

ການສຶກສາປະເມີນມູນຄ່າຊີວະນາໆພັນພາກໃຕ້ຂອງ ສປປລາວ

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ໃນຖານະທີ່ເປັນປະເທດທີ່ດ້ອຍພັດທະນາ, ເສດຖະກິດຂອງສປປລາວມີພື້ນຖານກະສິກໍາ ທີ່ມີອັດຕາສ່ວນຄົນທຸກຍາກທີ່ອາໄສຢູ່ຊົນນະບົດ. ເພື່ອໃຫ້ມີຄວາມເຂົ້າໃຈກ່ຽວກັບ ຄວາມສໍາຄັນຂອງພື້ນທີ່ປ່າໄມ້ໃນທ້ອງຖິ່ນ ແລະ ພາກພື້ນຕໍ່ຊຸມຊົນທີ່ອາໄສຢູ່ໃນ ຫລືໃກ້ແລວເສດຖະກິດອະນຸລັກຊີວະນາໆພັນ (BCC) ໃນພາກໃຕ້ຂອງສປປລາວ. ໂດຍມີຈຸດປະສົງໃນການປະເມີນມູນຄ່າຂອງຊີວະນາໆພັນໄດ້ຖືກນໍາໃຊ້ໂດຍຄົວເຮືອນໂດຍອີງໃສ່ລາຄາຕະຫຼາດ ແລະ ປະເມີນຄວາມເຕັມໃຈທີ່ຈະຈ່າຍໃນການປົກປ້ອງປ່າໄມ້ ແລະ ຊີວະນາໆພັນເພື່ອຄວາມຢູ່ລອດ ແລະ ຊີວິດການເປັນຢູ່ຂອງພວກເຂົາ ແລະ ເພື່ອກໍານົດປັດໃຈທີ່ສົ່ງຜົນກະທົບຕໍ່ຄວາມເຕັມໃຈທີ່ຈະຈ່າຍໃນການປົກປ້ອງປ່າໄມ້ ແລະ ຊີວະນາໆພັນເພື່ອຄວາມຢູ່ລອດ ແລະ ຊີວິດການເປັນຢູ່. ການນໍາໃຊ້ CVM ເພື່ອປະເມີນມູນຄ່າວັດແທກ ຂອງປ່າໄມ້ ແລະ ຊີວະນາໆພັນໃນ 15 ບ້ານຈາກ 5 ເມືອງຂອງ 3 ແຂວງ, ໃນພາກໃຕ້ຂອງລາວ. ຜົນໄດ້ຮັບສະແດງໃຫ້ເຫັນວ່າມູນຄ່າໄມ້ທ່ອນໃນ ຈໍານວນ 3,893,671,000 ກີບ (487,928.70 ໂດລາສະຫະລັດ) ຕໍ່ປີ ແລະ ມູນຄ່າເຄື່ອງປ່າຂອງດົງໄດ້ຖືກເກັບກໍາໂດຍຊາວບ້ານ ໃນໄລຍະລາຄາຕະຫຼາດ ແມ່ນ 1,644,521,000 ກີບ (206.080.33 ໂດລາສະຫະລັດ) ຕໍ່ຄົວເຮືອນຕໍ່ປີ. ສະເພາະ WTP ຂອງນະໂຍບາຍໃນການປົກປ້ອງປ່າໄມ້ ແລະ ຊີວະນາໆພັນໃນເກືອບພື້ນທີ່ໝູ່ ບ້ານຂອງພວກເຂົາແມ່ນ 91.023 ກີບ (11.41 ໂດລາສະຫະລັດ) ຕໍ່ຄົວເຮືອນຕໍ່ເດືອນໂດຍສະເລ່ຍ 7,25 ສ່ວນຮ້ອຍຂອງລາຍໄດ້ປະຈໍາເດືອນຂອງຄົວເຮືອນ. WTP ຂອງນະໂຍບາຍ 2 ແມ່ນສູງກ່ວາ WTP ຂອງນະໂຍບາຍ 1 ໃນ ຈໍານວນເງິນ 111,087 ກີບ (13.92 ໂດລາສະຫະລັດ) ຕໍ່ຄົວເຮືອນຕໍ່ເດືອນສະເລ່ຍ 8,41 ເປີເຊັນຂອງລາຍໄດ້ປະຈໍາເດືອນຂອງຄົວເຮືອນສະເລ່ຍ. ປັດໄຈທີ່ສົ່ງຜົນກະທົບຕໍ່ຄວາມເຕັມໃຈທີ່ຈະຈ່າຍໃນການປົກປ້ອງປ່າໄມ້ທີ່ມີຜົນກະທົບທາງລົບ ແມ່ນ ເພດ ແລະ ອາຊີບ ແຕ່ລະດັບການສຶກສາ ແລະ ຂະໜາ ຂອງຄົວເຮືອນ ແມ່ນມີຜົນກະທົບໃນທາງບວກ.

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Contingent Valuation Study of Biodiversity in Southern Part of Lao PDR

Abstract

As a least developed country, the economy of Lao PDR has an agricultural base with a high percentage of poor people living in rural areas. In order to gain a better understanding of the importance of local and regional areas of forest to communities living in or near the Biodiversity Conservation Corridor (BCC) in southern part of Lao PDR. With the objective to estimate the value of biodiversity was used by households based on market price and estimate the willingness to pay for protecting forest and biodiversity for their survival and livelihood and to identify the factors affecting willingness to pay for protecting forest and biodiversity for their survival and livelihood. Using CVM to estimate the measured value of forest and biodiversity in 15 villages from 5 districts of 3 provinces, in southern of Laos. The result shows that value of timber amount of 3,893,671,000 kip (USD 487,928.70) per year and the total value of NTFPs were collected by villagers in term of market price is 1,644,521,000 kip (USD 206,080.33) per household per year. For the mean WTP of policy for protecting forest and biodiversity only in nearly their village area was 91,023 kip (USD 11.41) per household per month an average of 7.25 percent of household monthly income. The WTP of policy 2 was higher than mean WTP of policy 1 in amount 111,087 kip (USD 13.92) per household per month an average 8.41 percent of average household monthly income. Factors affecting willingness to pay for protecting the forest with negative impact is gender and occupation but the education level and households size is positive impact.



1. Introduction

The Biodiversity Conservation Corridor aims to improve forest connectivity between three important National Forest Conservation Areas (formerly National Biodiversity Conservation Areas), being Xe Sap in Sekong Province, Dong Amphan in Attapeu and XePian in Champassak. While biodiversity Conservation has been given a high priority nationally, very little is known about the attitude of local communities towards biodiversity and the value that they place on protecting and restoring it. There are many villages located within, or close to the proposed corridor and the BCC project aims to promote participatory delineation and designation of forest within the corridor area and improve the livelihoods of the local communities through investment in small scale rural infrastructure and the improvement of agricultural productivity. At the same time support from the local communities will be enlisted to help with forest management and protection, which will provide some cash injection into the communities' economy through wage labour.

In the economic valuation of forests both Use and Non-use values are recognized. The former are divided into direct use, such as harvesting timber and other products, and indirect-use such as ecological services and option values. The Non-use values are divided into Bequest Values and Existence Values. The former recognizes that having forests can be a form of insurance against the consequences of climate change or the extinction of species, and for many communities forest also have an important Spiritual value. The latter takes account of the fact that forests are an important ecological life form, which contributes to human well-being by just being there.

In attempting to arrive at a comprehensive valuation of a national forest resource, account must be taken of the probability that different groups within the population at large will have different perspectives on the role and importance of forests and hence are likely to assign different values. Farmers whose crops are raided by wild animals may see the forest negatively, while others that rely on the forest for much of their livelihoods are likely to have a different attitude.

This likely variation in value between stakeholders applies to biodiversity, as it can generate direct-use values through ensuring the supply of Non-Timber Forest Products for communities living in or near forests, while urban dwellers will see biodiversity more in the light of ecotourism or the Existence value.

There is growing concern in Lao PDR regarding the continued decline in both forest area and the quality of the remaining forest, which is partly driven by conversion of forest to a wide variety of alternative land-uses. In order to strengthen the implementation of the BCC project and to provide an input to the general valuation of forests and ecological services in Lao PDR, the ADB decided to fund the study described in this report by the Faculty of Economics and Management, Champassak University to assess the value that communities associated with the project place on the biodiversity in the corridor area. This study is seen as both a pilot study to test the methods and to build capacity in Lao PDR to undertake such studies and as the first step in a comprehensive series of studies to evaluate attitudes towards biodiversity among different stakeholder groups that will eventually be able to inform land-use policy decisions.

The overall objective of the study was to estimate the value of biodiversity and evaluate the local communities' willingness to pay (WTP) for protecting forest by voluntary labor using the Contingent Valuation Method (CVM).

2. The objectives of this study

- 2.1 To estimate the value of biodiversity was used by households based on market price.
- 2.2 To estimate the willingness to pay for protecting forest and biodiversity for their survival and livelihood.
- 2.3 To identify the factors affecting willingness to pay for protecting forest and biodiversity for their survival and livelihood.

3. Research Methodology

3.1 Location

The Biodiversity Conservation Corridor aims to improve forest connectivity between three important National Forest Conservation Areas (formerly National Biodiversity Conservation Areas), being Xe Sap in Sekong Province, Dong Amphan in Attapeu and XePian in Champassak. To implement the Biodiversity Conservation Corridor Project (BCC) with funding from the Asian Development Bank (ADB) in the Provinces of Attapeu, Champassak and Sekong. The southern part of Lao is covered by forest and high biodiversity, this study survey in three provinces Champasak, Sekong and Attapeu.



1.2 Contingent Valuation Method

The Contingent Valuation Method (CVM) measures the value of forest and biodiversity. People will be asked their willingness to pay for protecting forest and biodiversity for improvement in environmental quality. CVM can be a good method to value conservation of un-priced natural assets such as forests and existence values of biodiversity. This method is useful when “environmental changes have no direct impact on marketed output” (OECD 1995) and it is not possible to obtain peoples’ preferences directly. In this study, the CVM was used to estimate households’ WTP or provide voluntary labor for biodiversity conservation. The mean value of willingness to pay was calculated by using accumulation. The survey was conducted in 15 villages, in five main districts: Pathoumphone District in Champasak Province, Dakcheung

and Kaleum district in Sekong Province; and Phouvong and Sanamxai District in Attapeu. These villages are located within the Biodiversity Conservation Corridor Project.

1.3 The population and sample size

According to field survey in 15 villages from 5 districts of 3 provinces, in southern Laos in 2012. These 15 villages there were 1,089 households. Thus, the population target group for this study is 1,089 households of 15 villages in rural area of these provinces. The sample size is used in this study is 303 households, including 61 households from Sekong province, 172 households from Attapeu province and 70 households Champasak province (see table 1). By using Yamane's equation (1967) to determine sample size for this study.

Table 1. The population and sample size

Name of Provinces	Name of District	Name of Village	Population	Sample size
			No. of household	No. of household
Sekong	Dakcheung	Dakting	16	5
		Dakle	23	6
		Dakbu	50	14
	Kaleum	Pakxai	27	8
		Songkon	61	17
		Panon	40	11
Attapeu	Phouvong	Namxouan	54	15
		Phougnang	33	9
		Phoukcu	52	14
	Snamxai	Sompoy	259	72
		Hardsisoung	104	29
		Hat Oudomxai	120	33
Champasak	Pathoumphone	Phalay	164	46
		Ta ong	44	12
		Tavang	42	12
Total			1,089	303

1.4 Sampling

The cluster random sampling method was employed in this survey. The survey site were five districts in the three southern provinces of Lao PDR such as Kaleum and Dakcheung districts of Sekong province; Phouvong and Snamxai districts of Attapeu province; and Pathoumphone district of Champasak province. Of the 15 villages in which 69 villages were randomly chosen, with three villages for each district. Of these, 61 households were randomly chosen from Sekong province, 172 households were randomly chosen from Attapeu province and 70 households were randomly chosen from Champasak province. So the total sample of 303 households.

1.5 Questionnaire Structure

The questionnaire had three parts. The first part contained the socio-economic information of respondents. The second part contained the information about consumption of timber, NTFP, wildlife, and aquatic resources, in order to evaluate biodiversity on the basis of how much in monetary value these villages consumed using market price. The final part contained question about WTP in term of voluntary labor to protect forest in day per month. In this study specify the species of plant and animal that are used by local communities for survival or livelihood. The attribute 'species of plant and animal that are used for survival/livelihood' is defined as 'any plant or animal that is likely to be used by local communities as a source of food, medicine, fiber or other purpose either in emergency situations or on a regular basis'. In the choice experiments design, the two levels of provision of species of animal and plant that are used for survival or livelihood will be presented as follows:

Policy Level 1: ‘Protect forests that are rich in species of plants and animals that are used for survival/livelihood, from further decline.’

This policy level limits protection to areas that still have viable populations of all or most of the species that are used by local communities. The first possible outcome would be that the populations of species that are used by local communities in the selected areas will be protected from further decline, but in degraded forest where populations of these species have already declined there would be no special protection and the decline can be expected to continue. Policies would therefore only target those species that are currently designated as being useful where they are still relatively abundant. These species would become more abundant in the protected areas and the threat of local extinction would be removed. Such a policy, however, would not target those species that are not designated as being useful. Therefore the populations of these species may continue to decline at current rates in unprotected forests, with some potentially becoming rare.

Policy Level 2: ‘Protection for all forests that contain species of plants and animals that are currently used, from further decline’

This policy is broader ranging than Level 1 and would provide more intensive protection as well as including forests that are still important for local communities even though their populations of species of plants and animals that are used have already declined. Over time this policy would allow populations of useful species in degraded forests to recover which could also benefit other species of plants and animals that may also rely on them.

In choice experiment it is common practice to include a standard option within all choice tasks. For this study, a ‘Do nothing’ policy option has been chosen. The ‘Do nothing’ option is intended to reflect the situation where no new policies would be implemented to protect and enhance biodiversity in the Province. In other words, participants were told that investors will continue to be granted concessions in forest land, regardless of the quality of the forest. Illegal logging will continue, and farmers will continue to clear forest wherever it suits them.

The questionnaire was finalized based on the results of discussion from the workshop on 16 March. The participants were forestry staff from each district and representatives from various government agencies. The questionnaire was revised with inputs from the pre-test that was conducted from 16 to 22 February 2012. The total 19 respondents were interviewed for pre-test and were from Phoukeua village, Harthsoung Village, Songkhon Village, Dakle Village, Tavang Village.

The survey carried out by students and lecturers from the Faculty of Economics and Management, Champasak University and authors. The students were trained before conducting survey and field survey was conducted between 23 March and 22 April 2012 and the data collection was undertaken by five teams. A team consisted of seven interviewers. Teaching and studying commitments meant that the teams could only go to field to survey during weekends. The first team surveyed in Phouvong district between 23 and 25 March 2012, the second team in Pathoumphone district from 29 March 2012 to 1 April 2012, the third in Sanamxay district between 6 and 8 April 2012, the fourth in Dakcheung district from 20 to 22 April 2012 and the final team in Kaleum district from 20 to 22 April 2012. The survey was conducted through face to face interviews with household heads.

1.6 Empirical Model of Factors Affecting WPT

To analyze the factors influence on willingness to pay (WTP) for protecting forest, and value of WTP was transferred from voluntary labor in day per month of households to protect the forest multiply by local average wage per person per day as twenty five thousand Kip

(USD 3.13), a multiple regression model was used to prove the factors determine the value of WTP, which authors refer to structure of Kyophilavong and Bennett (2011). The yield a regression equation of the form:

$$WTP = \beta_0 + \beta_1 Gend + \beta_2 Age + \beta_3 Educ + \beta_4 Farm + \beta_5 HS + \beta_6 Inco + \beta_7 Buff + \beta_8 Catt + \beta_9 Pig + \beta_{10} Timb + \beta_{11} NTFP + \beta_{12} Wild + \beta_{13} FNF + \varepsilon$$

WTP denotes value of money that household willingness to pay for protecting forest; which it is may determined by some socio-economic characteristics of household variables such as gender, age, Education, occupation, household size, income, number of buffalo, number of cattle and number of pig of household. In addition, it may depend on direct gain benefit of household from forest such as volume of timber from forest was used by household, non timber forest products were collected by household, wildlife was hunted by household, and fish and non-fish was catch by household. β_0 is the constant; $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9, \beta_{10}, \beta_{11}, \beta_{12}, \beta_{13}$ are coefficients of independent variables and ε normally distributed random error term. The definitions of variables were used in the regression analysis are shown in table 2. The Ordinary Least Square (OLS) method was used to estimate the factors affecting willingness to pay. The regression model may have econometric problems such as multicollinearity and heteroskedasticity that can be investigated and removed during estimation. Multicollinearity is a severe problem regarding the OLS method. If the coefficient of correlation between two independent variables have absolute value equal or more than 0.80, there is severe the problem of multicollinearity (Gujarati, 1995).

Table 2. Shows the variables and definitions of variables for using on regression model

Variables	Definition	Expected sign
Dependent Variables		
WTP	Willingness to pay for protection forest	kip/month
Independent Variables		
Gend	Gender of household head	1= female; 0 = otherwise Negative
Age	Age of household head	year Positive
Educ	Year of attending school of household head	year Positive
Farm	Main occupation of household head is farm rice	1= yes; 0 = otherwise Positive
HS	Household size	person Positive
Inco	Household monthly income	kip/month Positive
Buff	Number of Buffalo of household	number Positive
Catt	Number of Cattle of household	number Positive
Pig	Number of Pig of household	number Positive
Wood	Volume of wood was logged by household	m ³ /month Negative
NTFP	Non timber forest products were collected by household	kg/month Positive
Wild	Wildlife was hunted by household	kg/month Positive
FNF	Fish and Non-fish was caught by household	kg/month Positive

2. Research Outcome

4.1 Socio-economic characteristics of respondents

The socio-economic characteristics of respondents were investigated and are shown in table 3. About 30.7% of respondents as household head were female and the average age was around 43 years old. The average household size was 6 people. Average household monthly income of 911,000 kip (USD 114.16); and the average household monthly expenditure was 518,000 kip (USD 64.91). Farmer was the most frequent of the main occupation of household heads which accounts for 64% and the second most frequent of the main occupation of household heads was shifting cultivation accounting for 34.7%. Education level of household head was very low, with most of them completed primary school at 66.7%. In addition, about 27.4% of them were illiterate. With 57.8% of the respondents living in this area was ethnic group and 42.2% was Lao

Lum. 51.2% of respondents were Buddhist and Spirit accounted for 48.8%. The households got an average yield of rice from doing rice farming of 2,877 kg/hectare, but they got a yield of rice from shifting cultivation that was very low, only nearly half the yield from doing rice farming. If compared with other locals in Lao PDR, the productivity is very low because the national productivity average is 4,800 kg per hectare, for lowland rain-fed paddy is 3,700 kg per hectare and for upland hill rice is 1,900 kg per hectare. Especially for upland rain-fed rice production, the government support alternative ways for villagers to grow other crops with higher productivity to improve living conditions for the villagers and reduce damage of the land in doing dry rice on steep slopes and also to reduce the destruction of biodiversity as much as possible. Using direct benefits from forest of households such as logging wood to use for building household, household activities and to sell for getting money for their household consumption, with accounted for 37.3% of respondents. 95.4% of households in the studied area were collected non timber forest products (NTFPs) from inside and around the forest protection area for household consumption, sporting household activities and selling to get money for their survival and livelihood. In addition, they also hunted wildlife for household consumption and selling to get money for their survival and livelihood, which accounted for 61.7% of total sample. And most of them got benefit from inside and around forest by catching fish and non fish with 88.5%. This indicates that the forest is very important sources of food for their survival and their livelihood.

Table 3. Socio-economic characteristics of respondents

Socio-economic condition	
Female as household head (%)	30.7
Age of household head (year)	43
Household size (person)	6.0
Household income (10,000 kip)/month	91.1
Household expenditure (10,000 kip)/month	51.8
Main occupation of household head (%)	
Farmer	64.0
Shifting cultivation	34.7
Government	1.0
Retails/owner of business	0.3
Education level of household head (%)	
Illiterate	27.4
Primary school (1-5 years)	66.7
Lower secondary school (6-8 years)	5.0
Upper secondary school (9-11 years)	1.0
Ethnic group (%)	
Lao Lum (%)	42.2
Religion of household head (%)	
Buddhism	51.2
Spirit	48.8
Yield of rice from shifting cultivation (kg/ha)	1,028
Yield of rice from farm rice (kg/ha)	2,877
Percent of households used direct benefits from forest (%)	
Logging wood for using and selling	37.3
Collecting non timber forest products (NTFPs)	95.4
Hunting wildlife	61.7
Catching fish and non fish (FNF)	88.5

Source: Field survey from 23 March to 22 April 2012 and the authors' estimations.

2.2 The value of biodiversity was used by households based on market price

Most of Lao people's living is based on natural resources, which predominantly means forest resources that provides food resources, timber and other daily necessities such as medicines, fibers, resins etc.. This can also provide a source of income both for business and for subsistence and daily living. Table 4 shows the timber was logged by households for themselves and for sale. This indicates that the most volume of timber species was logged is bamboo about

3,112 m³ per year, with 98.1% used for themselves and 1.9% was sold; Second of most volume of 178.3 m³ is *Dipterocarpu*spp, with 97.25% was used for themselves and only 2.8% was sold; and the third is *Lagerstroemia*spp with 129.4 m³ per year, including 76.8% was used themselves and 23.2% was sold for income-generating for livelihood. Considered on timber were logged for using and sale in term of monetary value of timber was logged by across samples is about 3,893,671,000 kip (USD 487,928.70) per year. The most of total value is *Dalbergia cochinchinensis*, with accounted for 21.11%; the second is *Dipterocarpu*spp but had a small value, which accounted for 5.73% of total value; and the third is *Pterocarpus macrocarpus* with 4.23% of total value. In addition, the benefits those villagers got from the forest, particularly logging timber; and transferred in cash by average of 12,850,000 kip (USD 1,610.28) per household per year as shows in table 4.

Table 5, shows the non timber forest products (NTFPs) that were collected by villagers, which is an important source of income for improving livelihoods. NTFPs were collected both for their own consumption and for selling at local markets. From the estimation, we found that the total value of NTFPs were collected by villagers in term of market price is 1,644,521,000 kip (USD 206,080.33) per household per year. Average value of NTFPs were collected is worth 5,427,000 kip (USD 680.08) per household per year. The most value was provided by Amomum fruits which accounted for 50.31%, 34.27% and 6.94% of total value of NTFPs are Mushrooms and Siameses respectively. Table 4. Timber were logged by household for own using and sale Source: Field survey from 23 March to 22 April 2012 and the authors' estimations.

Table 5. Non timber forest products were collected by households

Type of NTFPs	Volume of NTFPs (Kg/year)			Price (Kip/kg)	Total Value (Kip/year)	Share of value (%)
	Total	Consumptio	Sale			
Malva nuts	1,052	60	992	26,900	28,298,800	1.72
Amomum fruits	17,866	1263	16603	46,312	827,424,086	50.31
Columbo wood	18,635	75	18560	1,700	31,679,500	1.93
Siamese sal	16,184	1010	15174	7,057	114,209,077	6.94
Sealing wax	11	11	0	52,500	577,500	0.04
Mushrooms	56,314	4555	51759	10,009	563,646,826	34.27
Orchid	260	105	155	7,833	2,036,580	0.12
Herbs Flora	9,291	865	8426	3,543	32,918,013	2.00
Bamboo shoot	302	182	120	33,350	10,071,700	0.61
Honey	5,578	5381	197	3,245	18,100,286	1.10
Vegetative	461	356	105	19,625	9,043,200	0.55
Other.....	332	227	105	19,625	6,515,500	0.40
Total					1,644,521,067	100.00
Average per household (kip/year)					5,427,462	

Source: Field survey from 23 March to 22 April 2012 and the authors' estimations.

The wildlife species are diverse and abundant in the southern part of Lao PDR. Based on the results of this study found that the most volume of wildlife that was hunted by villagers was snake of 38,817 kilogram per year, with 99.3% of total volume sold for getting money for livelihood, but it was very small for their households consumption with only accounted for 0.7%; Second is turtle with amount of 20,471 kilogram per year and most of this was also sold for household income generating income based on the price in the local market with 98.3%, the rest of 1.7% was used for households consumption; The third is wild pig with amount of 5,010 kilogram per year and most of this was used for their households consumption with 59.8%. Focusing on wildlife species were hunted in term of monetary value is about 3,146,562,000 kip (USD 394,306.02) per year. The most value came from snake, turtle and wild pig with 56.57%,

24.53% and 5.61% respectively. Average value of wildlife species were hunted for sale and their household consumption was 10,384,000 kip (USD 1,301.25) per household per year (See table 6).

Table 6. Wildlife was hunted by households for own consumption and sale

Kinds of wildlife	Volume of wildlife (Kg/year)			Price (Kip/kg)	Total Value (Kip/year)	Share of value (%)
	Total	Consumptio	Sale			
Deer	1,695	1,387	308	29,514	50,026,230	1.59
Montauk deer	1,939	1,383	556	39,141	75,894,399	2.41
Kai	913	644	269	38,621	35,260,973	1.12
Civet cat	2,086	1,763	323	27,721	57,826,006	1.84
Chipmunk	1,017	778	239	15,612	15,877,404	0.50
Chip mung	1,026	905	121	14,559	14,937,534	0.47
Flying lemur	177	151	26	46,818	8,286,786	0.26
Lizard	1,046	692	354	42,676	44,639,096	1.42
Rabbit	92	71	21	42,750	3,933,000	0.12
With black ruff	1,007	855	152	16,283	16,396,981	0.52
Wild pig	5,010	2,997	2,013	35,228	176,492,280	5.61
Monkey	697	639	58	38,410	26,771,770	0.85
Turtle	20,471	339	20,132	37,704	771,838,584	24.53
Snake	38,817	261	38,556	45,857	1,779,988,832	56.57
Mice	1,634	1,538	96	7,968	13,019,712	0.41
Jonh Phone	107	85	22	20,793	2,224,851	0.07
Chicken	583	529	54	25,979	15,145,757	0.48
Teal	25	25	0	31,250	781,250	0.02
Big birds	145	142	3	26,667	3,866,715	0.12
Small birds	994	901	93	19,951	19,831,294	0.63
Bear	40	20	20	100,000	4,000,000	0.13
Other...	38	30	8	250,607	9,523,066	0.30
Total					3,146,562,520	100.00
Average per household (kip/year)					10,384,695	

Source: Field survey from 23 March to 22 April 2012 and the authors' estimations.

Fish from natural is an important source of food, especially in rural area the low income and poor household lack of money to buy food for their household. Due to, they could catch fish from natural for their consumption. On the other hand, it is an important source of household income for them. The results show that the most volume of fish was caught by villagers was snake head fish with amount of 11,105 kilogram per year, this volume was consumed of 73.6% and the rest amount of 26.4% was sold for income generation for their survival; Second was spotted featherback of 6,346 kilogram per year, including 75.3% of this amount was consumed and 24.7% was sold in local market; The third was cat fish with amount of 5,322 kilogram per year, including 76.9% was consumed for their households and the rest amount was sold.

To converse the volume of fish was caught by household represents in monetary value based on local market values was 556,949,000 kip (USD 69,793.11) per year. To converse the volume of fish was caught by household represents in monetary value based on local market values was 556,949,000 kip (USD 69,793.11) per year.

The most of total value were come from spotted featherback, cat fish and snake head fish with 27.50%, 22.59% and 20.72% respectively. Average value of fish species were caught for sale and their household consumption of 1,838,119 kip (USD 230.34) per household per year as shows in table 7.

Table 7. Fish was caught by households for own consumption and sale

Fish species	Volume of fish (Kg/year)			Price (Kip/kg)	Total Value (Kip/year)	Share of value (%)
	Total	Consumption	Sale			
Cat fish	5,322	4,090	1,232	23,639	125,811,486	22.59
Snake skin gourami	192	162	30	9,833	1,883,020	0.34
Mystacoleucus marginatus	1,823	1,741	82	8,900	16,220,250	2.91
Snake head fish	11,105	8,176	2,929	10,391	115,392,055	20.72
Spotted featherback	6,346	4,778	1,568	24,139	153,186,094	27.50
Whisker sheat fish	1,659	1,588	71	13,576	22,526,657	4.04
Sole	262	202	60	13,111	3,435,082	0.62
Siamese mud carp	3,865	2,029	1,836	19,602	75,757,810	13.60
Other	1,530	243	1,287	27,933	42,737,490	7.67
Total					556,949,943	100.00
Average per household (kip/year)					1,838,119	

Source: Field survey from 23 March to 22 April 2012 and the authors' estimations.

The non fish or aquatic animal is an important source of food and income for the poor in rural area. Due to it provides food to them for survival. In addition, they also catch non fish from natural for sale to get money for household other consumption. The non fish species were caught by villagers in study area, including snail of 5,284 kilogram per year, with 89.6% and 10.4% of this amount for their own consumption and for sale based on local market; second is eel with 1,273 kilogram per year, which 83.5% and 16.5% were consumed and sold respectively; the third is crab of 843.1 kilogram per year (see table 8).

Transferred the volume of non fish was caught by villagers into monetary value based on local market price; it was 89,568,405 kip (USD 11,224.11) per year. The most of total value came from eel, snail and shrimps accounted for 54.12%, 29.16% and 7.80% respectively. The average value of non fish species were caught for sale and their household consumption was 295,000 kip (USD 36.97) per household per year as shows in table below.

Table 8. Non fish/aquatic animals was caught by households

Non fish or Aquatic animals	Volume of non fish (Kg/year)			Price (Kip/kg)	Total Value (Kip/year)	Share of value (%)
	Total	Consumption	Sale			
Shrimps	669.6	652.6	17	10,431	6,984,598	7.80
Crab	843.1	793.1	50	3,939	3,320,971	3.71
Snail	5284.6	4732.6	552	4,942	26,116,493	29.16
Eel	1273	1063	210	38,078	48,473,843	54.12
Other	267	267	0	17,500	4,672,500	5.22
Total					89,568,405	100.00
Average per household (kip/year)					295,605	

Source: Field survey from 23 March to 22 April 2012 and the authors' estimations.

Overall, gaining direct benefits from forest or biodiversity of households ample in the study area were converted into monetary value was about 9,331 million kip (USD 1,169,332.46), with higher percent for sale to get money to add their households accounted for 55.52% and the rest (44.48%) for households consumption. This indicates that forest or biodiversity is very important for people in rural area, especially the poor and low income households to find food for their livelihood. In addition, they also used the forest and biodiversity for household income generating activities as shows in table 9, we seen the average value of biodiversity was direct gained by households about 30.8 million kip (USD 3,859.15) per household per year.

Going on the detail to gain direct benefits of households, as being the total value of timber was used by household with about 3,893 million kip (USD 487,928.79) per year, including 78.91% was consumed and 21.09% was sold; the total value of NTFPs about 1,644 million kip (USD 206,080.33), only 9.27% was consumed but very high percentage of NTFPs were sold with 90.73%; there were only 14.70% of total value of wildlife (about 3,146 million kip or USD 394,306.08 per year) was consumed but it was sold accounted for 85.30%; with 69.10% and 30.90% of total value of fish (about 557 million kip or USD 69,793.23 per year) were consumed and sold respectively. In addition, the value of non fish with 89.6 million kip (USD 11,224.11), including 87.61% was consumed and 12.39% was sold in local market for improving their livelihood (see table 9).

Table 9. Summary the value of biodiversity was used benefits by households

List of biodiversity	Average value (kip/household/year)	Total value (kip/year)	Percent of total value for	
			Consumption	Sale
Timber	12,850,402	3,893,671,765	78.91	21.09
None Timber Forest Products (NTFPs)	5,427,462	1,644,521,067	9.27	90.73
Wildlife	10,384,695	3,146,562,520	14.70	85.30
Fish	1,838,119	556,949,943	69.10	30.90
Non fish/Aquatic Animals	295,605	89,568,405	87.61	12.39
Total	30,796,283	9,331,273,700	44.48	55.52

Source: Field survey from 23 March to 22 April 2012 and the authors' estimations.

2.3 Willingness to pay for protecting forest and biodiversity

Out of the 303 total sample, 83 (27.4 percent of total sample) provided a zero WTP, and 220 (72.6 percent) gave a positive WTP. The whole samples mean WTP for protecting forest and biodiversity was 66,089 kip (USD 8.28) per household per month. This amounts to an average of 7.25 percent of household monthly income. For the mean WTP of both policy for protecting forest and biodiversity only in nearly their village area was 91,023 kip (USD 11.41) per household per month. Focusing on mean WTP of policy 2 was higher than mean WTP of policy 1, but there were only of 116 households gave positive WTP with mean WTP was 111,087 kip (USD 13.92) per household per month, which accounted of 8.41 percent of average household monthly income, as show in table 10.

Table 10. Mean WTP of Respondents (kip per household per month)

Value of WTP	Value of WTP for Protecting Forest and Biodiversity			
	Whole sample (n = 303)	Positive WTP (WTP > 0) for		
		Both Policy (n = 220)	Policy 1 (n = 173)	Policy 2 (n = 116)
Mean	66,089	91,023	97,399	111,087
Std. Dev.	71,228	68,676	73,288	75,814
Min	0	25,000	25,000	25,000
Max	375,000	375,000	375,000	350,000
WTP/Income (%)	7.25	8.75	12.11	8.41

Source: Field survey from 23 March to 22 April 2012 and the authors' estimations.

The WTP of 50,000 kip (USD 6.27) per household per month was the most frequency recorded bid range at 24.4 percent, 17.8 percent and 11.2 percent for both policies, policy 1 and policy 2, respectively. WTP of 75,000 kip (USD 9.40) per household per month is the second most popular bid range accounting for 13.2 percent, 10.6 percent and 5.3 percent for both policies, policy 1 and policy 2, respectively (See table 11). The WTP of 50,000 kip (USD 6.27) per household per month was the most frequency recorded bid range at 24.4 percent, 17.8 percent and 11.2 percent for both policies, policy 1 and policy 2, respectively. WTP of 75,000 kip (USD 9.40) per household per month is the second most popular bid range accounting for 13.2 percent, 10.6 percent and 5.3 percent for both policies, policy 1 and policy 2, respectively (See table 11).

Table 11. Range of WTP of Respondents

Value of WTP (kip/household/month)	Both policies		Policy 1		Policy 2	
	Number of household	Percentage (%)	Number of household	Percentage (%)	Number of household	Percentage (%)
0	83	27.4	130	42.9	188	62.0
25,000	29	9.6	21	6.9	8	2.6
50,000	74	24.4	54	17.8	34	11.2
75,000	40	13.2	32	10.6	16	5.3
100,000	21	6.9	16	5.3	13	4.3
125,000	21	6.9	16	5.3	13	4.3
150,000	5	1.7	5	1.7	5	1.7
175,000	8	2.6	8	2.6	8	2.6
200,000	2	0.7	2	0.7	2	0.7
225,000	2	0.7	2	0.7	2	0.7
250,000	14	4.6	13	4.3	11	3.6
300,000	1	0.3	1	0.3	1	0.3
350,000	2	0.7	2	0.7	2	0.7
375,000	1	0.3	1	0.3	0	0.0
Total	303	100.0	303	100.0	303	100.0

2.4 Factors affecting willingness to pay for protecting the forest

To estimate the influence of socioeconomic characteristics and direct gain benefits of household from forest on value of willingness to pay (WTP). The value of WTP was transferred from voluntary labor in day per month of households to protect the forest multiply as mentioned. To correct the econometric problems we have checked the correlation among independent variables and found no multicollinearity problems. The independent variables with correlations of less than 0.28 (see Table A-1 of appendix). Heteroskedasticity was detected by a BreuschPagan test and found heteroskedasticity problems. To correct this problem, the Generalize Least Squares (GLS) approach was used (Greene, 2003) to prove the factors affecting value of WTP for protection the forest and biodiversity. The results are shown in table 12. The study demonstrates that there are two socioeconomic variables; gender and occupation of household head have negative impact on value of WTP and statistically significant, but insignificant for policy 2. This indicate that female as household head and occupation of household head as farm rice have lower value of WTP for protecting forest and biodiversity in the study areas. However, there are some socio-economic characteristic variables also had significant and positive effects on value of WTP such as education level of household head, but it is insignificant for policy 1. This indicates that the respondents would like to protect all area of the forest and biodiversity for their survival and livelihood in long term. We could be concluded that education level of household head had influenced on value of WTP. This can be explained that household heads who achieved higher education level they would higher WTP. Due to they may recognize the long term advantage and benefits from protect forest and biodiversity across the protected forest area. The household size also has a positive effect on WTP and statistically significant for both policy and policy 1. This indicates that households have a large number of members have higher WTP. Due to the households have more members; they may be manage their human for household activities and they would be providing the labor of household to increase number of day to participate the protection forest program, therefore household size has increased WTP for protecting forest and biodiversity. Household monthly income has positive effect on WTP for both policy and policy 2, but it negative relationship with WTP. However, the household monthly income has no statistically significant effect on WTP, its mean that changing in household monthly income has no effect on WTP for protecting forest and biodiversity. The number of buffalo of household has a positive effect on WTP, but is significant only in policy level 2. This indicates the households who have a large number of buffalo would be increasing the value of WTP for protecting forest and biodiversity in the forest protection area. But number

of pig has statistically significant and negative effect on WTP for policy level 2. It means that households who have a large number of pigs have lower WTP. Due to household that bred more pigs they might use more labor to take care them, therefore the household may lack of labor to provide for participating the project. Finally, it may lead to negative effect on WTP. Focusing on direct gain benefits of household from forest, particularly volume of wood was logged by household for using and selling has a negative effect on WTP and statistically significant, with coefficient of unexpected. This result could be explained that the households gain more benefits from forest by logging of wood for using and selling, then they would be decreasing WTP. Due to they lose direct benefits by decreasing or could not log the wood from the forest in short term. The non timber forest products (NTFPs) and volume of wildlife have statistically significant positive effect on WTP. It means the households got more benefits from forest by collecting NTFPs2 and hunting of wildlife for consumption and selling they would provide household's labor participate more day per month to protect forest and biodiversity for their survival and livelihood. Therefore, the value of WTP would be increasing. The volume of fish and non fish was catch by household have statistically significant positive effect on WTP for only policy level 1. This could be explained that the households had catch more volume of fish and non fish have higher WTP for protecting only the forest near their village, but they would be not WTP to protect the forest in other areas. Due to these households may not gain direct benefits from other area.

Table 12: The factors affecting WTP to protect forest and biodiversity by GLS

Independent Variables	WTP for both Policies		WTP for Policy 1		WTP for Policy 2	
	Coefficient	t	Coefficient	t	Coefficient	t
Cons	61117.660 ***	3.58	40692.05 ***	3.31	10316.940	0.96
Gend	-22173.470 ***	-2.8	-9943.81 *	-1.84	-6784.025	-1.38
Age	-37.754	-0.13	-61.48	-0.32	171.742	0.97
Educ	3035.722 **	1.97	51.97	0.05	2991.407 ***	2.64
Farm	-27886.780 ***	-3.14	-22474.58 ***	-3.78	-3495.117	-0.67
HS	1645.603 *	1.78	1399.97 **	2.18	109.999	0.22
Inco	0.001	0.39	-0.0004	-0.84	0.001	0.87
Buff	2839.079	1.58	989.32	1.00	1998.556 **	1.93
Catt	430.787	0.47	-335.61	-0.69	398.600	0.75
Pig	-718.206	-0.36	955.32	0.67	-885.951 **	-2.29
Wood	-1225.967	-1.35	223.91	0.37	-1177.661 ***	-3.08
NTFP	14.248 ***	2.52	18.73 ***	2.48	-0.555	-0.08
Wild	46.593 *	1.9	38.74 **	2.09	14.219	1.55
FNF	74.068	0.39	202.11 *	1.92	-128.513	-1.11
Number of obs	303		303		303	
F-test	24.92		19.35		6.69	
Prob > F	0.0000		0.0000		0.0000	
R-squared	0.5469		0.4838		0.2448	
Adj R-squared	0.5250		0.4588		0.2082	
Root MSE	2.0016		1.7229		2.2022	

Note: Estimated Coefficient statistically significant at (*) 90%, (**) 95%, and (***) 99% confidence levels. Source: Field survey from 23 March to 22 April 2012 and the authors' estimations.

3. Discussion

1.1 Conversation

With the high potential in natural resources, Lao people especially rural areas are living depend on the forest resources. The biodiversity Conservation has been given a high priority of national level and is in line with national policy to protect and conservation for sustainable consumption of people living depend on natural resources. This research to estimate the contingent valuation of biodiversity in Southern part of Lao to estimate the value of

biodiversity was used by households based on market price and estimate the willingness to pay for protecting forest and biodiversity for their survival and livelihood and to identify the factors affecting willingness to pay for protecting forest and biodiversity for their survival and livelihood. Using CVM to estimate the measures the value of forest and biodiversity with the survey site were five districts in the three southern provinces of Lao PDR such as Kaleum and Dakcheung districts of Sekong province; Phouvong and Snamxai districts of Attapeu province; and Pathoumphone district of Champasak province. Of 15 villages in which 69 villages were randomly chosen, with three villages for each district. Of these 61 households were randomly chosen from Sekong province, 172 households were randomly chosen from Attapeu province and 70 households were randomly chosen from Champasak province. So the total sample of 303 households. The result shows that value of timber for own consumption and sell amount of 3,893,671,000 kip (USD 487,928.70) per year but the total value of NTFPs were collected by villagers in term of market price is 1,644,521,000 kip (USD 206,080.33) per household per year that mean one quarter three of total households income. The WTP of both policies is for the protecting forest and biodiversity only near their village area was 91,023 kip (USD 11.41) per household per month an average of 7.25 percent of household monthly income. The WTP of policy 2 was higher than mean WTP of policy 1 in amount 111,087 kip (USD 13.92) per household per month an average 8.41 percent of average household monthly income. Factors affecting willingness to pay for protecting the forest with negative impact is gender and occupation because if the households head are female and farmers have lower value of WTP, but the education level and households size is positive impact because the large number of households members with higher education level have higher WTP to protect forest.

1.2 Recommendations

Increasing education level to the people living in that area with training support technique to protect forest for sustainable consumption. For the further study should be implement with the community base practice to participation in protect forest.

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References

- Antony, J., & Rao, A. (2010). Contingent Valuation: A review with Emphasis on Estimation Procedures.
- Carson, R. T., Flores, N. E., & Meade, N. F. (2001). Contingent valuation: controversies and evidence. *Environmental and resource economics*, 19(2), 173-210.
- Luangmany, D., Voravong, S., Thanthathep, K. K., Souphonphacdy, D., & Baylatry, M. (2009). Valuing Environmental Services Using Contingent Valuation Method (No. tp200910t4). Economy and Environment Program for Southeast Asia (EEPSEA).
- Han, F., Yang, Z., Wang, H., & Xu, X. (2011). Estimating willingness to pay for environment conservation: a contingent valuation study of Kanas Nature Reserve, Xinjiang, China. *Environmental monitoring and assessment*, 180(1-4), 451-459.
- Kaisorn Kaisorn, T. Daovinh, S. and Malabou, B. (2009). Using CVM for InSitu biodiversity conservation and sustainability: Case study of the Houay Nhang protected area. Report

- supported by EEPSEA and WREA. October, 2009. (pp. 25-37), Department of Economics, Uc San Diego.
- Khan, H. (2009). Willingness to pay and demand elasticities for two national parks: empirical evidence from two surveys in Pakistan. *Environment, Development and Sustainability*, 11(2), 293-305.
- Kyophilavong, P., and Bennett, J. (2011). Willingness to Pay for Cleaning up Road Dust in Vientiane. *International Business and Management*, 3(2), 12-18.
- Leong, P. C., Zakaria, M., Ghani, A. N. A., & Mohd, A. (2005). Contingent Valuation of a Malaysian Highland Forest: Nonmarket Benefits Accrued to Local Residents. *Journal of Applied Sciences*, 5(5), 916-919.
- Organisation for Economic Co-operation and Development (OECD). (1995). *The Economic Appraisal of Environmental Projects and Policies – A Practical Guide*. OECD. Paris. France.
- Salam, M. A., Noguchi, T., & Alim, M. A. (2006). Factors affecting participating farmers' willingness-to-pay for the tree farming fund: A study in a participatory forest in Bangladesh. *Environmental monitoring and assessment*, 118(1-3), 165-178.
- Venkatachalam, L. (2004). The contingent valuation method: a review. *Environmental impact assessment review*, 24(1), 89-124.
- Yamane, T. (1967). *Statistics, An Introductory Analysis*, 2nd Ed., New York: Harper and Row.

