

Livelihood Capital and Poverty Status of Forest Dependent Households in the Highland Area: A Case Study in Bac Kan Province, Vietnam

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Abstract

Bac Kan is the mountainous province with the largest forest cover in Vietnam and forest dependence by rural households is of great significance. The objective of this study was to assess the situation of livelihood capitals, as well as their impacts on the poverty status of forest-dependent households in highland areas of Bac Kan province. Data were collected through direct interviews of 218 households living near forests in the districts of Ba Be and Na Ri. Descriptive statistics, comparison, logit model, student t-test, and chi-square test were used in this study. The results revealed that forest-dependence was high for poor households; the households' livelihood capital was weak; and households with stronger livelihood capitals were primarily non-poor. The effect of livelihood capitals on household's poverty status was significant, and human and financial capitals had the strongest impact. The estimated logit model had high accuracy with 87.16% of observations correctly predicted. In poverty reduction programs, the state should improve the livelihood capitals, especially human and financial capitals, for the households in order to improve their welfare.

Keywords

Forests dependence, livelihood capitals, logit model, poverty status, ethnic minority, Bac Kan

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Introduction

Natural forests play an important role in rural livelihoods in the highland of Vietnam. However, the area of primary forest has been declining continuously (Vietnamese General Statistics Office, 2017). Therefore, forest plantation and reforestation are urgently needed. For centuries, the forest has been a key component of rural

livelihoods. Forest products are important, both socially and economically (Menaka *et al.*, 2009). Millions of people around the world depend on forest products and services for their daily needs (Kamanga *et al.*, 2009; Manyewu *et al.*, 2005; Vedeld *et al.*, 2007). However, the level of reliance on forest environmental products differs among households. Reliance reflects different livelihood strategies determined by household capitals (Xu *et al.*, 2015). Over the years, the sustainable livelihoods framework has been used extensively in rural development research and for forest-dependent households in particular. Livelihood capitals and livelihood outcomes are two important components in the sustainable livelihood approach in which, poverty is considered an indicator of livelihood outcomes. Improving incomes and reducing the rate of poor households in the uplands are two of the top national policy priorities in Vietnam. Bac Kan is a mountainous province with an area of 432,387 ha, accounting for 89% of the total province area (Vietnamese General Statistics Office, 2017). In recent years, agriculture and forestry have contributed more than one-third of the province's GDP. More than 70% of the province's labourers are agricultural and forestry workers, of which, forestry accounts for about 13%. Thus, reducing the poverty rate for forest-dependent households in Bac Kan has become an important contribution to the National Poverty Reduction Program as well as to reduce the negative impact on the forest area.

Recently, there have been a number of studies on factors affecting the poverty of households (Lawal *et al.*, 2001; Nui *et al.*, 2016). This research showed that forest income significantly contributed to the welfare of the households and greatly affected the poverty rate, by increasing income and enabling households to escape poverty. However, livelihood resources differ between households (Bebbington, 1999), and studies on poverty reduction for forest-dependent households are lacking. As a result, understanding of the impact of livelihood resources on people's well-being, especially knowledge of forest-dependent groups, is essential for both the conservation

and implementation of forest development policies. This study examines forest dependence as a livelihood strategy of ethnic minorities in the Bac Kan province of Vietnam and reports on the effect that livelihood capital has on the poverty status of forest-dependent households. We addressed the following two questions: (i) what are the poverty profiles of forest-dependent households in the study area?, and (ii) what are the effects of livelihood capitals, vulnerabilities, and livelihood strategies on the poverty status of forest-dependent households.

Methods

Conceptual framework

The definition of sustainable livelihoods, modified by Chambers and Conway (1991), is given as follows: "A livelihood comprises people, their capabilities and their means of living, including food, income, and tangible and intangible assets. Tangible assets are resources and stores, and intangible assets are claims and access. A livelihood is environmentally sustainable when it maintains or enhances the local and global assets on which livelihoods depend, and has net beneficial effects on other livelihoods. A livelihood is socially sustainable, when it can cope with and recover from stress and shocks, and provide for future generations" (Chambers and Conway, 1991). The Department for International Development (DFID)'s sustainable livelihoods' framework (SLF) is the foundation of the Sustainable Livelihoods Approaches (SLA), and it is known as a tool to improve understanding of livelihoods. SLA first seeks to identify important capitals (physical, natural, human, financial, and social capital) in households livelihoods (Morse *et al.*, 2009). These capital assets constitute the foundation for an individual's or a household's livelihood. People develop livelihood strategies based on the assets that are available to them in pursuit of beneficial livelihood outcomes and to meet their livelihood objectives. Based on SLA, many scholars have studied different topics including livelihood diversity in rural development (Ellis, 1999), poverty alleviation (Barrett and Swallow, 2004;

Table 1. Livelihood platform variables

Variable	Definition
Human capital	
nolabor	Number of laborers in HHs (log transformed)
hhedu	Education of the HH head (1 = less than primary; 2 = primary; 3 = secondary; 4 = high school and above)
hhage	Age of HH head in years (log transformed)
training	Whether the HH participates in training classes (1 = yes; 0 = no)
Financial capital	
saving	Whether the HH has savings (1 = yes; 0 = no)
incomesour	Number of HH income sources (1 = the HH has more than three income sources, 0 = otherwise)
loan	Whether the HH is in debt (1 = yes; 0 = no)
stableincome	Whether the HH has a stable income (1 = yes; 0 = no)
Social capital	
invtraining	Whether the HH gets invitations to participate in training classes (1 = yes; 0 = no)
forestpatrol	Whether the HH members are part of a forest patrol (1 = yes; 0 = no)
local union	Whether the HH often participates in the local unions (1 = yes; 0 = no)
trust	Whether the HH trusts their neighbors (1 = yes; 0 = no)
Natural capital	
agriland	Agriculture land area of the HH (in hectares) (log transformed)
forestland	Forestland area of the HH (in hectares) (log transformed)
water	Whether the HH has access to clean water (1 = yes; 0 = no)
forestaccess	Whether the HH can access the forest easily (1 = yes; 0 = no)
Physical capital	
house	Housing quality (1 = good; 2 = normal; 3 = bad)
houseasset	Combined value of HH non-productive assets (log transformed)
proasset	Combined value of HH productive assets (log transformed)

Erenstein, 2011; Erenstein *et al.*, 2010), natural resource management (William, 2003), and sustainable forest commons governance (Chen *et al.*, 2013). Within the SLF, sustainable livelihood asset endowments define not only a household's productive capacity but also its livelihood strategy (Babulo *et al.*, 2008).

Poor households (HHs) have been defined by the Vietnamese Government in Decision No. 09/2011/QĐ-TTg. A poor rural household is defined as a household where each member earn an average income of up to 400,000 VND per month ($\approx$ 17.8 USD per month). In this study, we considered HHs poor if they were issued a poverty certificate based on the government's review results.

The independent variables in this study were based on the livelihood capitals. Firstly,

this research used 32 livelihood capital indicators based on the synthesis of related research, and in consideration of the characteristics of the study area. After analysing and applying a stepwise exclusion of non-significant variables, 19 indicators were selected to express the livelihood capitals (Table 1).

Study site and data collection

Bac Kan province was chosen as the study site because it is one of the poorest provinces in the North East region, with the highest forest coverage in Vietnam. In particular, Bac Kan has a large area of special-use forests and protection forests (nearly 35.0% of the land area), which are forest types where timber extraction is not allowed and restrictions are placed on people's use of other forest resources. Additionally, the percentage of households dependent on forests

is still large. A livelihoods assessment of forest-dependent households was conducted in two districts representing highland areas of the province, Na Ri and Ba Be. Ba Be district represents one of the two poor districts in the province (Ba Be and Pac Nam) and the district has Ba Be National Park - a site that needs to be preserved. The surveyed area was the buffer zone of the national park, where the main forests are special-use and protection areas. Na Ri district represents the higher socio-economic district of the highland districts of the province. The surveyed area contained the households living near and owning the production forest. In each district, two communes in the highlands that shared a forest strip were selected. Accordingly, selected communes included Van Hoc and Lang Sang in the Na Ri district; and Hoang Tri and Dong Phuc in the Ba Be district. In each of the studied communes, the study was carried out in highland villages where households have access to forestland and access to forest resources. Due to the low number of households, every household in each village was included in the survey. The total sample for direct interviews was 280 households living near the forest. After collecting data, there were questionnaires with incomplete information. Hence, only data from 218 households were included in the analysis. The content of the survey focused on the indicators of the sustainable livelihoods framework and the forest dependency of the household.

Data analysis

Descriptive statistics were used to describe livelihood capitals as well as household livelihood strategies. In addition, the study used the student's t-test and chi-square tests to estimate the differences between the averages of each indicator in the five livelihood capital groups in pairs. In order to evaluate the poverty status and the influencing factors, we used a logit model. This is a form of selective probability, using the most reasonable estimation method after the dependent variable is the ratio of the probability of poor and non-poor households to natural logarithm. The probability of falling into the poor household

group of household i is as follows:

$$P_i = E(Y = 1 | X_i) = \frac{1}{1 + e^{-(\beta_0 + \beta_i X_i + u_i)}}$$

$i = 1, 2, 3, \dots, n$ are the surveyed households; $Y = 1$ for non-poor households; X is the vector representing the factors that affect the probability of non-poor households; B is the vector representing the coefficient of the influence of independent variables; and U_i is the random error. If $Z_i = \beta_0 + \beta_i X_i + u_i$, and if P_i is the probability of non-poor households, then $(1 - P_i)$ is the probability of poor households and we have the following ratio:

$$\frac{P_i}{1 - P_i} = \frac{1 + e^{Z_i}}{1 + e^{-Z_i}} = e^{Z_i}$$

This equation is the ratio between the probability that a household is poor or non-poor, and taking the natural logarithm of this equation is given by the formula of the logit model, $L(Y)$.

$$L(Y_i) = \ln\left(\frac{P_i}{1 - P_i}\right) = Z_i = \beta_0 + \beta_i X_i + u_i$$

The dependent variables were being poor or non-poor due to forest dependency, with the independent variables of the model being livelihood capital indicators. All data on the variables in the model were collected and calculated from the household survey data.

Results and Discussion

Household types and their income

The average total income of the surveyed households was 35.46 million VND ($\approx 1,578.45$ USD) per household per year (Table 2). With an average household size of 4.65 persons, the average income per capita was only 616,130 VND (≈ 28.29 USD) per month. This figure is only slightly higher than the poor and near-poor household income norms in rural areas under the Prime Minister's Decision No. 09/2011/QĐ-TTg. In the 2011 - 2015 period, the poor and near-poor poverty line was 520,000 VND/person/month (≈ 23.14 USD/person/month). In particular, the household income varied greatly. This demonstrated that there was a large income gap for the very poor

Table 2. Summary statistics for income by poverty status (thousand VND)

Criteria		No. of HHS	Agriculture	Livestock	Forest	Off-farm	Others	Total
Total sample	Mean	218	10,479.94	5,386.34	7,015.81	11,329.39	1,251.28	35,462.78
	SD		7,141.86	7,364.83	5,957.79	27,144.89	5,765.40	38,172.38
Non poor HHS	Mean	148	11,990.12	6,476.02	7,857.80	14,868.65	1,779.34	42,971.92
	SD		7,744.99	8,169.35	6,516.54	31,842.04	6,928.34	43,684.73
Poor HHS	Mean	70	7,287.00	3,082.47	5,235.61	3,846.40	134.83	19,586.31
	SD		4,169.22	4,524.35	4,052.74	8,577.21	639.96	11,844.05
Difference of two means*	Mean	-	4,703.12	3,393.55	2,622.19	11,022.25	1,644.51	23,385.61
	SE	-	808.47	862.18	722.20	2,811.01	574.62	3,859.83
	P-value	-	0.0000	0.0001	0.0002	0.0001	0.0024	0.0000

Notes: No = number; HHS = households; SD = standard deviation; SE = standard error; 1 million VND = 44.51 US dollars; H0 = no difference in mean income between the poor and the non-poor; Ha = the non-poor HHS income is higher than the poor HHS income; * The two means tested were non-poor and poor HHS.

households. The test results also showed a statistically significant difference between the poor and non-poor. The poor households' annual income (19.59 million VND $\approx$ 871.79 USD) was not equal to 50.0% of non-poor households (42.97 million VND $\approx$ 1,912.68 USD). If total income is an important indicator of household well-being, it is then logical to assume that the poor households will be more vulnerable than the non-poor households, as well as more negatively affected by restrictions on access to forest resources, when implementing the government's forest protection policy.

In general, income from agriculture, such as rice, maize, pigs, chickens, and other agricultural products, accounted for more than 45.0% of the total income. In particular, rice was the main crop in the locality. However, the rice production only sufficed to cover the needs of the family, with a small fraction left for livestock. The maize and cassava were only used for animal feeds. Local livestock was traditional livestock such as pigs, chickens, and a few buffalos for agricultural production. In general, agricultural production for households in highlands of the study area was mainly for own subsistence. The household cash income mainly came from casual labor, and from minor sales of agricultural products such as rice, chickens, and pigs, etc. When needed cattle were sold to cover larger expenses. Forest

income was mainly non-timber forest products (NTFPs) such as firewood, bamboo shoots, and vegetables for household use. Non-farm employment had only recently begun to develop but only in Na Ri district, where socio-economic and transport conditions were better. The results showed that all sources of income from cultivation, livestock, forestry, non-agriculture, and other income sources of non-poor households were higher than those of other households. The data are shown in Table 2.

Poverty status

According to the Ministry of Labor, Invalids and Social Affairs, in the period from 2011 - 2015, the Vietnamese Government implemented 16 national targeted programs with a total mobilisation of approximately 323,982 billion VND ($\approx$ 14.42 billion USD). Of these programs, the National Targeted Program for Sustainable Poverty Reduction is one of the few programs with a total budget higher than 30,451 billion VND ($\approx$ 1.355 billion USD), which is higher than the approved budget (109%). The rate of poverty in the country decreased from 14.2% in 2010 to 11.76% at the end of 2011 (down 2.24%); 9.6% at the end of 2012 (down 2.16%); 7.8% at the end of 2013 (down 1.8%); and to 5.97% at the end of 2014 (down 1.83%). In 2015, the poverty rate for the whole country was below 5.0% according to the poverty line established in 2011 - 2015. The proportion of

poor households in poor districts decreased from 50.97% at the end of 2011 to below 30.0% by the end of 2015, which averages a decline of over 5.0% per year. However, the results of poverty reduction are not consistent across all groups; the gap between rich and poor differs between regions and population groups, and the difference between these groups has not been narrowed, especially in the northern mountainous areas and the Central Highlands. Although the poverty rate has fallen rapidly in poor districts, in many places, the poverty rate remains over 60.0 - 70.0%, especially in communes with difficult access and in ethnic minority areas. The number of poor households who are ethnic minorities accounts for nearly 50.0% of the total number of poor households in the country. The average income of ethnic minority households is equal to one-sixth of the country's average income.

Sustainable poverty reduction has long been considered a central task in Bac Kan province's socio-economic development strategy. According to the sustainable poverty reduction project, the province developed and implemented a poverty reduction policy, and invested many priority resources in poverty reduction in the period 2011 - 2015. The total capital for implementation of the poverty reduction policies and projects reached 3,753

billion VND ($\approx$ 167.05 million USD). More than 30,000 poor and near poor households were entitled to loans, and 15,633 workers were trained. Many poverty reduction projects and policies have been implemented in a consistent manner. They have had a strong supporting effect, creating better conditions for poor and near poor households. Households were helped in developing their economy, gaining employment, increasing their incomes, and improving living conditions. Perceptions among the people, the poor, and ethnic minorities continued to sharply change, leading to behavioural change helping households to rise out of poverty. The rate of poor households decreased from 32.13% in 2011 to 11.24% in 2015 (at an average rate of 4.17% per year). The proportion of near-poor households declined from 16.93% in 2011 to 7.91% in 2015 (at an average rate of 1.8% per year). However, the results of poverty reduction in some locations in the province were still uneven and unsustainable due to the lack of vocational training and job creation for rural workers. Progress on infrastructure construction at communes was slow in difficult-to-reach communes. The implementation of support policies for people under Program 135 and Resolution 30a focused mostly on direct support in terms of plant seeds, livestock, fertilizers, and the purchase of machinery.

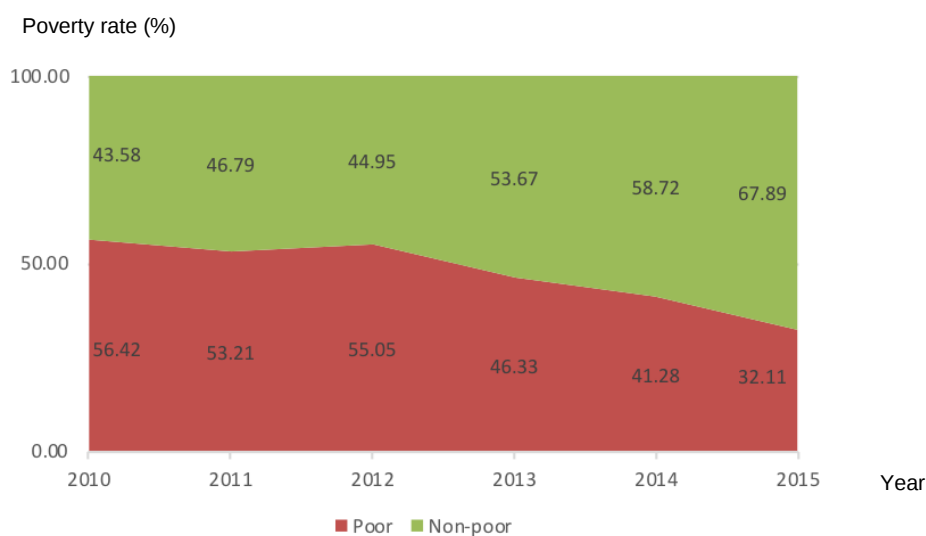


Figure 1. Poverty rate change 2010 - 2015

Source: surveyed data.

In addition, a number of regular poverty reduction policies (education support and preferential loans, etc.) were duplicated.

This study was conducted in poor districts in the highland areas, and focused on households living near forests and ethnic minority households. Hence, the poverty rate was higher than for average households in the province. For the whole sample, the poverty rate in 2011 was 53.21% and decreased to 32.11% in 2015, an average reduction of 5.0% per year (Figure 1). This rate was quite similar to the rate of poor households in the poor districts throughout the country. However, the situation of poverty reduction was not sustainable. The survey results showed that 4.0% of households became poorer over the surveyed timeframe. This means that many non-poor households risk falling into poverty. Accordingly, the province needs a program to reduce poverty in a more sustainable way. Transportation, infrastructure, irrigation, medical stations, schools, and cultural houses, etc. need to be finalised, which would contribute to boosting production and serving the people. Political security, social order, and security also need to be strengthened and the rural environment needs to be developed.

In 2015, the rate of poor households (32.11%) in the study area was high. However, this ratio varied significantly between household groups. In terms of geographic location, Ba Be district had a much lower percentage of non-poor households (37.40%) than Na Ri (64.18%). More than one-quarter of households surveyed in Ba Be district belonged to the near poor group, and high-risk households fell to become poorer households. This showed that although the poverty rate was not very different (less than 4.0%), poverty reduction in Ba Be was more unsustainable. This implied that the governments at all levels should prioritise projects in poorer districts to achieve the national goal of sustainable poverty reduction.

Livelihood platform by poverty status

Human capital was found to be weak, and there was a clear difference between poor and non-poor households. The average number of labourers was 3.2 persons per household (Table

3), in which the number of laborers of the poor was lower than the non-poor. This is an important factor determining whether a household can escape from poverty. Newly established young households are often poor households. Therefore, the age of the poor household head was also lower. The education level of household heads was mostly primary school, but there were differences between household groups. Poor households usually had lower qualifications. This can be explained by the fact that household heads with low education levels are less likely to acquire the knowledge and skills to diversify their income sources, so they tend to access and exploit forest resources more. Participation in training classes in non-poor households was also more frequent.

For the whole sample, 30.7% of the households had at least one member with a stable income (Table 3). This member was usually a participant in local government entities or worked in a factory in the locality. They are important members in their household's livelihood, both in quantity and in sustainability. Hence, households with stable formal income sources tended to be non-poor. The results showed that the difference was statistically significant between the household groups (P -value<0.01).

Survey samples focused mainly on ethnic minority households living near forest-highland areas, with a high percentage of poor households. The livelihoods of the people are still challenged. Nearly 60.0% of the households thought that their income did not meet their basic needs. They still had insufficient food and there were still days without food. The level of savings was very low (12.8%), which were mainly savings for procurement of production tools, savings in cash, or sending to credit institutions (Table 3). The debt situation of the people was very high (77.5%) with their debt mainly owed to agricultural supply stores. There was a positive sign in the income diversification indicator, though, with 58.0% of respondents saying that they were not simply dependent on farming, livestock, and forestry. They also started to have other livelihood activities such as trading and casual labor. However, indicators of

financial resources still showed clear and reliable differences between poor and non-poor households. In general, non-poor households had more financial capital and tended to diversify their income from non-farm activities.

For social capital, two of the four indicators included participation in local social unions and the trust level of local people. Both of these indicators were not statistically different among household groups. This can be explained by the fairness of the local government when selecting households, as well as in who is invited to attend meetings. However, the involvement of the forest protection team and getting invited to join the training classes factors were statistically

different. Non-poor households tended to have stronger social resources.

For natural capital, except for agricultural land, the remaining indicators of the household groups were even and equitable in the demarcation of the population at all levels. In addition, the ease with which a household had access to forest resources did not affect the level of poverty of the households. However, the agricultural land area was clearly different. Non-poor households owned larger land areas than the other group.

Physical capitals were measured by household and household property indexes. In this study, we used a poor household survey and

Table 3. Summary statistics for livelihood platform variables by poverty status

Variable ^a	Total sample		Poor HHS		Non-poor HHS		Difference of two means	
	Mean	SD	Mean	SD	Mean	SD	Difference	P-value
Human capital								
nolabor	3.202	1.201	2.786	1.034	3.399	1.227	-0.613***	0.000
hhedu ^b	2.821	0.853	2.557	0.810	2.946	0.847	-0.389***	0.001
hhage	45.037	10.073	42.300	10.387	46.331	9.690	-4.031***	0.004
training ^b	0.748	0.435	0.671	0.473	0.784	0.413	-0.112**	0.046
Financial capital								
saving ^b	0.128	0.335	0.014	0.120	0.182	0.388	-0.168***	0.000
incomesour ^b	0.578	0.495	0.457	0.502	0.635	0.483	-0.178***	0.007
loan ^b	0.775	0.418	0.814	0.392	0.757	0.430	0.058	0.164
stableincome ^b	0.307	0.462	0.086	0.282	0.412	0.494	-0.326***	0.000
Social capital								
invtraining ^b	2.257	0.836	2.100	0.854	2.331	0.820	-0.231**	0.031
forestpatrol ^b	0.440	0.498	0.343	0.478	0.486	0.502	-0.144**	0.022
local union ^b	0.151	0.359	0.143	0.352	0.155	0.364	-0.013	0.404
trust ^b	0.872	0.335	0.871	0.337	0.872	0.336	0.000	0.498
Natural capital								
agriland	0.543	0.287	0.401	0.192	0.611	0.300	-0.209***	0.000
forestland	3.656	7.517	2.536	7.096	4.186	7.674	-1.650*	0.060
water ^b	0.638	0.482	0.586	0.496	0.662	0.475	-0.076	0.142
forestacces ^b	0.450	0.499	0.429	0.498	0.459	0.500	-0.031	0.335
Physical capital								
house ^b	2.101	0.507	1.843	0.528	2.223	0.449	-0.380***	0.000
houseasset	32.940	22.947	18.514	8.404	39.764	24.458	-21.249***	0.000
proasset	18.128	10.730	12.129	6.633	20.966	11.138	-8.838***	0.000
LS ^b	2.170	0.811	2.014	0.789	2.243	0.813	-0.229**	0.025

Notes: ^a the name, definition, and unit of the explanatory variables are given in Table 1, ^b dummy variables; ***, **, and * denote the significance level at the 1%, 5%, and 10% levels, respectively.

monitoring approach in accordance with Circular No. 21/2012/TT-MOLISA. The results showed that housing and property scores were at a poor level. The difference in material resources was quite apparent between the two groups of households (P -value<0.01).

Effects of livelihood platform on poverty status

The results of the logit model are shown in Table 4. We did not find multi-collinearity in the model. In addition, we used the z statistic and robust standard errors to avoid heteroscedasticity of the independent variables. The Wald χ^2 was 50.27 ($\text{Prob} > \chi^2 = 0.0008$) which expresses that at least one of the independent variables had a significant determinant on the dependent variable. Additionally, the independent variables in this model were able to explain 53.92% of the changes in the dependent variables as the Pseudo R^2 was 0.5392. This result implies that the poverty reduction policy needs to focus on improving the livelihood capitals for the poor.

For financial capital, the three indicators of savings, indebtedness, and stable income labor had a statistically significant impact on household poverty. The effect was in the same direction, and accordingly, households with savings and stable income labour were able to escape poverty. If at least one member of the household had a stable job, the probability of getting out of poverty increased by more than 14.3%. Therefore, the state and local authorities need specific solutions to maintain and promote the national target program on employment and vocational training.

Of the four indicators of human capital, education level and the age of the household head had a significant effect on household poverty. The impact of the other two indicators was unclear. The impact dimension of the household head variable was also consistent with household poverty. The head of the household plays a decisive role in the livelihood activities of his family. Good household livelihoods depend largely on the quality of the decisions made by the head of the household.

The education level of decision-makers has a great influence on the quality of decision-making. The study results affirmed the influence of household heads on household poverty.

Natural capital also had a significant impact on the poverty of households in the study area. Agricultural land was an important condition for poverty reduction. The mean marginal impact coefficient disclosed that if the area of agricultural land increased by 100%, the probability of getting out of poverty would increase by about 15.6%. However, the possibility of increasing the area of agricultural land for households is quite limited due to the limited land area. The study area has only a small percentage of unused land. Therefore, the solutions to increase the land use coefficient should be applied, along with the application of scientific and technical advances, advanced cultivation methods, and improved crop varieties for high economic efficiency.

Two indicators of physical capital, including housing status and asset scores, used in binary research models, were statistically significant with high reliability. Like other capital, physical capital indicators had the same impact on household poverty in the study area. For household housing status variables, if the household had a poor housing status (temporary housing), the probability of non-poor households was lower than that of households with semi-detached houses. Property scores had a significant impact from the impact dimension to the marginal impact factor. This implies that if the household improved its asset status, including both productive and housing assets, it would increase the probability of getting out of poverty. This result showed that the state and local authorities need to maintain the policy for supportive housing and assets for the poor.

Social capital and household poverty also had a similar relationship. However, only local participatory variables were significant. This participation appears to give households the opportunity to share experiences and thereby improve their knowledge and skills improving their livelihoods. Therefore, it would help households improve their probability of

Table 4. Logit estimates and test statistics for the poverty status model

poverty	Logit model			Marginal effect	
	Coef.	Robust Std. Err.	P>z	dy/dx	P>z
1.saving ^a	5.726***	1.322	0.000	0.158***	0.000
1.loan ^a	-1.872***	0.691	0.007	-0.100***	0.001
1.incomesour ^a	-0.569	0.569	0.317	-0.042	0.279
1.stableincome ^a	2.427***	0.902	0.007	0.143***	0.000
nolabor	-1.170	0.721	0.104	-0.089	0.102
hhedu ^d					
1	-3.738**	1.607	0.020	-0.266	0.201
2	-3.558***	1.020	0.000	-0.232***	0.000
3	-2.512***	0.885	0.005	-0.091**	0.030
hhage	5.262***	1.818	0.004	0.400***	0.004
1.training ^a	0.875	0.685	0.202	0.080	0.229
agriland	2.060***	0.671	0.002	0.156***	0.003
forestland	-0.112	0.192	0.560	-0.009	0.572
1.forestaccess ^a	-0.421	0.502	0.402	-0.033	0.443
1.water ^a	0.924	0.707	0.191	0.079	0.209
house ^c					
1	-2.637**	1.189	0.027	-0.242	0.273
2	-1.393**	0.567	0.014	-0.070**	0.023
houseasset	2.410***	0.723	0.001	0.183***	0.002
proasset	0.727	0.528	0.168	0.055	0.183
invtraining ^b					
2	0.949	0.729	0.193	0.051	0.177
3	-0.351	0.649	0.588	-0.032	0.578
1.forestpatrol ^a	1.006	0.718	0.161	0.074	0.155
1.localunion ^a	2.120***	0.748	0.005	0.096***	0.002
1.trust ^a	-0.255	0.965	0.792	-0.018	0.773
_cons	-22.409***	7.882	0.004		

Notes: Log pseudo likelihood = -63.0483; Number of obs. = 218; Wald χ^2 (17) = 50.27; Prob > χ^2 = 0.0008; Pseudo R^2 = 5392; the name and definition of the explanatory variables are given in Table 1; ^{a, b, c, d} the reference category is 0, 2, 3, 4 respectively; ***, **, and * denote the significance level at the 1%, 5%, and 10% levels, respectively.

Table 5. Classification of poverty status model

Poverty status		Real poverty status		
		Poor	Non-poor	Total
Model estimation	Poor	53	11	64
	Non-poor	17	137	154
	Total	70	148	218
% correct estimation		75.71	92.57	87.16

escaping poverty. Thus, although the social relationships in the highland area were quite tight and even among the groups of households, households with more potent social resources were shown to have the ability

to improve their household incomes and were at a lower risk for poverty. Therefore, the social factors are important matters that the state needs to consider for its poverty reduction policy.

Based on the estimation results, we also conducted an accurate estimation of the model's prediction rate. The results showed that the predictive accuracy of the model was nearly 87.16%. In particular, the model predicted accuracy rate for poor and non-poor households was 75.71% and 92.57%, respectively (Table 5). This level of true prediction was very high, which again confirms the appropriateness of the estimated model.

Conclusions and Recommendations

Conclusions

The results showed that local household livelihoods were still limited, the poor households' livelihoods were weaker than the non-poor ones, and the livelihood capitals among the poor were the weakest. On average, only 40.0% of the households said that their incomes met the minimum demands, and this was exacerbated by a high debt ratio (78.0%) and virtually no savings. In addition, the level of education was also a concern because when the education level of a household head was mainly primary and secondary school, the rate of households with a stable income was only 31.0% and very different between types of households. In terms of physical capital, the housing status was mostly semi-solid with low quality, poor household assets, and production assets. However, the natural and social capitals of the household were assured. The proportion of households participating in social unions was high, the social relationships in the community were tight, and the cultivated land had access to safe water.

The household total income was quite low, an average of 35.46 million VND per year ($\approx$ 1578.5 USD per year), and the average income per capita reached around 613 thousand VND per month ($\approx$ 28.29 USD per month). The rate of poor households in the study area was higher than the average in the province due to high mountainous areas, ethnic minorities, and high forest dependency. Research results indicated that stronger capital households tended to escape poverty because they were more likely to choose or diversify their income from other sources such as livestock and non-forestry. Of

the five livelihood capital groups, human and financial capitals had the greatest impact on a household's ability to escape poverty, followed by physical, natural, and social capital.

Recommendations

The results of this study imply that the poverty reduction policy needs to focus on improving the livelihood capitals for the poor. Therefore, local authorities should first pay more attention to education and training. This may not help households improve their income in the short term but it is a sustainable solution in the long term. In addition, vocational training, the promotion of handicrafts, and non-agricultural forestry incomes are needed to create conditions for households with at least one laborer with a stable income. This solution will help households and localities to change their occupational structure, contributing to the diversification of income sources of households. In the current household debt situation, the local government should diversify the types of credit support, avoiding the need of rice farmers to borrow at high-interest rates. Simultaneously, it is necessary to continue to build village culture, community solidarity, harmony, and trust for community members to help each other. It is also vital to implement effective forestland allocation, avoiding overlapping encroachment and overlapping properties. In addition, in highland areas, the main priorities should be forest protection, allocating special use forests to the management community, and allowing the forest to regenerate. Therefore, the state should have specific policies to reduce forest dependency of the households, and there should be solutions to support the development of non-forestry trades, such as cultivation and breeding, rather than exploiting forest resources. Furthermore, the solutions to increase the land use coefficient should be applied, along with the application of scientific and technical advances, advanced cultivation methods, and improved crop varieties for high economic efficiency.

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