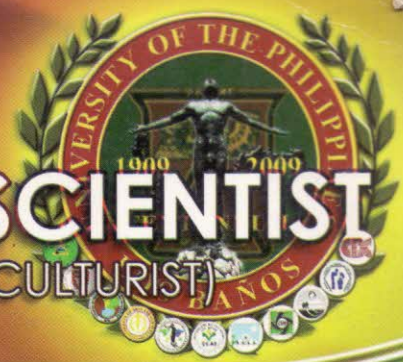




# THE PHILIPPINE AGRICULTURAL SCIENTIST

(FORMERLY THE PHILIPPINE AGRICULTURIST)



Founded in January 1911 by the Student Body of the College of Agriculture of the University of the Philippines

"PAS@100: Celebrating a Harvest of Excellence in Scientific Publication 1911-2011"

Producer		
Volume purchased (kg):	17,000	
Buying price (PHP/kg):	17.00	
Total value of purchase (PHP):	289,000	
Product form:	paddy	
Sales percentage:	100%	
Postharvest & Marketing cost	Value (PHP)	(PHP/kg)
1. Hauling	4,080	0.24
3. Sorting	1,200	0.10
4. Milling	25,060	2.11
5. Sacking	9,895	0.87
6. Storage	1,690	0.14
7. Transporting	7,140	0.60
8. Fixed cost	70,663	5.94
Total PH/mktg cost	119,288	10.03
Total cost	408,288	34.31
Net return	(6,068)	(0.51)

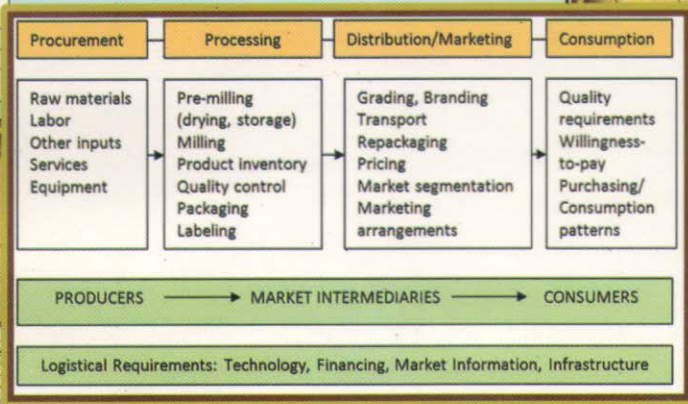
Selling price (PHP/kg)

38

31

Milling service provider

Consumers		
Market outlet(s)	Sales volume	
	(kg)	(%)
1. Consumers, Metro Manila	4,760	40
2. Walk-in buyers, Nueva Vizcaya	7,140	60
Product form:	brown rice	
Sales volume (kg):	11,900	
Sales percentage:	70%	
Total sales (PHP):	402,220.00	



Producer			Wholesaler		
Volume purchased (kg):	402,000		Volume purchased (kg):	12,000	
Buying price (PHP/kg):	18.50		Buying price (PHP/kg):	35.00	
Total cost of purchase (PHP):	7,434,000.00		Total cost of purchase (PHP):	420,000.00	
Product form:	paddy		Product form:	paddy	
Sales percentage:	100%		Sales percentage:	100%	
Postharvest & Marketing cost	Value (PHP)	(PHP/kg)	Postharvest & Marketing cost	Value (PHP)	(PHP/kg)
1. Hauling	20,210	0.05	1. Hauling	11,840	0.99
2. Drying	11,840	0.03	2. Drying	11,840	0.99
3. Sorting	18,260	0.05	3. Sorting	18,260	1.52
4. Milling	11,840	0.03	4. Milling	11,840	0.99
5. Sacking	11,840	0.03	5. Sacking	11,840	0.99
6. Storage	11,840	0.03	6. Storage	11,840	0.99
7. Transporting	11,840	0.03	7. Transporting	11,840	0.99
8. Fixed costs	11,840	0.03	8. Fixed costs	11,840	0.99
Total PH/mktg cost	119,288	0.30	Total PH/mktg cost	119,288	9.94
Total cost	7,553,288	18.81	Total cost	431,988	35.83
Net return	3,821,712	9.50	Net return	3,821,712	31.84



## TABLE OF CONTENTS

Article Digests 1

### ARTICLES

Rapid *In Vitro* Micropropagation of *Bambusa oldhamii* Munro  
M. Thiruvengadam, K. T. Rekha and I. M. Chung 7

Activity of the Ethanolic Extract of Propolis (EEP) as a Potential Inhibitor of Quorum Sensing-Mediated Pigment Production in *Chromobacterium violaceum* and Virulence Factor Production in *Pseudomonas aeruginosa*  
Lisa E. Lamberte, Esperanza C. Cabrera and Windell L. Rivera 14

Photosynthetic Features, Growth and Yield of Thai Jasmine Rice as Influenced by Saline Soil Treated with Organic Matter  
Suriyan Cha-um and Chalernpol Kirdmanee 23

Enhanced Tolerance of Transgenic Rice Overexpressing *Arabidopsis thaliana* Nucleoside Diphosphate Kinase (*AtNDPK2*) against Various Environmental Stresses  
Norvie L. Manigbas, Dong-Soo Park, Soo-Kwon Park, Sang-Ik Han, Hyang-Mi Park, Woon-Ha Hwang, Sang-Min Kim, Hoe-Jeong Wang, Hang-Won Kang, Doh-Hoon Kim, Dae-Jin Yun and Gihwan Yi 29

Tilapia Cage Farming in Freshwater Reservoir Using Artificial Diets During Dry and Wet Seasons  
Dan D. Baliao and Neil S. Dosado 38

Willingness to Accept Payment of Upland Farmers to Participate in Forest Management in the Northwest Mountainous Region of Vietnam  
Trinh Quang Thoai and Roberto F. Rañola, Jr. 46

Brown Rice Market Chain and Marketing Practices, Luzon, Philippines  
Isabelita M. Pabayon and Antonio Jesus A. Quillooy 54

Gender and Rice Genetic Resources Conservation: Issues and Policy Implications  
Dennis S. Erasga 66

### RESEARCH NOTES

Antifungal Activity of Onion (*Allium cepa* L.) Bulb Extracts Against *Fusarium oxysporum* and *Colletotrichum* sp.  
Djanna F. Cornago, Evangeline C. Amor and Windell L. Rivera, Jr. 78

Attraction of *Bactrocera cucurbitae* and *B. papayae* (Diptera: Tephritidae) to the Odor of the Bacterium *Enterobacter cloacae*  
Thaochan Narit and Chinajariyawong Anuchit 83

Evaluation of the Biodiesel Fuel Properties of Fatty Acid Methyl Esters from *Carica papaya* L.  
Celina Therese S.P. Charvet, Ma. Ruby Joy V. Duya, Ana Vanessa G. Miller and Luis F. Razon 88

Air Exchange Rates in Greenhouses with Different Types of Ventilation Opening in the Western Mediterranean Region of Turkey  
Atilgan Atilgan, Nefise Yasemin Emekli, Berna Kendirli and Yaşar Emekli 93

### *The Philippine Agricultural Scientist* Centennial

PAS@100: Celebrating a Harvest of Excellence in Scientific Publication 1911-2011  
Constancio C. de Guzman 98

The Rebirth of *The Philippine Agriculturist* as an International Journal  
Ofelia K. Bautista 104

# Willingness to Accept Payment of Upland Farmers to Participate in Forest Management in the Northwest Mountainous Region of Vietnam

Trinh Quang Thoai<sup>1,\*</sup> and Roberto F. Rañola, Jr.<sup>2</sup>

<sup>1</sup>Department of Economics, Faculty of Economics and Business Administration, Vietnam Forestry University (VFU), Xuan Mai, Chuong My, Hanoi, Vietnam

<sup>2</sup>College of Economics and Management, University of the Philippines Los Baños, College, Laguna 4031, Philippines  
\*Author for correspondence; e-mail: [thoaiq@gmail.com](mailto:thoaiq@gmail.com), [thoaitq@yahoo.com](mailto:thoaitq@yahoo.com); Tel.: + (0084) 912381910

**The study determined the level of willingness to accept (WTA) payment of upland farmers to participate in forest management programs in the northwest mountainous region of Vietnam. The results showed that the present payment level of 100,000 VND (US\$5.4/ha/yr) in the study areas as compensation for participating in the forest management programs was too low compared with the WTA of 286,000 VND (US\$15.5/ha/yr). The important factors affecting the level of WTA include the opportunity cost of forest management, ethnic affiliation, access to the forest, total income of households and topography of the forest area. Training programs and seminars could help enhance the level of awareness of upland farmers who were mostly poor, uneducated ethnic minorities about the benefits of improved management of the forest. This would help encourage upland farmers to participate in the program. These training programs should also be improved to ensure that they are readily understood and appreciated by the target audience. The promotion of ecotourism and community tourism, provision of technologies for annual crops and medicinal plants, plant production and support for livestock raising would help increase the income of upland farmers from the forest and encourage their participation in these programs.**

Key Words: forest management, upland farmers, willingness to accept (WTA) payment

## INTRODUCTION

Many countries have already instituted policies to address concerns related to deforestation given the adverse effects on their social and economic development. Biodiversity loss, flooding and many other environmental hazards are often attributed to deforestation. It is not surprising therefore to find many countries such as Vietnam investing in reforestation given their perceptions that these environmental hazards are due to deforestation.

Countries such as Vietnam that still have large forest areas consider forest management very important socially, economically and politically. From a social standpoint, forest areas are very important because they are home to a population that does not have enough access to social services such as education, health and other welfare-related services. Forests also are a legacy for the coming generations. They are also considered as

an economic resource given their potential for generating revenues from ecotourism, a source of raw materials for production and other economic services. For example, many tropical forests are wildlife hotspots. Politically, from the point of view of government, forest areas are considered important for boundary protection and should not be areas of illegal and/or violent activities.

Since the 1990s, the Vietnamese government has instituted programs, policies and regulations related to the management of its forests. These include laws on environmental protection, forest protection and development, reforestation and afforestation programs and the definition of the rights, privileges and obligations of upland farmers participating in its forest management programs. In 1998, the Five Million Hectares Reforestation Program (FMHRP, the national program on reforestation) was launched to increase the existing forest cover from about 28–43% by the year 2010 (The and Ngoc 2006). However, the program was not very

successful since only 1.5M ha or 28.5% of the target area of 5M ha was actually reforested (VIET BAO 2006). It is believed that the lack of financial incentives was the reason for the limited participation of farmers and the limited success of these programs.

### Payments for Managing Forest Areas

Table 1 shows a listing of legal documents that stipulate the payments for managing forest areas in Vietnam. These legal documents include Prime Minister Decision No. 178/2001/QD-Ttg of 2001 and the amended version of 2006, Prime Minister Decision No. 380/2008/QD-Ttg (2008), Government Resolution No. 30a/2008/NQ-CP (2008), and other related laws such as the Land Law (1998) and the amended version of 2003, the Forest Protection Law (2004) and other related laws. However, the payments stipulated in these legal documents have not been attractive enough compared with other income sources to encourage upland farmers to participate in the forest management programs. For instance, the amount paid for construction work is at least 80,000 VND/day (around US\$5) while an upland farmer gets paid 100,000 VND/ha/yr (US\$5.4) for managing a forest area. Although Government Resolution No. 30a/2008/NQ-CP of 2008 provides for the payment of 200,000 VND/ha/yr (around US\$12) for forest management, this is just a pilot program being implemented in 61 poor districts in Vietnam.

Most of the forests in the northwest mountainous region of Vietnam are natural forests. They serve as protection forests that are quite important in watershed protection, natural disaster prevention and boundary protection. Because of their elevation, these areas are also very important for the development of hydroelectric plants in the northern part of Vietnam. This mountainous region is therefore a key area not only for the socioeconomic development of the region but also the country as a whole.

Given its strategic importance, the government of Vietnam has embarked on programs to involve upland farmers in forest management (The and Ngoc 2006). Despite their importance, however, very few upland farmers have participated in these programs, mainly because they believe that the payments are not enough to compensate for their efforts. The payment level for forest management activities in Vietnam is still lower than that of other economic activities.

This paper estimates the amount of payment necessary to encourage upland farmers to willingly participate in the government's forest management programs. It also identifies factors that affect the level of payment that farmers are willing to accept to participate in the management of forests in the northwest mountainous region of Vietnam.

### Conceptual Framework

The level of payment that upland farmers are willing to accept (WTA) to participate in forest management programs is hypothesized to be influenced by physical, social, economic and institutional factors (Fig. 1).

Personal factors refer to individual characteristics of farmers such as age, educational level, gender and ethnicity of household heads. Age of upland farmers is hypothesized to be important because it has an influence on the opportunity to earn extra income from non-farm employment. Because of physical limitations, older farmers are less likely to get non-farm employment than younger farmers and are thus more likely to participate in forest management programs. The level of payment they would require to participate in the programs would most likely be lower than that of younger farmers, too.

The second factor is education. The better-educated upland farmers are expected to have more access to information and would have a better appreciation of the importance of managing the forest. Given this appreciation, they are expected to require a smaller payment than those with much less appreciation of the importance of forest management.

Gender of the household head is another important factor affecting WTA. Men are traditionally paid higher than women so that they have more incentive to participate in the forest management program than women.

Ethnic group affiliation is also expected to have an effect on the willingness to participate in the program as well as on the level of payment they would require for their participation. The Kinh upland farmers are expected to require a higher level of payment than the minority ethnic groups because as a group, they tend to live farther from the forest and are less dependent on its resources for their livelihood. In contrast, the ethnic minority groups tend to settle closer to the forest and are more dependent on its resources for their livelihood.

Upland farmers who attend training programs on natural resource management provided by State offices such as the Extension Center and the Department of Natural Resources and Environment are expected to have better access to information about the environment and a more positive attitude toward forest management programs. They would also require less payment for their service for managing the forest.

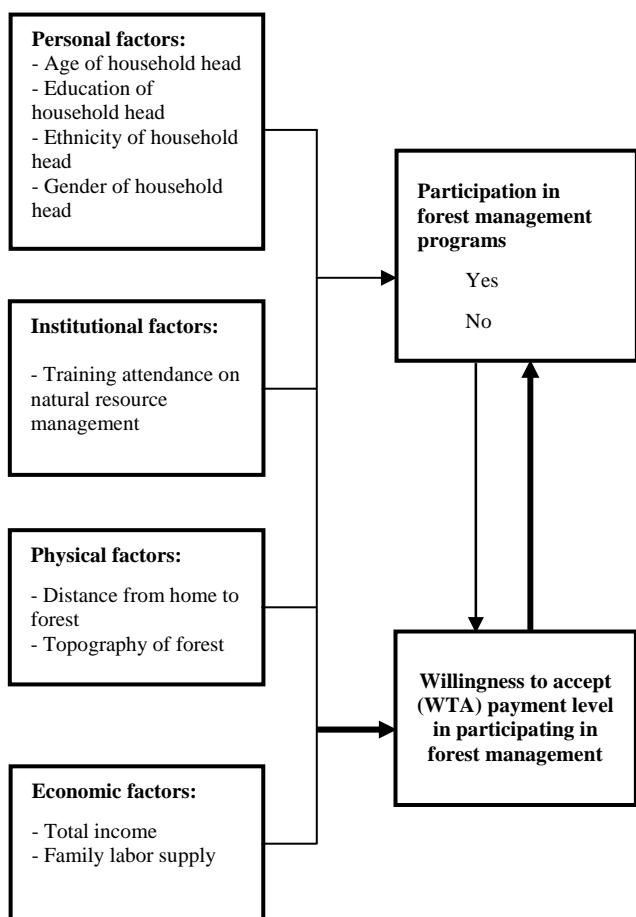
The distance of the house of the farmers from the forest area they are managing is also an important consideration. The greater the distance, the greater the expense and time required of the farmers to manage the forest area for which they would expect to receive better compensation.

The steepness of the forest area to be managed by the upland farmer is also an important consideration of farmers. Upland farmers would most likely be unable to

**Table 1.** Government policies regulating payments for management of forest areas in Vietnam.

Regulations	Provisions	Fees ('000VND/ha/yr)
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 (USD 3)
Revision of Prime Minister Decision No. 178/2001/QD-Ttg (2006)		100 (USD 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 61 poor districts in Vietnam	200 (USD 12)

Source: Vietnam Government (2001, 2008)



**Fig. 1.** Factors affecting willingness to accept (WTA) price of upland farmers to participate in forest management.

produce crops and raise livestock in areas with steep slopes for which they would expect to be compensated for the opportunity loss.

Forest management is labor-intensive, and upland farmers with limited family labor supply would have a

higher opportunity cost for labor and thus require a higher level of payment for the effort.

Lastly, the higher the total income of households, the less likely they would participate in forest management programs because there is less pressure for them to augment their income from working in the forest area.

### METHODOLOGY

The study was conducted in Muong La, a mountainous district of Son La province, which is 41 km away from Son La City that is the center of Son La province toward the northeast side. The district has 15 communes and one town, with a total area of 142,924 ha. The forest is especially important in this district because of the presence of 27 hydroelectric plants, including the Son La hydroelectric plant, the biggest hydroelectric plant in Vietnam.

Both primary and secondary data were used in this study. The secondary data was collected from general reports and summary records of the state offices in the study region such as the Muong La Statistics Department, the Muong La Natural Resource and Environment Department and other state offices in the study site. The secondary data collected included the natural and socioeconomic conditions, the forest management status and other relevant information.

The primary data was gathered through direct interviews using structured questionnaires. A total of 110 upland farmers who have not participated in the forest management programs were chosen using stratified random sampling. The samples were stratified following ethnicity groupings (Kinh group, and minority groups) and location (It Ong commune and Nam Pam commune). It Ong and Nam Pam communes were selected as the study sites for the following reasons: (1) these two communes are located in the buffer zone for the Son La hydroelectric plant; (2) all the forested areas of these two

communes are protection forests; and (3) It Ong is representative of a commune that has a high rate of households not participating in the forest management program (89%) while Nam Pam is representative of those communes that have a low rate of household non-participation in the forest management program (49%). The primary data collected included information on: (1) the age, education level, gender and ethnicity of farmer-household head; (2) topography of forest and distance from the family residence to forest; (3) access to training attendance on natural resources management and extension services on sustainable agricultural development; (4) economic condition of households such as annual total income of household and family labor supply; and (5) the amount that upland farmers were willing to accept as payment to participate in forest management.

### Analytical Tools

Two focused group discussions (FGDs) were organized in each commune to determine the opportunity cost of labor and the WTA bids of farmers. The participants of the FGDs included not only the upland farmers who did not participate in the forest management programs but also local officers in the study areas.

The WTA price of upland farmers to participate in forest management program in the study region was determined using the Contingent Valuation Method (CVM). Upland farmers who were not participants of the forest management programs were asked how much they would be willing to accept to participate in the forest management programs. Structured questionnaires were used to gather data from the farmers. The elicitation method used was the single-bound bidding process. The range of bid prices was estimated based on the present payment levels for forest management in Vietnam (100,000 VND/ha/yr) and the opportunity cost of agricultural labor in the study region. The results of the focused group discussions showed that the bid prices ranged from VND100,000/ha/yr to VND500,000/ha/yr. A multiple linear regression model was then estimated to determine the factors influencing the amount that upland farmers were willing to accept as payment to participate in forest management programs. The derived model is as follows:

$$\text{WTA} = b_0 + b_1\text{AGE} + b_2\text{GEN} + b_3\text{EDU} + b_4\text{ETHN} + b_5\text{INC} + b_6\text{LAB} + b_7\text{DIST} + b_8\text{TOPO} + b_9\text{TRAIN} + b_{10}\text{AREA} + u_i$$

where:

$b_0$  is the intercept of the model

$b_i$  ( $i = 1$  to  $9$ ) are the coefficients of the independent variable in the model

$u_i$  is the error term

The variables in this model are defined in Table 2.

## RESULTS AND DISCUSSION

### Description of the Forest Area

About 59,202 ha of the 68,707 ha, roughly 86% of forested land of the Muong La district, is classified as natural forest. By function, 89% of the forested land is classified as a protection forest with the rest intended for timber production (Table 3). Similarly, 454 ha of the 534 ha of the It Ong commune, roughly 85%, is classified as natural forest, while 315 ha (59%) and 219 ha (41%) are classified as production and protection forest areas, respectively. In Nam Pam commune, however, the entire forest area, 95% of which is still natural forest, is classified as protection forest.

The forests of Muong La district play a very important role in the socio-economic development of the whole district. They are a buffer area that also serves to mitigate natural disasters and supply wood, firewood and non-timber products for the inhabitants in these areas. However, most of the forest in the whole district is natural forest that provides limited income to farmers, making it difficult to convince them to join the forest management programs of the government.

### Characteristics of Respondents

There was no significant difference in the average age, level of education and available family labor between the two communes of It Ong and Nam Pam (Table 4). On average, the respondents in both areas were in their early 40s with 4 years of schooling and 3 units of available family labor. The income of It Ong at 18.81 million VND/yr was significantly higher than that of Nam Pam at 16.06 million VND/yr. It Ong commune is the center of Muong La district and most of the upland farmers in this commune are Kinh farmers. These farmers have a higher educational level than the other ethnic groups and have settled in the lowland areas where there are better chances of augmenting their income from non-agricultural employment. In contrast, the upland farmers in Nam Pam commune are minorities and have settled closer to the forest where chances of augmenting their income from non-agricultural employment or activities are limited.

### Willingness to Participate in the Forest Management Programs

Despite the number of forest management programs introduced in the Muong La district, only a few upland farmers have participated in them. Their key considerations for participating in the programs are as follows: 1) the opportunity cost of working in the government reforestation programs, 2) the available supply of family labor to work in the forest, 3) the opportunity to carry out their farming activities such as raising their livestock or planting their crops in the steep,

**Table 2.** Factors affecting willingness to accept (WTA) payment to participate in the forest management program.

Variable	Definition	Unit of Measure
<b>Dependent variable</b>		
WTA	Willingness to accept payment	VND thousand /ha/yr
<b>Independent variable</b>		
AGE	Age of farmers	yr
EDU	Education level	yr
GEN (dummy)	Gender of farmer	1 = male; 0 = female
ETHN (dummy)	Ethnicity of farmers	1 = Kinh group; 0 = minority groups
INC	Total annual household income	VND thousand/yr
LAB	Availability of family labor	person
DIST	Distance from home to forest	km
TOPO (dummy)	Topography of the forest	1 = steep; 0 = otherwise
TRAIN (dummy)	Training attendance	1 = yes; 0 = no
AREA (dummy)	Study area	1: It Ong; 0: Nam Pam

**Table 3.** Forest area of Muong La district, Son La province, Vietnam (2008).

Type	Muong La District		It Ong Commune		Nam Pam Commune	
	(ha)	(%)	(ha)	(%)	(ha)	(%)
Total Area	68,707	100	534	100	5,022	100
Distribution by characteristics of forest						
Natural forest	59,202	86	454	85	4,771	95
Planted forest	5,339	8	27	5	0	0
Bare land	4,166	6	53	10	251	5
Distribution by function of forest						
Protection forest	61,437	89	219	41	5,022	100
Production forest	7,191	11	315	59	0	0

Source: Muong La Natural Resources and Environment Department (2009)

**Table 4.** Characteristics of non-participating farmer respondents in forest management programs, Muong La district, Son La province, Vietnam (2009).

Characteristics	It Ong (n = 55)	Nam Pam (n = 55)	DIF. (t-stat)	All (n = 110)	
				Mean	Std Dev.
Age (yr)	43.7	41.6	1.566 <sup>ns</sup>	42.6	7.1
Years of schooling	4.13	4.25	0.39 <sup>ns</sup>	4.2	1.7
Family labor supply (no.)	3.00	3.15	0.73 <sup>ns</sup>	3.1	1.0
Distance to forest (km)	8.36	4.43	4.95 <sup>***</sup>	6.4	1.6
Total income (M VND)	18.81	16.06	2.98 <sup>**</sup>	17.4	5.0

\*\*\* and \*\* significant at 1% level and 5% level, respectively; ns: non-significant

mountainous areas, 4) available time to go and visit their farms in the forest and 5) the opportunity to go and seek alternative employment given their personal circumstances such as their age and training or education.

The responses from the upland farmers clearly reflected these important considerations (Table 5). Notably, a greater percentage of the respondents from It Ong commune mentioned these reasons compared with those from Nam Pam commune, clearly indicating that there was less incentive for them to work with government in managing the forests given their circumstances.

*Willingness to accept payment.* Table 6 shows the willingness to accept payment of upland farmers if they were to participate in the forest management program of the Vietnam Government. Note that upland farmers in Nam Pam commune were willing to accept a smaller amount of payment than those in It Ong. If the government decides to pay VND 450,000/ha/yr for participating in these government programs, all upland farmers in Nam Pam were willing to participate compared with the upland farmers in It Ong where only 87% were willing to participate. On average, the WTA payment of upland farmers in It Ong was higher at VND

**Table 5.** Reasons of upland farmers for non-participation in forest management in Muong La district, Son La province, Vietnam.

Reasons	It Ong Commune (n = 55) %	Nam Pam Commune (n = 55) %	All (n = 110) %
Low price paid for forest management activities	82	64	73
Limited supply of family labor	47	31	39
High opportunity cost of labor	78	45	62
Distance from the forest	71	36	54
Steep forest areas	67	55	61

**Table 6.** Willingness to accept (WTA) payment of upland farmers to participate in forest management programs in Muong La district, Son La province, Vietnam (2009).

WTA (‘000VND)/ha/yr	It Ong Commune (n = 55)		Nam Pam Commune (n = 55)		Total Sample (n = 110)	
	No. of Households	%	No. of Households	%	No. of Households	%
150	9	16	4	7	13	12
200	7	13	21	38	28	25
250	10	18	6	11	16	15
300	8	15	11	20	19	17
350	4	7	8	15	12	11
400	2	4	3	5	5	5
450	8	15	2	4	10	9
500	7	13	0	0	7	6
Total	55	100	55	100	110	100

308,000 than that in Nam Pam commune at VND 264,000. The reason is that It Ong commune is the center of Muong La district and most of the upland farmers in this commune are Kinh farmers who have higher educational level and more opportunities in earning non-agricultural income than upland farmers who belong to minority groups in Nam Pam commune.

*Factors affecting WTA.* Factors affecting the amount of WTA among upland farmers who decided to participate in the forest management program are shown in Table 7. The model shows a fairly good fit given that it is able to explain 71.35% of the change in WTA among upland farmers who participated in the forest management programs.

Six factors can significantly explain the amount of WTA. Five of these factors that include ethnicity, distance between the house of the farmer and forest location, topography of the forest area, level of income and study area are positively related to the amount of WTA. On the other hand, age of the upland farmer is negatively related to the amount of WTA.

The two communes of Nam Pam and It Ong best illustrate the importance of ethnicity.

Upland farmers in It Ong commune tended to require a higher WTA payment to participate in forest management programs than those in Nam Pam. One reason is that It Ong is located in the center of Muong La district where there are more opportunities for non-farm work. Another reason is that farmers in this commune were also better educated than other minority groups.

They therefore had better opportunities to earn from non-agricultural employment such as construction work, small business, etc. than the other minority groups. In contrast, Nam Pam commune is located farther away from the center of the district and the farmers in this commune belonging to the minority groups were far less educated than those in It Ong. Thus, their opportunity for employment outside of agriculture was more limited (Table 8).

Another factor influencing the level of WTA of upland farmers to participate in forest management is the level of income from forest-related activities. Households that have higher total income tend to have a higher WTA to participate in forest management programs than other households. Households that have better opportunities to augment their income from non-agricultural activities (small business, service supplier, etc.) have a higher WTA to participate in forest management programs than other households.

Upland farmers in Nam Pam commune earned more from the forest than their counterpart upland farmers in It Ong commune. The income from the forest of non-participating households in forest management programs in Nam Pam commune was 1.52 VND million/yr while their counterpart upland farmers in It Ong commune got only 1.20 VND million/yr (Table 8).

Distance from the home of upland farmers to the forest areas (DIST) also had a positive significant effect on WTA level of upland farmers to participate in forest management programs. Upland farmers who lived farther



**Table 7.** Estimation of linear regression model for WTA of upland farmers participating in forest management programs.

Variable	Coefficient	t-statistics
Intercept	259.13 <sup>***</sup>	6.31
GEN	-15.44 <sup>ns</sup>	-1.11
AGE	-2.69 <sup>***</sup>	-3.28
ETHN	86.31 <sup>***</sup>	6.06
EDU	2.56 <sup>ns</sup>	0.79
LAB	-1.10 <sup>ns</sup>	-0.21
DIST	2.39 <sup>*</sup>	1.75
TOPO	75.69 <sup>***</sup>	5.42
INCOME	2.11 <sup>**</sup>	1.73
TRAIN	0.63 <sup>ns</sup>	0.06
AREA	31.95 <sup>**</sup>	2.57
R square	0.7460	
Adjust R square	0.7203	
F – stat	29.08	
No. of observations	110	

Note: <sup>\*\*\*</sup>, <sup>\*\*</sup>, and <sup>\*</sup> - statistically significant at 1%, 5%, and 10%, respectively; ns - not significant

**Table 8.** Comparison of willingness to accept (WTA) payment and income (VND in million) of non-participating households in forest management programs in Muong La district by study site and ethnicity, Son La province, Vietnam, 2009.

Item	Distribution by Study Site			Distribution by Ethnicity		
	It Ong	Nam Pam	DIFF (t-stat)	Kinh Group	Minority Group	DIFF (t-stat)
WTA	0.308	0.264	2.29 <sup>***</sup>	0.358	0.200	12.87 <sup>***</sup>
Non-agricultural income	4.46	3.07	4.11 <sup>***</sup>	4.29	3.13	3.41 <sup>***</sup>
Income from forest	1.20	1.52	2.67 <sup>***</sup>	-	-	-
Income from non-timber	128	159	0.74 <sup>ns</sup>	-	-	-
Income from firewood	1.32	1.61	3.12 <sup>***</sup>	-	-	-

Note: <sup>\*\*\*</sup>, <sup>\*\*</sup> significant at 1% and 5%, respectively; ns: not significant

from the forest tended to have a higher WTA than their counterparts who lived in the forest nearby. This is because the transportation cost increased with distance and thus became more expensive, especially because their activities related to protection of the forest required more of their regular presence.

Even non-participants of the forest management program also derived some benefits from the forest. They were able to harvest firewood and non-timber products such as bamboo shoots. In contrast to Nam Pam commune, however, the amount of non-timber products harvested (1.32 VND million) and the income derived from firewood (VND 128,000) in It Ong commune were much lower because the upland farmers were located farther from the forest (Table 8).

In contrast, upland farmers in Nam Pam commune were more willing to participate in the upland management program than those in It Ong commune because they lived closer to the forest and their income from the forest was much higher than their income from agricultural activities. Thus, their level of WTA was much lower than that of farmers in It Ong.

The forest topography (TOPO) also had a positive significant effect on WTA level of upland farmers to

participate in forest management programs. The positive relationship shows that the WTA of upland farmers would be higher for those who would manage a forest area located in the high and steep mountain sites where they could not plant any annual crop and/or raise livestock and where it would be difficult to harvest non-timber products.

The age of household head had a negative significant effect on WTA level of upland farmers to participate in forest management programs. The older upland farmers tended to require a lower WTA level to participate in forest management programs than younger upland farmers because of fewer opportunities to get extra income from non-agricultural activities. In contrast, younger upland farmers had more opportunities to augment their income from non-agricultural activities such as working as porters, construction workers, and motorbike taxi drivers, among others, because they were physically more able. Thus, given a higher opportunity cost, their WTA to participate in forest management programs would be higher.

## CONCLUSION AND RECOMMENDATIONS

The WTA payment level (US\$15.5/ha/yr) of upland farmers who have not participated in the forest management program of the government was higher than the present amount (US\$5.4/ha/yr) currently paid by the government for forest management. The amount of payment that upland farmers would be willing to accept to participate in the forest management programs of the Vietnamese Government was clearly influenced by their specific circumstance such as the availability and opportunity cost of family labor. Thus, government should make adjustments in the level of remuneration for participants in the program, depending on the specific circumstances in particular locations. To help raise the funds to pay for the environmental service providers, the government may institute taxes for environmental service users such as hydroelectric plants and ecotourism agents. Also, programs that would enhance the level of benefits of farmers from the forest such as eco-tourism programs where they can be involved, crop technologies that would allow them to plant corn and beans in the buffer zone areas and support for livestock activities especially for animals that can survive in the high mountain areas such as goat, native pigs, etc. may be developed. Upland farmers may be encouraged to grow medicinal plants that have economic value to help augment their income. A research on these medicinal plants can be undertaken. Lastly, people living in the lowland areas may be encouraged to contribute to the fund that can be used to compensate the upland farmers who participate in forest management programs. However, they would need to be informed about the benefits of protecting and conserving the forests around them.

## REFERENCES CITED

- Muong La Natural Resources and Environment Department. 2009. Forest and forestry land situation. Data base. Muong La district. Son La Province. Vietnam.
- Son La Natural Resources and Environment Department. 2009. The administrative map of Son La province. Data base. Son La Natural Resources and Environment Department. Son La province. Vietnam.
- THE BD, NGOC HB. 2006. Payment for Environmental Services in Vietnam: Assessing An Economic Approach To Sustainable Forest Management. Research Report. Economy and Environment Program for Southeast Asia (EEPSEA). Available (online) [http://www.idrc.ca/eeepsea/ev-108103-201-1-DO\\_TOPIC.html](http://www.idrc.ca/eeepsea/ev-108103-201-1-DO_TOPIC.html) [November 13].
- VIET BAO. 2006. It is difficult to finish the Five Million Hectares Reforestation Program in 2010. Việt báo.vn Mang thông tin Việt Nam ra thế giới. Available (online) <http://vietbao.vn/xa-hoi/Du-an-5-trieu-ha-rung-kho-hoan-thanh-va-2010/70069318/157> [November 13].
- Vietnam Government. 2001. Prime Minister Decision No. 178/2001/QĐ-TTg dated November 12, 2001 on the benefits, rights and responsibilities of households and individuals with allocated, leased, and contracted forest land. Vietnamese Official Gazette No. 47, December 22, 2001. Socialist Republic of Vietnam. p. 3128-3136.
- Vietnam Government. 2008. Prime Minister Decision No. 380/2008/QĐ-TTg dated April 10, 2008 on the Pilot Policies on Payment for Environmental Services. Vietnamese Official Gazette No. 239+240, April 22, 2008. Socialist Republic of Vietnam. p. 1347-1351.
- Vietnam Government. 2008. Resolution No. 30a/2008/NQ-CP dated December 27, 2008 on Support Programs to reduce poverty for 61 poor districts in Vietnam. Vietnamese Official Gazette No. 73+74. January 24, 2009. Socialist Republic of Vietnam. p. 3903-3914.