

Potential of Payment for Ecosystem Services (PES) for the Conservation of the Layawan Watershed in Upland Communities in Misamis Occidental, Philippines

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INTRODUCTION

The establishment of protected areas (i.e. natural parks, reserves and sanctuaries) is among the efforts to conserve and preserve the remaining natural environment (BMB 2014; Chape *et al.* 2005). In the Philippines, Republic Act 7586, otherwise known as the National Integrated Protected Areas (NIPAS) Act, was enacted for the said purposes (La Viña *et al.* 2010; Dressler *et al.* 2006; NIPAS Act 1992), and also as the country's response to its global commitment to the Convention of Biological Diversity (CBD) to ensure that future generations will benefit from the environmental goods and services that the present generation currently enjoy (La Viña *et al.* 2010; Subade 2007; MA 2005; NIPAS Act 1992). One of these important ecosystem services is water provided by watersheds.

A watershed is a catchment or a reservoir that serves primarily in conserving the water resource aside from improving biodiversity and other ecological functioning (Nilsson & Renöfält 2008; Swallow *et al.* 2002). These resources are threatened due to conflicts between conservation and social needs (Brown 2002; Turner *et al.* 2000), magnified by increasing human population especially in the uplands (Pressey *et al.* 2007). Several studies have focused on finding solutions to reconcile ecological conservation with economic development (Tallis *et al.* 2008) to achieve sustainable development. Indeed, sustainable development is not easy to attain but continuous efforts have been proposed to support our ecosystem, one of which is the mechanism called Payments for Ecosystem Services or PES (Norgaard 2010).

ABSTRACT

The Layawan Watershed is one of the important major rivers emanating from Mt. Malindang Range Natural Park (MMNRP) that supplies water to Oroquieta City and nearby towns. Over the years, different anthropogenic activities, together with changing global climate, negatively affected the park. Studies show that the water produced by the watershed has been decreasing, while the demand for water is increasing. Thus, there is a need to conserve and protect the Layawan Watershed to prevent further degradation and ensure the sustainable production of ecosystem services. This paper analyzed willingness of upland communities to participate in the Layawan Watershed Conservation and Management Program (LWCMP). A contingent valuation survey involving 110 respondents from six upland barangays of Oroquieta City was conducted to evaluate: the respondents' awareness about and perceptions towards the conservation and protection of the Layawan Watershed, their openness to and opportunity costs that would be incurred if they would adopt new conservation techniques, and their willingness to accept (WTA) compensation. The results of the study show that 99% of the respondents are willing to participate in the LWCMP despite the fact that their land will be subjected to a permanent conservation easement. In general, the Subanen tribe had a positive perception and feelings towards the different statements provided in the survey. They agreed on most of the statements and have identified provision of fresh water for drinking, domestic, agricultural and industrial uses as an important watershed service (90%). The total average willingness to accept compensation revealed in the survey (PhP 3,050/month) is higher by 56% compared to the total average farm income (PhP 1,334/month). Furthermore, the WTA amount elicited is higher by 5% compared to the total average households' income (PhP 2,887). The high level of willingness to participate in the conservation program presents great potential in implementing a Payment for Ecosystem Services (PES) scheme in Layawan Watershed.

Key words: Payment for Ecosystem Services (PES), reverse auction, watershed conservation, willingness to participate

PES is generating interest among conservation scientists because it offers a promising approach to protect the ecosystem while at the same time addresses the economic aspect of development (De Groot 2002; Alkemade *et al.* 2010; Engel *et al.* 2008; Spangenberg & Settele 2010). The important role that ecosystems play in providing goods and services is widely recognized (Ojea *et al.* 2012; Plummer 2009; MA 2005).

Flood control, water regulation, soil erosion control, water purification, and continuous water supply are common concerns under the Millennium Ecosystem Assessment (MA) frameworks (Lele 2009; MA 2005), making it necessary to conduct studies in watershed areas. The watershed services associated with water as a resource relate to the consumptive

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use of water by upland and lowland households, farmers and industrial fields (Engel *et al.* 2008; De Groot *et al.* 2002).

Mt. Malindang Range Natural Park (MMRNP) is one of the 12 protected areas declared in Region 10. It is both a Watershed Reserve and a Natural Park (RA 9304). MMRNP covers 34,694 ha of land, and falls under the jurisdiction of the provinces of Misamis Occidental, Zamboanga del Norte and Zamboanga del Sur in Northern Mindanao, Philippines. Its declaration as a protected area primarily aimed to protect and conserve the remaining natural forest of the Zamboanga Peninsula (PAWB 2012; GMP-MMRNP 2010). The MMRNP hosts fifteen (15) major water catchments, one of which is the Layawan Watershed with a total area of 10,076 ha (Palao *et al.* 2013).

The Layawan River is one of the major rivers running through Mt. Malindang. It provides water resources to Oroquieta City and nearby towns. The condition of the Layawan Watershed influences the quality and quantity of the water being supplied to the lowland community. Being part of the MMRNP, the Layawan Watershed has been negatively affected by the anthropogenic pressures to the environment, specifically human encroachment, illegal cutting of timber, slash and burn practices, and gathering of firewood (SEARCA-BRP 2006). These human-induced activities, together with changing global climate, have adversely affected the park and have caused great losses of important flora and fauna, shortage of food and agricultural products, low water supply, and denudation of upland areas due to accelerated soil erosion.

The study looked into the willingness of upland farmers to participate in the Layawan Watershed Conservation and Management Program (LWCMP). Specifically, the study assessed the respondents' awareness about and perceptions towards the conservation and protection of the Layawan Watershed, their openness to and opportunity costs that would be incurred if they would adopt new conservation techniques, and their willingness to accept (WTA) compensation.

METHODOLOGY

Sampling Technique

Figure 1. shows the conceptual framework of the study. A combination of probability and non-probability sampling techniques was used in the study. The sample households were systematically chosen (two-house interval) for the barangays of Bunga, Dullan Norte, Victoria, and some portions of Toliyok. The non-probability sampling technique was used in the barangays of Sebucal, Mialen, and some portions of Toliyok due to inaccessibility and peace and order considerations in the area. In this case, the respondents were selected without intervals, and the household next to the other was interviewed. A total of 110 households were included in the survey.

Contingent Valuation Survey

A contingent valuation survey questionnaire was prepared to evaluate the willingness of upland communities to participate in the LWCMP. The questionnaire had five major parts: (1) introductory part that stated the intent, purpose and importance of the respondents' participation in the survey, (2) socio-demographic profile of the respondents, (3) basic farming information that provided the basis in identifying the possible

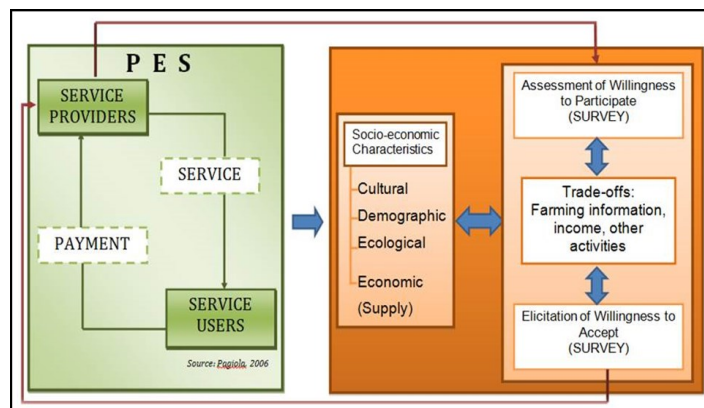


Figure 1. Conceptual framework of the study

opportunity costs of upland communities in participating in the program, (4) questions and statements that measured the level of awareness of the respondents about MMRNP and Layawan Watershed, and (5) the contingent valuation scenario. The questionnaire provided a description of the present condition of the Layawan Watershed and the water supply situation. It also presented the proposed LWCMP, Layawan Watershed Conservation and Management Fund (LWCMPF), and the reverse auction mechanism that would provide a means of compensation. The last part presented the willingness to participate and willingness to accept questions, the latter to determine the amount respondents would be willing to accept to participate in the program. Debriefing questions and statements important in the analysis of upland communities' perception and attitude towards the protection and conservation of the Layawan Watershed were likewise presented.

A semi-structured open-ended question was used in gathering information. These were mostly in the form of multiple choice type of questions and questions answerable by yes or no. Likert scale was used to determine the level of importance in majority of the survey questions and in scaling responses.

The Proposed Layawan Watershed Conservation and Management Program

The barangays surveyed were divided into primary upland barangays (PUB), namely Toliyok, Mialen, and Sebucal; and secondary upland barangays (SUB), namely Bunga, Dullan Norte, and Victoria. The CV scenario explained to the respondents the creation of the LWCMPF, and the objective of the LWCMP to generate solutions to the different forest related problems and secure sustainable water supply for Oroquieta City. Under the LWCMP, the Subanen and upland migrant communities will be highly involved in protection and conservation activities. Destructive forest activities will be reduced through regular patrolling and monitoring activities. Sustainable upland farming technologies will be employed, and upland communities will be given sustainable livelihoods to compensate the opportunity costs they will incur in adopting improved farming technologies from destructive ones.

Under the hypothetical market created for the survey, the lowland dwellers benefitting from the watershed will serve as buyers of the watershed services while the upland communities will serve as sellers. The Oroquieta City Water District (OCWD), which sources raw water from the Layawan

Watershed, will collect fixed monthly contributions from water subscribers, which in turn will be remitted to the LWCMF. The fund will be used to support the conservation activities of the Subanen and upland migrants to ensure good water supply of Oroquieta City. They will be compensated if they will adopt watershed conservation measures and participate in the program as a whole.

Upland communities that will agree to participate in the program will convert portions of their land into permanent conservation easements. A reverse auction mechanism will be used, where upland communities, or the sellers, will submit bid amounts indicating the compensation they require to participate in the program. This is in contrast to a normal auction where buyers submit bids to buy a good or service. The seller with the least cost required shall be favored (Kelsey Jack *et al.* 2008). The Subanen and upland migrants will submit proposals to participate in the program. They will submit bids corresponding to the minimum one-time payment necessary to persuade them to put the property under a permanent conservation easement.

Elicitation of Willingness to Accept

The lowest possible amount that the respondents want to receive in exchange for their participation in the LWCMP was elicited. The respondents were reminded to consider their current income from farming and other benefits derived from their land in stating the amount they would be willing to accept in exchange for their participation in the program. An open-ended question was used to capture this information due to insufficient information gathered to create bid amounts that will represent the opportunity costs or the forgone economic value from participation in the LWCMP prior to the survey. The study recognizes the disadvantages of using open-ended questions in eliciting WTA such as overestimates of value. Thus, in order to validate the captured WTA values, indicative costs and benefits of the program as well as the indicative costs and benefits that upland communities can get from participating in the LWCMP were obtained.

Data Analysis

Descriptive statistical analysis was used in interpreting the data captured on households' willingness to participate in the PES program. Absolute frequency and percentage values were determined. The respondents' high willingness to participate in the LWCMP restricted the study from statistically identifying the significant variables that affect households' participation in the LWCMP. To address this, results from household interview were utilized.

The different variables under the socio-economic profile, basic faming information and level of awareness towards the protection and conservation of the Layawan Watershed were considered in determining their willingness to accept. It was explained to the respondents that the amount they would reveal should represent the amount that would be lost if they participated in the program (i.e. income they get from farming). The WTA values revealed by the respondents were categorized into five: (a) very high; (b) high; (c) moderate; (d) low; and (e) no data (for respondents who were hesitant to reveal their WTA).

Two-way ANOVA was used to determine the variables that have significant effects on the respondents' willingness to accept. The following were computed and presented in the ANOVA table (Sparks 2011).

The total sum of squares, SS_{Tot} , measures the total variability in the response variable values computed using the formula: (eq.1)

$$SS_{Tot} = \sum_{i=1}^a \sum_{j=1}^b \sum_{k=1}^n (Y_{ijk} - \bar{Y}_{...})^2.$$

The degrees of freedom, the sum of squares in two-way ANOVA tend to be influenced by the values of a, b, and N (eq. 2)

$$df_{Tot} = N-1, df_A = a-1, df_B = b-1, df_{AB} = (a-1)(b-1), df_E = N-ab$$

Note that $df_{Tot} = df_A + df_B + df_{AB} + df_E = N-ab$

The means of square, the sums of squares divided by their degrees of freedom (eq.3)

$$MS_A = \frac{SS_A}{df_A}, MS_B = \frac{SS_B}{df_B}, MS_{AB} = \frac{SS_{AB}}{df_{AB}}, MS_E = \frac{SS_E}{df_E}.$$

The interaction between variables was evaluated using the following decision rules: (a) IF $F_{calc} < F_{tab}$, interaction does not exist; (b) IF $F_{calc} > F_{tab}$, interaction does exist.

Probit analysis was also used to identify the slope and correlation between the dependent and independent variables. Moreover, it was used to analyze the relationship between the factor in study and the response. Probit analysis transforms a sigmoid curve to linear and then runs a regression on the relationship (Vincent 2008).

In the study, probits (short probability unit) were determined by looking up those corresponding to the % respondent in Finney's table (Table 1) or through the use of the equation (Finney & Stevens 1948 as cited by Vincent 2008):

(eq.4)

$$P = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{-5} e^{-\frac{1}{2}u^2} du$$

Variables were used to determine the degree of relationship to WTA. The following independent variables, namely gender, marital status, age, educational attainment, number of family members, total income per household, barangay, Subanen or Non-Subanen, outside/inside watershed, manner of land acquisition, land bought or rented, length of stay, years of farming, watershed/program awareness, watershed services, importance of watershed, quality of water, quantity of water, and problems with watershed were tested at 1% level of significance and at 99% certainty.

Table 1. Transformation of percentages to probits (Finney 1952)

%	0	1	2	3	4	5	6	7	8	9
0	—	2.67	2.95	3.12	3.25	3.36	3.45	3.52	3.59	3.66
10	3.72	3.77	3.82	3.87	3.92	3.96	4.01	4.05	4.08	4.12
20	4.16	4.19	4.23	4.26	4.29	4.33	4.36	4.39	4.42	4.45
30	4.48	4.50	4.53	4.56	4.59	4.61	4.64	4.67	4.69	4.72
40	4.75	4.77	4.80	4.82	4.85	4.87	4.90	4.92	4.95	4.97
50	5.00	5.03	5.05	5.08	5.10	5.13	5.15	5.18	5.20	5.23
60	5.25	5.28	5.31	5.33	5.36	5.39	5.41	5.44	5.47	5.50
70	5.52	5.55	5.58	5.61	5.64	5.67	5.71	5.74	5.77	5.81
80	5.84	5.88	5.92	5.95	5.99	6.04	6.08	6.13	6.18	6.23
90	6.28	6.34	6.41	6.48	6.55	6.64	6.75	6.88	7.05	7.33
—	0.00	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
99	7.33	7.37	7.41	7.40	7.51	7.58	7.05	7.75	7.88	8.09

RESULTS AND DISCUSSION

Layawan Watershed

The Layawan Watershed is one of the 15 major catchment basins of Mt. Malindang Range that covers a total area of 11,718 ha. Its annual precipitation ranges from 98.62 to 233.4 mm, which falls between November and December (LAM-IMO 2003). Rainfall in the watershed is more or less evenly distributed throughout the year, categorized under the Philippine Climatic Type IV of Corona's climate categories.

The watershed is composed of seven notable mountains and has an elevation that ranges from 100 to 2000 meters above sea level (masl). Among these mountains, North Peak has the highest summit (estimated to be 2183 masl), and is situated in Barangay Sebucal. The headwaters of the Layawan Watershed are also located in Barangay Sebucal, and the Layawan River drains to the coastal zone of Oroquieta City.

The Layawan River has a total length of 30.5 km with nine tributaries, and supplies water to different provinces in the Zamboanga Peninsula, namely Misamis Occidental, Zamboanga del Norte, and Zamboanga del Sur in Northern Mindanao, Philippines. The watershed is under the jurisdiction of two municipalities (Don Victoriano covering 2,769 ha and Aloran with 190 ha), and the City of Oroquieta with a total area of 5,749 ha.

The Layawan Watershed is composed of rice lands (197 ha), mangrove areas (63 ha), coconut lands (3,055 ha), forest lands (3,947 ha), and others (i.e. grasslands, shrublands and open lands). Forest lands (mainly mossy and dipterocarp forests) occupy the largest area in the watershed, and cover the upper portion of the watershed along the ridges of mountain peaks surrounding Old Liboron and Sebucal down to Clarin Settlement, Toliyok, Dullan Sur, Sinampongan, and Mialen.

Farming is the main livelihood of the upland barangays. There are about 15,335 ha of land cultivated for agricultural purposes and planted with rice (irrigated/non-irrigated), corn, vegetables,

root crops, fruits, and some commercial crops like coconut, coffee, cacao, and banana (CAO-Oroquieta City 2008). Upland farmers, especially those living in the uppermost barangays of Sebucal and Mialen, produce crops primarily for family consumption, but also sell to nearby barangays when the harvest is good. The barangays of Bunga, Toliyok, and Clarin Settlement, on the other hand, sell copra either in the city or nearby barangays. They usually intercrop coconut with fruit trees such as mangosteen, durian, lanzones, and marang.

Barangays of Dullan Norte, Victoria, Bunga, Toliyok, Mialen and Sebucal comprise the upland area of the watershed. Activities in these barangays significantly influence the condition of the whole watershed. The total land area covered by these barangays is 16,226 ha with a total population of 3,304. The number of households is estimated at 695 with an average household size of five. Its population density is approximately four persons per hectare. Figure 2 provides a location map of the Layawan Watershed and the barangays surveyed.

The barangays surveyed are dominated by young people with ages 24 and below (54%) and single individuals (55%). The female population outnumbered the male population with a sex ratio of 100 males for every 107 females. About a third (37%) of the people living in the area have had elementary education, while about 26% reached different levels in high school.

Human disturbances such as illegal logging, timber poaching, quarrying or sand and gravel extraction, encroachment in forested areas, and *kaingin* (slash-and-burn) have been identified as the primary problems in the watershed (Profile of Layawan Watershed 2010). The Protected Area Management Board (PAMB) considers the protection and monitoring of the whole protected area, including the Layawan Watershed, as major challenges, mainly due to the limited number of staff and forest rangers (4) and accessibility issues. It has also been noted that upland communities still cultivate areas within the protected area, but many of them do not adopt soil conservation measures, nor do they practice fallow period in their farms. These adversely affect water supply.

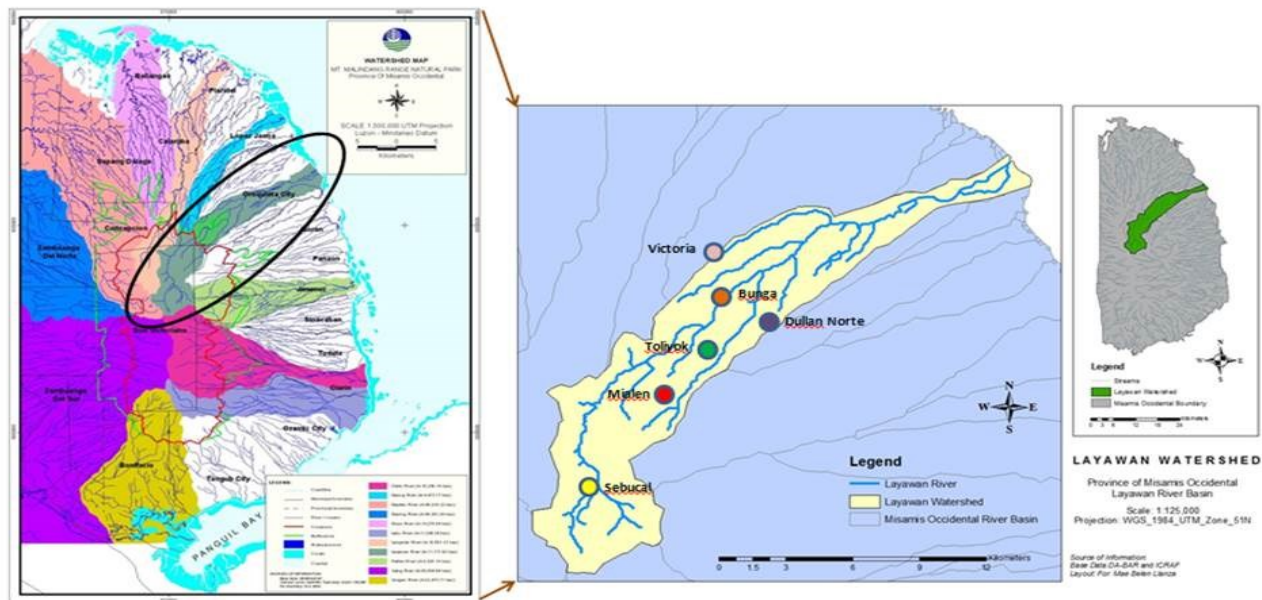


Figure 2. Location map of the Layawan Watershed and the barangays included in the study

Figure 3 shows that the forested area in the Layawan Watershed has been decreasing since 1973 due to logging activities in the area. Land conversion has intensified and has now reached the uppermost portion of the watershed. This situation of the watershed is alarming and can cause interrelated problems and issues in the area.

Water pollution is also evident in the watershed. Some of the agricultural activities in the uplands, such as application of fertilizer and pesticides, affect water quality in the watershed. Surface water in the tributaries and to some extent ground water resource has become unsuitable for drinking. Studies have confirmed the presence of coliform in the river, making water unsafe for drinking (SEARCA-BRP 2006). Water quality related problems are also remarkably attributed to erosion and sedimentation, temperature, and nutrient levels, among other things (Hansel *et al.* 2006).

Respondents' Profile

Only household heads (61%) and household members (39%) who were at least 18 years old at the time of the survey were interviewed because they have the capability to decide for their families. Seventy-four percent (74%) of the respondents were Subanen while the remaining 26% were upland migrants from different provinces such as Misamis Occidental, Cagayan de Oro, Bohol, Siquijor, Cebu, Zamboanga del Sur, and Zamboanga del Norte. The age of respondents ranged from 20 to 78 years with an average of 46 years old. Eighty-two percent (82%) of the respondents were married and living with their spouses. The average household size in the study area was four members in a family. Men (58%) outnumbered their female (42%) counterparts with sex ratio of 14 males for every 10 females. The highest level of education attained by the respondents was vocational graduate. The greatest proportion (42%) of the respondents were elementary undergraduates, followed by elementary graduates (20%) and high school undergraduate (12%).

Their primary source of income was cultivation of own farm (28%), while other sources of income not related to farming include furniture making, own business, driver, on call cleaner, glass cutter, store owner, rattan collector, carpenter, quarry, vendor, and laborer. The average primary income of households in all the barangays surveyed was PhP 1,823 per household per month (range: PhP 100-8,000 per household per month). On the other hand, the average household income from secondary sources was PhP 1,245 per household per month (range: PhP 30-6,000 per household per month). The average household income from all sources of all the barangays surveyed was PhP 2,887 per household per month (range: PhP300 to PhP 18,300 per household per month).

The main livelihood in the area is farming or work related to farming (53% of respondents). About 82% of the respondents owned a single farm lot with an average size of 1 ha, with 42% under conjugal ownership. Seventy-eight percent (78%) of the farms are located inside the watershed. Vital farming information is presented in Table 2.

On the average, land owners have used their farm for about 15 years already. About 74% of the respondents are able to plant on their land while 13% are not able to do so. The respondents' inability to plant on their land is mainly because of the following: (1) lack of capital (86%), (2) lack of capacity to hire laborers (57%), (3) lack of family labor (21%), (4) insufficient water supply (14%), and (5) other reasons (36%) such as continuous and too much rain, and poor soil quality. Eighty-five percent of the respondents expressed their interest in continuing farming activities in the future.

In the last 10 years, more than half (51%) retained the use of their land while about 7% of the respondents have converted their farmland to other uses. About 73% of the farmers allow their land to rest at least once a year (47%) at an average of two (2) months.

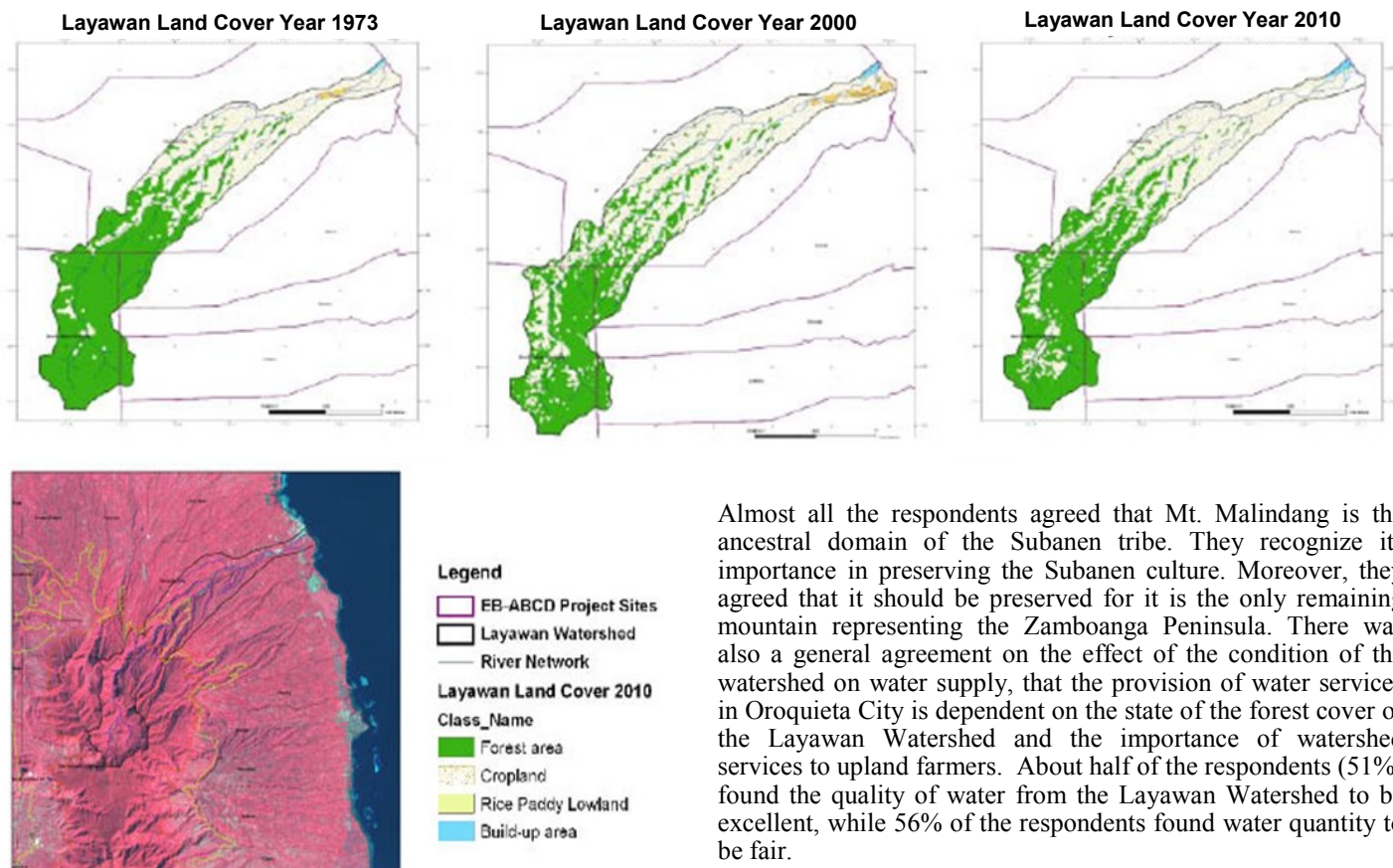


Figure 3. Time series map showing land cover change in Layawan Watershed

Awareness and Perceptions about the Mt. Malindang Range Natural Park and Layawan Watershed

Table 3 summarizes the responses to questions that sought to evaluate the awareness and perceptions of the respondents about the MMRNP and Layawan Watershed. In general, the Subanen tribe had a positive perception and feelings towards each statement. They agreed with the statements provided in the survey.

Both IPs and non-IPs were familiar with the terms watershed and protected area. However, based on the responses, upland migrants were more familiar because of their relative location to the lowland. Information dissemination is easier in the lower or secondary upland barangays, thus resulting in higher awareness and familiarity.

Respondents recognized the impacts of upland activities on the quantity and quality of the water supplied to lowland communities. They also agreed that the government is the one responsible for the management of the Layawan Watershed and that conservation of the watershed will be more effective if the community is empowered to implement the conservation program. Furthermore, upland migrants firmly believed that the Subanen, who live in the uplands, play a crucial role in the conservation and protection of the watershed.

Almost all the respondents agreed that Mt. Malindang is the ancestral domain of the Subanen tribe. They recognize its importance in preserving the Subanen culture. Moreover, they agreed that it should be preserved for it is the only remaining mountain representing the Zamboanga Peninsula. There was also a general agreement on the effect of the condition of the watershed on water supply, that the provision of water services in Oroquieta City is dependent on the state of the forest cover of the Layawan Watershed and the importance of watershed services to upland farmers. About half of the respondents (51%) found the quality of water from the Layawan Watershed to be excellent, while 56% of the respondents found water quantity to be fair.

Respondents were also asked to identify two or more services of the Layawan Watershed that they deemed important. The provision of fresh water for drinking, domestic, agricultural, and industrial uses was considered the most important watershed service by 90% of the respondents. About 44% of the respondents also stated that water storage is an important watershed service while 42% gave high importance to maintenance of water quality and quantity.

The survey also revealed that 94% of the households gave importance to the protection and conservation of the watershed for the following reasons: water retention (70%); host a number of economically important flora and fauna species (37%); minimize flood during the rainy season (36%); constant and continuous supply of clean and safe water (34%); avoid forest/nature destruction (22%); water for irrigation (13%); improve the water quality (13%); and lessen the effect of climate change (8%). The results indicate that the communities place great importance on the continuous provision of water and its availability in the future.

Willingness to Participate in the LWCMF

In the hypothetical market created for the study, upland communities will serve as the provider or seller of the watershed services, while the domestic water users located in the low lying barangays will serve as the buyer. A certain amount will be paid and placed in the LWCM Fund, which will be used to provide incentives and compensation to those who will participate in the LWCM Program through reverse auction. The preferred modes of compensation of the respondents are shown in Table 4.

Table 2. Farming information of respondents (n = 108).

Characteristics		Frequency			Percentage		
		PUV	SUV	TOTAL	PUV	SUV	TOTAL
No. of Farm Lots	0	4	10	14	29%	71%	13%
	1	46	43	89	52%	48%	82%
	2	0	5	5	0%	100%	5%
Lot Size	0.1-0.5 ha	18	24	42	43%	57%	39%
	0.6-1.0 ha	15	15	30	50%	50%	28%
	1.1-2.0 ha	8.00	5	13	62%	38%	12%
	2.1-3.0 ha	2	2	4	50%	50%	4%
	3.1-4.0 ha	1	1	2	50%	50%	2%
	4.1-5.0 ha	0	0	0	0%	0%	0%
	5.1-6.0 ha	1	1	2	50%	50%	2%
	6.1-7.0 ha	1	0	1	100%	0%	1%
	N/A	4	10	14	29%	71%	13%
	Conjugal	25	20	45	56%	44%	42%
Farm Ownership	Husband	9	4	13	69%	31%	12%
	Wife	2	6	8	25%	75%	7%
	Other relatives	2	2	4	50%	50%	4%
	Rented	0	2	2	0%	100%	2%
	Others	8	14	22	36%	64%	20%
	N/A	4	10	14	29%	71%	13%
	Inherited	35	25	60	58%	42%	56%
Manner of Acquisition	Bought	2	3	5	40%	60%	5%
	Free use	9	14	23	39%	61%	21%
	Rented	0	2	2	0%	100%	2%
	N/A	4	14	18	22%	78%	17%
	Inside the watershed	42	44	86	49%	51%	80%
Location of Farm	Outside the watershed	4	4	8	50%	50%	7%
	N/A	4	10	14	29%	71%	13%
	1-10 years	16	23	39	41%	59%	36%
Length of Land Ownership	11-20 years	9	11	20	45%	55%	19%
	21-30 years	13	8	21	62%	38%	19%
	31-40 years	5	2	7	71%	29%	6%
	41-50 years	2	4	6	33%	67%	6%
	51-60 years	1	0	1	100%	0%	1%
	N/A	4	10	14	29%	71%	13%
	1-10 years	16	25	41	39%	61%	38%
	11-20 years	10	11	21	48%	52%	19%
Years of farming	21-30 years	13	6	19	68%	32%	18%
	31-40 years	4	2	6	67%	33%	6%
	41-50 years	2	3	5	40%	60%	5%
	N/A	5	11	16	31%	69%	15%

Table 3. Respondents' awareness, familiarity, and perception of the MMNRP and Layawan Watershed.

Statement	Responses	Frequency			Percentage		
		PUV	SUV	TOTAL	PUV	SUV	TOTAL
Protected Area	Aware	38	38	76	50%	50%	70%
	Not aware	12	20	32	38%	63%	30%
Mt. Malindang Range Natural Park (MMRNP)	Familiar	36	42	78	46%	54%	72%
	Unfamiliar	14	16	30	47%	53%	28%
Source of knowledge	DENR	22	23	45	49%	51%	42%
	LGU	5	12	17	29%	71%	16%
	Magazines	0	1	1	0%	100%	1%
	TV	1	2	3	33%	67%	3%
	Radio	4	3	7	57%	43%	6%
	Friends	12	19	31	39%	61%	29%
MMRNP as protected area	Consider	50	57	107	47%	53%	99%
	Do not consider	0	1	1	0%	100%	1%
Mt. Malindang landscape as the ancestral domain of Subanen	Agree	50	58	108	46%	54%	100%
	Disagree	0	0	0	0%	0%	0%
Importance of Mt. Malindang in preserving Subano Culture	Agree	50	57	107	47%	53%	99%
	Disagree	0	1	1	0%	100%	1%
MMRNP is the remaining mountain representing the Zamboanga Peninsula	Agree	50	57	107	47%	53%	99%
	Disagree	0	1	1	0%	100%	1%
Know watershed	Aware	42	40	82	51%	49%	76%
	Not aware	8	18	26	31%	69%	24%
Condition of watershed affects water supply	Agree	48	56	104	46%	54%	96%
	Disagree	2	2	4	50%	50%	4%
Watershed services depend on the state of forest cover	Agree	49	57	106	46%	54%	98%
	Disagree	1	1	2	50%	50%	2%
Oroquieta/Layawan Watershed	Familiar	46	58	104	44%	56%	96%
	Unfamiliar	4	0	4	100%	0%	4%
Layawan watershed provides services to upland farmers	Agree	49	58	107	46%	54%	99%
	Disagree	1	0	1	100%	0%	1%
Importance of conservation and protection to upland farmers	Important	50	58	108	46%	54%	100%
	Not important	0	0	0	0%	0%	0%
Condition of the water coming from the watershed	Excellent	25	30	55	45%	55%	51%
	Fair	25	28	53	47%	53%	49%
	Poor	0	0	0	0%	0%	0%
Condition of water coming from the watershed	Excellent	22	25	47	47%	53%	44%
	Fair	28	33	61	46%	54%	56%
	Poor	0	0	0	0%	0%	0%

Table 4. Preferred type of compensation mechanism of respondents.

Compensation	Primary Upland Barangays		Secondary Upland Barangays		Total	
	No.	%	No.	%	No.	%
Reverse Auction						
Individual	22	44%	42	72%	64	59%
Group	28	56%	16	28%	44	41%
In Kind						
Scholarship	11	22%	20	34.5 %	31	29%
Farming Inputs	19	38%	20	34.5 %	39	36%
Trainings	15	30%	10	17%	25	23%
Others	5	10%	8	14%	13	12%

Source: Household Survey on Willingness to Participate, 2011

The survey revealed that 99% of the respondents agreed to participate in the LWCMP. This is primarily because they care about the Layawan Watershed (61%). People would also like the Layawan watershed to be conserved (40%) and to have reliable water supply (29%). The high participation of the households in the program restricted the study from identifying the statistical relationship of the variables that affect the respondents' willingness to participate in the program. However, it was evident in the survey that the respondents' high level of awareness on the importance of conserving, preserving, and protecting the Layawan Watershed contributed to their desire to participate in the program. The high level of awareness, involvement in different activities of different government agencies, exposure to information related to it, and level of education affect the willingness of farmers to participate in the conservation program. This is consistent with the findings of Abdolmaleky *et al.* (2011), Womack (2008), Ervin & Ervin (1982), Kreuter *et al.* (2006), Serbruyns & Luyssaert (2006), and Malekmohammadi & Sarani (2001).

The age of the respondents is also an important factor. The results of the survey revealed that respondents within the younger age bracket tended to choose the easy way to have income. There was no stable income in agriculture, and the risk due to calamities and pest infestation was perceived to be high. Moreover, the desire to go abroad and try their fortune outside the locale was common among the younger generation, resulting in low labor. This is similar to the findings of Dizon *et al.* (2012) in the Ifugao Rice Terraces, where the elders noted the lack of interest of the younger generation in farming the terraces. The high willingness to participate in the program reflects that farmers see it as an opportunity to earn income. This observation is consistent with the findings of Womack (2008), Ervin & Ervin (1982), Kreuter *et al.* (2006), and Serbruyns & Luyssaert (2006).

Household income is another important factor that affects willingness to participate in the LWCMP. If farmers' on-farm

incomes were enough to cover the expenses of their families, it is most likely that they will not participate in the program. Otherwise, they will tend to reveal high participation, which is similar to findings of Womack (2008), Corbett (2002), and Rhodes, Leland, & Niven (2002).

There was also a positive response in terms of participating in other activities such as reforestation to rehabilitation of degraded areas (99%) and monitoring and patrolling in the Layawan Watershed (94%). The respondents were willing to be part of the reforestation activities if they would receive PhP 186.00 per day on the average in exchange for their services. Respondents willing to participate in the monitoring and patrolling activities agreed to weekly compensation of PhP 278.00.

Willingness to Accept

The average WTA of the respondents was computed to be PhP 3,050 per month (Table 5). The average WTA value elicited in the survey is almost similar with the WTA value revealed in the KII conducted by Manlosa (2011), which was estimated at PhP 3,000.00/month. However, Manlosa's study just covered the WTA of Subanen living in Barangay Sebucal.

The factors affecting the values of willingness to accept were identified using the two-way ANOVA, using the following decision rules: (a) IF $F_{\text{calc}} < F_{\text{tab}}$, interaction does not exist; (b) IF $F_{\text{calc}} > F_{\text{tab}}$, interaction does exist.

As shown in Table 6, variables such as barangay, length of stay in the farm, length of farming in the area, and manner of acquisition of the land or farm were statistically proven to have an interaction with the elicited values of WTA. On the other hand, the base origin of the respondents and the location of their farm did not have interaction on the amount revealed for WTA.

Furthermore, a set of independent variables was subjected to PROBIT regression to test the significance of their correlation with WTA. Six independent variables (i.e. gender, marital status, manner of acquisition of land, length of stay in the area, years of farming, and provision of watershed services) were statistically proven to have a significant effect on WTA but have a negative correlation (Table 7). Five independent variables (i.e. educational attainment, number of family members, watershed/program awareness, quality of water and quantity of water) were statistically proven to have a significant effect on WTA and with positive correlation. Eight variables did not show any correlation with WTA and were proven insignificant. The independent variables were tested at 1% level of significance and or at 99% certainty.

Opportunity Cost of Participating in the LWCMP

In the study, the "opportunity costs" of watershed conservation was obtained by taking the difference of income between farming, the most profitable land use, and watershed conservation. The watershed in general is assumed to produce no commercial income primarily because logging or cutting of timber and cultivation are not allowed in the watershed, especially in a protected area like MMRNP. However, the study revealed that the forest cover in the Layawan Watershed is gradually decreasing due to agricultural expansion. Thus, the

Table 5. Summary of the elicited willingness to accept compensation of the upland communities.

Barangay	No. of Respondents	Willingness to Accept			
		Total Amount (PhP/Month)	Average Amount (PhP/Month)	Minimum (PhP/Month)	Maximum (PhP/Month)
Sebucal	5	18,000.00	3,600.00	4,200.00	4,600.00
Mialen	10	32,400.00	3,240.00	1,000.00	6,000.00
Toliyok	35	105,250.00	3,007.00	150.00	7,200.00
Bunga	35	100,100.00	2,860.00	100.00	6,000.00
Dullan Norte	16	44,050.00	2,753.00	100.00	6,000.00
Victoria	5	23,500.00	4,700.00	3,000.00	6,900.00
Total	106	323,300.00	3,050.00	100.00	7,200.00

Source: Household Survey on Willingness to Participate, 2011

Table 6. Summary of two way ANOVA analysis on variables interaction with WTA.

Variables	Sum of Squares	Degrees of Freedom	Mean of Squares	FC	FTAB at 5%
Barangay Surveyed	45779262	15	3051951	9.97	1.50
Length of stay in the area (no. of years)	26021974	15	1734798	4.98	1.50
Length of farming in the area (no. of years)	28085922	15	1872395	5.46	1.50
Ethnicity (Subanen or upland migrant)	783682	3	261227	0.74	2.60
Location of the farm (within or outside the watershed)	675171	3	225057	0.62	2.60
Acquisition of land/farm (bought/rent)	5489322	3	1829774	2.90	2.60

Table 8. Income from farming per household.

Variables	Annual (PhP)			Monthly (PhP)		
	Total Income	Total Cost	Net Income	Total Income	Total Cost	Net Income
Mean	21,160.17	6,872.72	16,005.63	1,763.35	572.73	1,333.80
SD	10,969.26	3,867.25	9,176.76	914.10	322.27	764.73
Minimum	1,574.22	2,168.73	1,574.22	131.19	180.73	131.19
Maximum	34,087.88	12,822.92	27,971.95	2,840.66	1,068.58	2,331.00

Table 7. Summary result of Probit Regression per independent variables.

Independent Variables	Probit Values	Effect on WTA***
Gender	-1.761	Significant, negative correlation
Marital Status	-0.590	Significant, negative correlation
Age	-0.131	Not significant
Educational Attainment	0.406	Significant, positive correlation
No. of Family Members	0.539	Significant, positive correlation
Total Income per Household	-0.090	Not significant
Barangay	0.183	Not significant
Subanen or Non-Subanen	-0.332	Not significant
Outside/Inside Watershed	0.000	Not significant
Manner of Land Acquisition	-0.319	Not significant
Land Bought/Rented	-3.853	Significant, negative correlation
Length of Stay	-0.375	Significant, negative correlation
Years of Farming	-0.257	Significant, negative correlation
Watershed/Program Awareness	0.082	Significant, positive correlation
Watershed Service	-0.251	Significant, negative correlation
Importance of Watershed	0.067	Not significant
Quality of Water	1.651	Significant, positive correlation
Quantity of Water	1.032	Significant, positive correlation
Problems with Watershed	-0.028	Not Significant

*** Tested at 1% level of significance

opportunity cost of conserving the watershed is equal to the foregone optional net return from farming.

The study captured prices of farming inputs and outputs to estimate upland farmers' income (Table 8). On the average, a family earned PhP 1,334 per month. The highest monthly income reported was PhP 2,331 while the lowest was PhP 131. If the farmer will participate in the program and agree to the 100% conservation easement, they can earn PhP 3,050 per month, the computed average WTA value. This is PhP 1,716 higher than the average monthly income farmers get from upland farming, and shows possible strategic bias in the respondents' revelation of the amount that they were willing to accept to participate in the program.

As upland communities participate in the LWCMP, they will be provided direct benefits such as monthly income estimated at PhP 3,050, scholarships, and farming inputs to name a few. Moreover, they will also receive indirect benefits such as good microclimate conditions, fresh air, good quality of water, conserved biodiversity, among other things.

CONCLUSION AND RECOMMENDATION

In response to the need to conserve and protect the Layawan Watershed, the study evaluated the willingness of communities

from six upland barangays in Oroquieta City to participate in the Layawan Watershed Conservation and Management Program. Using a contingent valuation survey, the study assessed the respondents' awareness about and perceptions towards the conservation and protection of the Layawan Watershed, their willingness to accept compensation, and the opportunity costs that would be incurred if they would adopt new conservation techniques.

Results show that the respondents had a high level of awareness about the MMRNP and its being a protected area, the importance of the Layawan Watershed in securing water supply for upland and lowland barangays of Oroquieta City. Almost all respondents expressed willingness to participate in the LWCMP, mainly because they cared about the Layawan Watershed and would like to see it conserved. The average WTA, computed to be PhP3,050/month was higher than the average opportunity cost from foregone farming income of PhP1,334 per month, showing possible strategic bias in the WTA amount revealed by the respondents.

Upland communities, whether Subanen or upland migrants, place great value on their environment. Thus, their willingness to participate in programs, projects, and activities that will improve the integrity of the Layawan Watershed is positive. They want to ensure that the watershed will provide water

resource today and in the future. However, there is a need to further study the tenorial status within the watershed and to delineate the watershed to validate extent of land ownership among the residents. Poorly defined property rights has been one of the barriers for an effective PES scheme especially for watershed services (Landell & Poras 2002).

Since farming is the primary livelihood in the area, there is a need to provide upland farmers assistance to efficiently carry out farming technologies appropriate for uplands, such as agroforestry. The assistance can be in the form of determining the combination of crops suitable to the area, training and information dissemination regarding the use of agroforestry farming system.

While these upland communities are open to adopting sustainable farming practices, harmful practices such as slash and burn, timber poaching, and animal poaching cannot be eliminated totally. Thus, strong IEC campaigns and capacity building as well as provision of sustainable livelihood activities are needed. Furthermore, effective monitoring and patrolling is vital.

In order to ensure buyers' participation in the scheme, simulation of various scenarios for the watershed is recommended. This will give them a basis for investing in the conservation program for the Layawan Watershed.

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¹North Peak, Sumalarong, Siatog, Binitinan-Agong, Capuli, Tindol-Bato, and Dampalan

²Manimatay, Panubigan, Saliron, Buntawan, Malican, Baliksaan, Lunganga, Tuminawan, and Tipan