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Management of the Nypa Mangrove as a Mitigating Measure against Resource Over-Utilization in Pamplona, Cagayan

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Abstract
The nypa palm, like the coconut palm, is a tree all of whose parts have uses including everything from the leaves down to the roots. Its uses range from food, medicine and as a material for construction and industry, not to mention its environmental, ecological and socio-cultural uses. In many areas in Southeast Asia before World War Two, its products were highly traded commodities. At present, nypa palm/mangrove is still one of the major sources of livelihood in many coastal towns in the Philippines and also plays a major role in the socio-cultural practices at the study area of the barangays (villages) Tabba and Cabaggan in Pamplona, Cagayan. These barangays are found along the tip of the Province of Cagayan and are influenced by the Kuroshio Current. However, this resource is now threatened due to over-utilization and conversion of its growth area into fishponds. Improved management of the nypa resource will increase its value to the community and will compel the population to protect it from over-utilization and prevent the imminent conversion of its habitat to other uses. Possible measures to increase the value of the resource to the community are an improvement in its utilization and advocacy to increase the community recognition and appreciation for its environmental and ecological roles. These measures can possibly be implemented through a participatory strategy. Such a strategy was therefore assessed as to its applicability in the area which also took into consideration the preparedness of the community for participatory undertakings.
The results of the assessment show that community participation as a management tool is a good strategy that can be employed to manage the nypa resource and increase its value to the community. This would ultimately result in the protection not only of nypa but of the entire mangrove resource and preserve its function as a source of livelihood and a buffer against the elements including threats posed by climate change.

Key words: biophysical resources, coastal ecosystem, mangrove, nypa palm, Cagayan

1. Introduction

Mangroves are vegetation growth between the marine and terrestrial environments. They act as an interface between the land and the sea and are viewed as coastal rainforest. Environmentally and ecologically, mangrove areas play a major role as they protect the land from sea accretions, strong waves and winds, and provide a favourable environment for a healthy coastal ecosystem. They serve as spawning grounds for various aquatic organisms and provide refuge for both terrestrial and aquatic life. Mangrove areas also support biodiversity in both land and water ecosystems. Mangroves provide many economic benefits. Mangrove trees are used for firewood, construction materials, a source of raw materials for industry, for medicines and as a source of food for coastal dwellers. One mangrove plant that provides a major source of livelihood in many coastal communities is the nypa palm. Like the coconut palm in all its parts can be used for economic purposes.

It is sad to note however that these various economic uses of mangrove plants have led to a high level of exploitation that contributed to the decline of mangrove areas around the world. Communities living near the mangrove areas over-harvested the trees, other plants and resources that it provides, not to mention converting the habitat for other uses. This lessens the protection that the mangrove areas provide from tidal surges and from strong winds during the occurrence of typhoons its vital role in maintaining a healthy and aquatic coastal ecosystem is undermined. Proper management of mangrove areas is needed to reverse their precarious condition and

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sustainably provide benefits to communities living near by.

This study aims to identify and analyze the present management of the nypa palm/mangrove in the study area and identify the development needs that are necessary to further increase its economic and environmental value through greater participation of the population and the community.

2. Methodology

1) Selection of the study area

Barangays or villages of Tabba and Cabaggan were chosen as the study areas due to the expanse of nypa mangrove and the number of households depending on nypa mangrove resources for their livelihood. The barangays are representative of other similar areas in Cagayan. Based on the socio-economic profile of the two barangays (National Nutrition Council, 2004) fishing and nypa product processing are the predominant occupations in the area making these two barangays popularly known as the major sources of nypa products and seafoods in the municipality. Most of the households of the two barangays are engaged in nypa product processing and these two barangays have the largest areas of nypa mangrove in the municipality.

2) Determination and selection of the sample of respondents

The head of the households were targeted to be the respondents regardless of their occupation or sources of income as long as they were permanent resident in the area.The total number of respondents in each of the barangays was determined using Slovin's formula (Pagoso, 1997). The list of household heads was obtained from the barangay secretary through the barangay chairman in each of the study areas. A simple random sampling was taken from the list. The total number of respondents surveyed was 252 households. Out of the total number of household head respondents, 175 (or 76%) were men and 55 (or 24%) were women. The total respondents was more than the figure of 230 computed from Slovin's formula because the members of the Cabaggan Women's Organization (22 respondents) were given separate survey questionnaires. Their responses were considered because of their valuable experiences and knowledge in the nypa industry. Their responses also served as a countercheck to the accuracy of the information provided by the household head respondents.

3) Research tools used

The research used the Participatory Rural Appraisal (PRA) process in data gathering. PRA involves a wide range of participatory tools and techniques depending on the situation or needs, and the respondents are not only considered as sources of data/ information but more as participants and partners in the generation of data. They are involved in the conduct of the survey from the planning to the evaluation of the accuracy of the data gathered (Pokharel, 1998).The data gathering tools used included the use of structured questionnaires, interviews, workshops, and field surveys.

The use of questionnaires was generally focused on getting information from the general population in the study area on the present management system of the nypa mangrove including its uses and functions, factors affecting these, and also its importance to the community. This was supplemented by interviews from key informants such as traders, government officials, store owners, and members of organizations in the area. To further enrich and validate the information gathered, a field survey was undertaken. The field survey made use of the PRA technique known as the "boat ride." This technique uses a predetermined transect which is an imaginary line drawn in a schematic map of the area to be visited. This was done with the key informants by planning the locations of the best areas to be visited and investigated. From the identified areas an imaginary line called a transect was drawn which was then used as a guide during the field visit. The field survey was done with the guidance of key informants in the barangays with the purpose of assessing/investigating the physical conditions of the nypa palm/mangrove.

A workshop was also held to solicit residents' visions, problems, ideas and other information needed in planning for better management of the nypa resource. The workshop was attended by 50 participants coming from a cross-section of the population of the community which included representatives from youth, women, farmers and fishers, elderly, religious, and traders.

4) Statistical analysis

In the analysis of the data gathered, the basic statistical tool used was descriptive statistics including the use of frequency analysis. The frequency of responses of the respondents to specific questions were tallied, grouped and statistically analyzed. The mean and percentages were computed and used as the basis for ranking the responses. The ranked responses served as a guide and basis in discussing the data gathered. The study used the Statistical Package for the Social Sciences (SPSS) pro-

gram in processing the data. SPSS is a computer based statistical program used in interpreting and analyzing data for Social Sciences research.

3. Result and Discussions

1) Characteristics of mangrove areas

The word "mangrove" has been used to refer either to the constituent plant of a tropical or subtropical inter-tidal community or to the community itself (Bo-Sun, 2000). Aksornkoae *et al.* (2001) defines mangrove as an ecological group of evergreen plant species belonging to several botanical families but possessing marked similarities in their physiological characteristics and structural adaptation and having similar habitat preferences. Brinkman (1998) characterized mangroves as densely-vegetated mud flats that exist at the boundary of marine and terrestrial environments. Mangroves are rainforests by the sea. Mangrove forests are comprised of taxonomically diverse, salt-tolerant trees and other plant species, which thrive in inter-tidal zones of sheltered tropical shores, "overwash" islands, and estuaries (Quarto 2001). Mangrove trees have specially adapted aerials, salt filtering roots and salt-excreting leaves that enable them to occupy the saline wetlands where other plant life cannot survive. These complex ecosystems are found between the latitudes of 32 degrees north and 38 degrees south along the tropical coasts of Africa, Australia, Asia and the Americas.

There are varying scientific classifications of what constitutes a mangrove plant. According to reputable scientific studies, mangroves include approximately 16-24 families and 54-75 species (Thombinson, 1986). The greatest diversity of mangrove species exists in Southeast Asia. Vantomme (2001), characterized mangrove forests as littoral plant formations of tropical and subtropical sheltered coastlines. Generally, mangrove trees and bushes grow below the high-water level spring tides. Their root system is regularly inundated with saline water, even though it may be diluted due to freshwater surface runoffs and only flooded once or twice a year. The mangrove forests are evergreen. However, due to the situation of mangrovesalong the coast, mangrove formations are constantly controlled by marine and terrestrial factors such as coastal erosion or accretion by the sea or by rivers, tidal waves, high salinity, water logged-soils, and other edaphical characteristics. These, together with the distance from the sea, and the frequency and duration of inundation and tidal dynamics govern to a great extent the local distribution of mangrove plant species and their successions. The best developed mangrove forests are found at locations with deep soils, rich organic matter, and low sand, usually in river estuaries.

2) Economic uses of mangroves

Local populations have traditionally sustainably managed the mangrove ecosystem for the production of food, medicines, tannins, and construction materials. This is demonstrated in the recorded history of mangrove management for timber in the sundarbans. The 6,000 kilometers of mangrove forest that cover the Sundarban Region of India and Bangladesh were managed since 1769. A parallel example is given by the 40,000 hectares of mangrove forests of Matang (Malaysia) that have been managed for fuel production and other economic purposes since 1902 (Kairo, *et al.,* 2001). For millions of indigenous coastal residents worldwide, mangrove forests offer dependable basic livelihoods and help sustain their traditional culture (Quarto, 2001). Mc Clurg (2002) elaborates on the economic uses of mangroves. According to her, mangroves provide a range of food products such as plant-based food, meat, fish molluscs and crustaceans. They are also a source of tannin for the leather industry. Mangroves also provide timber, firewood, and charcoal that the local residents sell as a major source of cash. Medicine and honey are also sourced from mangroves. They also serve as pasture areas for domesticated animals and as sources of construction materials. Some mangrove areas also provide cash to the population through tourism ventures. Therefore, sustainably- managed mangroves can be a good source of supplementary income or constitute a major source of livelihood in rural areas and at the same time provide ecological and environmental benefits.

Traditionally people have used mangroves for the economic benefit of the local community, but population increases have led to greater non-sustainable uses of the resource. Reports indicate mangrove areas in the Philippines have considerably declined from about half a million ha in1918 to 139,700 ha in 1993.

3) Ecological uses and functions of mangroves

According to Quarto (2001) mangrove forests are vital to healthy ecosystems. The forest detritus, consisting mainly of fallen leaves and branches from the mangroves provides nutrients for the marine environment and supports immense varieties of marine life in intricate food webs associated directly through detritus, organic waste material from decomposing dead plants or animals (Wikipedia, 2005), or indirectly through planktonic and epiphytic (plants that grow attached to other living plants) algal food chains. Plankton and benthic algae are

primary sources of carbon in the mangrove ecosystem, in addition to detritus. The mangroves also offer refuge and nursery grounds for juvenile fish, crabs, shrimps, and molluscs. They also serve as prime nesting and migratory sites for hundreds of bird species.

Mangrove forests play a primary role in nutrient recycling and carbon export because there is a constant movement of living matter into and out of the mangrove swamps. Biomass production converted into litter fall which decomposes provides nutrients to various organisms in the mangrove (Mc Clurg, 2002). Mangroves also play a significant role in coastal stabilization and land accretion, the fixation of mud banks, and the dissipation of wind tidal and wave energy. Ecologically they are important in maintaining and building the soil, as a reservoir for the tertiary assimilation of wastes, and in the global cycle of carbon dioxide, nitrogen and sulphur (Bandaranayke, 1991).

Mangroves serve as a buffer zone between land and sea. Hence they are effective in protecting the land from storm surges and ocean currents due to climate change and also in minimizing both damage to property and loss of life. They stabilize shorelines, prevent soil erosion and reclaim land from the sea. The loss of hundreds of thousands of lives in Bangladesh in 1970 following a hurricane and a tidal wave might have been less serious had large areas of mangroves not been converted to rice paddies. This is just one of the many consequences of the loss of mangroves which serve as buffer zones between land and sea. Mangroves trap sediments preventing the siltation of adjacent marine habitats. Vital coral reefs and sea grass beds are protected from these damaging siltations (Mc Clurg, 2002). Mangroves have also been useful in treating effluent, as the plants absorb excess nitrates and phosphates, thereby preventing the contamination of near shore waters (Quarto, 2001).

4) Uses and functions of the nypa palm/mangrove

The most versatile and useful plant in the mangrove forest is undoubtedly the nypa palm (*Nypa fruticans*). Practically all parts of this plant can be used to provide a supply of basic goods, ranging from construction and fuel materials to food, drugs and various materials used in rural industries. Nypa palms have a high potential for both ecological and economic importance. Accordingly, nypa palms should be taken into consideration as an alternative to solve environmental problems in degraded coastal areas. Nypa palm (Nypa fruticans), which is still abundant in Southeast Asia, is the mangrove plant with the oldest known fossil (Tan, 2001) and can be recognized from rocks dated to 69 million years ago (late Cretaceous period of Borneo) solely from its distinctive pollen features (Jansen *et al*. 2002).

The feather-like fronds are up to 9m long and form a rosette at each trunk tip. There is an inflorescence with a head-like part at the tip bearing female flowers with male flowers being borne below. The female flowers are spherical while the male flowers are yellow catkins. The fruits are woody and flattened sideways, ridged lengthwise and clustered forming a large ball about the size and shape of a soccer ball, rising from the mud on the stalk. When it ripens, the ball breaks away and breaks up into individual fruits. These float away and may even germinate as they float.

Nypa palm is among the few palms that grow well in mangrove areas. They are found in areas with low water salinity and they grow well in soft mud, usually where the water is calmer, and where there is a regular inflow of fresh water and nutritious silt. They can be found inland, as far as the tide can deposit the palm's floating seeds. They can tolerate infrequent inundation so long as the tide does not dry out for too long.

Fig. 1. The nypa palm, its fruits and flowers.

5) Economic uses

Nypa palm, like the coconut, can be seen as a tree of life, as almost all parts of the palm have a use. The mature leaves are used for thatching materials, which are commonly sold for roofing and even for wall construction of temporary houses, especially in Southeast Asia. The young leaves are used as cigarette wrappers, weaved into baskets, and used as decorative materials during special occasions. They also used for making tea.

The sap of the palm provides products with the highest economic value. The sap from the inflorescence stalk is collected and can be used to make toddy, a strong liquor, or vinegar or can be boiled down to produce sugar. These were important trade items in Southeast Asia before World War II. To date, nypa sap is still collected to make sugar, vinegar and liquor. Only plants five years and older are tapped. The flowering stalk is cut and inserted into a pot, plastic bag or bamboo container, and the end is sliced everyday to stimulate new flow and prevent bacterial growth. The base of the stalk is pounded using a mallet, to keep the flow going. About one half to one litre of sap can be collected per day. A flower stalk can be tapped this way for three months. The liquid can be drunk as is; boiled to produce brown sugar; fermented to produce strong liquor; or fermented further for several months to produce cooking vinegar (Tan, 1995). In Malaysia, Indonesia, and the Philippines there still exist distilleries producing nypa products such as liquor. If appropriate methods of planting, tapping and management are employed, nypa culture can be a viable economic proposition, principally because of the palm's ability to regenerate rapidly.

The fruit of the nypa palm is edible. Nypas bear delicious fruit whose whitish endosperm can be eaten raw or cooked. The young fruit is eaten directly and is also considered a delicacy by the local community (Goh, 2001). Nypa fruit taste somewhat like young coconut meat. It can be cooked into confectionaries and is a much-appreciated dessert in the daily meals of mangrove dwellers. When preserved in syrup it provides a natural flavouring for ice cream and confectionary. Even the hard kernels of the fruit have an economic value when carved into vegetable-ivory buttons and checkers. The petals of the nypa flowers can be brewed to make an aromatic tea. The young shoots, decayed wood and leaves of this plant are used in Southeast Asia to cure herpes, toothache, and migraine. The outer layers of the leaf stalks yield pulp suitable for good quality boards, while the outer layers of young shoots are converted into cigarette wrappers(e. g. in Malaysia). When burnt, these shoots produce useful mineral salts .

Nypa palm can be tapped all year round and can be a sustainable source of sugar. This is an advantage compared to the seasonal production of sugar from sugarcane (Dalibard, 2002). The use of products from the sap of the palm as feeds for animal production is being considered as such research is being conducted to improve its sap production (Jansen, 2002). For instance, Dalibard (2002) found that nypa produces more inflorescences (potentially more sap) when the stands are kept thinned of old leaves and sap production can be improved by wider spacing between trees than in wild almost pure stands of nypa: from 2500 trees per hectare down to only 500 trees per hectare. Similar research is being carried out in South India at the Kerala Forest Research Institute focusing on the increase in the production of the palm products on a sustainable basis and their conservation and efficient utilization (Jansen *et al.* 2002).The sugar that can be derived from nypa palm can be further converted to alcohol and can be used as a transport fuel making nypa a possible source of renewable fuel and an alternative to pollutive fossil fuels (DENR, 2002).

6) Ecological uses and functions

Nypa palm, with its thick horizontal creeping stems, provides good protection for the banks of waterways. The stem is a good stabilizer of riverbanks and also excellent in preventing erosion. The trunks of the palm, which usually are closely lined up in their habitat, are also good collectors of sediments and help in soil accretion. The sediments collected are rich in nutrients making the base of the nypa palms a habitat for various aquatic organisms. Nypa mangroves support aquatic ecosystems and are a refuge for various species of birds and other wildlife. New fronds emerge quickly after being damaged and so quickly protect the land after storms. With their nine-meter height they can also be an effective protection from strong winds for the communities living near the riverbanks (Bamroongrugsa, 2000).

Although it is considered to be a sturdy palm, the nypa palm is already threatened in some Asian countries. It is now rare in Singapore and rapidly dwindling in area in Sri Lanka. Its economic value is loosing ground to more highly economically productive ventures such as aquaculture, specifically shrimp culture.

7) The threat to nypa palm/mangrove in the Philippines

The conversion of Nypa mangrove as per Presidential Decree Number 704 (The Forestry Reform Code) which was enacted in 1975 during the regime of President Ferdinand E. Marcos (1965-1986), nega-

tively impacted the Nypa mangrove in the Philippines. This presidential decree provided for the expansion of aquaculture and allowed the conversion of mangrove areas into aquaculture ventures. The conversion was done by the issuance of a twenty- five year Fishery Leases Agreement (FLA) in mangrove areas which were declared as disposable for fishpond construction. The Bureau of Fisheries and Aquatic Resources (BFAR,2003) provided technical assistance to investors in aquaculture in mangrove areas, thus facilitating further the conversion of these swamplands. The granting of FLAs contributed significantly to the reduction of mangrove areas in the country. The nypa palm, although it has a wide range of economic uses, not to mention its ecological role, was not spared in the conversion (Havemann, 2002).

FLAs became a threat to the nypa mangrove and other mangrove areas in the country as shown by the statistics of the DENR with a reduction in mangrove areas from about half a million hectares in 1918 to only 115,000 hectares in 2003. This is predicted to continue because the promotion of aquaculture is viewed as a national strategy in the Philippines that would provide jobs, increase food supply and increase export earnings (Havemann, 2002). However with the enactment of the Philippine Fisheries Code of 1998, the negative impact of Nypa conversion is assumed to be minimized. The law prohibits conversion of mangrove areas into fishpond or for any other purpose.

4. Status and Ownership of the Nypa Mangrove in Pamplona, Cagayan

1) Characteristics of nypa growth in the study area

Nypa grows abundantly in the riverbanks and in the shallow portions of the river in the barangays of Cabaggan and Tabba. Its growth formations give protection to the mainland from the wave surges and provide an ideal habitat for other organisms. However they can also grow in areas that are completely dry as long as they are flooded during the rainy season and are near the river. The responses of the household heads interviewed confirmed the status of Nypa mangrove in their areas. Their responses rank river banks as the number one area where nypa grows (with 170 responses); this is followed by the shallow portion of the river (56 responses) and dry lands occasionally flooded during rainy seasons (14 responses). Nypa palms also grow in dry lands occasionally flooded by tidal water (12 responses) and in completely dry lands and not flooded (2 responses). The responses were consistent with information noted during the 'banca ride.'

Nypa growth in the study area is characterized as predominantly old growth with a small portion of dense new growth. Some areas of the old growth are characterized as sparsely populated. The characteristics of nypa growth described are also supported by the household heads' responses in the survey questionnaire wherein 109 (43%) of them characterised their nypa palm trees as having dominantly old growth with a small portion of dense new growth. On the other hand 48 (19%) of them identify nypa palm trees having dominantly new growth with a small portion of dense old growth. The same number (48) of the household head respondents identify nypa palm trees characterised as having old dense growth. Further details of the responses of the household heads are shown in Table 1.

The predominance of old growth is desirable because only old growth (nypa palm with an age of 5 years and over) is ideal for sap tapping. Old nypa palms therefore can provide higher incomes because their sap can be tapped to derive the products of highest return.

Table 1. The frequency of responses of household heads regarding the characteristics of their nypa mangrove area holdings.

Characteristics of nypa growth	Frequency of responses
Dominantly Old Growth With Small Portion of New Growth and Dense	109
Dominantly New Growth With Small Portion of Old Growth and Dense	48
Old Growth and Dense	48
Old Growth not Dense	29
Fifty Percent (50%) Old Growth and Fifty Percent (50%) New Growth and Dense	12
Dominantly Old Growth With Small Portion of New Growth Not Dense	3
Dominantly New Growth With Small Portion of Old Growth Not Dense	2
Fifty Percent (50%) Old Growth and Fifty Percent (50%) New Growth Not Dense	1
Total	252

2) Nypa mangrove area holdings of households

The most common nypa mangrove area holding of the households in the study area is one to five (1-5) hectares, although a considerable number hold less than one hectare. This is because according to them a nypa sap collector should have at least one hectare to be economically viable. Hence if a household head has less than one hectare he usually accepts additional areas for tapping from other owners that have large areas or those that no longer tap their nypa or do not live in the area anymore. Most of the respondents have 1 to 5 hectares of nypa mangrove landholding. Very few of the household

respondents have more than 10ha of nypa mangrove land holdings. Based on the interviews with the household heads, this is because the landholdings of their parents were already apportioned to all children thus making their own land holdings smaller. Landownership in the study area is highly prized and land is almost never sold but rather is willed to future generations regardless of the quality and size. The frequency of responses of the household heads with regard to their area of land holdings is shown in Table 2.

3) Period of ownership of nypa mangrove

Almost all the families in the study area are dependent on selling nypa products for their livelihood. However, based on interviews with them, it seems that the management of the nypa resources lies mainly with the individual owner who is in charge of the maintenance, harvesting, processing and selling of their respective produce. It is mostly a family undertaking with all the capable members of the family helping in the process. Hence skills, management, and ownership of the resource are commonly passed on from one generation to the next. Each family unit works together with little or no coordination with the other members of the community except with the middlemen who are mostly not from the locality.

Nypa maintenance and product processing is learnt even during childhood because of the demand for family labour in the production of various nypa products. Children learn at an early age how to make nypa shingles, baskets, and even sap collection and processing. Hence, some household heads consider themselves to be dependent on nypa for their livelihood since childhood. Table 3 shows the responses of the household heads on how and when they started to depend on nypa for their livelihood.

It is noteworthy that a majority of the household heads have been depending on nypa as a means of livelihood for ten years or more (Table 3). This is an indication that the population of the community had been deeply influenced by the nypa palm economically and probably socio-culturally. Hence, the importance of nypa to the population at present is high. However, the lack of a holistic approach or community-based management of the nypa resource hinders the improvement in the productivity of the palm, threatens long-term sustainability, and results in less return for products sold thus making it less economically profitable compared to other livelihood ventures.

Table 2. The frequency of responses of household heads with regards to their area of nypa mangrove land holdings.

Area of nypa mangrove land holdings (hectares)	Frequency of responses
Less Than One	101
1-5	110
6-10	34
11-20	2
21-30	4
21-30	1
Total	252

4) Administration and maintenance of nypa palm/ mangrove

Nypa mangrove management is basically a family endeavour. Individual family units manage their own nypa palm area holdings with little or no coordination with other owners or with the community at large. The only coordination existing is through the middlemen who provide capital for the operating expenses of the nypa palm owners in producing nypa products and who subse-

Table 3. Age of household heads and how and when did they have been depending on nypa as a source of livelihood.

Age of household heads	Depended since childhood	Depended 1-5 years	Depended 6-10 years	Depended 11-15 years	Depended 16-20 years	Depended over 20 years	Total
<20-24	5	1	1	1	1	1	10
25-29	5	2	-	1	1	2	11
30-34	17	-	-	2	4	2	25
35-39	12	-	4	1	4	8	29
40-44	18	-	3	3	8	17	49
45-49	15	-	-	1	2	5	23
50-54	16	1	-	1	4	24	46
55-59	17	-	-	-	-	12	29
60-64	-	1	-	-	1	11	13
65-69	-	-	-	-	-	6	6
70-74	3	-	-	-	-	3	6
75-79	2	-	-	-	1	1	4
80-84	1	-	-	-	-	-	1
Total	111	5	8	10	26	92	252

quently buy the produce.

According to the local officials of the barangays, those who work in the nypa swamps fall into several categories. A nypa palm farmer either attends to his own nypa area or has other areas to attend to aside from his own nypa palm area holdings. Other nypa palm farmers do not have any nypa area of their own. The nypa areas that they manage are owned by absentee landowners who reside abroad or in cities in the Philippines. Other nypa farmers are lessee of the declared alienable and disposable areas. And others lease from private owners who have no time to attend to their palms because they have other employment or are no longer residing in the area.

Based on the output of the workshop, the responses in the survey questionnaires of the household heads and the members of Cabaggan Women's Organization and interviews with key respondents, the vision of the community for the development of the nypa palm/mangrove, is to have a nypa palm/mangrove which is well managed with good nypa palm stands, well-developed export-quality, nypa products nypa palms with high economic productivity and nypa products that can compete with similar products in terms of price and quality, and a well-developed nypa growth and stand that is suitable for ecotourism.

The perceptions of the community for the development of the nypa palm/mangrove are better realisable through the use of participatory resource management, specifically community-based resource management. This is the common strategy used in the area, according to the barangay officials, whenever there are projects that need the contribution of the barangay, the residents willingly contribute their labour as long as it is for the good of the community. School buildings, multi-purpose halls, multi-purpose pavements and temporary foot bridges were built with the residents contributing their labour. The community-based resource management in the case of the improved management of the nypa mangrove can be a viable tool to sustainably manage this critical resource.

5. Conclusion

Mangroves are very useful to humans either directly as a source of livelihood or indirectly through their environmental and ecological benefits such as protection from sea accretion, buffering from strong waves and winds or maintaining healthy water ecology. However mangroves worldwide are being threatened because of various factors such as population pressure, economic needs and pollution from households and industrial activities. Mangrove areas are continuously decreasing, threatening the livelihood of coastal dwellers and putting at risk coastal areas and ecosystems. Their protection and maintenance therefore is paramount to sustain favourable environments for aquatic resources especially in the estuarine areas where aquatic diversity is highest.

Just like other mangrove species nypa can provide adequate protection to the mangrove environment and can be a hedge against adverse climate change because of its desirable characteristics especially its various economic uses which can provide livelihoods for coastal dwellers. Based on the presented information and discussion, it seems that the study area is not exempt from this grim predicament. Their nypa resources are threatened by overharvesting, and conversion to other uses like fishponds.

The nypa resource is very important to the community the majority of whom have been dependent on it for a long time. The improvement and promotion of the products from the palm is therefore needed to increase the income being derived by the residents from the resource and thus compel them to prevent conversion of mangrove areas into other uses.

Improved management of the resource through collaboration among the resource users is likewise necessary to achieve this goal.

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