

Community-Based Management of the Calatagan Mangrove Forest Conservation Park in Batangas, Philippines: A Case Study on Environmental Sustainability

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Glenn Bryan A. Creencia¹, Blesshe VL. Querijero²

¹Cavite State University, ²University of the Philippines Los Baños,

²De La Salle University- Dasmariñas, Philippines

glennbryancreencia@yahoo.com¹, blessheq42@yahoo.com²

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Abstract – Mangroves provide valuable resources and services to humankind. Depletion of mangrove forests in the Philippines was attributed to over-exploitation by coastal dwellers, conversion to agriculture or fishponds, and settlement. The efforts of a small group of women to protect a mangrove forest called Ang Pulo in Brgy Quilitisan, Calatagan, Batangas triggered the curiosity of the researcher to conduct this study. The study determined the level of knowledge and awareness (KA) on mangrove resources, services and conservation practices of the local government unit (LGU) of Calatagan, Batangas, the people's organization (PO) called PALITAKAN which was initially composed of 10 women, and the local coastal community of Brgy. Quilitisan. It also determined the value that these stakeholders ascribe to various mangrove resources. Data was collected through the use of questionnaires. The results showed that LGU, PO, and the local community had high to very high level of KA toward mangrove resources, services, and conservation practices but the PO had consistently very high level of KA. Their active role in mangrove conservation enabled them to have higher level of KA. The mangrove tree was perceived to have the highest selling price (value) while lowest for seed and seedlings. The perceived selling price of the mangrove resources reflected how the stakeholders value these resources based on their prior knowledge and experiences. They also have very high level of KA on mangrove resources, services and conservation practices.

Keywords – knowledge, awareness, economic valuation, mangrove conservation, Philippines

INTRODUCTION

Mangrove resources are among the most severely threatened ecosystem around the world, and mangrove resources are often undervalued. Yet, they provide a variety of ecosystem services important for coastal protection and survival, in carbon sequestration and storage, and as sources of food and livelihood for coastal communities. Their importance was highlighted after Typhoon Yolanda (International Name: Typhoon Haiyan) in 2013 when coastal communities without mangrove forests cover were most severely damaged [1]-[5]. It is reported that approximately 60% of the mangrove ecosystems are degraded and used unsustainably [6]. Specifically, 35% of the world's original mangrove forests cover is already lost, with some countries having lost up to 80% [7].

The Calatagan Mangrove Forest Conservation Park (CMFCP) is locally known as "Ang Pulo." It is a 7.5 hectare marine protected area (MPA). There were

estimated 500 households in the barangay. The CMFCP is being managed by the people's organization named Pro-mangrove Alliance and Implementing Team and Arm as Kilitisan's Advocates of Nature or PALITAKAN [8]. In addition, CMFCP houses ten (10) mangrove species such as *Aegicerascorniculatum*, *Avicennia marina*, *Bruguiera cylindrical*, *Ceriopsdecandra*, *Ceriopstagal*, *Excoecariaagallocha*, *Rhizophoraapiculata*, *Rhizophoramucronata*, *Rhizophorastylosa*, and *Sonneratiaalba*. The *A. marina* has the highest density and *S. alba* has the lowest density [9].

According to the framework of Abdullah et al. (2014) [10] as adapted from Baral & Stern (2011), Campbell & Vainio-Mattila (2003) and Farley et al. (2010), the local community must be at the center of the ecosystem rehabilitation or conservation programs and paradigm because they would be the direct beneficiaries of these programs when successful, as well as the ones that will be greatly affected when

rehabilitation or conservation fails. As the community both manages and extracts its local natural resources, it also shares the power and responsibility to manage these natural resources with other groups of stakeholders such as i) government agencies, ii) non-government organizations (NGO), iii) and iv) industrial sector). The role of the government, particularly the local government in managing protected natural resources lies more importantly in the assessment, monitoring and evaluation and financing, and in decision making [11]. In sum, it is the local community who must take greater role in caring for these resources; as stewards and beneficiaries of goods and services of the natural resources regardless of possible absence of the support from external governing bodies [12].

On the other hand, the lack of community participation is one of the causes of mangrove degradation in many part of the world [2]. Lack of stakeholders' participation in conservation projects led to many different problems [13] and failures in achieving natural resources management and conservation goals [14],[2]. However, mangrove conservation still being prioritized to save the remaining mangrove forest; like in the Philippines, community-based conservation of mangrove projects were initiated by the different non-government organizations (NGOs) whose members are mostly the local fishers [15].

Objectives of the Study

The study determined the community-based efforts done by local government unit of Calatagan municipality and Batangas province, local community of Barangay Quilitisan, and people's organization (PALITAKAN) toward sustainable management of the Calatagan Mangrove Forest Conservation Park in Barangay Quilitisan, Calatagan, Batangas, Philippines.

It specifically determined the level of knowledge and awareness of local government unit (LGU), people's organization (PALITAKAN), and local community of Barangay Quilitisan toward mangrove resources, services, and mangrove conservation practices; and the valuation of direct uses of mangrove resources as perceived by LGU, people's organization (PALITAKAN), and local community.

METHOD

Study Area

The study area is the Calatagan Mangrove Forest Conservation Park (CMFCP) located at Barangay Quilitisan in Calatagan, Batangas. The CMFCP is locally known as "Ang Pulo." It is a 7.5 hectare marine

protected area (MPA). There were estimated 500 households in the barangay. The CMFCP is being managed by the people's organization named Pro-mangrove Alliance and Implementing Team and Arm as Kilitisan's Advocates of Nature or *PALITAKAN*. It was formerly named as *Tagapangalaga ng Likas Yamang-Dagat Mula sa Kilitisan* or *TALIMUSAK* [8]. *TALIMUSAK* started in 2010 with ten female members. Currently, *PALITAKAN* has 39 members composed of 19 females and 20 males but there are 15 female and 11 male active members. There are, therefore, more females than males who are active in the conservation efforts and management of the mangrove park.

Knowledge and Awareness (KA) Survey

The researcher used the structured questionnaire modified from instrument of Da Silva (2015) [16] to determine the knowledge and awareness toward mangrove resources, services, and conservation practices.

The questionnaire used a 5-point Likert scale. It has two parts, the demographic profile and KA questions. The KA questionnaire is divided into three sub-facets: mangrove resources, mangrove services, and mangrove conservation practices. It has a total of 48 statements and it is distributed as: 14 for mangrove resources, 14 for mangrove services, and 20 for mangrove conservation practices. Each statement has Filipino translation for it to be easily understood by the respondents. The questionnaires were given to the respondents to answer, while the researcher was available to answer questions. In some cases when the respondents could not read or write, then the researcher read the question twice, and recorded their responses.

This questionnaire was administered to 79 respondents which included the local community people composed of 39 fishers and gleaners, and 19 representatives from local barangay, and municipal government, and 21 *PALITAKAN* members.

Contingent Claim (Option) Valuation Survey

This used structured questionnaire based on Option Pricing Model of Damodaran (2011) [17] to determine the value of direct uses of mangrove resources based on their knowledge and perception. It used the same respondents on KA, which were composed of 39 fishers and gleaners, 19 representatives from local barangay, and municipal government, and 21 *PALITAKAN* members who were asked how much they were willing to sell listed mangrove resources, if in case they are going to sell or can sell them.

Statistical Analysis

Mean, percentage, standard deviation, and range were used to analyze the demographic profile, knowledge and awareness toward mangrove resources, services and conservation practices, perceived selling price of mangrove resources and gender disaggregated data. Duncan's Multiple Range Test and General Linear Model were used to further analyze the differences between the different variables mentioned above.

The following shall be the basis of the interpretation of scores in the KA Survey Questionnaire in terms of the Level of Knowledge/Perception: 24-43: Very Low; 44-63: Low; 64-83: Moderate; 84-103: High Level; and 104-120: Very High.

Ethical Considerations

Consent letter were given to all participants before the conduction of the survey. Information such as participant's name and address were kept confidential and would never be disclosed to anybody.

RESULTS AND DISCUSSION

Demographic Profile of the Respondents

The respondents in FGD were composed of 21 PALITAKAN members who were present during their regular monthly meeting at the time data collection. Average age was 40.9 years old, with range between 17 to 71 years old. More male members of PALITAKAN who served as *bangkeros* or boatmen were present than female members during the KAV questionnaire data survey but more females during the monthly meeting wherein FGD was also conducted. Initially, this people's organization started with ten female members. Eventually, male members of the community appreciated the economic value of the conservation and became members of the PO. Now, it has total 39 members, with more active female members than males who devoted time in managing the mangrove conservation park toward environmental sustainability. *Ang Pulo* is now an ecotourism site and requiring all the guests to pay for entrance fee, accommodation, food, and tour. They are also selling seedlings to whoever likes to conduct tree planting on the site. The PALITAKAN members were benefited from the income generated and some of income goes to the maintenance of the facilities.

Table 1. Demographic Profile of the 79 respondents in the Knowledge, Awareness and Valuation (KAV) surveys using questionnaire and FGD in Bgry Quilitisan, Calatagan, Batangas.

SEX			
Respondent	Male	Frequency Female	Total
KPV Respondents			
LGU	11	8	19
NGO	12	9	21
(PALITAKAN)			
Local Community	23	16	39
(Fishers and gleaners)			
Total	46	33	79
AGE			
Respondent	Mean (Year old)	Range (Year old)	Standard Deviation
KPV Respondents			
LGU	39.3	22-71	12.9
NGO	43.2	19-61	12.9
(PALITAKAN)			
Local Community	37.6	13-72	17.2
(Fishers and gleaners)			
Total	39.6	13-72	15.2

*KAV or Knowledge-Awareness-Valuation

Table 2. Knowledge and Awareness of the local community, local government and the PALITAKAN toward Mangrove Resources, Services, and Conservation Practices

	Resources			Services			Conservation Practices		
	Mean (N=79)	Level	SD	Mean (N=79)	Level	SD	Mean (N=79)	Level	SD
Knowledge	28.25	High	5.01	29.71	High	4.67	40.42	High	8.01
Awareness	29.30	High	4.80	30.39	High	6.14	41.81	High	7.45

Table 2 shows the level of knowledge and awareness of the respondents toward mangrove resources, services and conservation practices. Mangrove resources are the things that can be extracted from the mangrove, mangrove services are the indirect benefits that mangrove can give to human ecosystem, and mangrove conservation practices are the ways of managing and sustaining mangroves. It is showed that the respondents have high level of knowledge and awareness toward mangrove resources, services, and conservation practices. The high score obtained means that the respondents are more knowledgeable and aware. Since there is sharing of power and responsibility between local community, local government and people's organization in managing mangrove resources, these stakeholders became knowledgeable and aware on the mangrove resources, services, and conservation practices [10]. Moreover, the knowledge and values of the stakeholders are needed to have sustainable biodiversity conservation [18].

Table 3 shows that the means on the knowledge and awareness of people's organization or PO (PALITAKAN) towards mangrove resources, services and conservation practices were significantly higher than that of the LGU and the local community, while the means of the knowledge and awareness on resources, services and conservation practices of local community have higher values although not significantly different from that of the LGU. These results indicated that the active involvement in the conservation of the mangrove forests enabled the

members of the PALITAKAN to have higher knowledge and awareness on mangrove resources, services and conservation practices than the members of the LGU and the general members of the local community who are not members of the PALITAKAN.

The members of PALITAKAN have very high level of knowledge and awareness toward mangrove resources, services, and conservation practices. Both LGU and local community who were represented by the fishers and gleaners have high level of knowledge and awareness toward mangrove resources, services, and conservation practices. Results indicated that the PALITAKAN who are the key driver of conservation efforts for CMFCP exhibited a very high level of knowledge and awareness toward mangrove resources, services and conservation practices that may be attributed to the different experiences and exposure and access to the different information about mangrove resources and services [19] which is essential in conservation efforts. Since LGU, PO, and local community have been involved in community-based conservation program, they are knowledgeable and aware on the mangrove resources, services, and conservation practices and develop a sense of ownership towards the mangrove resources and how to conserve these resources [15].

In developing conservation project, local community must have education and awareness on the project [19] and they must perceive that mangroves were beneficial to their lives [1]. Improving the knowledge of the local community can affect the conservation effort of the managed resources [20].

Table 3. Mean differences of Knowledge and Awareness of LGU, NGO and Local Community toward Mangrove Resources, Services, and Conservation Practices

	Resources			Services			Conservation Practices		
	Mean (N=79)	Level	SD	Mean (N=79)	Level	SD	Mean (N=79)	Level	SD
Knowledge	28.25	High	5.01	29.71	High	4.67	40.42	High	8.01
Awareness	29.30	High	4.80	30.39	High	6.14	41.81	High	7.45

* Values with the same letter in the superscript under the same column means not significantly different at $p(0.05)$

Table 4. Mean of Perceived Valuation (Selling Price) of Mangrove Resources

Mangrove Resource	Quantity	Perceived Selling Price (Peso)	SD
Timber	Per Kilogram	201.46	355.29
Fuel wood	Per Bundle	44.75	70.19
Charcoal	Per Sack	228.67	278.14
Bark	Per Kilogram	278.8	304.8
Seed	Per Piece	29.09	69.63
Seedling	Per Piece	28.22	46.18
Mangrove tree	Per Piece	903.04	3055

Moreover, the rehabilitation and restoration projects for mangroves provide potential increase in mangrove resources and it also provides employment to local community, protection to the vulnerable coastline areas and maintenance of biodiversity [6],[21],[22],[23]. Conservation project is successful because of the strong cooperation of different stakeholders like government, NGO, local community and donors [2]. Government really has significant role maintaining a healthy social-ecological system and in the success of the conservation project [24]. The local government managed protected natural resources through assessment, monitoring and evaluation and financing and decision [11]. The local community plays a great role in conservation project as they are the stewards and beneficiaries of the resources being conserved [12]. That is why it is recommended that strong linkages between the local community, government agencies, and NGOs will develop a successful community based conservation project towards sustainable development [10].

Since mangroves are sources of timber, charcoal, and bark, [6],[22] these mangrove resources obtained high perceived selling price from the LGU, PO and local community. Mangrove tree has the highest perceived selling price while seeds and seedlings have the lowest. However, the LGU, PO, and local community have different perceived monetary values

of these resources which reflected in their high standard deviation values.

Table 5 shows that the mean of perceived selling price of the timber of PO have significant difference from the LGU. The rest of the means have no significant differences from each other. The LGU, PO and local community would sell these mangrove resources in different prices. The LGU would sell timber in the lowest price compared to PO and local community. The local community would sell the mangrove tree in the highest price compared to LGU and PO.

The role and direct experiences of the different stakeholders could dissect how they put value on the resources. The local community and PO members are dependent to the resources and involved in extracting and selling mangrove resources during the times when CMFCP were not yet established, they gave their perceived selling price based on their prior experiences. On the other hand, LGU has limited involvement in selling these resources since they are also involved in law enforcement and conservation of these mangrove resources.

The community is the direct beneficiary of many goods and services of mangrove forest [25] and it is undeniable that people used the different resources to make a step in improving their life and economic status and just to feed their family [26]. The results revealed that a fully grown mangrove has a perceived average selling price of ₱903.04. It was estimated that 35% of the mangrove forest in the Philippines were converted into fishponds [27] and this is indirect option in contingent claim (option) valuation for the decision makers. They have to decide on how these mangrove resources which are undervalued, is to be sacrificed to establish fishponds. This may imply that decision makers often place the short-term economic benefits of the few over the benefits of the many [28]. They are using the mangrove resources without realizing its true value [1] which is realized in the study of [2] that the value of mangroves in relation to fisheries is five times greater than the value when the same forest is cleared for timber.

Table 5. Mean differences of Perceived Selling Price of Mangrove Resources

Stakeholder	Perceived Selling Price Mean Difference						
	Timber	Fuel Wood	Charcoal	Bark	Seed	Seedling	Mangrove Tree
LGU	70.26 ^b	44.21 ^a	123.68 ^a	250.53 ^a	38.66 ^a	41.42 ^a	239.70 ^b
PO (PALITAKAN)	315.24 ^a	55.00 ^a	214.05 ^a	201.43 ^a	38.14 ^a	32.19 ^a	277.40 ^b
Local Community of Brgy. Quilitisan	204.10 ^{ab}	39.49 ^a	287.69 ^a	334.23 ^a	19.56 ^a	19.65 ^a	1563.10 ^a

Values with the same letter in the superscript under the same column means not significantly different at $p(0.05)$

CONCLUSION AND RECOMMENDATION

The mangrove conservation project in Quilitisan, Calatagan, Batangas is participated by the different stakeholders such as local government unit (LGU), people's organization (PO) which is the PALITAKAN, and local community which is composed of local fishers and gleaners. The three groups of stakeholders, composed of the LGU, PO, and local community have varying levels of knowledge and awareness on the mangrove resources, services and conservation practices which also affected (positively and negatively) on the perceived values they put on mangrove resources. The higher the involvement in conservation practices such as those of PO and LGU, the greater are their desire to reduce the selling price of the mangrove resources. On the contrary, the local community with lower knowledge and awareness on conservation practices, considered the mangrove tree which they can use for fuel and dye for bark, to have the highest value. The results indicated for harmonizing the knowledge and awareness of the three important stakeholders of the *Ang Pulo* conservation measures so that everyone in the community could benefit in both the direct and indirect ecosystem benefits and services that mangroves can provide.

This study determined limited psychological factors such as knowledge and awareness that affect the success of community-based conservation. It is recommended to determine the other ecological, institutional, and psychological factors that are not included in this study such as quality of flora and fauna, organizational commitment, participatory process, political status, attitude, willingness to participate and others. Knowledge, awareness, and perceived value of the resources and benefits of the stakeholders are key drivers for community-based conservation efforts. In view of this, it is recommended that it is very important to educate and motivate the direct stakeholders such as the local community and LGU in managing mangrove conservation projects.

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