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Gender Roles in the Utilization and Challenges in the Management of Mangrove Forests in Casiguran, Aurora, Philippines

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Abstract

Mangrove utilization and management were observed done by men and women depending on their needs and priorities in Casiguran, Aurora. This study, therefore, tried to investigate the gender roles in the utilization and management of mangrove forests, the existing mangrove management practices and their challenges, and the relationship between gender and mangrove resources management. A mixed-method approach was used and data were obtained through triangulation. Respondents were obtained through snowball sampling and interviewed using a structured questionnaire with a few open-ended questions. Results revealed that the majority of the respondents were women (60.7%) and residents of Brgy. Esteves (52.5%) live within or near the mangrove forest. Mostly married (59%) who were providing food and income for the family. They utilized mangrove woods (58.20%) with an average quantity of less than 10 board feet (34.4%) for cooking (40.2%). Roots were utilized in minimal amounts (2.50%) for mythical, medicine, and cork purposes. Mollusks (93.44%), commonly bivalves (93.4%), were primarily gleaned by women for food consumption (93.4%) and as a source of income (93. 61%). On the other hand, catching of crabs (57.4%) for consumption (56.6%) and as a source of income (14.8%) and catching of fish (31.1%) for consumption (27.9%) were done by men. Both genders were involved in mangrove management practices, although only 65% of them had actual involvement in mangrove planting, 19% in mangrove nursery development and maintenance, and 16% in mangrove plantation maintenance. Challenges in management include low survival rate of planted mangroves (33%), lack of maintenance activity (20%), and lack of funds for mobilization (20%). A chi-square test of independence revealed that both men and women have no

significant difference in their involvement in nursery establishment and maintenance, mangrove planting, and plantation management.

Keywords

Social Science, Gender Roles, Utilization and Management, Mangrove Forests, Mixed-Method Approach, Philippines

1. Introduction

Mangrove is a rich habitat that supports terrestrial and marine species. This has been used, since time immemorial, as a source of timber, food, charcoal, firewood, and medicine. The two most common uses of mangrove wood are for fuel and construction [1]. Unfortunately, the continuous use of mangrove resources has led to large-scale exploitation, internationally. Global conservation efforts are now engaging local communities in their actions to reverse this dangerous trend [2].

In Aurora, 90% of its mangrove forest is located in the northern municipalities of Casiguran and Dilasag while the remaining 10% is scattered in patches in other municipalities but more common in the municipality of Baler [3]. In Casiguran, particularly in the Barangays of Cozo, Tinib, and Lual, it is observed that coastal residents are gleaning for mollusks, catching crabs, gathering firewood, and even collecting fruits from *Nypa fruticans* in a mangrove forest. It is evident that mangrove forests serve as a source of income and livelihood. It is noted, however, based on actual observation and informal interviews, that mangrove utilization and management differ in men and women depending on their needs and priorities. For example, men are into wood gathering as women usually find it heavy to carry the bulk of firewood while women are into mollusk collection as men usually have little patience in gleaning. The differences between men and women in responsibilities and constraints in terms of mangrove use would produce differential impacts to the mangrove forest resources, that is, the continuous wood gathering would result in the decline of mangrove forest while continuous mollusk collection would result in the decline of mollusk resource.

In the study conducted by [4], results revealed that local people are mainly dependent on fishing and aquaculture around the mangroves. It also noted that women have a good understanding of the role of mangroves and they are associated with mangroves not less than men, but so far, their role has been overlooked. The mangrove management process seems to exclude women. This is related to the findings of [5] that mangrove management is androcentric and that there is a deep gender inequality. What previous studies failed to discuss are the challenges that were experienced by different genders in the management of mangrove forest.

This study, therefore, tried to investigate the gender roles in the utilization, existing mangrove management practices and challenges encountered, and the relationship between gender and mangrove resource management. Furthermore, interventions, and extension activities appropriate for the sustainability of mangrove resources and improvement of economic condition in the coastal communities in Casiguran, Aurora were also determined.

The result of this study will serve as a basis for the formulation and implementation of mangrove management policies that are gender-sensitive for the sustainability of mangrove resources. This will also serve as a basis for extension programs and activities by the Department of Forestry and Environmental Science of the Aurora State College of Technology related to mangrove management and training for alternative livelihood within the study areas e.g. mangrove planting, lectures on the importance of mangrove forest and or training on mud crab hatchery.

2. Methodology

2.1. Research Design

A mixed method was used in this study. This drew primarily on quantitative survey data supplemented with qualitative data obtained from respondent interviews, key informant interviews, and participants' observations.

2.2. Population and Locale of the Study

This study was conducted in Barangays Esteves, Lual, and Tinib in Casiguran, Aurora where mangrove forests and resources users are present. Men and women are observed utilizing the different mangrove resources based on their needs and priorities.

2.3. Data Collection Procedures

The participants were obtained through snowball sampling until at least 90% of the total population involved in mangrove utilization and management were interviewed. The data were collected by triangulation which involves participant observation, survey, and key informant interview.

All data gathered, including photos, videos, and recordings were used only for the purpose of this study. There were handled with utmost confidentiality.

The researcher participated in some activities of the respondents such as mollusks gleaning and crab catching. All observations during each activity participated were recorded on a field notebook. Taking pictures and videos were done with the consent of the participants.

For the survey, a questionnaire consisting of structured and open-ended questions was utilized. The questions were translated into Filipino and were interviewer-administered.

A semi-structured interview was conducted to validate the information obtained from the questionnaire. The informants were the Barangay Captain, NGO,

and heads of groups that work with the mangrove ecosystem.

2.4. Research Instrument

A self-made structured questionnaire, with questions, where respondents were asked to tick their answers as well as open-ended questions, was utilized for the survey. For the Key Informant Interview, the researchers used a semi-structured interview guide. Camera and voice recorders were used for documentation.

2.5. Treatment of Data

The data obtained were transcribed and analyzed by categorization and theme formation with relevance for the study. Statistical tools used descriptive analysis (frequency, mean, and percentage), a chi-square test of independence was used to determine if there is a relationship between the engagement in mangrove management activities and gender. The Chi-square test is suitable for testing the relationship between variables when both are categorical or nominal [6]. This test is also appropriate when dealing with unpaired samples such as the samples used in this study.

3. Results and Discussion

Table 1 shows the profile of the respondents. The majority of the respondents were women (60.7%) and most at the age range of 21 - 30 years old. These individuals were seen collecting and using mangrove resources in the study areas, the majority of which were residents in Brgy. Esteves (52.5%) are living within or near the mangrove forest while mangrove users in Tinib and Lual were living a little distant from the mangroves. Most were married (59%) and were self-employed (44.3%) providing food and income for the family from whatever resources were gleaned or collected from the mangrove forests. Most of them were utilizing mangrove resources for one year to less than ten years (27.9%).

The sociodemographic profile of the respondents revealed that women were more familiar with the mangrove forests, collecting resources within while males were into the sea, fishing. This is related to the study of [4] who noted that women have a good understanding of the role of mangroves and that they are associated with mangroves not less than men, but so far, their role has been overlooked.

The majority of the respondents utilized wood from the mangroves (58.20%) specifically, deadwood (40.2%) with an average quantity of less than 10 board feet (34.4%). The collected woods were mostly used for cooking (40.2%) (Table 2). This is related to the result in the study of [7] in Sine-Saloum Delta, Senegal where the most important use of mangrove by the community is for fuelwood. In addition, the study of [8] in Sundarbans mangrove forest in Bangladesh revealed that households are dependent directly on the mangrove forest for livelihood support at varying degrees extracting mostly fuelwood. In Esteves, Tinib, and Lual, dead woods for fuelwood are commonly found inside the mangrove

Table 1. Socio-demographic profiles of respondents.

	Frequency	Percentage
Gender		
Male	47	38.5
Female	74	60.7
Age		
Below 10 years old	5	4.1
10 to 20 years old	16	13.1
21 to 30 years old	26	21.3
31 to 40 years old	21	17.2
41 to 50 years old	17	13.9
51 to 60 years old	25	20.5
Over 60 years old	12	9.8
Place of Residence		
Esteves	64	52.5
Lual	22	18.0
Tinib	36	29.5
Marital Status		
Single	40	32.8
Married	72	59.0
Widowed/widower	6	4.9
Separated	4	3.3
Educational Attainment		
Elementary Level	20	16.4
Elementary Graduate	27	22.1
Secondary Level	33	27.0
Secondary Graduate	29	23.8
College Level	8	6.6
College Graduate	5	4.1
Employment Status		
Student	18	14.8
Self-Employed	54	44.3
Unemployed	40	32.8
Employed in Private Agency	5	4.1
Employed in Government Agency	4	3.3
Retired	1	0.8
Number of Years as Mangrove Users		
Less than one year	17	13.9
One year and one day to 10 years	34	27.9
10 years and one day to 20 years	21	17.2
20 years and one day to 30 years	21	17.2
30 years and one day to 40 years	12	9.8
40 years and one day to 50 years	9	7.4
50 years and one day to 60 years	5	4.1
over 60 years	3	2.5

Table 2. Wood utilization by the respondents.

	Frequency	Percentage
Numbers of mangroves wood user	71	58.20
Number of non-mangrove wood user	51	41.80
Types of wood used		
Deadwood	49	40.2
Green Wood	1	0.8
Both Green and Dead Wood	1	0.8
Purpose of collecting wood		
For Cooking	49	40.2
Lumber	2	1.6
Average quantity of wood gathered in one month		
less than 10 board feet	42	34.4
11 to 20 board feet	4	3.3
21 to 30 board feet	1	0.8
41 to 50 board feet	3	2.5
61 to 70 board feet	1	0.8

forests and are usually abundant after a typhoon and occasionally, after a strong wind that caused branches of mangroves to fall. Deadwoods for fuelwoods were common as traditional stoves were still prevalent in every household within the study areas. However, some of the respondents also collected woods as lumber for house construction or house repair after a typhoon where most of the houses near the mangrove forests are damaged. Collection of woods was done both by men and women in small quantity only as respondents are aware that cutting of mangrove is prohibited under Philippine law as specifically written in Section 4 of Republic Act 7161. However, it is noted that collection for firewood was usually done by women while the collection of wood or lumber for house repair was done by men. This gender-influenced wood collection is also noted in the study of [9] where mangrove wood harvesting was influenced by gender type and physical strength.

The percentage of respondents utilizing the roots of mangroves is very minimal (2.50%) and are utilizing the roots for mythical purposes, medicine and cork for a bottle (**Table 3**). For mythical purposes, roots are dried, sewn inside a small cloth, and hanged inside the house to ward off evil spirits. As a medicine, the roots were prepared by pounding to extract the juice and used as a paste to treat toothache. The roots were also utilized as a decoction to treat stomach aches.

In the study of [7], pencil roots of *Avicennia germinans* are used as a tea; and as a treatment to stomach, body, and toothaches; asthma, diarrhea, menstruation crumps, sexually transmitted infections, and pain associated with pain and childbirth. *Rhizophora* spp. prop roots on the other hand are used for mystical purposes where respondents reported that pieces of roots can be worn to protect the wearer from having to go to prison; can be tied to a child to keep healthy

Table 3. Root utilization by the respondents.

	Frequency	Percentage
Number of Mangroves Roots User	3	2.50
Number of Non-Mangroves Roots User	119	97.50
Purpose of collection		
Mythical Purposes	1	0.8
Medicine	1	0.8
tools	1	0.8
Quantity of Roots Collected in one Month		
less than 10 kg	2	1.6
11 - 20 kg	1	0.8
31 - 40 kg	1	0.8

during the rainy season, can be buried in the house for household protection, and can be scattered in the field to increase crop yields.

The majority of the respondents were gleaning mollusks (93.44%), commonly bivalves (93.4%), for food consumption (93.4%), and a source of income (936.1%) (Table 4). The collection mostly amounted to less than 10 kilograms (66.4%) a month as most of the respondents were able to collect mollusks only at an average of 2 hours during low tide, either in the morning or in the afternoon. Collected mollusks are served as food for the family while some are sold to nearby Barangays. This activity was done mostly by women together with their children using an improvised rake. This implies that women were familiar with the mangrove forest environment. This is related with the study of [10] where gleaning was observed to be a traditional practice conducted by women with other family members, a subsistence activity, taking place in mangrove areas aside from shallow reef flats, mudflats, sand, and rocky areas, thus explaining the familiarity of the gleaners with the immediate coastal habitats.

The majority of the respondents were catching crabs (57.4%) specifically, swimming crab (*Charybdis annulata*) (48.4%) and mud crab (*Scylla serrata*) (39.3%) for consumption (56.6%) and as a source of income (14.8%) (Table 5). The swimming crab was easily collected by respondents as these can be seen readily under submerged logs and coconut husks within the mangrove forests while in order to catch a mud crab, one needs the expertise to identify the right hole to dig and a wire hook to use for a sure catch. In addition, swimming crabs were most preferred for food consumption while caught mud crabs were sold in the neighborhood or in the market because of their higher price. Although mud crab can be sold for a profit, only a few of the respondents had the skill to catch this species. The collection of crabs per month did not exceed 10 kilograms per respondent (50%) and the collection was commonly done by men since they were the ones more familiar with the crabs' environment that enable them to catch this species. This is similar to the case of gleaners in Albay Side of Lagonoy Gulf where Crustaceans were reportedly caught along with shellfish and other

Table 4. Mollusks collection by the respondents.

	Frequency	Percentage
Number of Mollusks Collector	**114**	**93.44**
Number of Non-Mollusks Collector	**8**	**6.56**
Types of Mollusks Collected		
Bivalves	114	93.4
Gastropods	85	36.1
Quantity of Mollusks Collected in one Month		
Less than 10 kgs	81	66.4
11 - 20 kgs	21	17.2
21 - 30 kgs	2	1.6
31 - 40 kgs	6	4.9
60 - 70 kgs	3	2.5
More than 70 kgs	1	0.8

Table 5. Crab utilization by the respondents.

	Frequency	Percentage
Number of Crabs Catcher	**70**	**57.4**
Number of Non-Crab Catcher	**52**	**42.6**
Types of Crabs Caught		
Mud crab (*Scylla serrata*)	48	39.3
Swimming crab (*Charybdis annulata*)	59	48.4
Singapore vinegar crab (*Episesarma singaporense*)	44	36.1
Coconut crab (*Cardisoma guanhumi*)	29	23.8
Fiddler crab (*Uca vocans*)	14	11.5
Purpose of Catching Crabs		
Consumption	69	56.6
Source of Income	18	14.8
Bait	3	2.5
Quantity of Crabs Collected in one Month		
Less than 10 kgs	61	50.0
11 - 20 kgs	8	6.6
51 - 60 kgs	1	0.8

invertebrates as gleaners have the intimate knowledge or familiarity with the environment that enable them to easily identify and harvest the target species where they are found [10].

Table 6 shows that most of the respondents do not catch fish within the mangrove forests (68.9%), although some did (31.1%) for consumption (27.9%). Catching when done was mainly for food consumption (27.9%) and mostly less than 10 kilograms per month (26.2%). Commonly caught fishes were "bakuli", "banak", and "mamong". The catching of fish was usually done by men at night time during high tide, but not during full moon where the moon would illuminate the mangrove forests and fishes were scattered in different locations making

Table 6. Fish caught by the respondents within the mangrove forests.

	Frequency	Percentage
Number of fish Catcher	38	31.1
Number of Non-fish Catcher	84	68.9
Purpose of Catching fish		
Consumption	34	27.9
Source of Income	8	6.6
Bait	1	0.8
Quantity of fish Collected in one Month		
less than 10 kgs	32	26.2
11 - 20 kgs	1	0.8
21 - 30 kgs	4	3.3

it hard for them to catch fish. Some of the respondents caught fish as a source of income (6.6%) and sold their catch in the neighborhood or nearby barangays. The selling of fish caught within the mangrove area was also observed in the study of [11] where 36% of the income of the local community in Ayeyarwaddy Region, Myanmar was from mangrove fish, confirming the dependence of the livelihood on the mangrove forest ecosystem.

Respondents knew the importance of mangrove forests in their lives. They were aware of the benefits they can get from the mangrove forests as evidenced by the resources they were collecting. They also received free seminars and training from the Community Environment and Natural Resources Office (CENRO) on mangrove plantations and management. However, only 65% of the respondents had actual involvement in mangrove planting, 19% in mangrove nursery development and maintenance, and 16% in mangrove plantation maintenance (**Table 7**). Those involved in planting, nursery development and management, and mangrove plantation maintenance activities were active members of a certain organization who worked hard to get funding from the government.

However, when it comes to the management of the mangrove forests, the majority of the respondents considered the following challenges: the low survival rate of planted mangroves (33%), lack of maintenance activity (20%), and lack of funds in the mobilization of the barangay to manage the mangrove forests (20%) (**Table 8**). The obvious lack of maintenance after planting resulted in the low survival rate of planted mangroves. Planted mangroves were prone to trampling and cutting by mollusk gleaners; and damage by small fishing boats passing through mangrove plantations.

Engagement in Mangrove Management between Gender

In the nursery establishment, it was evident that only a few of the respondents were involved. Most of those involved were women (**Figure 1**). Nurseries constructed for mangrove planting were temporary and labor was only offered to selected few individuals who were paid with a minimal amount. Nurseries were

Table 7. Actual percentage of respondents with direct involvement in existing mangrove management.

Projects	Frequency	Percentage
Mangrove planting	79	65%
Mangrove nursery development and maintenance	23	19%
Mangrove plantation management	19	16%

Table 8. Actual percentage of the respondents considered the following as challenges in the management of mangrove forests.

Challenges	Frequency	Percentage
Low survival rate of planted mangroves	40	33%
Lack of maintenance activity in reforested mangroves areas	25	20%
Lack of fund to mobilize the community for mangrove management	24	20%
Lenient implementation of laws and ordinances	13	11%
Incompatibility of mangrove species planted during reforestation activity	3	2%

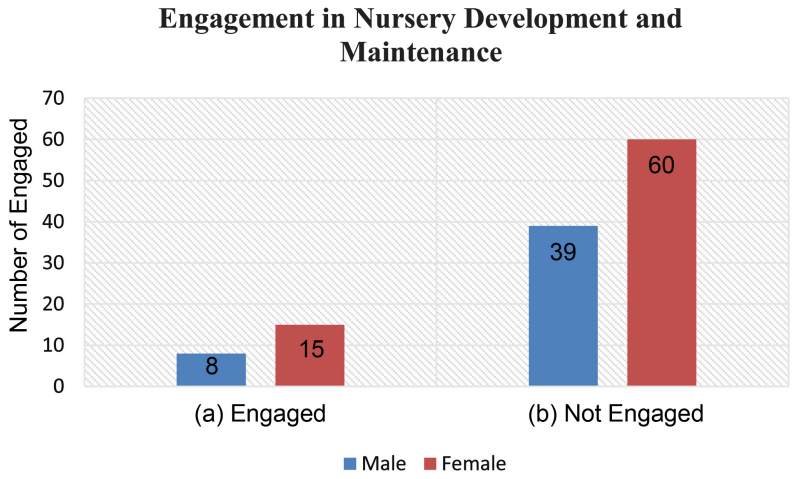

Figure 1. Engagement between sexes in nursery development and maintenance.

usually established near or within the mangrove forest to minimize the damage that will result in transporting the seedlings during planting. Management of the nursery was only assigned to one or two individuals who will look after the safety of the seedlings from damage by animals, wind, and strong waves. However, other individuals may also take part in the management during their free time.

Most respondents were involved in mangrove planting (**Figure 2**). They were

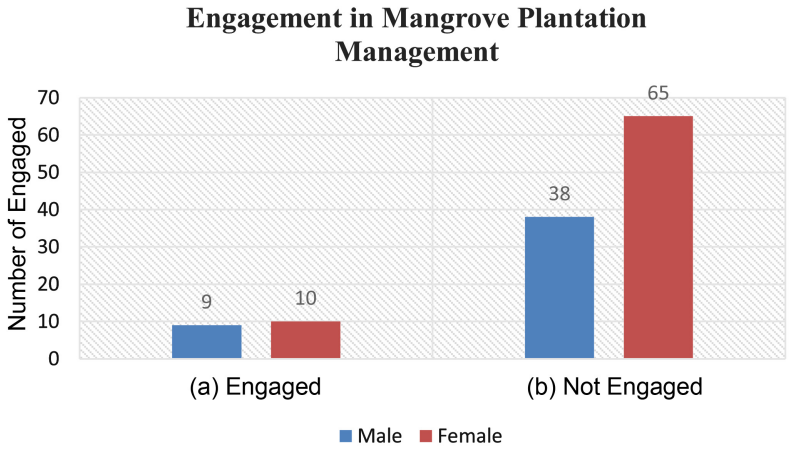

Figure 2. Engagement between gender in mangrove planting.

hired as laborers, mostly men, for a minimal fee. However, only a few of the respondents were involved in mangrove plantation management with almost equal representation by both men and women (**Figure 3**). These individuals were selected by a group leader in a certain organization who managed to get funding from the government agencies like the Community Environment and Natural Resources (CENRO) and Municipal Environment and Natural Resources Office (CENRO) for mangrove plantation and management activities.

A chi-square test of independence was used to determine if there is a relationship between gender and mangrove resource management (**Table 9**). It was found that the two variables are independent of each other. It means that being men or woman is not associated with certain mangrove management activities. Results showed that both men and women have no significant difference in terms of their involvement in nursery establishment and maintenance; mangrove planting, and mangrove plantation management.

The majority of the respondents believed that mangrove planting as an intervention or extension program must be done in the study area (n = 103) (**Table 10**). They know that mangrove planting could provide them income and at the same time could reforest the already deforested mangroves. Some of the respondents were also eager to participate in seminars on the importance of mangrove forests (n = 89); attend training on mangrove nurseries and nursery establishments (n = 89), and training on mud crab hatchery establishments (n = 24). These responses will be used as the basis for the Department of Forestry and Environmental Sciences of the Aurora State College of Technology for extension services to the community by providing free seminars and training that will serve as a driving force for the community to become partners in maintaining the sustainability of the mangrove resources. In relation, the study of [12] stated that the values of individual understanding of mangroves are the main force in maintaining the sustainability of mangroves and that the behavior of local communities towards the existence of mangroves is a very important social capital for the success of mangrove conservation.

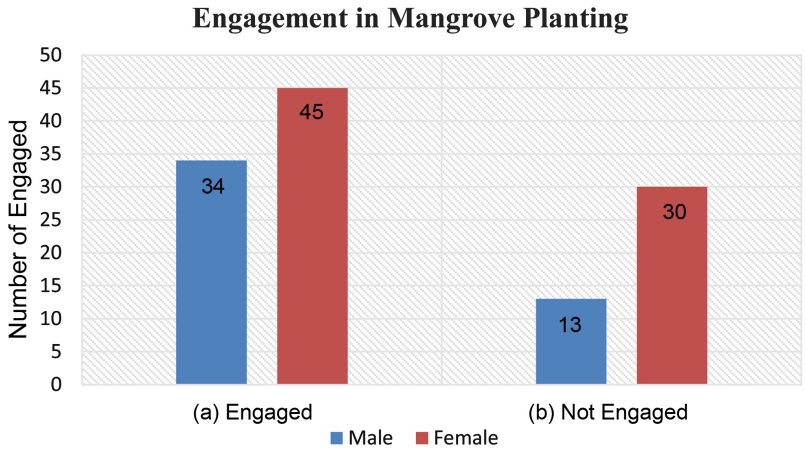

Figure 3. Engagement between gender in mangrove plantation management.

Table 9. Tests of Independence between gender and mangrove resource management.

Mangrove Management Activity	Pearson Chi-Square Value
Nursery Establishment and Maintenance	0.168 (0.682)^{ns}
Mangrove Planting	1.928 (0.165)^{ns}
Mangrove Plantation Management	0.743 (0.389)^{ns}

Figures in parentheses are p-values. ns indicates that p-value is more than 0.05 level hence there is no significant correlation.

Table 10. Mangrove management interventions and extension programs needed.

Interventions and Extension Programs	Frequency
Mangrove planting	103
Seminar on the importance of mangrove forests	89
Training on Mangrove nursery and plantation establishments	89
Training on mud crab hatchery establishment	24

4. Conclusion

The mangrove forests in Casiguran, Aurora served as a source of food, income, and even medicine for the community. It is concluded that specific gender roles in the utilization and management of the mangrove forests differ. The majority of the mangrove resources users were women commonly collecting fuelwood and mollusks. Men prefer gathering wood for house repair, collecting crabs, and catching fish for consumption in the mangrove forests. The majority of those involved in nursery establishment and maintenance as well as plantation management were men, although when it comes to planting, both men and women

had almost equal representations. A chi-square test of independence, however, revealed that both males and females have no significant difference in terms of their involvement in mangrove nursery establishment and maintenance, planting, and plantation management. As for the challenges, the low survivability of mangroves planted is considered as the main concern. The low survivability is connected to the second challenge perceived by the respondents which is the lack of maintenance activity in reforested areas. After planting, no follow-up activities were done that will ensure mangroves strive. Lastly, respondents believed that there are minimal funds to mobilize the community for mangrove management. The mangrove contributions to the livelihood of the community in the study areas served as an eye-opener to conserve the resources. To achieve this, the community needs and is willing to participate and be involved in interventions or extension programs like mangrove planting, seminars and training in mangrove nursery and plantation management, and training on mud crab hatchery establishment.

5. Recommendations

It is recommended that gender roles in the utilization and management must be considered to sustain the resources and should not be ignored in policy-level decisions and interventions; long-term monitoring is conducted within the study areas to determine the ecological effect of continuous utilization of the resources and to evaluate the success of the current management strategies, e.g. mangrove planting and management; and to prevent an inefficient use and reduce the community's dependency of the mangrove resources, interventions or extensions programs that will provide alternative income to the community be implemented. It was also recommended that mangrove forest managers and policymakers must implement community-based mangrove management in order to assure that mangrove panting activities will become successful.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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