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What motivates farmers to adopt agroforestry? a contingent valuation analysis

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Abstract

Up till this time the adoption of agroforestry as a sustainable land use technology has a low adoption in developing countries and among upland farmers in the Philippines particularly in Calbayog Pan-as Hayiban Protected Landscape (CPHPL), Calbayog City, Samar. Unlike many studies in agroforestry adoption which primarily deals with farming technologies and socioeconomic analysis, this study was conducted to analyse the factors of adoption of agroforestry as a sustainable land use practice among upland farmers in exchange for an incentive by participating in the program using economic modelling. A total of 294 upland farmers were randomly chosen as respondents to participate in the survey using a contingent valuation method with WTA approach. As a result, 77.21% of the farmers were willing to accept the incentive in the said program to shift from their current land use practice to agroforestry. In addition, shifting cultivation, with off farm income, age, and bid amount appears to be significant factor in WTA. Thus, policy makers need to be sure that farmers are compensated very well for their service provided to downstream communities. Further, we conducted cost-benefit analysis to determine the economic cost of participating in the program using four base case scenario to model economic trade-offs among upland farmers. Since farming is the bread and butter of this upland communities policy makers need to consider the economic and socio cultural aspect of the community as well as its political involvement. Often, incentive programs from government are lesser compared to the income that farmers would receive from their farming activity. As such, determining the amount to be given is very important because this would add to the success of the program. While it is true that poverty in general and farmer's income (in particular) is not adequate in explaining land use change, market incentives (e.g. compensation to shift to sustainable land use practice) would enable payment for ecosystem services (PES) scheme to be successful. Unlike other agroforestry studies, we argue that the land use practice (e.g. shifting cultivation) should be considered in policy making for incentivizing farmers because aside from income, traditionally and culturally, in Philippines and other developing countries shifting cultivation has been the practice. As such, shifting cultivators needs to have alternative sustainable land use technology (e.g. agroforestry) with proper financing mechanism to properly implement and sustain the program.

Keywords: Willingness to accept, payment of ecosystem services, cost-benefit analysis, water supply, agroforestry, shifting cultivation.

Introduction

In developing countries where majority of upland dwellers have low income and survive only in forest agriculture[1], protecting watershed remains in paper. This is because of activities that affect the forestlands in watershed areas. It is documented in some parts in Southeast Asia, land degradation and deforestation is caused by unsustainable land use practice attributed to shifting cultivation which is done mostly through slash and burn[2,3]. In the Philippines, subsistence agriculture is the major livelihood in upland communities[4] which may affect watersheds. For example, in Calbayog Pan-as Hayiban Protected Landscape (CPHPL) in Calbayog City, Samar, land users do vegetable cropping and coconut farming as main source of income. But aside from this, some of the residents still practice slash and burn farming (kaingin)[5] as a process in shifting cultivation. It only shows that although farmers knew the negative effects of burning on soil nutrients, many farmers still do prefer to practice slash and burn because of ease of land clearing[6]. Yet, in spite of being aware of the conservation programs, CPHPL land users still practice slash and burn and shifting cultivation. In literature, slash and burn threatens environmental services like watershed protection[7, 8] and a major source of land degradation.

However, upland communities and land users are forced to practice unsustainable and detrimental land use practices because of poverty and lack of alternative livelihood that promotes environmental protection. For example, in Mt. Malindang most of the residents extract natural resources to suffice their income; such that low income households and farmers are forced to exploit the environment for survival[9]. Thus, overexploitation of natural resources happens because of limited options for livelihood of the respondents[10].

In addition, there are other environmental services (ES) threatening activities like firewood gathering, charcoal making, selling of non-timber and timber products[11] in which many of the land users practiced in CPHPL[3]. This implies that to have a sustainable watershed protection, participation through a change in current land use practices is important. Hence, the government, policy makers, researchers should offer a proper mechanism to the upland communities to shift from their conventional land use practices to a sustainable technology. One of the ways to do this is through incentivizing farmers in adopting sustainable land use technology (e.g. agroforestry) using the payment for ecosystem services (PES) principle.

As such, environmental policy (e.g. market based incentives) could help sustain upland agriculture and livelihood of upland dwellers. Such incentives can be design in collaboration with the local government and the people. Back in 1990s, payment for ecosystem services (PES) has gained much attention from forest scientists because of its success in mobilizing upland communities (environmental service providers) and downstream communities-- beneficiaries of environmental services (service buyer) to protect the environment.

As a principle, PES recognizes two major actors in its implementation along with the activities that both parties should take part. Upland farmers are paid for conserving the environment (e.g. change in land use practices) while receivers (downstream users) pay for environmental services (e.g. watershed protection)[9,12]. However, implementing PES needs a thorough analysis on economic, social, environmental and local constraints and circumstances (e.g. government policy and socio-cultural aspects).

Though adoption of agroforestry is considered as one of the sustainable land use practices in many developing countries in watershed protected areas still there are many criticisms of this from the farmers. Accordingly, Mercer and Pattayanak[13] categorized some factors into the five technology adoption such as economic incentives, biophysical conditions, risk and uncertainty, household preferences, and resource endowments. The authors suggest that market or economic incentives is positively related to adoption such that the higher the farm income the more likely the farmers will adopt; while steepness of the farm location is also positively correlated with adoption; risk and uncertainty especially on tenure shows negative relationship to adoption. This means that those who do not own the land are less likely to adopt to sustainable land use practices. Meanwhile, household preferences are considered good indicators for adoption depending on the cultural, educational and experiences in life of a person. For example, the higher the educational attainment the more likely farmers will adopt to land use change. Lastly, cash allowances on the farmers increases adoption of the technology. This is advantageous to the farmers since this will add more income to their livelihood.

Another important factor that affects the adoption of agroforestry was scrutinized by Meijer, Catacutan, Ajayi, and Sileshi[14] in which the role of knowledge, attitudes and perceptions in the uptake of agricultural and agroforestry innovations in Sub-Saharan Africa shows that the processes of adoption in the farmer level is complex. The authors found difficult to reconcile the extrinsic and intrinsic motivational factors in decision making when faced in such situation. More recently, Maluki, Kimiti, Nguluu, and Musyoki[15] showed that the rate of adoption in agroforestry is low in Mumbuni and Ndovoini, Kenya. Its adoption was significantly influenced by the following: size of the household, mode of acquisition of land, security of land tenure, size of landholding, gender and the level of education of the head household.

In the Philippines, though there are lots of program about environmental conservation, protecting watershed still remains unsolved because of conflict of interest from the land user itself and government policy. Nevertheless, factors influencing the adoption of agroforestry technology seemed to be complicated[12] as there is no one size fits all.

Obviously, there are many studies on adoption of agroforestry with respect to socioeconomic and biophysical aspects, but there is a scant literature that looks into the land use practice as it affects the adoption such as shifting cultivation and slash and burn. In connection to this, the research is only focused on upland community's willingness to accept an incentive for land use change (e.g. from shifting cultivation to agroforestry) to protect the environment at the same time drawing some policy recommendation for environmental conservation, using socio-cultural, political and economic analysis. Conversely, it does not delve on the issue on intrinsic and extrinsic motivational factors as other have already studied it[12]. Rather, this study looks at what motivates farmers in adoption agroforestry from an economic and environmental point of view. It is because, there has been efforts to protect watersheds and forest like CBFM and NGP, still sustainable practices is unattainable to many of the poor people because it is costly[16]. Unlike other PES design which draws WTP for environmental policy, this study uses WTA to recommend economically, socially and environmentally viable solution to environmental degradation. Specifically it looks on the i. willingness to accept a compensation for adopting an alternative land use system; ii. factors that affect the respondents' willingness to accept a proposed alternative sustainable land use practice (e.g. agroforestry); iii. evaluate trade-offs in deciding to accept the compensation for land use change.

Methodology

Study area: Calbayog Pan-as Falls Hayiban Protected Landscape is one of the proclaimed protected areas in the Philippines in 1998 under proclamation no. 1158. It has a total land area of 7,832 hectares that is situated at between the two political districts of Tinambacan and Oquendo. Based on the report of the PENRO-Calbayog City Field Office CPHPL watershed was deforested with an area of more than 5,000

hectares before the implementation of the National Greening Program of Aquino's administration particularly the Pan-as Area. In 2013, the PENRO-Calbayog had reported that the deforested area was rehabilitated through the NGP and there was 1,450 hectares of reforested area out of the total deforested watershed area of the CPHPL. This program is a part of the CPHPL Watershed Rehabilitation Project of the LGU, Calbayog City Water District, CENRO, PENRO and it was participated by the People Organization (PO) of Sitio Pena 2. The CPHPL is composed of 13 barangays divided into two parcels (Pan-as and Hayiban).

Socio cultural Profile: In 1992, the Philippine Congress enacted Republic Act No. 7586 establishing the National Integrated Protected Areas System (NIPAS). Its mandates include the creation of protected areas to conserve biodiversity, and provides the basic framework for the conservation and management of protected areas in general. Through this act, it can be inferred that watersheds are protected but in reality it's not. For instance, community-based forest management programs are not enough to support sustainable watershed protection because land use practices in upland communities do not coincide with the protection program of the government. In the study of Malabarbas and Celeste[3], results shows that many of the respondents are highly and moderately aware of watershed and its protection programs. However, this awareness was not translated into action since people's land use practices are not coherent to watershed protection practices. For instance, there were 10.7 percent (69) respondent's answered that they are practicing slash and burn farming (e.g. kaingin system) despite the fact that they were aware of watershed protection programs. Informal interview confirmed that slash and burned were practiced by many respondents before cropping, which has a positive relationship between the awareness and practices of watershed protection in Calbayog Pan-as Hayiban Landscape.

Research Design: The study used qualitative and quantitative research methods. Key Informant Interviews (KIIs) and FGD with selected farmers directly utilizing the land inside the watershed areas was conducted. The focus group discussion elicits issues on program implementation among farmer beneficiary of NGP. Cost estimation of production process was also explored during the discussion. This was used to improve the analysis on WTA which should be economically feasible, socially acceptable, and environmentally sound alternatives to current slash-and-burn systems. Survey among farmers in CPHPL was also conducted using contingent valuation methodology (CVM) with a willingness to accept (WTA) format in spite to the theoretical and empirical gaps between the WTP approach.

Accordingly, since PES pays those who provides for ecosystem services to downstream communities while adopting to new technology, thus willingness to accept needs to be investigated[17]. In addition, it is likely that the adoption of technology will incur welfare change of the farmer – that is from status quo to a new welfare. Hence, WTA was used for deriving the resource value and also eliciting consensus among stakeholders where their participation to the program would contribute significantly to its success. To remove any bias on the results of WTA, adequate question should be site- specific and should reflect both political and socio-economic circumstances of the specific environmental change to valued[18].

Elicitation of Bid Amounts: Preliminary survey was conducted to test the bid amounts used in the WTA questionnaires. Secondary data regarding farmer's monthly average income and farm income[3] were also used as basis for the bid amounts. Furthermore, comments from preliminary survey were taken into consideration in framing the WTA questions. Focus group discussion (FGD) with the where a farmer association was conducted to gather salient data regarding the WTA of alternative land use practices and the cost of farming among the farmer respondents.

Data Collection and Elicitation of Willing to Accept: The study employed survey questionnaire using a contingent valuation format with willingness to accept approach which uses stratified random sampling[19] focusing on the upland farmers. The questionnaire to be used is composed of five (5) parts. Part I is the survey protocol and statement of confidentiality. Part II assessed the farm characteristics such as land tenure, livelihood income generating activities and average monthly income from forest and agriculture use. Part III assessed the awareness of government incentive programs and watershed. Part IV presents the contingent valuation question using willingness to accept approach. To avoid hypothetical bias, a "cheap talk" and pictures about agroforestry system was presented to the respondents and was asked about their voluntary enrolment to a hypothetical program. After which debriefing questions will be employed to minimize hypothetical bias[19]. Part V assessed the respondents' socio-demographic profile as the last part as a proper and standard way of doing CV studies[20].

Analysis of WTA: The data gathered from CV survey was rigorously analysed using the standard econometric modelling. In spite to the theoretical controversy of WTA even to this very date among practitioners and economists. Nonetheless, this is still quite a good way to measure individual welfare gains in adopting a project or policy. Theoretically, WTA can be used to measure welfare gain[20]. In this study, WTA represents farmer's willingness to accept compensation for land use change – that is shifting from unsustainable practices to a more sustainable land use system (e.g. agroforestry). However, as farmers inside the CPHPL, protecting the watershed and its biodiversity entails opportunity cost (e.g. income from farming and other livelihood activities). Economic theory suggest that farmer's utility is derived from this livelihood activity inside the watershed protected area. Activity would include land use practices like monocropping, intercropping, shifting cultivation, slash and burn and grazing. Participating to the protection program would entail a gain in their current state of livelihood income referred

as reference point (H_0)[20] to a new state H_1 (after accepting or adopting the policy intervention or program (A_1).

In this study, the WTA is examined to know the willingness to accept to forgo the gain while maintaining the utility level of the farmer individual. Thus, WTA is equals to equivalent variation. Like many WTA studies, this study uses logit model where WTA takes a binary response "Yes = Y_i" for participating or accepting while "No" if otherwise. In here, logit regression was used as the statistical tool with the following dependent variables and independent variables.

Dependent variable: Willingness to Accept compensation for land use change.

Independent variables includes the following: as adopted from the study of Lindhjem and Mitani[21]. i. Farm characteristics: (e.g. farm size, tenure, land use type or practice, number of harvest per year), ii. Policy and economic variables: (e.g. government incentive program, access to credit), iii. Environmental variables (e.g. awareness of watershed, agroforestry, ecosystem provider), iv. Owner characteristics: (e.g. socio-demographic profiles, residence, age, education, membership in farmers association, income).

Willingness to accept elicitation question: The WTA elicitation question is patterned after the study of Lindhjema, and Mitani[21] and Nyongesa, Bett, Lagat, and Ayuya[22]. However, in this study, some adjustments has to be made to suit to the local circumstances in the site location.

The question goes: Suppose an NGO or the government initiates/starts a project on different agroforestry system of your choice to protect the CPHPL and provide sustainable ecosystem service in lowland communities. This project will require farmers to adopt to agroforestry system and you will be paid for the trees you would plant in your farm and allowed to harvest at most 50% of the trees of which you plant yearly. Take note that these tree seedlings are also provided for free.

Would you be willing to adopt the project? Yes [ ] No [ ]

If YES, will you be willing to accept an annual payment of _____ per hectare in compensation for shifting into agroforestry? The amount you state will not be used to decide compensation for your forest, but will give an idea about how much conservation would cost in total.

Data processing and interpretation: The data gathered were analysed using SPSS version 24 while coding was done in Excel. The dependent variable which measures their willingness to accept is equal to YES. In this case, YES is equal to 1 if the respondent would accept compensation for land use change and 0 if otherwise which is equal to NO. Table-1 summarizes the dependent (WTA=1) and independent predictor variables (e.g. farm characteristics, policy, socioeconomic, and environmental).

Results and discussion

Socioeconomic profile and farm characteristics of Calbayog: Pan-as Hayiban Protected Landscape Farmers: Based on the survey, farmers in CPHPL has an average farm size of 1.94 hectares and many of them (64.3%) has below 1 hectare farm area. A large percentage of the farmers are tenants (39.1%), other farmers owned the land but without title (23.1%) while only few of the farmers are renting the land (1.4%). Less than one fourth of the farmers were practicing monocropping (20.65%), however, many of them were practicing a combination of intercropping (24.34%), shifting cultivation (24.34%), slash and burn farming (27.60%) and a little of grassland /pasture area (3.04%). On average, farmers harvest at least thrice a year (2.7), while the cost per cropping is P 5, 028.53. Most of the farmers belong to 48-57 years with an average of 49 years. Majority of the respondents were male (97.3%). Mostly married (90%), and is the household head (97.5%). Many of them (44.9%) have 4-6 members in the family with an average of 5 members. Half of the respondent's attained primary level of education, only a few with bachelor's degree (1.1%) with farming (91.2%) as the major occupation and only a little (5.5%) had a small business. Their monthly income falls in between Php1,001-Php 5,000 (66.5%) with an average of Php 3,489.80 and off farm income of P 2,759.42 which is below the poverty threshold in the Philippines. Thus, it is true up till this time that majority of the farmers especially in the watershed protected areas are low income earners.

Factors affecting the WTA: Among the group of variables, after conducting multicollinearity and heteroskedasticity to ensure that variables are suited and perfectly fit to describe the respondents WTA using the different models, it appears that only farm characteristics (Model 1) and socioeconomic profile (Model 2) have significant results in the predictor variables.

Using the farm characteristics such as farm size, land tenure, land use practices, cost per cropping, and number of times harvest as predictors. It appears that shifting cultivation (p=.02) and bid amount (p=.048) predicts the WTA of farmers in CPHPL among all other variables. The Exp(B) value indicates that when shifting cultivation is raised by one unit (e.g. one person practicing shifting cultivation) the odds ratio is 141 times as large and therefore farmers are 141 more times willing to take the offer. Meanwhile, when bid amount is raised by one unit (in thousand peso) the odds ratio is 1 times as large and therefore farmers are 1 more times willing to take the offer (Table-2). This would mean that instead of doing short term crop rotations and short fallows as a traditional shifting cultivation practice by many Asian countries[23], farmers are willing to venture into a full type of subsistence agroforestry farming, of which many farmers claimed have improved their farm income[24]. More so that those farmers who are practicing shifting cultivation will participate because they have the reason to do so. It's because the program is catered to provide alternative and sustainable land use technology.

Table-1: Dependent and Independent variables.

Variable Classification	Description	Variable Type
Dependent Variable		
WTA = 1 = Yes	Willingness to Accept Compensation for land use change	Dummy Variable (Yes= 1, 0 = Otherwise)
Independent Predictor Variables		
Farm Characteristics		
Farm Size	Size is in square meter	Continuous
Land tenure	Ownership of the land	Dummy Variable (Yes= 1, 0 = Otherwise) (Borrowed, Rented, Owned with title, owned without title. Tenant)
Land use type/practice	Refers to the farming practices of the farmers	Dummy Variable (Yes= 1, 0 = Otherwise) Mono cropping, Intercropping, Shifting Cultivation, Slash and Burn, Grassland)
Cost per cropping	Estimated cost of farming per cropping	Continuous
Harvest times/year	Number of times the farmer harvest the crops	Continuous
Policy and Economic Variables		
Extension services received	Extension services received for the past six months	Dummy Variable (Yes= 1, 0 = Otherwise)
Extension providers	Agency or organization providing extension services	Dummy Variable (Yes= 1, 0 = Otherwise)
Aware of NGP	Awareness of National Greening Program (NGP)	Dummy Variable (Yes= 1, 0 = Otherwise)
Information dissemination	Where did the farmer learned the information about the NGP	Categorical (Media, Seminar, NGO)
Beneficiary of 4Ps	Receiving cash from 4Ps	Dummy Variable (Yes= 1, 0 = Otherwise)
Access to credit facility	Had access to credit facility (e.g. ASA, CARD, DUNGGANON, etc.)	Dummy Variable (Yes= 1, 0 = Otherwise)
Socioeconomic Variables		
Age	Age of respondents	Continuous
Gender	Gender	Categorical Variable (1= Male, 2 =Female)
Civil Status	Civil Status	Single, Married, Separated, Widow
Gender of household head	Gender of Household head	Categorical Variable (1= Male, 2 =Female)
Number of members in the family	Family size	Continuous
Educational Attainment	Educational attainment	Categorical (Elementary level, elem. Grad., HS level, HS Grad., Bachelor)
Household head occupation	Occupation of the Household head	Categorical (employed, not employed, farmer, farmer with business)
Family Income	Monthly income	Continuous
Off-farm Income	Average off farm income	Continuous
Environmental Variables		
Member of environmental/ community organization	Membership in any environmental cause oriented groups/community org. or association	Dummy Variable (Yes=1, 0=Otherwise)
Awareness about agroforestry	Aware about agroforestry	Dummy Variable (Yes=1, 0=Otherwise)
Awareness about watershed	Awareness about watershed	Dummy Variable (Yes=1, 0=Otherwise)
Aware being ecosystem service provider	Aware being ecosystem service provider	Dummy Variable (Yes=1, 0=Otherwise)

Table-2: Farm Characteristics (Model 1)

Parameter	B	S.E.	Wald	df	Sig.	Exp(B)
Farm Size	-4.0E-06	1.1E-05	1.4E-01	1E+00	7.1E-01	1.0E+00
Land Tenure			1.9E+00	3E+00	6.0E-01	
Borrowed	3.366	2.528	1.772	1	0.183	28.957
Rent	1.017	2.049	0.246	1	0.620	2.764
Owned without title	1.550	1.654	0.878	1	0.349	4.713
Monocropping	2.631	2.402	1.200	1	0.273	13.892
Intercropping	-2.927	2.268	1.666	1	0.197	0.054
Shifting cultivation	4.954	2.128	5.418	1	0.02*	141.700
Slash and burn	2.007	1.556	1.663	1	0.197	7.441
Grassland	17.865	17689.840	0.000	1	0.999	57384122.00
Cost per cropping	0.000	0.000	0.441	1	0.506	1.000
Harvest	0.052	0.925	0.003	1	0.956	1.053
Bid Amount	0.000	0.000	3.902	1	0.048*	1.000
Constant	-5.249	3.071	2.922	1	0.087	0.005

Note: * - significant at p-value <.05.

Meanwhile, among socioeconomic predictor variables such as age, civil status, family size, educational attainment, household head occupation, monthly income, other source of income and off-farm income (in pesos) as predictors. The Wald criterion demonstrated that AGE made a significant contribution to prediction (p=.037), with off farm income (p=.025) and BID Amount (p=.334). All the rest of the variables were not a significant predictor. The Exp(B) value indicates that when farmers become older the odds ratio is .89 times as large and therefore farmers are .89 more times likely to decline the offer' considering that as they grow old, their working capacity also depreciate won't be able to cope with the demands of the project or program. This can also be explained by the negative coefficient (B=-.109). On the other hand, the Exp(B) in other source of income value indicates that when farmers have other source of income the odds ratio is 15 times as large and therefore farmers are 15 more times likely to take the offer' considering that PES will serve as other source of income (Table-3). Likewise for BID amount, any increase in amount offered would tend that farmers would accept the compensation which is similar with the result of other WTA study[25].

Both models (1 and 2) suggests that WTA is dependent on the offered monetary incentive (e.g., bid amount), land use practice such as shifting cultivation and age. This is similar to the findings of Fortenbacher and Alave[1] were income and land use rights are among the many factors which may affect acceptance of compensation for a change in land use practices[1] and why a slow rate of adoption of agroforestry exist.

Farmer's reasons for willingness to accept compensation for land use change: Accordingly, there are 62% of the farmers who are willing to accept compensation with the following payment per hectare per year. This implies that majority of the farmers in the CPHPL would likely to be part of a project. Though many of the farmers are willing to accept compensation, some farmers (38%) did not respond positively with the question (Table-4). There are some reasons why they would not want to participate in the program.

Conversely, key informant interviews and focus group discussions suggest that the program is good but it is difficult to apply it in their own way. Some farmers are also somewhat afraid to participate in the program thinking that the government might displace them from being a tenured migrants. According to one of the participant of the FGD, there is really the tendency to practice slash and burn as learn clearing process because it is easy and saves time. While some other reasons for the decline of participation or adoption of the program based on the survey is that some farmers are satisfied with their current farm income (33.3%). Meanwhile 27.1 percent believed that the program does not provide such benefits. Moreover, only few said that they do not trust the government (10.4%) and the rest are amenable that they just cannot do it.

Table-3: Socioeconomic Profile to WTA (Model 2).

Parameters	B	S.E.	Wald	df	Sig.	Exp(B)
Age	-0.109	0.052371	4.346571	1	0.037*	0.896564
Civil Status			9.04E-07	3	1.000	
Single	-1.403	47560.93	8.7E-10	1	1.000	0.245981
Married	-17.934	25427.69	4.97E-07	1	0.999	1.63E-08
Separated	1.646	47560.93	1.2E-09	1	1.000	5.187359
Family Size	0.124	0.233891	0.281204	1	0.596	1.132049
Educational Attainment			2.220244	5	0.818	
Elem Level	23.786	40193.09	3.5E-07	1	1.000	2.14E+10
Elem Grad	25.893	40193.09	4.15E-07	1	0.999	1.76E+11
HS Level	24.713	40193.09	3.78E-07	1	1.000	5.41E+10
HS Grad	23.772	40193.09	3.5E-07	1	1.000	2.11E+10
Bachelor	43.112	56841.53	5.75E-07	1	0.999	5.29E+18
Household Head Occupation			1.724437	3	0.632	
Employed	24.832	40193.12	3.82E-07	1	1.000	6.09E+10
Not employed	22.858	40193.12	3.23E-07	1	1.000	8.45E+09
Farmer	43.012	56841.55	5.73E-07	1	0.999	4.79E+18
Monthly Income	0.000	0.000259	0.491654	1	0.483	0.999818
With Off farm Income	2.711	1.216365	4.967672	1	0.026*	15.04534
Off farm income (PhP)	0.000	0.000165	1.118163	1	0.290	1.000175
BID Amount	0.000	0.00014	4.523101	1	0.033*	1.000299
Constant	-28.4868	62269.98	2.09E-07	1	1.000	4.25E-13

Note: * - significant at p-value <.05

Table-4: Distribution of bid amount according to WTA response.

BID Amount	Willingness to Accept				Total
	NO	%	YES	%	
2500	35	31	30	17	65
5000	16	14	36	20	52
7500	16	14	39	22	55
10000	21	19	40	22	61
15000	25	22	36	20	61
Total	113	38	181	62	294

Further, those who were willing to participate in the program were asked what farming technology they would prefer. Most of them want to try multi-storey system (70.2%), only a little are interested in livestock with trees and CAT (6.2%). Meanwhile, intercropping had 12.9% probably because farmers are already practicing this kind of farming technology. With regards to the area they wanted to be enrolled in the program, about 43.8% want only a portion of their land (less than 1 ha), while many (32.4%) preferred to have 1 hectare to be enrolled in the program. Only a little preferred that their entire land will be subject to the said program. This results is valid because farmers have at least 1 hectare of farm based on their farm characteristic.

Estimating values for watershed protection program activities through land use change: To estimate the Mean WTA for compensation in land use change, there is a need to compute for the payment for participating for the program. Based on the discussion of Oddershede[23], Mean WTA is computed with the formula:

$$\text{Mean WTA} = \frac{x_1\beta_1+x_2\beta_2+x_3\beta_3+x_4\beta_4+x_i\beta_i}{\beta_{bidamt}}$$

From the results of logit regression, it appears that only farm characteristics (Model 1) and socioeconomic profile (Model 2) have made significant result as predictor to farmers WTA. Thus, the following computation is made for the two models:
Model 1 logit (Y=1=WTA) =β+shifting cultivation/ bid amount

Model 2 logit (Y=1=WTA)=β-age+with off farm income/bid amount

In this study, Model 1estimated value is Php13,807.55/ha/yr or an aggregate of Php50,430,387.46/ha/year. While Model 2 estimated Php17,334.40/ha/year or an aggregate of Php63,11, 760.85/ha/year per household. It can be gleaned that Model 1 is lower than Model 2. The large estimate is expected because WTA has endowment effect[26] – this means that farmers give more value to what will be lost to them in exchange to what they will gain from joining or adopting the program. It can be inferred from comments during the FGD which according to the farmers, *the government might take their lands in exchange for the payment.* On the other hand, literatures suggest that WTA or this estimated value could be treated as the minimum willingness to accept[27] for compensation. This however, could not be used to decide for the exact payment but rather an estimate of the cost of watershed protection and rehabilitation through land use change. To implement the payment, we did a cost-benefit analysis and examination of the trade-offs among livelihood activities vis-à-vis to the adoption the program.

Evaluating Farmers Cost in Participating PES program: In participating to government programs like watershed protection, ex-ante estimates should also be measured to determine the possible effect on the part of the adopter. Asking the willingness to accept to adopt for the program entails cost (e.g. social and environmental cost). In this regard, measuring the cost of the farmers in participating the program vis-à-vis the benefits the program can be derived is necessary. In this study, cost of participating the program does not mean only to the cost per cropping they had. But rather the value that will be lost or gain to them if they participate in the program referred as the opportunity cost. Welfare theory suggest that an increase in consumer's income is the utility which is maximized from making a decision. This is the change of initial welfare (reference point) with respect to their new welfare state (e.g. benefits).

We used four scenarios in the cost-benefit analysis to be more sensitive in our estimation. Results from the FGD from one farmer organization inside the CPHPL area were used as basis of the cost estimation.

Scenario 1 (household income) used the monthly income and off farm income based on the conducted survey of upland farmers and the Mean WTA estimated value in model 2 of Php17,334.40/ha/yr.

Scenario 2 (farm income) includes the initial welfare of the farmer based on their current level of income derived from the farm activity is Php54,600/year (e.g. abaca which is Php21,000//ha/year and coconut of Php33,600 /ha/yr). While the benefits that they will receive from the program is Php13,807.55/ha/yr as computed from model 1 Mean WTA. If farmers opt to enroll in the program, they would not only earn 54, 600 but Php68,407.55/ha/year (to include the incentives and their initial farm income).

However, scenario 3 was analyzed using the same data in scenario 2 (income from abaca and coconut) plus the MWTA of model 1 at Php13,807.55 if it would have an effect to the decision rule.

Looking at the table below, farmers are better off under scenario 3 with 17% internal rate of return (IRR). However, for all scenarios, a positive NPV, BCR and IRR is observed. As a rule of thumb, a positive NPV, IRR and BCR is favorable for any program or project. In this case, the decision to accept Php13, 807.55/ha/yr to enroll in the program of land use change will incur a welfare gain on the side of the farmers. The amount may be too low for them, since based on the FGD the farmers demanded for Php30,000/ha/yr. But providing Php30,000per year may be also too high for the government. Hence, we tested scenario 2 in which we had a positive NPV, IRR and BCR which is an indicator that the farmer is better off if they will participate or join in the program. Notice that we used both Mean WTA for Model 1 and 2 as the additional benefits that they would receive in joining the program. But again this should not be made as the ultimate incentive to be given to the farmers but needs further study and stakeholder consultation if this would be adopted. This would tell us that the estimate Mean WTA at Php13,807.55/ha/yr is conservative enough for policy makers as basis for the incentives.

Interestingly, scenario 3 revealed that using MWTA model 2, farmers are better off in their situation. Moreover, scenario 4 used scenario 2 as baseline date with a discount rate of 15%. It shows that scenario 2 has the highest NPV, IRR and BCR compared to scenario 4. Nevertheless, the farmer are still better off at scenario 3.

Table-5: Summary of sensitivity analysis of decision making rules.

Decision Rules	Scenario 1	Scenario 2	Scenario 3	Scenario 4
NPV	31,368.50	29,695.66	51,227.23	14,696.90
BCR	1.06	1.08	1.13	1.04
IRR	8%	10%	17%	6%

Note: Scenario 1: HH Monthly income, off farm income + MWTA in Model 2 + 10% discount rate. Scenario 2: Income derived from abaca and coconut per ha/yr + MWTA in Model 1 + 10% discount rate. Scenario 3: Uses baseline scenario 2 plus MWTA of Model 2. Scenario 4: Uses baseline scenario 2@15 % discount rate.

Conclusion

The study just demonstrated the farmer's willingness to accept compensation for adopting an alternative land use system in Calbayog Pan-as Hayiban Protected Landscape (CPHPL). Eventually, majority of them (62%) were willing to accept the compensation for a land use change. On the other hand, factors that would affect its WTA are shifting cultivation, with off farm income, age and bid amount. Meanwhile, the reasons for declining the project is more on the satisfaction on the current income of the farmers followed with the belief that the kind of program do not provide such benefits to them. Other categories of independent variables like environmental and policy and economic variables did not appear to matter in the farmers WTA though in most cases it does influence WTA (i.e. land tenure). Conversely, the aggregate economic value of the CPHPL from the farmers WTA amounted to Php 50,430,387.46/ ha/year and Php 63,311,760.85/ha/year per household for Model 1 and 2 respectively. This value is the estimate that would help implement watershed protection program that would buffer the livelihood of the farmers. Any amount below the estimated value of WTA at Php13,807.55/ha/yr/household should be examined closely and be decided with the participation among stakeholder's prior implementation. This is because WTA is treated as the minimum incentive for farmers to participate in the program. This implies that it is the minimum amount that farmers are willing to join the program.

Since farming is the bread and butter of this upland communities and contributes largely to the food security and livelihood of farmers[2] policy makers need to consider the economic and socio cultural aspect of the community as well as its political involvement. Often, incentive programs from government are lesser compared to the income that farmers would receive from their farming activity. As such, determining the amount to be given is very important because this would add to the success of the program. While it is true that poverty in general and farmers income (in particular) is not adequate in explaining land use change[28], market incentives (e.g. compensation to shift to sustainable land use practice) would enable PES scheme to be successful[29].

Unlike other agroforestry studies, we argue that the land use practice (e.g. shifting cultivation) should be considered in policy making for incentivizing farmers because aside from income, traditionally and culturally, in Philippines and other developing countries shifting cultivation has been the practice. As such, shifting cultivators needs to have alternative sustainable land use technology (e.g. agroforestry) with proper financing mechanism to properly implement and sustain the program.

Recommendation: The researcher would like to recommend policy makers to be precise about the farmer's incentives to compensate the participating farmers. There should be proper consultation and close collaboration between NGO, academe and the farmers involve should prior to the implementation of PES. On the part of the implementers, PES activity should be monitored closely to avoid problems in implementation. More especially that PES is voluntary in nature.

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