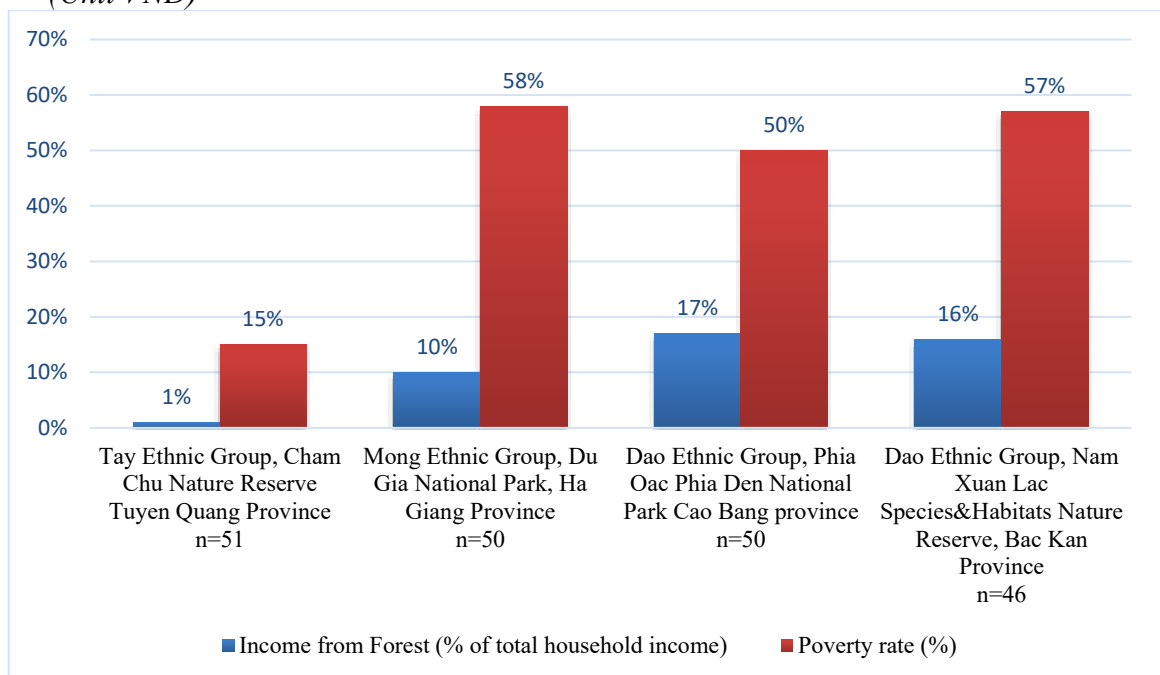*Figure 1. Mean cash income per household in each ethnic minority group in 4 study sites (Unit VND)*

Figure 2. Mean cash income in each from forest resources total household income among the ethnic groups in 4 study sites (Unit VND)

❖ The data analysis also shows that income from forests correlated very well with poverty rate. The higher the poverty rate exists the higher the income villagers earned from forests. This is true for Phia Oac - Phia Den National Park, Nam Xuan Lac Species and Habitat Reserve and Du Gia National Park where the poverty rate is much higher if compared with that of Cham Chu Nature Reserve (See Figure 3).

Figure 3. Distribution of income from forest resources and poverty rate in 4 study sites (Unit VND)

❖ It is important to note that income earned from forest resources did no correlate with social differentiation within the village. For the Tay ethnic minority group in Cham Chu Nature

Reserve, on average, the poor household group earned the least income from forest resources compared with the middle and better-off groups of households. Meanwhile for the Mong ethnic minority group in Du Gia National Park, the poor household group earned the most income from forest resources, followed by the middle group. The better-off households earned the least income from forest resources. For the Dao ethnic minority group in Phia Oac - Phia Den National Park, the poor household group earned the most from forest resources, followed by the group of better-off household; The middle household group earned the least income from forest resources. The data also demonstrate an interesting fact that the Dao ethnic minority group in Nam Xuan Lac Species and Habitat Reserve, the better-off household group earned the most from forests, followed by the middle household group; The poor household group earned the least income from forests resources (See Figure 4 below)

Figure 4. Income from forest resources and social differentiation in 4 study sites (Unit VND)
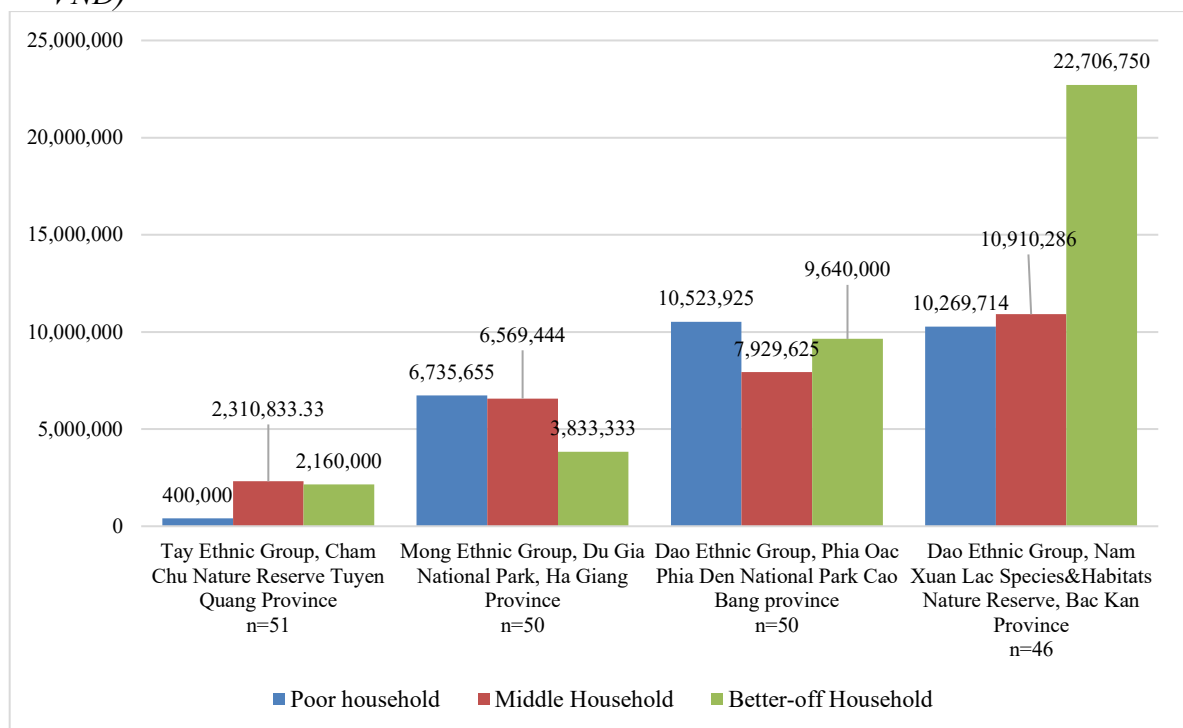
- ❖ The gender issues were also paid due attention during the process of data analysis. The results demonstrate income from forest resources correlated with gender in the study sites. The Tay female-headed households in Cham Chu Nature Reserve earned the least (more than VND 4 million) from forest resources and the Dao female-headed household in Phia Oac - Phia Den National Park earned the most from forest resources (almost VND 17 million), followed by Nam Xuan Lac (almost VND 9 million) and Du Gia (nearly VND 4 million). However, the Dao male-headed households in Nam Xuan Lac Nature Reserve earned the most from forest resources (almost VND 13 million), followed by those in Phia Oac - Phia Den (more than VND 9 million) and Du Gia National Park (almost VND 7 million). Those in Cham Chu Nature Reserve earned the least of all from forest resources (almost VND 3 million).

Figure 5. Income from forest resources and gender in 4 study sites (Unit VND)
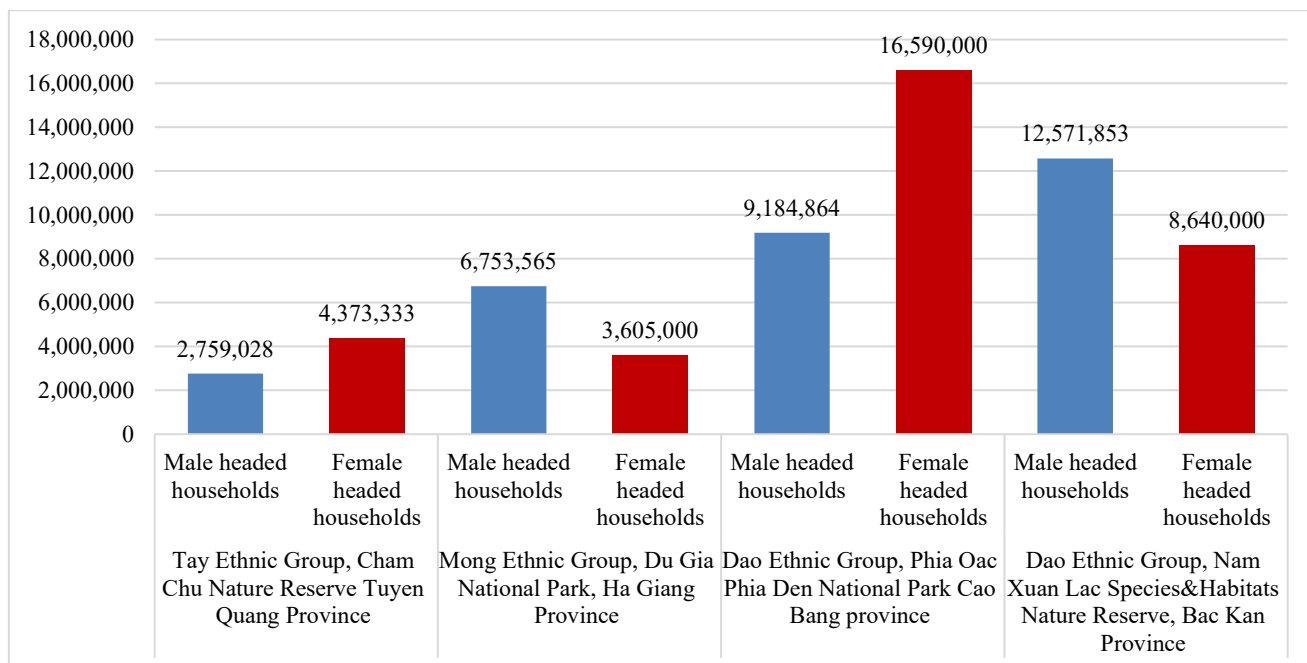
❖ With regard to the age of the household, it is important to note that the income from forest resources did not correlate with the age of the household heads if at all in the 4 study sites (See Table 2 below).

Table 2. Distribution of income from forest resources and the age of the household heads

Tay ethnic group in Cham Chu Nature Reserve, Tuyen Quang Province		Forest income	Age of household heads
Forest income	Pearson Correlation	1	-0.006
	Sig. (2-tailed)		0.965
	N	51	51
Age of household heads	Pearson Correlation	-0.006	1
	Sig. (2-tailed)	0.965	

			51	51
	N			

Mong ethnic group in Du Gia National Park, Ha Giang province		Forest income	Age of household heads
Forest income	Pearson Correlation	1	**-0.184**
	Sig. (2-tailed)		0.201
	N	50	50
Age of household heads	Pearson Correlation	-0.184	1
	Sig. (2-tailed)	0.201	
	N	50	50

Dao ethnic group in Phia Oac - Phia Den National Park, Cao Bang province		Forest income	Age of household heads
Forest income	Pearson Correlation	1	0.056
	Sig. (2-tailed)		0.700
	N	50	50
Age of household heads	Pearson Correlation	0.056	1
	Sig. (2-tailed)	0.700	
	N	50	50

Dao ethnic group in Nam Xuan Lac Species & Habitat Reserve, Bac Kan province		Forest income	Age of household heads
Forest income	Pearson Correlation	1	**0.163**
	Sig. (2-tailed)		0.280
	N	46	46
Age of household heads	Pearson Correlation	0.163	1
	Sig. (2-tailed)	0.280	
	N	46	46

❖ Income from forest resources did not correlate with the area of forest land owned by the households in the 04 study sites (See Table 3 below).

Table 3. Income from forest resources and area of forest land owned by households

Tay ethnic group in Cham Chu Nature Reserve, Tuyen Quang Province		Forest income	Forest land area
Forest income	Pearson Correlation	1	-0.059
	Sig. (2-tailed)		0.682
	N	51	51
Forest land area	Pearson Correlation	-0.059	1
	Sig. (2-tailed)	0.682	
	N	51	51

Mong ethnic group in Du Gia National Park, Ha Giang province		Forest income	Forest land area
Forest income	Pearson Correlation	1	**.363**[**]

	Sig. (2-tailed)		0.010
	N	50	50
Forest land area	Pearson Correlation	.363[**]	1
	Sig. (2-tailed)	0.010	
	N	50	50

Dao ethnic group in Phia Oac - Phia Den National Park, Cao Bang province		Forest income	Forest land area
Forest income	Pearson Correlation	1	-0.021
	Sig. (2-tailed)		0.885
	N	50	50
Forest land area	Pearson Correlation	-0.021	1
	Sig. (2-tailed)	0.885	
	N	50	50

Dao ethnic group in Nam Xuan Lac Species & Habitat Reserve, Bac Kan province		Forest income	Forest land area
Forest income	Pearson Correlation	1	-0.029
	Sig. (2-tailed)		0.850
	N	46	46
Forest land area	Pearson Correlation	-0.029	1
	Sig. (2-tailed)	0.850	
	N	46	46

2.6.2. Policy implications

This section discusses the current approaches and policies on biodiversity conservation in Vietnam and Northern Mountain Region and how the findings will be translated in order to contribute to design of appropriate policy and tools on biodiversity conservation and livelihood improvements in the Northern Mountain Region in particular and in the whole country in general.

The previous and current policies and approaches on biodiversity conservation in Vietnam	Social research group's findings in the 4 study sites in Northern Mountain Region
The approaches and policies on biodiversity conservation have been mainly top-down and one-size-fit all.	The policies and approaches often do not take the other factors into consideration. Those might affect the way in which different social groups of households use and manage forest resources such as socio-economics, gender and ethnicity. Our research in the 4 study sites found that other factors such as ethnicity, gender, household classes and poverty rate are very important factors that influence policy enforcement on biodiversity conservation.
Poverty is main cause of biodiversity loss and degradation. Current conservation approaches, policies, and programs have applied pro-poor as main approach.	Our research in the 4 study sites found that level of poverty among the 4 study sites and dependence of local people on forest resources varies among the sites. Some better-off households earned more from forest resources if compared to the poor. This is case for Nam Xuan Lac National Park.
The approaches and policies on biodiversity conservation aim to increase the fees from Payments for Forest Environmental Services (PFES) to increase household income and advance biodiversity conservation.	Our research found in the 4 study sites that the income from PFES makes up a very small proportion to the total household income (ranging from 0% to 1.6% out of the total household income).
Crop boom development contributes to deforestation and biodiversity conservation.	Our research in Cham Chu Nature Reserve indicated that the orange boom in the area has increased the forest cover trends and reduced the number of cases violating the Forest Protection and Development Law over the last 36 years. (Accepted and Published Paper to the VNU Science Journal of this social group).
Increased forest land holding would increase income from forest resources and improve biodiversity conservation.	Our research findings show that income from forest resources did not correlate with the area of forest land each household holds.
Biodiversity conservation policies and approaches consider the local people around the protected earned significant percentage of income from forest resources and high dependence	Our research found that there were significant differences among the studied communities. On average, each Tay household in Cham Chu Nature Reserve earned the least - less than 1% of the total household total income from forest resources. Each Mong household on average in Du Gia National

The previous and current policies and approaches on biodiversity conservation in Vietnam	Social research group's findings in the 4 study sites in Northern Mountain Region
on forests.	Park earned more than 10% from forest resources. Finally, each 2 Dao household earned 16% and 17% in Nam Xuan Lac and Phia Oac - Phia Den respectively.
Current biodiversity conservation policies and approaches consider both genders of household heads the same.	Our research found in the 4 study sites female-headed households had the lowest income from all sources compared with the male-headed households. Important as well is that female-headed household earned more from forest resources and they also depended more forests.

2.7. Discussions

The social research group has provided new insights into the root causes of biodiversity loss, which has has serious negative social-economic impacts and environmental impacts, and how the biodiversity loss can be reversed and advanced in the future. We have collected the important baseline data on socio-economic development in the Northern Mountain Region, which have not been taken into consideration by policy-makers to design policy and tools for biodiversity conservation in the region. Our research findings show that only when the factors that affect the ways in which different social of households groups use and manage forest resources such as gender, ethnicity, and household classes are better understood would incentives and appropriate institutions for biodiversity conservation be designed at the local level.

There are many miss-leading approaches and theories on biodiversity conservation based on limited understanding socio-economic factors. The social research group has published an important paper on crop boom and biodiversity conservation in the Northern Vietnam. By applying both qualitative and quantitative methods, the paper highlighted there was correlation between crop boom, which was orange development and biodiversity conservation. Thanks to a significant percentage of income that orange development contributed to the total household income, forest cover has significant increased and as a result the number of illegal poaching cases and poverty rate decreased. The significant findings of this study demonstrate that understanding of the causes and consequences of agrarian change provides a useful blueprint for other studies of resource use and management and biodiversity conservation in other regions of the country as well as in other countries and other situations

Our findings show that the other factors such as ethnicity, gender, household classes, and poverty rate have also contributed to failure and successes of the implementation and enforcement of biodiversity conservation policies and tool in Northern Vietnam. It is of great important to take those into consideration in the design of appropriate policies and tools for biodiversity conservation and socio-economic development in the region.

2.8. References

Du Gia National Park (2018). Annual report on management, conservation and development of biodiversity. Bac Me District, Ha Giang province. https://dantocmiennui.vn/dien-tich-rung-trong-vuon-quoc-gia-du-gia-duoc-bao-ve-nho-giao-khoan-cho-cong-dong-dan-cu/192989.html. Accessed 15/12/2021

Nam Xuan Lac Nature Reserve (2016). Natural characteristics. https://kiemlam.backan.gov.vn/portal/kbtnamxuanlac/Pages/2016-3-1/Khu-bao-ton-thien-nhien-Nam-Xuan-Lacjhwsn4.aspx. Accessed 15/03/2021.

Nam Xuan Lac Nature Reserve (2019). Annual report on management, conservation and development of biodiversity. Cho Don District, Bac Kan province.

Phia Oac Phia Den (2020). Annual report on management, conservation and development of biodiversity. Nguyen Binh district, Cao Bang province.

2.9. Publication and products

❖ Paper published by the VNU Journal of Science: Earth and Environmental Sciences, Vol. 37, No. 4 (2021) 1-10. https://js.vnu.edu.vn/EES/article/view/4669

3. EMPOWERMENT OF YOUNG SCIENTISTS

3.1. Guiding principles for education and training

Brief description of regulations or guideline of the research group for young research assistants.

- The team leader and key researcher provided tools and approaches and training to the young research assistants in the first year.

- The team leader and key researcher provided research ethics and safety to the young research assistants.

- The team leader and key researcher provided trainings on designing questionnaires, focus group discussion, key informant interviews to the young research assistants.

- The team leader and key researcher provided trainings on using SPSS and NVIVO to the young research assistants.

- The team leader and key researcher provided trainings on conducting literature reviews and writing papers to the young research assistants.

- The team leader and key researcher accompanied the young researcher assistants to the field to conduct pre-testing the questionnaire, which were finalized later based on the pre-testing.

- The completed survey tools, including the key informant interviews, focus group discussion and household survey questionnaire were used for actual interviews in the field by the whole team.

3.2. Achievement of each young scientist

The key achievement of research assistants and/or young scientists during the time of project implementation and assessment of their progress are listed in Table 5.

Research assistants and/or young scientist	All products and results	The time of project	Assessment
Vinh Nguyen (left VNU-CRES for her PhD in South Korea)	Conducted fieldwork Conducted literature review and wrote the first paper for publication in the VNU Journal of Science	2nd year	Good
Thanh Nguyen (left VNU-CRES for another ministry)	Conducted fieldwork Logistics support	1st year	Good
Ly Bui	Conducted fieldwork Provided logistics support for the whole team	1st year, 2nd and 3rd years	Good
Dung Ngo	Conducted fieldwork Provided logistics support for the whole team Entered all data into the SPSS and Nvivo program, which was later analyzed.	2nd and 3rd years	Very good

Research assistants and/or young scientist	All products and results	The time of project	Assessment
	Wrote a paper for the VNU Journal of Science In the process of writing the second paper for publication in a reviewed international journal (Appendix 2)		23
Toan Le	Conducted fieldwork Entered all data into the SPSS and Nvivo program, which was was later analyzed. Wrote a paper for the VNU Journal of Science In the process of writing the second paper for publication in a reviewed international journal (Appendix 2)	2nd and 3rd years	Very good

4. APPENDIX

Appendix 1. Paper was already published in the VNU Journal of Science

Original Article

Roles of Crop Boom (Orange) in Biodiversity Conservation in the Northern Limestone Mountain Region of Vietnam

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Nguyen Thi Vinh, Le Thi Van Hue**

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Abstract: This study examines the roles of crop boom (orange) in biodiversity conservation in Cham Chu Nature Reserve, Tuyen Quang province in the Northern Limestone Mountain Region of Vietnam. The results indicated that the local policy on orange development in Tuyen Quang since 2000 has made positive contributions to both local livelihood improvements and biodiversity conservation. On average, household income has significantly increased (VND 161 million Vietnam/household/year), of which income from sale of oranges made up 62% of the total household income. Poverty rate has been reduced by half during the last 10 years. Therefore, the dependence of the local livelihoods on the harvesting of forest resources has remarkably decreased, accounting for only 1% of the total household income. Data analysis indicates that the trend of increasing orange area (from 7% in 1986 to 27% in 2017) is related to the increasing forest cover in Cham Chu Nature Reserve (60.4 % of 1986 to 63.8% in 2017) and the decreasing trend of forested areas under human impact (11.3% in 2007 to 3.7% in 2017). Notably, the number of cases of violation of the Law on Forest Protection and Development has significantly decreased (from 66 in 2013 to 13 cases in 2017) in the study area. The case of Phu Luu shows that commodity agricultural development has had a positive impact on biodiversity conservation at the local level. Recommendations are provided at the end of the paper as how to strengthen the linkages between commodity agriculture and biodiversity conservation in the limestone mountains of Northern Vietnam so that growth of rural incomes, poverty reduction, and biodiversity conservation can all take place.

Keywords: **Crop boom, orange, livelihoods, forest, wellbeing, Tay people, Northern limestone mountain region of Vietnam.**

Appendix 2. Outline of the paper will be published in international journal

Forest environmental income in Northern Highlands Limestone Mountains, Vietnam: household socioeconomic factors influencing forest use and management

Contents

Abstract

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Research setting
Figure 1 Map of the study area

Study sample

Data collection

Household characteristics
Table 1 Characteristics of the surveyed households.

Data analysis

RESULTS

Forest products collected

Table 2 Average cash income generation from forest-based sources in the Northern Mountain Region.

Factors influencing forest environmental income
Sources of household cash income
Table 3 Sources of household cash income in the Northern Mountain Region.
Table 4 Comparison of forest income (FCI) households with non-forest cash income (non-FCI) households

Household age

Ethnicity

Gender (male/female headed households)

Household class (Better-off, middle, poor)

Relationship of overall household wealth to forest environmental income

Table 4 ANOVA of socioeconomic variables, comparing households ranked by cash income sources.

Figure 2 Box plot of total cash income from forest based resources by income classes

Figure 3 Percentage of household cash income contributed by forest based sources by income classes.

Factors affecting income from forests

Table 5 OLS regression with absolute forest income as the dependent variable.

Table 6 OLS regression with relative forest income as the dependent variable.

DISCUSSION

CONCLUSIONS

ACKNOWLEDGEMENTS

REFERENCE

Appendix 3. Reference in this report