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Economic Implications of Different Management Opportunities in Makiling Forest Reserve (MFR), Philippines

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ABSTRACT

Opportunity costs incurred in devoting the areas of MFR to agroforestry, grassland and timber production and combinations of them as well as the willingness to accept incentives of farmers to promote conservation were evaluated using the Net Present Value approach and contingent valuation. The main goal of the study is to determine the economic implications of different management options in the Makiling Forest Reserve (MFR) in the Philippines. Economic linkages between the local people and the conservation program in the area were also assessed. In this study, it was found that the analysis of the different options for MFR indicates that the conservation of remaining natural forests in tandem with agroforestry in all open areas yielded the highest stream of benefits. Therefore, appropriate strategies that would further integrate local economic concerns in agroforestry and natural forest conservation are necessary. It is recommended that the local people and the government seek optimal management opportunities in the conservation of MFR by partnering in the further development, restoration, and protection of the reserve.

Key words : Net present value, agroforestry, conservation, Makiling Forest Reserve, opportunity cost

I. INTRODUCTION

Recent years have witnessed a growing concern for the integrated management of forests focusing on people and environmental services provided by forests. Among these, avoiding deforestation and degradation of forests as well as restoration of denuded forest areas have been at the forefront of many environmental initiatives. In the Philippines, the main challenges are the diminishing areas of natural forests, and forest management practices that do not favour forest protection.

At present, the Philippines has around 4 million ha of natural forests that are managed for forest protection and production purposes. These are forest areas allocated to address "public goods" (like

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protected areas and watersheds).

Makiling Forest Reserve (MFR) is the only intact natural forest within a 65-kilometer radius of Metro Manila and is a favourite recreational site for tourists (Pulhin and Tapia, 2005). Since its jurisdiction was transferred to the University of the Philippines at Los Baños (UPLB) by virtue of the Republic Act 6967 in 1990, saving its valuable natural resources from man-driven destructions, such as illegal occupancy within the reserve, poaching, agricultural clearing, and among others, becomes a great task. In any locality where people are dependent on its natural resources, environmental problems always render economic instability and the likelihood of sustainable forest management is reduced.

Hence, several forest conservation initiatives and programs had been developed and established in MFR by UPLB through the help of various sectors concerned. For instance in 1994, as indicated in the 1995 University Master Plan of Mt. Makiling Conservation and Development, UPLB issued policies and guidelines preventing further migration and limiting farmer's cultivation. In addition, farmers in MFR were organized to serve as partners of UPLB in conserving MFR. The *Kaisahan ng mga Samahang Magsasaka sa Mt. Makiling* (KASAMA-BM) or Confederation of Farmer's Organizations in MFR initiated measures to protect forest by reforestation of critically damaged areas and adoption of ecological farming practices (Duthy and Bolo-Duthy, 2003). This partnership attempts to foster mutual approach towards conservation, rehabilitation and sustainable development of MFR. Furthermore, Porras and Neves (2006) tried to create a watershed protection and conservation scheme through the Makiling Forest Reserve Management Plan of the UPLB to increase their efforts in halting land degradation and reduction in water quantity within the Reserve but studies and negotiations for this scheme have been ongoing for several years.

Not all efforts to conserve and protect MFR have been successful. Nonetheless, the reserve has been maintained and improved due to the commitment of its administrators in achieving the objective of conserving natural resources for scientific and educational purposes.

In MFR, partnership with the community has been used as an appropriate forest management strategy in which environmentally sustainable use is assured while benefiting local communities. Also, one way to ensure the sustainable development of MFR is to foster awareness of its economic value. This study seeks to determine the economic implications of conserving MFR that focuses on the economic reliance of local farmers on forest areas and explores mechanisms for assessing this dependence.

Specifically, the objectives of the study were : to apply methodologies in determining the economic impacts of managing MFR; assess economic linkages between the local people and the conservation program in the area; and to recommend appropriate strategies that would integrate local economic concerns.

Ⅱ. METHODS

1. Description of the study site

The study was conducted in Makiling Forest Reserve (MFR), which is located in the southern part of Metro Manila, Luzon Island, Philippines. MFR geographically radiates to coordinates of 14° 08′14″ N latitude and 121°11′33″ E longitude (Figure 1). It is only about 42.44 km^2 andalso classified as a national park and a critical watershed

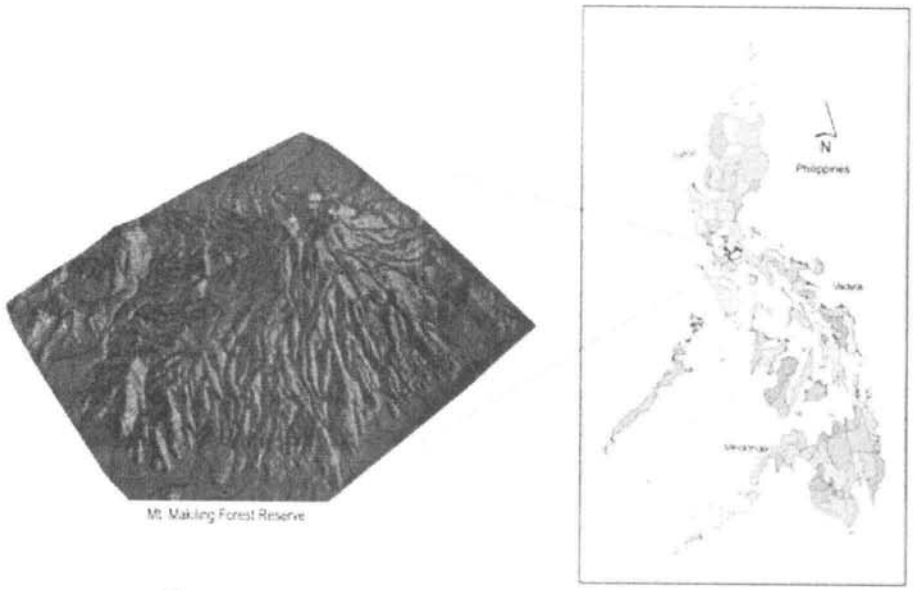

Figure 1. Location of Makiling Forest Reserve, Philippines

for power generation (Vallesteros, 2002).

MFR's topography is generally rugged with elevation ranging from 40 to 1,100 meters above sea level (m asl). About 70 percent of the total area has an elevation of more than 400 m asl. The areas at lower elevations have gentle slopes which aresuitable for farming and settlement. The soils of MFR belong are classified into four series such as *Lipa, Macolod, Gulugod* and *Makiling*, and are generally fertile. The dominant soil texture is clay loam. The favourable soil and climate makes the forest reserve a rich habitat of valuable plant species. The vegetation of MFR is a gradient from low vegetation at the base, to a typical tall forest on the lower elevations, and to a crooked, stunted mossy forest at its three peaks (Fernando *et al.*, 2004). The forest reserve contains at least 225 families and 2,038 species of vascular plants (Pancho, 1983) and may serve well as a representative of the Philippine mixed hardwood vegetation. The botanic gardens are haven of many exotic and locally introduced species of plants, which add up to the floral diversity in the area.

2. Data Gathering and Analysis

The data used in this paper were mostly based on the study by Camacho (2001) where 188 resident farmers and 354 non-resident farmers of the Makiling Forest Reserve were interviewed using a prepared questionnaire. Secondary data were also gathered from the different researches already conducted in MFR as well as from forestry statistics publications.

The economic implications of devoting the portions of the area to single use like agroforestry, grassland and timber production together with their logical combinations were evaluated by estimating the opportunity costs incurred in devoting areas available to those uses. This would determine the benefits foregone as a result of conserving the reserve. These benefits were translated into present values using the Net Present Value (NPV) as follows :

$$NPV=\sum_{t=0}^{n}\frac{B_t}{(1+i)^t}-\sum_{t=0}^{n}\frac{C_t}{(1+i)^t}$$

Where : t = Year when transaction occurred

B_t = Total revenue/value of benefits received at year t

C_t = Total costs incurred at year t

i = Discount rate

n = Planning/analysis period

The discount rate of 12 per cent was used in the computation of total benefits, which represents a real interest rate. Discounting all the benefits to the present allows comparison of streams of values with one another. Although the values may change with time, these changes should offset each other.

In order to determine how the farmers value their stay in MFR, the contingent valuation method (CVM) was also used to estimate the farmers' willingness to accept incentives or compensation for not continuing farming and forest products gathering in the area, thus, give up the area.

A logistic regression model was used to analyze the data generated by the survey. Based on the formula of Hanemann (as cited by Jacobsson and Dragun, 1996), the following is the model which was used to estimate the willingness of the respondents to accept incentives or compensation.

$$\log\left(\frac{\Pr(WTA=yes)}{1-\Pr(WTA=yes)}\right) = \alpha+\beta_L X_1+\beta_2 X_2+\ldots+\beta_m X_m+\beta_n A$$

Where : WTA = Willingness to accept

Pr(WTA=yes) = Probability of a yes WTA response

X_1, X_2, ... X_m = Independent variables

A = Bid amount

The willingness to accept incentives of MFR farmers was hypothesized to be a function of socio-economic, attitudinal and other variables. The contingent valuation responses have been regressed against the variables set out below :

(1) Dependent variable in logistic regression :

• WTA (Binary variable indicating whether respondent is willing to accept or not)

(2) Independent variables :

• AGE (Actual age of respondents)

• SEX (Sex of respondents : 1 = male, 0 = female)

• STATUS (Marital status : 1 = single, 2 = married, 3 = widow/widower)

• EDUC (Educational level : 1 = elementary, 2 = high school, 3 = 2-yr course, 4 = College, 5 = higher studies)

• HHSIZE (Actual household size)

• INCOME (Actual household income per year)

• ZONE (Zones of origin : zone 1 = 0-25 km, zone 2 = 26-50 km, zone 3 = 51-75 km, zone 4 = greater than 75 km)

• IMP (Importance of protecting biodiversity in MFR : 1 = very important, 2 = moderately important, 3 = slightly important, 4 = not important at all, 5 = don't know)

• ORGMEM (Membership of environmental organization : 1 = member, 0 = non-member)

• BIDAMT (Peso amount posed to respondents in discrete choice question)

From the model, the mean WTA was determined using the formula :

Mean = α/β

Where :

α = Constant plus the coefficients of the other variables multiplied by their respective mean values

β = Coefficient of the bid amount variable

The software program used in the data analysis was SPSS.

Ⅲ. RESULTS AND DISCUSSION

1. Opportunity Costs of Conserving MFR

Opportunity costs are an important consideration in planning or evaluating the best management option possible for an environmental resource, whether as part of some development project or to establish a preservation or conservation program. An estimation of the opportunity costs of conservation enables us to understand the extent to which these costs would constrain protection, as well as determine the benefits of conservation as a viable and efficient investment (Krutilla and Fisher,1985). In situations where the opportunity costs of conservation are high, valuation of the benefits of conservation for comparison becomes crucial. The degree to which such benefits are lost through development or conversion to other use would require a high value for preservation and conservation.

Opportunity costs, as defined by Gittinger (1989), are "the benefits foregone by using a scarce resource for one purpose instead of its next alternative use." In the case of the Makiling Forest Reserve (MFR), the opportunity costs of conservation would be the costs of alternative land uses, namely : agroforestry, grassland, timber, and a combination of these uses. Table 1 shows the values of opportunity costs for each of the alternative uses in MFR. Among the basic uses of MFR that were evaluated are as follows :

1) Agroforestry

A study by De Luna (2008) reveals the value of net returns per hectare per year from agroforestry farms in MFR. The average cash and non-cash returns per hectare are PHP 38,218 (US$ 849.29) and PHP 8,942 (US$ 198.71), respectively, while the total cash costs amounts to PHP 5,930 (US$ 131.78) resulting in a net returns per hectare per year of PHP 47,187 (US$ 1048.6).

The average size of the multi-storey coconut-based agroforestry system in the study of De Luna (2008) is 1.4 hectares. Crop diversity is high with coconut and fruit trees the dominant crops and cash crops growing underneath. Cropping is extensive and minimum tillage is common among farms. Harvesting of crops is continuous throughout the season. Estimating the total agroforestry area of MFR to be 1678.26 ha, the total net income derived per year is PHP 79.21 million (US$ 1.76 million).

Table 1. Costs and benefits per hectare of alternative land uses for MFR

Alternative Use	Net Income (1000 Pesos)	Capitalized Net Income[e] (Million Pesos)	Capitalized Net Income[e] (Million US$)
Agroforestry[a]	47.2	0.47	0.010
Grassland[b]	34.8	1.01	0.022
Timber[c]	94.7	0.95	0.021
Timber[d]	307.8	3.08	0.068

[a] Based on annual returns; based on study by De Luna (2008)
[b] Based on study by Baconguis *et al.* (1995) and Rosacia (1994)
[c] Based on stumpage value
[d] Based on clear felling value
[e] Computed at 10% discount rate

2) Grassland

A study conducted by Baconguis and Alcantara (1995) shows that the yield of grasses studied in MFR ranged from 9.3 to 36.45 tons per hectare per 45-day cutting cycle, or a realistic average herbal yield of grasses of 15.0 tons per hectare per cycle. The grass species studied are napier (*Pinnesetum purpureum*), paragrass (*Panicum purpurascens* Radd) and Guinea grass (*Panicum maximum* Jacq). At a cost of PHP 1.50 (US$ 0.03) per kilogram of grass, and considering the average yield of grasses of 15.0 tons per hectare, the value of grasses per ha in MFR if fully planted to the above species of grasses is PHP 22,500.00 (US$ 529.4). There is much herbage available during the rainy season, but very little during the dry months. Thus, considering the 45-day cutting cycle of grasses in MFR, harvesting takes place only 4 times per year. On a yearly basis, the grassland of MFR thus has a gross value of PHP 90,000.000 (US$ 2,117.6) per hectare. For the whole 66.05 ha grassland area of MFR, the gross value is estimated at PHP 5,944.5 million (US$ 139,870.6). Considering net value of 40 %, the net value per ha would be PHP 36,000.00

A similar study was conducted by Rosacia (1994) in which a price of PHP 1.5 (US$ 0.03) per kilogram of grass was applied to an average herbage yield of grasses of 10.9867 tons per hectare. Accordingly, the value of the grassland is estimated to be PHP 16,480 (US$ 263.7) per hectare. With the same cutting, the grasslands of MFR would have a net value of PHP 36,368 per hectare of USD 1,054.7. On the average, the grassland has a net value of PHP 31,184.00 per ha (or USD 733.7).

For the whole MFR grassland area of 66.05 ha, the average gross farm income is about PHP 2.06 million or US$ 0.048 million.

3) Timber

The term "timber" generally refers to saw logs (or roundwood) processed into lumber, veneer, plywood, furniture, etc., and poles and pulpwood (Tewari,1994). While logging or timber harvesting in the country is not allowed in remaining old-growth forests of the country, timber harvesting is allowed in production forests, or areas which include residual or second-growth forests dominated by natural Dipterocarp species. Residual forests are now the major source of raw materials for the Philippine wood industry.

Timber extraction or logging is not allowed within MFR. As a forest reserve, it is managed as a protected area primarily for educational and research purposes, while maintaining and protecting its biological diversity and serving the recreational needs of the general public. In this section, the timber resources within MFR are valued (based on stumpage values of harvestable trees) as part of the opportunity costs of MFR.

Stumpage, as defined by Davis (1978), is timber in unprocessed form as it is found in the woods. Normally, this is the standing tree found in the forest ready for harvest. The normal practice is based on the selective logging policy where certain percentage of trees above 60 cm and all trees above 70 cm in diameter are available for harvest. Most of the timber harvested is converted into sawlogs and then processed into lumber or veneer.

Stumpage value is calculated as the difference between the selling value of the product produced (in this case, sawlogs) and the total direct logging cost, with a 20 per cent margin for profit and risk added to total cost. Based on data from different regions in the Philippines, the current value of logs (mostly dipterocarps) ranges from PHP 2,000 (US$ 44.44) to PHP 6,200 (US$ 137.78) per cu m or an average of PHP 4,100 (US$ 91.11) per cu m. The

total logging cost is estimated to be PHP 1,405 (US$ 31.22) per cu m, while the margin for profit and risk is PHP 281 (US$ 6.24) per cu m. Hence, the present stumpage value for production forest in the area is PHP 4,280 or US$ 107 per cu m.

Based on the multi-resource inventory conducted by Villanueva (1997), the average commercial volume of timber (mostly of dipterocarp species) is estimated to be 22.13 cu m per ha (or 46,130.65 cu m for the whole forest of MFR). This approximates the average figure on the commercial volume for Region 4b of 25.8 cu m (Uriarte & Virtucio, 1988). Considering the estimated average commercial volume of timber for the whole of 2,084.53 ha of intact forest, the current stumpage value is PHP 94,705 or US$2,368 per ha, or a total of PHP 197.42 million or US$4.38 million

Considering the above pricing analysis, five management opportunities were considered. These are as follows :

1. Timber plantation of all open areas including areas currently under agriculture and agroforestry production claims and the rest to be devoted to conservation of natural forests
2. Pure Conservation which would entail restoration of all open areas and devoting both natural and plantation forests to pure conservation landuse
3. Agroforestry and Conservation that intends to fully utilize all open areas for agroforestry at the same time devoting all natural forests to pure conservation
4. Grassland and Conservation where all open areas shall be devoted to grass or fodder production while retaining the natural forests for pure conservation landuse, and
5. Timber production as main landuse for all open areas and natural forests.

Table 2. Summary of NPV results for 5 management options

Options	Net Present Value (Pesos)
For timber plantation of all open areas and conservation of natural forests	290,781,516.8
Pure conservation	279,896,881.9
Agroforestry and conservation	981,360,566.3
Grassland and conservation	710,271,614.8
Timber (plantation and natural)	450,635,494.4

Given the five options, the analysis showed that the combination of agroforestry in open and cultivated areas in tandem with the conservation of natural forests (Option 3) gives the highest NPV of PhP 98.36 million. This is followed by a management option devoting open and currently cultivated areas for grassland production and all natural forests for conservation (Option 4) obtaining an NPV of PhP 710.47 million. Based also on the analysis, using the whole of MFR for timber production (Option 5) is nota wise option at all as it is only third in the most economical option ranking. This is due to the low volume of natural forests of MFR as shown in various timber inventories already conducted. This analysis show that conservation alone would not provide the greatest benefit from a forest land especially if there are people that are dependent on the forests for their livelihood.

2. Willingness to Accept Compensation Measure of Giving Up MFR

1) The cost of conservation

The big majority of people inside MFR and surrounding areas are dependent on MFR'sresources for their livelihood, either as primary income or as supplements. Because MFR is a forest reserve,

people have been prohibited by law from making traditional use of its resources. However, the area continued to suffer from encroachment and illegal settlement, and forest products poaching in the absence of an effective plan for forest development and conservation and difficulties in forest law enforcement. This situation actually leads to a decrease in the environmental values of MFR. Occupants of the reserve claim rights over the area as they have been there for a long time. There have been attempts by the government to resettle these occupants but to no avail.

Based on the study by Camacho (2001), a contingent valuation survey has been carried out to determine the importance of MFR to resident and non-resident farmers. In the survey, willingness to accept (WTA) questions were asked of the resident and non-resident farmers of MFR. In spite of the negative effects of farming activities in MFR, elimination of occupancy and encroachment in the area may not be a good option. Hence, questions posed to respondents were in terms of the compensation or incentives farmer respondents were willing to accept for not continuing farming and forest products gathering in the area.

In the first set of WTA question, respondents were asked about the amount of compensation they were willing to accept for protecting forest areas in MFR. A hypothetical situation of the forest was presented to the respondents, e.g. the forest contains more than 400 trees per hectare. Initial values in terms of possible amounts of protection costs per hectare (e.g. PHP 1000 per ha/year) were provided to respondents to aid them in the bidding process. Logistic regression analysis was carried out to determine the factors that affect the WTA compensation of respondents. These factors were then included in a model used to estimate predicted WTA values, which were then compared to the actual values generated from the survey.

The second set of non-monetary WTA question consisted of asking the resident and non-resident respondents whether they were willing to give up MFR access and resettle in other places given a choice of incentives. If the answer was "yes", they were asked about specific incentives they wanted the government to give them in order to give up the area. If the answer was "no", the reasons for not willing to give up MFR access were asked.

2) Regression analysis for the WTA responses

Logistic regression analysis is undertaken on the WTA response variable with zone, status, household size, income, and attitudinal factors as independent variables. Regression analysis was carried out as a result of the high proportion of positive responses.

The coefficients of the explanatory variables as well as the P-values indicating the significant variables are given in Table 3. Results indicate that for resident farmers, age and education are highly significant with respect to the willingness to accept compensation. The older the respondents the higher the amounts demanded. Also, the higher the educational levels, the higher the WTA. In the case of the non-resident farmers, sex is the only factor that is highly significant to WTA responses, which indicates that males have higher willingness to accept responses than the females being the head of households. The results however indicate that regression analysis has not produced robust results.

3) WTA values from actual survey and predicted values

The annual willingness to accept compensation for the conservation of MFR was derived from the

Table 3. Logistic regression coefficients and P-values for the independent variables

Independent Variables	Coefficients		P-Values	
	Resident Farmers	Non-Resident Farmers	Resident Farmers	Non-Resident Farmers
Constant	3,273	2,687.8	0.007	0.005
ZONE	-93.7	78.2	0.808	0.695
SEX	-392.7	-675.2	0.190	0.006*
AGE	20.3	3.973	0.050*	0.639
EDUC	-211.9	-67.64	0.055*	0.368
STATUS	143.4	277.40	0.729	0.375
HHSIZE	-122.5	24.65	0.189	0.696
INCOME	-0.006	.00322	0.121	0.357
IMP	-48.9	0.5	0.854	0.999
ORGMEM	-60.7	-52.5	0.834	0.863
R^2	.014	.043		

* Significant at 5% level

actual survey and the result of regression analysis undertaken. There were respondents (18%) who submitted protest bids or were not willing to accept the responsibility of conserving forest areas in MFR at any price (Table 4). Some respondents expressed doubts on the capability of government to pay compensation for loss of access to MFR while others simply mentioned the higher income that they would get if they continue to farm and gather forest products in the area. These protest bids were included in the regression analysis.

As shown in the table, the average willingness to accept for all the respondents is PHP 2,539 (56.42) per ha per year. The resident farmer-respondents gave a higher average WTA amount (PHP 2,837 or US$ 63.04) than the non-resident-farmers (PHP 2,242 or US$ 49.82). In terms of the predicted amounts, the resident farmers also incurred a higher amount (PHP 3,912 or US$ 74.97) compared to the non-resident farmers (PHP 2,013 or US$ 47.24). The higher WTA of resident farmers seemed to reflect their high opportunity costs of giving up their farming and forest products gathering in the area in favor of protecting certain areas of MFR.

4) Willingness of farmers to give up access to MFR

Farmers were asked a non-monetary WTA question about whether they were willing to give up the area and resettle in other places. The survey showed that a majority of respondents (60%) are not willing to give up their occupation of MFR, which they use for settlement, farming or a source of forest products (Table 4). The resident farmers represented a relatively higher percentage (62%) than the non-resident farmers (59%). Several reasons were mentioned for not willing to give up access. Fifty per cent of the resident farmers said that they are attached to the area, or the area has sentimental value to them. Other respondents (40%) mentioned security reasons or noted that the area provided a regular source of income. Thirty-three per cent of

Table 4. WTA values generated from the actual survey and predicted values

Classification of Respondents	Mean WTA (Pesos) (Survey)	Percent of Protest Bids	Predicted Mean WTA (Pesos) (Regression Analysis)	AVERAGE WTA	
				(Pesos)	(US$)
Resident Farmers	2,837	13	3,912	3,374	74.97
Non-Resident Farmers	2,242	23	2,013	2,126	47.24
Average WTA	2,539	18	2,962	2,751	61.13

the respondents would find it difficult to adjust again in other areas, a reaction based on their experiences in the past. Others (32%) did not want to take risks and had no trust in the government's promise to pay them in exchange for resettlement. Few respondents considered the land more important than money, while others valued the access they had because they inherited it from past generations and intended to pass it on to their children.

About 26 per cent of the resident farmers believe they have a right to their land and are not willing to give up the land whatever the cost.

For the majority of the non-resident farmers (62%), it seems that no amount of money would compensate for the loss of their present land. It was very likely that they said this because they do not trust that they would get compensation on the level they actually demand. About 40 per cent mentioned the difficulty to adjust to other areas and a regular source of income. Amongst the resident and non-resident farmers, most (47%) consider the present land as more important than money. Other farmers (25%) are not willing to give up the area in spite of the government's policy and incentives.

Table 6 shows the monetary and non-monetary willingness to accept of farmer-respondents. Most resident farmers (35%) demanded that the government provide them with stable jobs in other areas or regular livelihood opportunities. Others (25%) said that they should be provided with equally productive land in other areas, and the rest (23%) demanded the right payment for the crops they had planted in the area. Other responses included : payment of an amount of PHP 20,000 - PHP 50,000 (US$ 44 - US$ 1,111) for the capital invested in the farm; payment for the claimed land at current prices; government sustenance for at least three years; and whatever the government could offer.

In the case of non-resident farmers, 40 per cent mentioned that they have to be given the right

Table 5. Willingness to give up access to MFR

Willingness to give up access	Percent of Respondents		
	Resident Farmers	Non-Resident Farmers	Average
Willing to give up the area			
YES	37.5	40.6	39.1
NO	62.0	59.1	60.5
Uncertain	0.5	0.3	0.4

Table 6. Monetary and non-monetary willingness to accept responses of farmers to give up access to MFR

Monetary and Non-Monetary Willingness to Accept Responses	Percent of Respondents		
	Resident Farmers	Non-Resident Farmers	Average
Provision of stable job in other areas/livelihood opportunities	35.0	20.0	27.5
Provision of an equally productive land in other areas	25.0	12.7	18.8
Right payment for the crops planted in the area	23.0	40.0	31.5
Payment of PHP 20,000~50,000 for the capital invested in the farm	2.0	8.0	5.0
Payment for the claimed land at current prices	5.0	0.8	2.9
Government sustenance for at least three years	2.0	0.5	1.2
The government has the choice to give or not to give incentives since the land is not theirs	8.0	18.0	13.0

payment for the crops they planted on their farms in MFR. About 20 per cent said that the provision of stable jobs in other areas and regular livelihood opportunities could make them give up access to land in MFR. About 18 per cent, however, had no specific demands, accepting that the lands they occupied in MFR are not theirs. According to the latter, the government has the choice to give or not to give any form of incentives for them to go.

3. Comparison of benefits and costs of conservation

The opportunity cost analysis is indicative of the costs borne by local farmers as a result of further conservation of measures in MFR. These costs are reflected by the average WTA compensation amount in terms of protection cost of PHP 2,751 (US$ 61.13) per ha per year, generated by the contingent valuation survey. The value is higher than the protection cost for all protected areas in the country of PHP 1,000 (US$ 22.22) per ha per year estimated by Revilla *et al.*(1999). Farmers tend to state higher WTA compensation regardless of what the government can actually offer.

Ⅳ. CONCLUSION

The judicious management and conservation of forests like MFR is a priority in the Philippines as it is in other countries worldwide. For the local communities, indirect or opportunity costs are incurred as a result of using the forests not according to its best use.

The opportunity costs measure facilitates choices between preservation or conservation and development. It enables a comparison in monetary terms of the benefits of conservation (i.e. use and non-use values) with the opportunity costs of MFR derived from its agroforestry, grassland and timber uses. Analysis of the different options for MFR indicates that agroforestry with conservation yields the highest stream of benefits.

Opportunities for engaging the participation of local people can be offered in terms of managing new MFR conservation areas, e.g. helping in restoration, trail maintenance or law enforcement in

the reserve. Based on the survey, farmers find it difficult to put compensation value for loss of access to the resource. However, farmers are more receptive if given an assurance of a regular monetary compensation for protecting the resource instead oftheir traditional use of the resource. Their forms of non-monetary incentives to give up the area would only indicate that WTA deals with just a narrow commercial value of forest land being put to practices such as farming and forest products gathering. Such situation is a clear indication that, in general, people would want get the best in a given situation. People would generally prefer to receive certain amounts of compensation when if relocated, if and only if the amounts were more than the perceived existing value of the particular resource. To the farmers, such compensation should also cover losses incurred as a result of long waiting time for actual relocation.

The higher benefits of agroforestry in tandem with conservation compared to other management options indicate that policy options along this line must be pursued by the University, being the mandated manager and administrator of MFR. The results of opportunity costs analysis and the contingent valuation shows that the hard stance approach of evicting forest occupants in MFR is an inferior option compared to forging lasting partnership with them in pursuing sustainable agroforestry land use in open and cultivated areas while pursuing strict conservation of MFR's natural forests.

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