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DECISION MAKING BY UPLAND FARMERS ON FOREST MANAGEMENT IN THE NORTHWEST MOUNTAINOUS REGION OF VIETNAM

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ABSTRACT

In Vietnam, especially in the northwest mountainous regions, deforestation remains unabated in spite of the national reforestation and forest management programs of the government that started as early as the 1990s. This is of particular importance to the country because many of its poor people are dependent on forest and forest products for their livelihood. One objective of the study was to determine the major factors affecting the decision of upland farmers to participate in forest management programs in the northwest mountainous region of Vietnam.

The results of the study show that the important factors affecting the decision of upland farmers to participate in forest management programs include the age of upland farmers which is reflective of their farm experience, their ethnicity, availability of family labor, access to forest resources and income earned from forest-related activities. To encourage the participation of upland farmers in forest management programs, it will be important to increase the level of awareness of upland farmers who are mostly poorly educated ethnic minorities about the benefits of improved management of the forest. It will be important also to modify existing forest management policies to ensure that upland farmers are adequately compensated for their efforts in forest management and promote eco- and community tourism.

Key word: deforestation, watershed protection, binary logit model, ethnic upland farmers

INTRODUCTION

Forests play a very important role in human society. They provide many useful ecological services and benefits for society such as wood products, watershed protection, biodiversity conservation, carbon storage, landscape beauty preservation, boundary protection, and natural disaster prevention. Moreover, forests also prevent and reduce the greenhouse gas (GHG) emissions that are the main culprits of the climate change (Malmsheimer, et al., 2008).

In recent years, deforestation has become a serious global problem. Increasing deforestation is one of the major causes of global climate change. It caused the release of 16 billion metric tons of carbon into the atmosphere. It would need about 450 million hectares of forest to sequester the 29 billion metric tons of carbon that have accumulated in the atmosphere as a result of all past emissions (Ramirez et al., 2000). Due to the negative effects of climate change on the social and economic development of all countries, forest management is considered to be very important by most countries in the world, especially those with have large forest areas like Vietnam.

Vietnam is directly affected by global climate change given its long shoreline and location. To mitigate its effects, the Vietnamese government launched several upland reforestation and afforestation programs. These include the PAM program (1992), program 327 (a nationwide

reforestation program), and Five Million Hectares Reforestation Program (National Reforestation Program - a continuation of program 327). The objective of this program is to increase the existing forest cover from about 28 to 43 % by the year 2010 (The and Ngoc, 2006). In addition, the National Assembly of Vietnam promulgated a number of laws such as the Law on Environmental Protection (1991); the Land Law (1993), and the amended versions (1998, 2001, 2003); and the Law on Forest Protection and Development (2004). These are intended to encourage farmers to participate in its reforestation and afforestation programs. In addition, the Vietnamese Government defined the obligations of farmers participating in these programs and the corresponding payments for their participation. The provisions of these policies are contained in the Prime Minister Decision No. 178/2001/QD-Ttg (Bien, 2006) and its amended version (2006), and Prime Minister Decision No. 308/QD-Ttg (2008).

However, despite these programs and policies, deforestation in Vietnam remains unabated. This is especially true in the northwest mountainous regions where the livelihood of many poor people is dependent on the forest and forest products. One major reason given is that only a few upland farmers are participating in its forest management programs because the remuneration is quite low although there are no studies to support this contention. This paper discusses the major findings relating to the factors affecting the decisions of upland farmers to participate in forest management programs in the northwest mountainous region of Vietnam.

Forest Management

Forest management includes a range of human interventions that affect forest ecosystems. These interventions include both conservation and economic activities (Wikipedia, undated). The economic activities of forest management include the extraction of timber (Wikipedia, undated), maintenance of forest property (About.com, undated), planning forest utilization for wood production (Eionet, undated), and manipulation of tree and forest stands to meet landowner objectives (University of Wisconsin Stevens Point, undated). The conservation activities related to forest management consist of planting and replanting of various species, cutting roads and pathways through forests, and techniques for preventing or reducing outbreaks of fire (Wikipedia, undated); control of wooded land to maintain health, vigor, product flow, and other values such as soil condition, water quality, wildlife preservation, and beauty (About.com, undated); making forest healthier, protecting forests and related resources against disease and disaster and promoting sound ecology and management practices (North Carolina State University, undated); protection of fauna and flora, recreation and water supply (Eionet, undated); and fulfilling relevant ecological functions including biological diversity (Natural Resources Canada, undated).

A study conducted by the NGA Center for Best Practices – Natural Resources Policy Studies Division (2000) found that the three major forms of forest management in the world include collaboration, rules and regulation, and institutions. There are three types of collaboration in forest management in the USA - the state/federal, state/state, and state/local areas collaboration. In addition, there are collaborations between private companies and government agencies, and those between companies and public interest groups. Findings of the study showed that collaboration and compromise could address the primary concerns of all parties and enhance forest health. Wollenberg, et. al. (2004) mentioned that millions of the rural poor now participate in collaborative forest management schemes under a variety of tenurial and organizational arrangements. They mention also that governments around the world tap the participation of people living nearby these forests. The government forestry agencies oblige local people to cooperate in the protection and replanting of existing forest. The forest "co-management" programs have improved formal access of rural people to the forests although there is great difficulty in assigning the roles, rights and responsibilities especially among groups with highly divergent interests.

In Ghana, the forest environment has a significant impact on the social life of many of its tribes and exercises a profound influence on social organization. The forests are considered very

important culturally, economically, and ecologically. The traditional natural resources management is shaped around local rules and regulations (Mensah and Oduro, 2007). These rules and regulations are most often enshrined in religious or cultural beliefs and superstitions and enforced by prohibitions. These have no legal basis but the beliefs have been strong enough in the past to make people obey the regulations. Traditional natural resources management includes the protection of particular ecosystem habitats, and animals or plant species, and regulation of the exploitation of some natural resources.

"Institutions" is another form of forest management. In Pakistan, the management of forest resources is generally considered the exclusive domain of the Forestry Department, especially since the state is the formal owner of all forest resources (Kruseman and Pellegrini, 2008). There are two strategies for the sustainable forest management in Pakistan. First is the organizing by local groups of citizens to defend some stretches of forest from exploitation. Second is the joint management of the local communities with the Forest Department. While this has been found to be a successful approach, the success depends very much on the willingness of the Forestry Department to endorse such process.

Forest Management in Vietnam

In Vietnam, the policy of the government is to encourage everyone to participate in the management and protection of the forest. Since participation is voluntary, the approach of the government is to inform everyone especially upland farmers who settle close to the forest about its importance and the benefits to be derived by participating in the program. Individuals, organizations or communities may sign a contract with the government to participate in the reforestation, management, and other protection activities. For this study, participating upland farmers are persons who sign a contract with the local government to manage the natural forest near their area.

Studies show that there are five major forms of forest management in Vietnam. The first is by households who as private entrepreneurs manage the allocated forestlands, mainly bare lands and lands intended for production forests (Bien, 2001). Nam, et al. (2001) however mentioned that commercially managed forests are best for households with large farms. Smallhold upland farmers however have very little incentive to engage in forest management activities because forest products contribute very little to their income. The second is community-based management where the Commune's People Committee is the basic administrative unit that has authority within a commune's boundary to manage the forests and forestlands (Bien, 2001). There are three major models of this form (Mai, 2002). The first is where communities manage the forest through conventional ownership. The second model is co-management where the village community signs a contract for forest protection and management with the state organization. The third is where the village community manages forest allocated by local authorities. Nam et al. (2001) suggests that community-based management (or strict protection forest management) is suitable for the management of reserved Melaleuca forest. This form of management contributes to the improvement of the economic status of the community. However, the development of community forest management involves changes that can only be achieved through a strong collaborative effort.

The process of devolving community-based forest management however has been facing some significant challenges. The first challenge is the lack of capacity in participatory methodology to support forest allocation, community forest assessment and planting. The second is the vagueness of the policy on benefit sharing for land recipients as well as the administrative procedures for harvesting forest products which are too complicated. Also, there is a need to include changes in the policy framework, as well as the introduction of new management procedures and technologies (Huy, undated).

The third form of forest management is joint management. Joint management is the cooperation between forest enterprises and household-based management in forestry (Bien, 2001).

Joint venture management is the best option for state production forest (Nam et al., 2001). Another form of forest management is by forest enterprises. As state representative, forest enterprises manage forestlands covered with natural forests and state-funded plantation forests (Bien, 2001). And the last is the contract-based management. According to Bien (2001), contract-based management is implemented with commitments to a contract signed by both forest enterprise and households or village.

METHODOLOGY

Conceptual Framework

Four groups of factors are hypothesized to be affecting the decisions of upland farmers to participate in forest management programs. These include the physical, social, economic and institutional factors (Fig. 1).

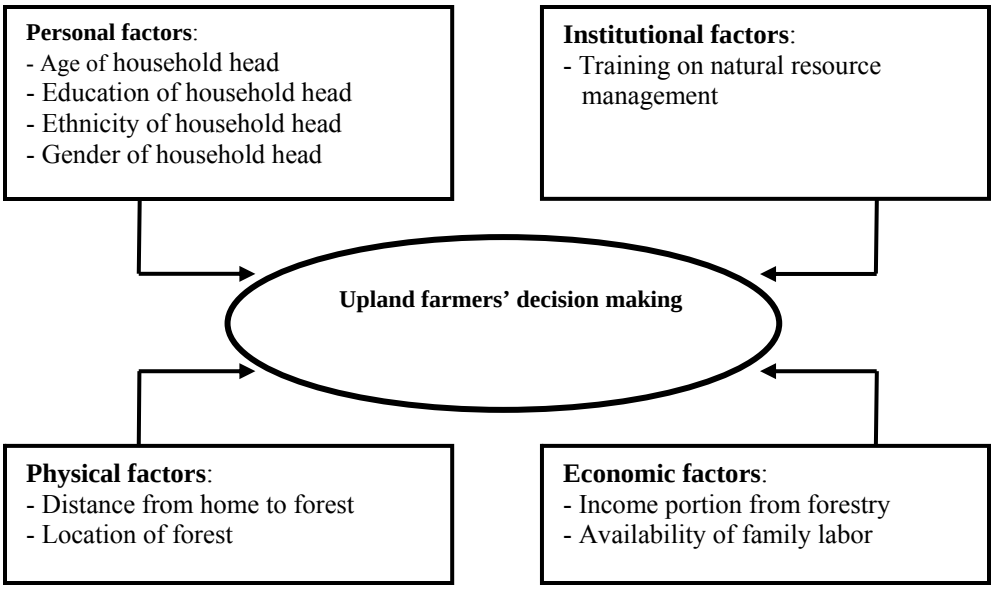

Fig. 1. Factors affecting decisions of upland farmers to participate in forest management

Personal factors refer to individual characteristics of farmers such as age, level of education, gender and ethnicity of household heads. Institutional factors include access to training services on natural resource management and extension services that provide information related to the importance of forest management for human life and activities. State offices such as the Extension Center and Department of Natural Resources and Environment administer these services. The physical factors include the physical characteristics of the forest such as its location and distance from the farmers' home. Lastly, the economic factors include the availability of family labor and share of income from forest activities as a proportion of total household income.

Both primary and secondary data were used in this study. The primary information was gathered thru direct interview of 200 farmers in two communes, It Ong and Nam Pam using a structured questionnaire that was pre-tested before being used. A total of 200 households that was 6.5% of total households of the two communes in the study site were chosen using stratified random sampling. The total sample included 90 participants and 110 non-participants of the forest management program.

The primary data collected included information on: (1) the age, education level, gender and

ethnicity of farmer-household head; (2) decision of farmers to participate or not in forest management; (3) location of forest and distance from residence of family; (4) access to training services on natural resources management and extension services on sustainable agricultural development; and (5) economic condition of households such as annual total income of household, availability of family labor and household's income from forest activities.

The secondary data on the other hand was collected from general reports, and summary records of the state offices in the study region such as the Muong La Statistics Department, Muong La Natural Resource and Environment Department, and other state offices in the study site. The secondary information collected included data on the natural and socio-economic conditions, the forest management status and other relevant information.

Analytical Tools

Some descriptive statistics were used to characterize and compare the different farming households across the two groups of farmers – the participating and non-participating farmers in the government forest management program. A quantal response or choice model, specifically the binary logit model, was used to determine the factors affecting decisions of farmers to participate in the forest management programs in the study site. The empirical model is:

$$\text{DECISION} = \text{Ln}\left(\frac{P_i}{1-P_i}\right) = \alpha_0 + \alpha_1\text{AGE} + \alpha_2\text{EDU} + \alpha_3\text{GEN} + \alpha_4\text{ETHN} + \alpha_5\text{INPOR} + \alpha_6\text{LAB} + \alpha_7\text{DIST} + \alpha_8\text{LOCA} + \alpha_9\text{TRAIN} + u_i \quad \text{…….(Eqn. 1)}$$

Where:

- P_i is the probability of participating in forest management program, and $(1\text{-}P_i)$ is the probability of non-participation in forest management program.
- α_0 is intercept of the model
- α_i (i = 1 to 9) are coefficients of dependent variables in the binary logit model.
- u_i is the error term of the model.

The marginal effects explain the probability of upland farmers participating in forest management programs. The marginal effect is the change in predicted probability associated with changes in explanatory variables of the binary logit model (Anderson and Newell, 2003). Marginal effect or the probability of farmers' participation in forest management programs of government can be determined given the coefficients of the binary logit model for the different personal, institutional, physical and economic factors. According to Green (2003), the marginal effect is estimated as follows:

$$ME = \frac{\partial \Lambda((X''\beta))}{\partial X} = \Lambda((X''\beta))[1 - \Lambda((X''\beta))]\beta \quad \text{….. (Eqn. 2)}$$

Where:

X is matrix of independent variables in logit model
β is matrix of parameters in logit model

Both coefficients of the binary logit model and marginal effects were estimated using the STATA 8.0 program.

Table 1 shows a description of both the dependent and independent variables of the empirical logit model.

Table 1. Definition of variables in the empirical logit model.

Variable	Description	Unit of Measure
Dependent variable		
DECISION	Decision of upland farmers to participate or not in forest management	1: participating; 0: non-participating
Independent variables		
AGE	Age of farmers	Years
EDU	Education level	Years
GEN	Gender of farmer (dummy)	1: male; 0: female
ETHN	Ethnicity of farmers (dummy)	1: Kinh group; 0: Minority groups
INPOR	Income portion from forest activities	%
LAB	Availability of family labor	Person
DIST	Distance from home to forest	Kilometers
TOPO	Topography of the forest (dummy)	1: if steep; 0: otherwise
TRAIN (dummy)	Participation in natural resource management training courses	1: yes; 0: no

RESULTS AND DISCUSSION

The Study Area

Muong La is a mountainous district of Son La province, which is 41 kms away from Son La city toward the northeast side. The district has 15 communes and 1 town, with a total area of 142,924 hectares. Muong La district is 500 to 700 meters above sea level and located at $21^0$15' to $21^0$42' north latitude, and at $103^0$45' to $104^0$20' east longitude. It borders on Lao Cai province in the north, Son La city and Mai Son district in the south, Yen Bai province in the east, and Thuan Chau district in the west. Toward the east and northeast side of the district are high mountain chains and in the south side are the lowlands. The forest is especially important in this district because of the presence of 27 hydroelectric plants, especially the Son La hydroelectric plant, the biggest hydroelectric plant in Vietnam.

There are two distinct seasons in a year in Muong La district, the rainy and dry season. The rainy season starts in April and ends in September. The dry season starts October and ends in March the following year. Annual average temperature ranges from 20 to 26 degrees. The highest temperature is 41 degrees in June and July. The average rainfall is 1347 mm/year. There are dry and hot winds in March and April. There are many rivers and streams that include the 50 km. Da river, the longest river in the North that flows across the district and 5 big streams that are 200 kilometers in length namely Nam Mu, Nam Chien, Nam Trai, Nam Pan, and Nam Pia. The district therefore is an ideal location for hydroelectric plants because of the large number of river and stream systems in the area. At present, there are a total of 27 hydroelectric plants (General Report of Muong La Committee, 2009). In April 2009, its total population was around 91000 of which 78000 or about 85% belong to a minority ethnic group (Table 2). The labor force comprises 51% of its population that is mostly employed in agriculture and the forestry sector.

Table 2. Population and labor force of Muong La district, Son La province, Vietnam, 2008.

ITEMS	No.	%
Total Population	91,234	100
Distribution by gender		
Male	48,988	54
Female	42,246	46
Distribution by ethnicity		
Kinh group	13,290	15
Minority group	77,944	85
Total Labor Force	46,204	100
Distribution by gender		
Male	23,564	51
Female	22,640	49
Distribution by area		
Urban	4,310	9
Rural	41,894	91

Source: Muong La Statistic Department, 2009

The total land area of Muong La district is around 142,924 hectares of which 60% is classified as agricultural/forestry land. Of the agricultural/forestry area, 79.5% is classified as forestry land while 19.2% is planted to crops such as rice, corn, soybean and others (Table 3).

Table 3. Land use in Muong La district, Son La province, Vietnam, 2008.

Type of Land	AREA (has.)	%
Agricultural/Forestry land	86,374	60.0
Annual crops area	16,605	19.2
Perennial trees area	925	1.2
Forestry land	68,707	79.5
Surface water area	137	0.2
Non-agricultural land	5,710	4.0
Other lands	50,840	36.0
Total Area	142,924	100.0

Source: Muong La Natural Resources and Environmental Department, 2009

The Muong La district is one of the 63 poorest districts of Vietnam. The income per capita

of only 5,340,000 VND (equivalent to US$330) per year is very low compared with the national per capita income of US$1,030/year (Chau, 2008). The economy is very dependent on the agro-forestry and aquaculture sector that in 2008 contributed 43% to whole gross income of the district. The sector contribution of this district to total income of the that of is even higher than industry and construction that contributed only 27% (Table 4).

Item	Amount	%
Gross income (billion VND)	487	100
Agro- forestry and aquaculture	211	43
Industry and construction	133	27
Commerce and services	143	30
Income per capita ('000VND/year)	5,340	-

Table 4. Economic structure and income per capita of Muong La district, Son La province, Vietnam, 2008.

Source: Muong La Statistic Department, and General Report of Muong La People's Committee, 2009

Forest Management

Of the 68,707 has. of forested land of the Muong La district, 59,202 has. (86%) is classified as natural forest. By function, 89% of the forested land is classified as a protection forest with the rest intended for production of timber (Table 5). Similarly, of the 534 hectares of the It Ong commune, 454 hectares (85%) is classified as natural forest, 315 hectares (59%) as production forest and 219 hectares (41%) as protection forest area. In Nam Pam commune however, the entire forested area is classified as protection forest of which 95% is natural forest. The forested area plays a very important role in the socio-economic development of the whole district. It is a buffer area that also serves to mitigate if not prevent natural disasters, supply wood, firewood and non-timber products for its inhabitants. However, majority of the forest in the whole district is natural forest that provides a limited source of income for the farmers. It is very difficult therefore to encourage farmers to join the forest management programs of the government.

Type of Forest	Muong La District		It Ong Commune		Nam Pam Commune	
	(has,)	(%)	(has,)	(%)	(has.)	(%)
Total Area	68,707	100	534	100	5,022	100
Natural forest	59,202	86	454	85	95	
Planted forest	5,339	8	27	5	0	
Bare land	4,166	6	53	10	5	
Protection forest	61,437	89	219	41	5,022	100
Production forest	7,191	11	315	59	0	0

Table 5. Forest and forestry land of Muong La district, Son La province, Vietnam, 2008.

Management Groups	Area (has.)	%
Household	13,741	20
Household group	4,810	7
Local community	32,919	48
Organization	17,177	25
Whole district	68,707	100

Source: Muong La Natural Resources and Environment Department, 2009

Forest management and payment. Forest management in Vietnam includes activities such as reforestation, protection, and other management activities. The Vietnamese Government is very keen on encouraging individuals and organizations alike to participate in these programs especially in the regions of most high mountainous where the livelihood of the residents depends on the forest.

There are four groups managing the forest in Muong La district. The area managed by the local community is the largest with 32,919 hectares or 48 percent of the entire forest area followed by organizations with 17,177 has. or 25% of the total forested area. This is followed by households that manage 13,741 has. or 20% of the total forested area. Household groups manage the smallest area with 4,810 has. or 7% of the total forested area. The local minority groups living in nearby communities manage the largest forested areas. These minority groups can be considered as the best managers especially in the high mountainous regions because they follow very strict, culturally-based rules for managing the forest.

Table 6. Forest land areas managed by different management groups in Muong La district, Son La province, Vietnam, 2008.

Regulations	Provisions	Fees ('000VND/ ha/year)
Prime Minister Decision No.178/2001/QD-Ttg (2001)	It provides for the rights and obligations of households or individuals who have been allocated forest land for benefit sharing	50 (US$3)
Revision of Prime Minister Decision No.178/2001/QD-Ttg (2006)		100 (US$6)
Prime Minister Decision No. 380/2008/QD-Ttg (2008)	Still a pilot program, it provides that hydroelectric plants, local water utility and tourist agencies should pay providers of environmental services	-
Government Resolution No. 30a/2008/NQ-CP (2008)	Pilot program being implemented in sixty one poor districts in Vietnam	200 (US$12)

Source: Muong La Forest Protection Department, 2009

It is worthwhile noting the reasons why households are only managing 20% or 13,741 hectares of the total forested area in Muong La district. The first is that payments for activities related to managing the forests are not as attractive as other economic activities. The level of payment to upland farmers for participating in the government forest programs is regulated. For example, the highest amount that can be paid to upland farmers is only 200,000 VND (around US$12) per hectare per year (Table 7). This amount is much less than those paid for other jobs such as construction work that pays at least 80,000 VND (around US$5) per day.

Table 7. Government policies regulating payments for management of forest areas in Vietnam.
Source: Vietnam Government (2001, 2008)

The second reason is that most of the forest management programs are located in high mountainous areas and are usually natural forests that provide very little opportunity for upland farmers to earn additional income. The difficult terrain of the forests makes it difficult for them to raise crops or livestock. Table 8 shows the level of income for It Ong and Nam Pam communes of the Muong District by sources for both participating and non-participating households from forest management. In both communes, the level of income from the forest of both participants and non-participants in the forest management program of the government is very low. In It Ong Commune, the income from the forest for participants is 2,047,000 VND (US$117) per household per year while income from the forest of non-participants is only 1,452,000 VND (US$83) per household per year. In Nam Pam commune, the income from the forest of participants is 2,876,000 VND (US$164) per household per year while those of non-participants is only 1,769,000 VND (US$101) per household per year. The reason is that the sources of income from the forest of participants in forest management programs include the payment from government, firewood, and non-timber products while income from the forest of non-participants comes from only firewood and non-timber products. However, the quantity and value of non-timber products in the study site are quite low. The non-timber products that can be harvested from the forest are only bamboo sprouts and some kinds of vegetables.

Table 9 shows the sources of income from the forest of households participating in the

Source of Income	It Ong				Nam Pam			
	P_H (n=45)		NP_H (n = 55)		P_H (n=45)		NP_H (n =55)	
	Amt.	%	Amt.	%	Amt.	%	Amt.	%
Crop production	3,778	28	4,411	23	3,867	32	4,898	31
Livestock activity	5,335	40	8,487	45	4,213	35	6,826	42
Forestry	2,047	15	1,452	8	2,876	23	1,769	11
Non-agricultural	2,238	17	4,463	24	1,162	10	2,570	16
Total Income	13,398	100	18,813	100	12,118	100	16,063	100

government forestry program. About 84 % of the income is from firewood, about 8% from non-timber products and only about 6% from government payment for forest management. The non-timber products include bamboo sprout and some kinds of vegetables. However, it is very difficult to harvest these non-timber products because they are found in the high mountainous areas which are very difficult to access. A comparison of income from forest activities of participants in forest management programs however shows that those from Nam Pam commune earn much more than those in It Ong Commune. This is because the size of the forest areas managed by farmers in Nam Pam is

Sources of Income	It Ong		Nam Pam		DIFF (t-stat)
	Amount ('000VND)	%	Amount ('000VND)	%	
Forest management payment	108	5	189	7	5.87***
Firewood	1,804	88	2,422	84	4.05***
Non-timber product	135	7	265	9	2.16**
TOTAL	2,047	100	2,876	100	4.15***
Average forest area (hectare)	1.1	-	1.9	-	5.86***

much larger than those in It Ong Commune. The average forest area managed by participating

households in Nam Pam commune is 1.9 hectares while those managed by participating farmers of the It Ong commune is only 1.1 hectares.

Table 8. Sources of income of participating and non-participating households in It Ong and Nam Pam Communes, Muong La district, Son La province, Vietnam, 2008.

Variables	P_H (n = 90)	NP_H (n = 110)	DIF. (t-stat)	All (n = 200)	
				Mean	Std
GEN (Gender)	0.68	0.80	-	0.75	0.44
Age	50.81	42.64	6.46***	46.32	9.51
ETHN (Ethnicity)	0.19	0.53	-	0.38	0.49
EDU (Educational level)	5.13	4.19	4.16***	4.62	1.68
LAB (Labor)	3.72	3.03	5.01***	3.34	1.03
DIST (Distance)	2.79	6.39	6.24***	4.77	4.43
LOCA(Location of forest)	0.47	0.35	-	0.40	0.49
INPOR (Income from forest)	25.17	7.99	12.48***	15.72	12.31
TRAIN (Training attendance)	0.72	0.35	-	0.52	0.50

Note: P_H and NP_H are participating and non-participating households in forest management program, respectively; Amt is amount ('000 VND/household/ year).

Table 9. Average forest area and percentage of income of participating households from forest resources in the forest management program in It Ong and Nam Pam Communes, Muong La district, Son La province, Vietnam, 2008.

Note: DIFF is difference; *** and ** are significant at 1% and 5% level, respectively

Empirical Results

Upland farmers participating in the forest management program of the government tend to be older, more educated, have more family labor, derive a larger percentage of income from forest activities and live nearer the forest than those not participating in the program (Table 10). This is indicative of the greater dependence of participating households on the forest for their livelihood than non-participating households.

Table 10. Descriptive statistics of participating and non-participating farmer respondents, Muong La

district, Son La province, Vietnam, 2009.

Note: P_H and NP_H are participating household and non-participating household, respectively
Std is standard deviation;
*** significant at 1% level

The Estimated Participation Logit Model

Variable	Coefficient	z-TEST	ME (dy/dx)	z-Test
Intercept	-12.185***	5.12	-	-
GEN	0.533ns	0.84	0.1211ns	0.88
AGE	0.150***	3.91	0.0355***	3.86
ETHN	-1.058*	-1.67	-0.0237*	-1.83
EDU	0.151ns	0.89	0.0356ns	0.90
LAB	0.434*	1.67	0.1025*	1.67
DIST	-0.148*	-1.93	-0.0348*	-2.01
TOPO	0.626ns	1.18	0.1489ns	1.19
INPOR	0.211***	4.31	0.0497***	3.86
TRAIN	0.738ns	1.38	0.1722ns	1.37
LR chi2(9) = 166.93			Log likelihood = -52.26	
Prob > chi2 = 0.0000			Pseudo R^2 = 0.6149	

The estimated participation logit model is significant given an LR chi2 (9) of 166.93 and p-value of 0.0000. Based on the Pseudo R^2, the model is able to explain 61.49 % of the change in the probability of upland farmers participating in forest management programs (Table 11). There are 5 factors that clearly affect the decision of upland farmers to participate in the forest management programs. These are age and ethnicity of upland farmers, availability of family labor supply, distance from house of farmer to the forest, and percentage of income derived from the forest.

Results show that older farmers are more likely to participate in the forest management program, ceteris paribus because their opportunities to be employed or engaged in other livelihood activities such as driving taxis, working in construction projects or as porters is more limited than younger people who tend to have more employment choices. The marginal effect shows that the probability of upland farmers to participate in forest management programs increases with age. The younger upland farmers who have more options do not usually participate in the forest management program because the pay is lower than their other economic activities.

Kinh upland farmers are also less likely to participate in forest management programs than their counterparts in minority groups because they are better educated and have more opportunities to be employed or engaged in other livelihood activities than the other minority groups. In contrast, the other minority groups are less educated and have more limited employment opportunities. In addition, upland farmers in minority groups whose livelihood depends so much on forest resources have to follow very strict rules of their community regarding the use of forest resources.

Table 11. Estimated coefficients of logit model for decision of upland farmers to participate in Forest Management Program, n=200.

Note: *** and * significant at 1% and 10%, respectively;
ns is non-significant

Results show that there is an inverse relationship between distance of the house (DIST) of the farmer from the forest area to be managed and probability of participation. This is because the transportation cost increases with distance and thus becomes more expensive, especially because their activities related to protection of the forest require more of their regular presence. Households of upland farmers with more family labor are also more likely to participate in the forest management programs. This factor shows the greatest effect on decisions of farmers to participate with a 10.25% increase in probability of participating with a unit increase in family labor supply, ceteris paribus. This is important because the management of the forest is labor intensive and would require an adequate supply of household labor for the different activities such as reforestation, protection and others. It is also not surprising to find that households that get more benefit from participating in the forest management activities are more likely to participate in the forest management program. Households that are very dependent on the forest products for their livelihood are more willing to participate in forest management programs than other households. The higher income derived from the forest helps farmers recognize the benefit from protecting the forest and are therefore more willing to participate in forest management programs. Gender, level of education, location of forest, and training were not significant factors affecting the decision of upland farmers to participate in the forest management programs for the study areas.

CONCLUSION AND RECOMMENDATIONS

The availability of family labor and unattractive remuneration are the major reasons why very few upland farmers participate in the forest management program of the Vietnamese government. There are three major recommendations to encourage their participation. The first is to generate enough funds to adequately compensate farmers for their services. These can come from taxes imposed on environmental service users such as hydroelectric plants, ecotourism agents, etc. Involving upland farmers in various ecotourism programs that may be developed can also help augment their income. The second is to simplify the contents and language used in these training programs on natural resources management to ensure that the topics discussed are readily understood and appreciated by the target audience, the upland farmers. In addition, some members of these minority groups may be trained as trainers because they have a better understanding of the behavior of members in their communities. And lastly, increase the income of upland farmers from forest activities by (1) providing appropriate technologies to encourage households especially those located closer to the forest to cultivate annual crops like corn, bean, etc. in the buffer zone; (2) providing training in the production of animals such as goats, local pigs, etc. that can adapt to the high mountain conditions; (3) undertake research on medicinal plants adapted to high mountain conditions that upland farmers can cultivate as a source of additional income, and (4) educate people who live in the lowlands about the importance of the forest for them and encourage them to contribute to a fund that can be used by the government to provide compensation for forest management activities of upland

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