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Knowledge, attitude and practice of coastal communities on mangrove benefits, conservation and rehabilitation

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Abstract

Degradation of mangrove ecosystems is a major concern in many countries of the world. This study assessed the level of knowledge, attitudes, and participation in mangrove conservation among two selected coastal communities of Gonzaga, Cagayan, Philippines. The study used a descriptive survey research design to a total of eighty participants selected through site selection approach. Results of the study revealed that the respondents from both coastal communities have a "high extent" level of knowledge, attitude and participation in mangrove benefits, conservation, and rehabilitation. Consequently, it is evidential that participation of both groups of respondents to community training and meetings was generally in a low -level extent implying necessary intervention. Test of difference showed that male respondents have the higher extent of participation over the women counterpart. Meanwhile, the middle age group had the highest level of participation in mangrove conservation. Also, the respondents who have long years of residence and living in proximity from the mangrove conservation areas have the higher level of their awareness and perception on sustainable mangrove program. This generally implies that gender, age, years of residence, and proximity of mangrove areas play important roles in public perception towards sustainable mangrove conservation programs in Gonzaga, Cagayan, Philippines. Results of this study will serve as the basis for implementing more effective mangrove conservation program.

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Introduction

Mangrove forest also plays an important role to sustain the human and environment well-being for several reasons (Badola *et al.*, 2012). Mangrove forests are a congregation of salt-tolerant trees and shrubs that provide substantial values and benefits to mankind and other marine organisms. They are a source of valuable plant products used as food, traditional herbal medicines, and other wood and forest products. Mangrove forests are nesting grounds for many types of birds, and a habitat of various species of reptiles, amphibians, mammals, fish, crabs, shrimps, mollusks and many other invertebrates (Nagelkerken, *et.al.,* 2008).

The vulnerability of the Philippines to storm surges and strong winds caused by typhoons has identified mangrove planting as one of the strategies to adapt to such climactic events. Garcia (2014) mentioned how mangrove forests play an important role in the protection of the coastline for coconut plantation the eastern coast of Samar Island. And in areas without mangroves, the coconut trees were uprooted due to wave action during stormy weather (Mendoza and Alura, 2001). In coastal areas directly exposed to strong wave action of the Pacific Ocean, coastal erosion was reduced either by mangrove trees or cliffs. Mangroves also act synergistically with adjacent ecosystems such as seagrass and coral reef communities for coastal protection. With the challenges of climate change, the necessity of mangroves is increasing, especially as a shield against storm surges and floods.

The municipality of Gonzaga, Cagayan, Philippines has mangrove forests sporadically located in seven coastal barangays with swamp and brackish areas, which cover an aggregate area of approximately 69.1 hectares (Pasion and Tumaliuan, 2015). Generally, the status of the mangrove forests of the municipality is poor with an average of 25% living mangrove trees (Pasion and Tumaliuan, 2015). Most of the areas manifested severe cutting, heavy erosion and siltation specifically observed in barangays Caroan and San Jose, where the largest tracts of mangrove forest in the municipality are located.

Community-based conservation has been widely used recently in natural resource management especially in managing the sustainability of the protected area, restoring the ecosystem and reducing poverty in rural areas (Abdullah, *et al.,* 2014). Local people can play an important role in keeping existing mangrove forests safe from degradation and destruction (Schmitt and Duke, 2015). With this, the community is believed to be a major player in the rehabilitation of mangroves.

Successful mangrove rehabilitation by the community depends largely on the knowledge on mangroves, attitude, and practice on mangrove rehabilitation of the local folks. Community support is an important factor in the effectiveness and success of the marine protected area like mangrove forest conservation and protection (Beger, *et al.,* 2004). It is important to identify the awareness level of the local community towards mangrove conservation and appreciation and it is essential to develop a community- based ecosystem management and development- based community opinion (Badola, *et al.,* 2012). Education campaigns are necessary to encourage public awareness, community involvement and compliance with mangrove management programs (Carter *et al.*, 2015). In addition, awareness-raising about the importance of mangrove ecosystems and the involvement of local communities in their management can contribute to better protection (Schmitt and Duke, 2015).

As an academic institution mandated to provide instruction, research, and extension, Cagayan State University, is geared towards providing the best education to its stakeholders to include those in the far-flung and deprived communities. The local coastal communities of Barangays Caroan, San Jose and Tapel, Gonzaga, Cagayan have been identified as pilot barangays in the mangrove rehabilitation project of CSU and DOST. Measuring the community folks' depth of knowledge on mangroves, their attitude, and practices on mangrove rehabilitation will allow the government to make future decisions on how to effectively implement mangrove conservation and rehabilitation projects in devastated areas.

The main objective of this study is to determine the value of mangroves in the two coastal communities of Gonzaga, Cagayan. Specifically, it aims to: (1) describe the profile of the community folks of the coastal communities of Gonzaga; (2) assess the extent and level of knowledge, attitudes and practices of the communities on mangrove benefits, conservation and rehabilitation; (3) ascertain the demographic factors affect extent of knowledge, attitude and practice on mangrove.

Mangrove Conservation and Rehabilitation in the Philippines
The Philippines as being archipelagic in nature, a large part of the population depend on the mangroves for food, livelihood, and shelter derived from the mangrove ecosystem (Garcia *et al.*, 2014). However, the conversion of mangroves to fishponds has been the major cause of the decrease and degradation of mangroves and accounted for about 175,000 hectares (35%) of mangrove forests lost.

The country has lost much of its mangrove resources to other uses (Melana *et al.*, 2005). Protection of our remaining mangrove and restoration of destroyed or degraded areas through afforestation and reforestation is essential (Nwosu and Holzlohner, 2015). Rehabilitation of the mangrove ecosystem is one management strategy, apart from being a precautionary approach; it would improve the livelihood of local and immediate users of the resources; increase productivity (e.g. fisheries); increase tourism revenues; sustain mangrove forestry; enhance sea defenses and provide security from natural hazards; and save cost for the construction and maintenance of sea dikes (Nwosu and Holzlohner, 2015).

A number of efforts on mangrove conservation and rehabilitation have been completed in the country. Some were successful, some were not (Garcia *et al.*, 2014). Primavera and Esteban (2008) reviewed eight mangrove rehabilitation projects in the Philippines and found out that despite heavy funding in the hundreds of millions of dollars to rehabilitate thousands of hectares of mangroves over the last two decades, the long-term survival rates of mangroves are generally low at 10–20% (Garcia *et al.*, 2014). In addition, among the issues that were identified that impede success of mangrove rehabilitation and conservation efforts include lack of awareness, complexity of interactions between natural systems, social systems, and human values across temporal and spatial scales, weak and inadequate manpower, and lack of political will to enforce the laws (Primavera and Esteban, 2008; Farley *et al.*, 2009).

Among the reforestation projects that were implemented, community involvement is identified as the key factor for success (Camacho *et al.*, 2011). Local people can play an important role in keeping existing mangrove forests safe from degradation and destruction (Schmitt and Duke, 2015). Involving local communities in mangrove management is an effective way of maintaining and enhancing the protection function of the mangrove forest while providing the livelihood for local people and contributing to better assessment and governance of natural resources (Schmitt and Duke, 2015).

The different calamities that hit the country have increased the awareness of the people on the importance of caring for their mangrove areas (Pasion and Tumaliuan, 2015). As a remarkable example, the owners of titled mangrove areas at Gonzaga voluntarily gave their land rights to the local government for the development and protection of mangrove areas (Pasion and Tumaliuan, 2015).

Depth of Knowledge
An assessment on local communities' knowledge on mangrove ecology by Sawairnathan and Halimoon (2017) says that education is the main factor in determining the communities' understanding and creating a positive perception on mangrove forest among local communities. More conservation and awareness campaigns need to be conducted to support the mangrove conservation and continuously strengthen the enforcement and environment activities to increase public awareness in protecting the mangrove forest and creating appreciation among the local community.

Environmental Knowledge

Environmental knowledge can be defined as a common knowledge someone has about facts, concepts, and relationships between the natural environment and the ecosystem (Fryxell and Lo, 2003). Knowledge is defined as the stage when people are aware of the product and gain some understanding of the function and benefits of the product. The important role of consumer knowledge of products in consumer decision making has been found in the literature and has been done in several studies (Brucks, 1985; Rao and Monroe, 1988; Sujan, 1985). What kind of knowledge has an influence on the information source preferences used for the decision-making process (Brucks, 1985; Rao and Monroe, 1988). Knowledge directly affects the level of behavior control and perceived attitudes toward pro-environment behavior. Thøgersen (1996) in his research finds relevant issues that impact on the level of knowledge about the adoption of environmental labels.

The attitude on Mangrove Conservation and Rehabilitation

In a local community in Malaysia that underwent an assessment, it was found out that most of the respondents have a positive perception about mangrove forest conservation but their practice and action for conservation are still low according to analyzed result, for successful conservation effort needs an active participation from the local community. Any conservation effort without support form the community will be failed. (Sawairnathan and Halimoon, 2017). Many studies in the literature of behavioral psychology state that attitudes are important predictors of behavior, behavioral intentions are also an explanatory factor of each type of individual behavior. Environmental Attitudes once used a person to predict behavior on energy conservation, ecology, and awareness to buy and use products (Mustafa 2007). The results of Chan's (2001) study show that attitudes toward purchasing green products by Chinese people are caused by environmental knowledge, ecological impact, and culture in consuming products. Research shows that different cultural contexts may have different environmental behaviors. Sugandini, *et al* (2017), conducted research emphasizing the behavior of

natural batik crafters in adopting natural dyes in Imogiri SME, Special Region of Yogyakarta, Indonesia. This research discusses some issues related to factors influencing the adoption of natural dyes by batik crafters. Based on Planned Behavior Theory, this study adds perceived environmental responsibility factor, trialability, ease of use, and experience as factors influencing the adoption of natural dyes in batik making practice. The results showed that the attitude has a positive effect on the use of natural dyes on batik.

Community Participation

Community-based conservation is an approach that was used in many conservation projects that relate to the significant characteristics of community participation including community-based natural resource management, community-based social-ecological systems approach, community-based social-ecological systems approach, community-based conservation-protected areas, incentive-based conservation and ecosystem management (Gruber, 2010). This strategy emphasized the role of local communities in decision making and being actively involved as partners in protected area management (Dimitrokopoulos, *et al.,* 2010).

The fundamental principle for promoting community-based conservation models is for sustainable management where local communities can manage and extract benefits from natural resources at the local level (Baral and Heinen, 2007). Community-based conservation places community involvement at the center of conservation program which is generally a collaborative management framework among four major groups that share the power and responsibility to manage natural resources in the protected area.

These are government agencies, nongovernmental organizations, local communities and ecological scientists (Baral and Stern, 2011). However, Abdullah (2014), claims that involving local communities in natural resources governance and management comes with numerous challenges such as capacity,

desire and the time it takes for communities to establish, renew and/or maintain sustainable natural resource management.

Factors Affecting Knowledge Attitude and Practice

In a study by Abdullah, et.al (2014) the destruction and encroachment of mangrove forests are common in Malaysia and community-based conservation approach was considered new in Malaysia and received increased interest of mangrove rehabilitation after the Tsunami disaster in 2004.

In the study, psychological factors were determined as important factors needing to be explored. Gathering information on the respondents' willingness to participate in the main factor in determining the communities' level of readiness towards community bases conservation establishment in mangrove rehabilitation initiative. The study shows that the local communities in the study area are willing to participate as a part-time job and they want to be paid. Willingness to participate (WTP) had a significant positive correlation with gender, race and education level.

This research found that males and females are slightly different in WTP. Although the number of women samples is small, a majority of them expressed their interest to participate in community-based conservation programs as a facilitator at the rehabilitation site. The Chinese respondents were found not interested to participate because of lack of skills and knowledge and that they are busy with their work compared to the Malays. Highly educated respondents are more likely WTP than the less educated ones because the former had more awareness of environmental issues especially for future sustainability (Abdullah, 2014).

In the study, it was found out that lack of skills in rehabilitation warrants special training on how to identify good and matured propagules and skill of monitoring at the replanting site. Besides that, the length of residency factor does not positively correlate in CBC establishment for the study area.

The limitation in these correlations is probably because of the respondents' heterogeneity and the limited number of samples collected.

Material and methods

Research Design

The research used of the descriptive research design. It described the profile of the community folks in the three selected communities as well as the depth of their knowledge on mangrove benefits, attitude and practice on mangrove conservation and rehabilitation.

Respondents

Respondents of the study were the residents of the two coastal communities selected through site selection approach.

Locale

The study was conducted in the two coastal communities of the Municipality of Gonzaga, Cagayan, Philippines. Gonzaga is located at the north-eastern tip of the province of Cagayan, bordered by the municipality of Santa Ana to the north-east, the municipality of Santa Teresita to the west, and the municipality of Lal-lo to the south. It is approximately 45 kilometers (28mi) from Aparri, the nearest commercial center, 125 kilometers (78 mi) from the provincial capital of Tuguegarao City and 607 kilometers (377mi) from Manila. Gonzaga has a total land area of 56,743 hectares (140,220 acres), the majority of which remains undeveloped.

It has large stretches of virgin forests, especially throughout the mountainous areas of the Sierra Madre mountain range. The majority of the municipality's 40 kilometers (25mi) coastline is mostly along the Babuyan Channel to the north, although it is also bounded by the Pacific Ocean to the southeast where the two coastal barangays namely Tapel and Caroan are located.

The eleven coastal barangays contain a total of 139 hectares (340 acres) of beaches, 69 hectares (170 acres) of mangrove forests, and 348 hectares (860 acres) of coral reefs (Municipal Coastal Environmental Profile, 2005).
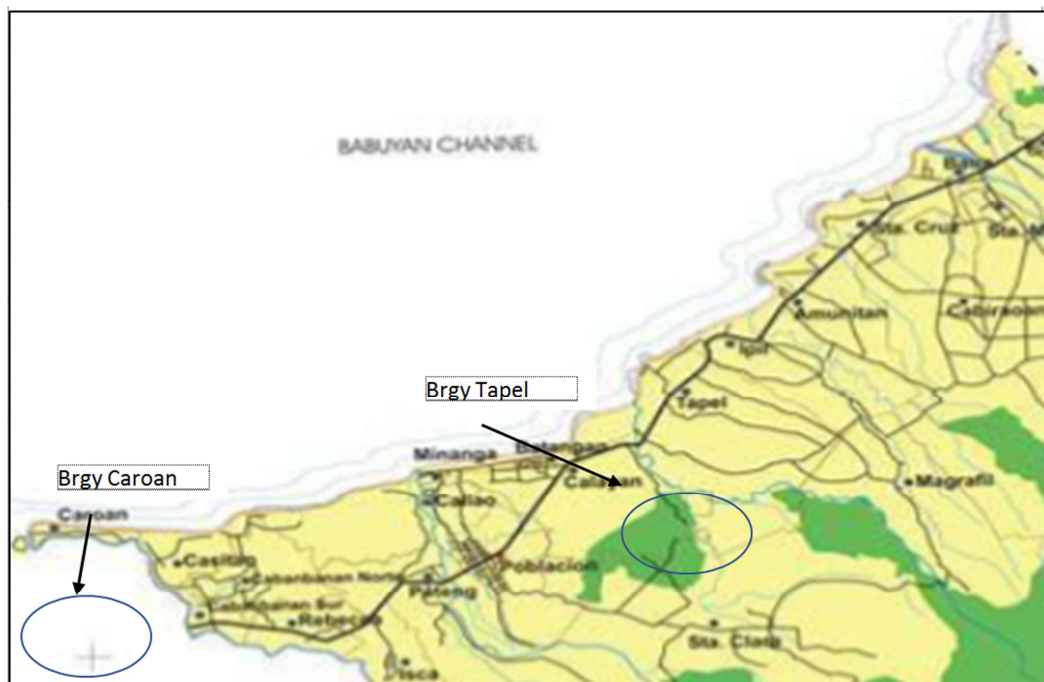
Fig. 2. Location map of Brgy. Caroan and Brgy Tapel of the Municipality of Gonzaga, Cagayan, Philippines as sites of the study.

Research Instrument

The research instrument used is a structured questionnaire assembled and adapted from similar researches on community knowledge, attitude and practice on mangrove benefits conservation and restoration. It comes in three parts: Profile, Knowledge on Mangroves, Attitude on Mangrove Rehabilitation and Participation in Mangrove Activities.

Data Gathering Procedure

This research employed a community survey and a focus group discussion for more in-depth data gathering. Basic information was gathered from the participating barangays. The result of this initial activity shall ensure a smooth distribution of questionnaires. On-site, questionnaires were personally distributed by the researchers and their research assistants and retrieved the same immediately. The questionnaires were translated and explained in *Ilocano* or *Tagalog*.

The researchers, after all the data from the questionnaires, tallied and went back to the extension site for a focus group discussion to elucidate from the respondents' detailed responses.

Analysis of Data

After the collection and coding of data, the study used appropriate statistical tools. Descriptive statistics such as mean, frequency, and percentage were used to describe the socio-demographic profile of the respondents and their level of level of knowledge, attitudes, and practices of the communities on mangrove benefits, conservation and rehabilitation. Meanwhile, inferential statistics such as independent sample t-test and one way ANOVA were used to test the hypotheses of the study. Post-Hoc Tukey HSD test was utilized to identify the significant differences on the extent and level of knowledge, attitudes, and practices of the communities on mangrove benefits, conservation and rehabilitation when grouped according to the demographic profile of the respondents. Further, the assessment of the respondents on their extent and level of knowledge, attitudes, and practices of the communities on mangrove benefits, conservation and rehabilitation used the common following arbitrary scale:

Scale	Range	Description	Interpretation
5	4.20-5.00	Strongly Agree	Very High Extent
4	3.40-4.19	Agree	High Extent
3	2.60-3.39	Neutral	Moderate Extent
2	1.80-2.59	Disagree	Low Extent
1	1.00-1.79	Strongly Disagree	Very Low Extent

Results and discussion

Profile Characteristics of the Selected Coastal Communities

Determining the socio-demographic profile of the respondents is a major independent variable of the study. This is to provide insight and background on the orientation of the respondents towards mangrove conservation management. The results in Table 1 show the summary of the respondent's demographic profile in frequency and percentage values in order to make it easier to comprehend. For sex, when taken as a whole, there were more female respondents, where 46% (37 respondents) represents male respondents and the female respondents are 54% (43 respondents).

Table 1. Socio-Demographic Profile of the Respondents.

	Brgy. Tapel		Brgy. Caroan		Over-all	
Profile Variables	frequency	Percentage	frequency	Percentage	frequency	Percentage
Gender						
Male	15	60	22	40	37	46
Female	10	40	33	60	43	54
Total	25	100	55	100	80	100
Age Brackets						
63-70	2	8	5	9	7	9
55-62	3	12	4	7	7	9
47-54	6	24	9	16	15	19
39-46	0	0	12	22	12	15
31-38	4	16	10	18	14	18
23-30	5	20	10	18	15	19
15-22	5	20	5	9	10	13
Total	25	100	55	100	80	100
Occupation						
Farmer	2	8	3	5	5	6
Hog Raiser	1	4	4	7	5	6
Fish Vendor	3	12	14	25	17	21
Fisherman	12	48	18	33	30	38
Tricycle Driver	1	4	2	4	3	4
House Keeper	3	12	10	18	13	16
Sales Lady/ store seller	1	4	2	4	3	4
None/ student	2	8	2	4	4	5
Total	25	100	55	100	80	100
Educational Attainment						
College Graduate	3	12	2	4	5	6
College Undergraduate	1	4	1	2	2	3
Vocational3	1	4	0	0	1	1
K-12 Graduate	1	4	0	0	1	1
High School Graduate	4	16	11	20	15	19
High School Level	5	20	7	13	12	15
Elementary Graduate	7	28	12	22	19	24
Elementary Level	3	12	21	38	24	30
Did not attend schooling	0	0	1	2	1	1
Total	25	100	55	100	80	100
Distance from the Mangrove Areas						
Very near	16	64	31	56	47	59
Near	6	24	4	7	10	13
Not so near	3	12	2	4	5	6
Below average	0	0	10	18	10	13
Far	0	0	1	2	1	1
Very far	0	0	7	13	7	9
Total	25	100	55	100	80	100
Length of Residency						
Below 10 years	2	8	5	9	7	9
11-20 years	4	16	6	11	10	13
21-30 years	10	40	13	24	23	29
31-40 years	2	8	15	27	17	21
41- 50 years	1	4	8	15	9	11
51-60 years	3	12	6	11	9	11
61- 70 years	2	8	1	2	3	4
71 years and above	1	4	1	2	2	3
Total	25	100	55	100	80	100

When taken from separate communities, most of the respondents from *Brgy. Tapel* is male composing of 60 % (15 respondents) over their female counterpart of 40% (10 respondents). Meanwhile, *Brgy. Caroan* also shows that there are more female respondents than male respondents represented by the table showing that 54% (43 respondents) is comprised of females while 46% (37 respondents) males. Although the results showed the dominance of the fisheries sector by men, the contribution of women folk in fishing among coastal communities cannot be underrated. Hence, women's role among coastal communities cannot be undervalued. It is evidential that women show high participation in the fishing sector.

Age of respondents is one of the most important variables in understanding their views about certain issues. Generally, age is indicative of the level of maturity of individuals and is a basic consideration in understanding their response in terms of their knowledge, attitude and practice on mangroves. As regards to age brackets of the respondents, majority or 19% belonged to 23-30 (15 respondents), 47-54 (15 respondents), followed by 18% of 31-38 (14 respondents). When taken in separate communities, the majority of the respondents from *Brgy. Tapel* has the almost equal number to those having 15-22 (20%), 23-30 (29%) and 47-54 (24%). Meanwhile, for *Brgy Caroan, the* big percentage of respondents belonged to the age groups of 39-46 (22%), 31-38 (18%) and 23-30 (18%). Hence, a few numbers of respondents come from the age group of 55-62 and 63-70 is indicative that young and middle-aged groups of population dominate the two communities.

Relative to occupation, most of them are engaged to fishing as livelihood where 30 or 38% of them are fishermen and 17 or 21% are fish vendors. For *Brgy. Tapel,* 12 or 48% are the fishermen. *Brgy Caroan* also shows a similar pattern where the majority (18 or 33%) of the respondents are engaged in fishing. The dominance of fishing and fish vending occupations indicate that the site of the study is a coastal community in Northern Philippines. Hence, fishing is a major economic factor contributing to the income of the residents in Brgy Caroan, Gonzaga, Cagayan.

With respect to educational attainment, when taken in general, the majority (24 or 30%) of the respondents were elementary undergraduate, followed by 19 or 24% elementary graduates. *Brgy Tapel* shows 28 percent of the respondents had education as elementary graduate and 20 percent of them had reached high school level, followed by 16 percent high school graduate, 12% college graduate and elementary level and very less percentage (4%) K-12 Graduate and Vocational. It was interesting to note that the majority of the residents have a low level of education and none of the respondents were illiterates. For *Brgy. Caroan*, majority or 21 or 38% percent had the elementary level of education. It is still evidential that most of the respondents have a low level of education. This finding confirms the widely held assumption that the standard of education is low in most fishing communities.

As to the length of residence, the majority (23 or 29%) have 21-30 years followed by 17 or 21% 31-40 years. When taken separately, most of the respondents from *Brgy Tapel* have 21-30 years of residence while most of the respondents from *Brgy Caroan* have 31-40 years of residence. Finding reveals a majority of the young and middle-aged population residing in the area. Hence, finding still shows a dominance of the young and middles aged groups of the population residing in the area.

Finally, as to the distance from them mangrove areas, the majority of the respondents (47 or 59%) from both communities are residing very near the mangrove areas. This indicates that promotion of community-based management mangrove reserve is feasible because of its short distance link from the community which will serve as their boundary walls to shield them from furious high tides and seawater intrusion as well as to facilitate the breeding ground of clams and other marine creatures.

The data would mean that majority of the respondents are residing near the mangrove reserve as an indication of possible livelihood dependency of the people to rely heavily on the mangrove ecosystem.

Assessment of the Level of Knowledge, Attitude, and Participation on Mangrove Rehabilitation

The level of respondents' perception towards their level of knowledge, attitude, and participation in mangrove rehabilitation is a major research query of the study. Giri (2011) noted that mangroves throughout the world are facing many threats such as pollution, deforestation, aquaculture farming, and rising sea-level. Eddy (2017) confirms that the involvement of local communities is vital to ensure a successful conservation of mangrove forests since they depend on these resources in their daily lives.

Table 2. Summary of the Level of Knowledge, Attitude, and Participation on Mangrove Rehabilitation.

Knowledge, Attitude, and Practices Towards Mangrove benefits, conservation, and rehabilitation	Brgy. Caroan (N=55)			Brgy Tapel (N=25)			Both Communities (N=80)		D. I.
	Mean	SD	D. I.	Mean	SD	D. I.	Over-all Mean	S.D.	
1. Knowledge of Mangrove Conservation	3.26	0.47	ME	3.45	0.44	HE	3.36	0.46	ME
2. Attitude towards Mangrove Rehabilitation	3.92	0.70	HE	3.96	0.55	HE	3.94	0.65	HE
3. Participation in Mangrove Production Activities	3.45	1.29	HE	3.44	1.32	HE	3.45	1.29	HE
4. Participation on Mangrove Conservation/ Maintenance Activities	3.24	1.09	ME	4.17	0.90	ME	3.70	1.11	HE
5. Participation in Mangrove Rehabilitation	3.11	0.94	ME	3.80	0.73	HE	3.46	0.94	ME
6. Participation to Community Training/ Meetings	2.29	0.51	LE	2.67	0.72	ME	2.48	0.61	LE
Grand Mean	3.21	Moderate Extent		3.58	High Extent		3.40	High Extent	

Legend: 4.20-5.00 (Very High Extent/ Strongly Agree);
3.40-4.19 (High Extent/ Agree);
2.60-3.39 (Moderate Extent Neutral);
1.8-2.59 (Low Extent/ Disagree);
1.0-1.79 (Very Low Extent/ Strongly Disagree)

Table 2 presents the assessment on the level of knowledge, attitude and participation of the respondents on mangrove benefits, conservation and rehabilitation. Using descriptive statistics the data discloses that the respondents assessed themselves to have a "high extent" level of knowledge, attitude, and participation in mangrove benefits, conservation, and rehabilitation. This implicates that in general, the respondents manifest favorable awareness of mangrove protection. Further, comparing the grand means obtained by both communities, *Brgy. Tapel* has the high extent of knowledge, attitude, and practices towards mangrove benefits, conservation, and rehabilitation with the computed mean of 3.58 over the computed grand mean of 3.21 for *Brgy. Tapel.*

Consequently, the table also shows that attitude towards mangrove rehabilitation, participation in mangrove production activities, and participation in mangrove conservation/ maintenance activities were assessed to have a high extent of assessment by the respondents. Meanwhile, knowledge of mangrove conservation and participation in mangrove rehabilitation were assessed to have moderate extent. Kaiser (1998) noted that ecological behavior, feelings of responsibility for the environmental factors that could be used to predict the decision mangrove conservation. Cherian & Jacob (2012) seconded that the perceived seriousness of environmental problems is also a factor for mangrove conservation among stakeholders.

Participation in community training/ meetings was generally assessed with low extent by the respondents. This necessitates intensive communication campaign for mangrove conservation for both communities taking into consideration the different forms of communication in the dissemination of mangrove information. According to Shunula (2001), public awareness is the key to mangrove management and conservation. Hence, a public awareness program designed to educate and sensitize the local community will generate positive interest in the participatory management of mangrove. Wekesa & Aswani (2015) also confirmed

that face to face communication through village meetings and seminars on mangrove conservation were found to be more effective communication channels. Communication serves as the basis for generating awareness, consensus building, creating participation in processes of change and development, informed decision-making processes, and for finding conflict solutions. It can help individuals to change their attitudes and their behavior patterns and introduce new ideas and practices into their lives that will improve their economic and social situation. In the earlier study of Marasri (2000) who investigated the factors which influenced people participation in mangrove conservation. The results indicated the high level of participation in mangrove conservation. The villager's form of participation was mostly informal. Problems and obstacle to people participation were that of no support and inadequate information concerning mangrove conservation from government agencies.

A closer look on the dimensions to which the two communities have the high level of extent of mangrove management and conservation show that *Brgy Tapel* has the highest mean assessment of 4.17 on the participation on mangrove conservation and maintenance activities while *Brgy. Caroan* has the highest mean of 3.92 on the attitude towards mangrove rehabilitation. Oppositely, both groups of respondents from *Brgy. Tapel* and *Brgy. Caroan* has the lowest mean assessment to community training/ meetings with 2.29 and 2.67 respectively. This finding indicates that involvement of the respondents as listener and participants on mangrove information dissemination campaign is generally low. The stress of the respondents of *Brgy. Tapel* on the participation on mangrove conservation and maintenance activities indicates that among all others that conserving and maintaining mangrove forest is important for them. On the other hand, the high level of the attitude of the respondents from *Brgy. Caroan* on mangrove rehabilitation indicates their willingness to mangrove rehabilitation in their area, and their willingness to willing to contribute effort for the mangrove program's success.

According to Giri (2011), mangroves throughout the world are facing many threats such as pollution, deforestation, aquaculture farming, and rising sea-level. Mangroves have main functions: shoreline protection, food web support, and carbon sequestration (FAO, 2007). Barbier *et al.* (2008) stated that mangroves can buffer the impact of waves, storm surges, and tsunamis on coastal areas and stabilize the coastline from natural erosion at the same time. Mangroves also provide shelters to many species of fish, shrimp, mollusk, and birds. They also play a role as the breeding area for many species since they are protected from high waves (Mastaller 1997).

Personal related factors Affecting the Knowledge, Attitude, and Practices towards Mangrove Benefits, Conservation, and Rehabilitation

In determining the association between respondents' perception towards mangrove benefits, conservation, and rehabilitation programs and socio-demographic characteristics, a test of difference such as Independent sample T-test and one-way Analysis of Variance, Chi-square analysis were employed. Generally, the results show that there are several socio-demographic characteristics that have an association with perception towards the mangrove programs, namely: sex, age, length of residence and distance of mangrove areas. According to Coulibaly-Lingani (2011), socioeconomic and demographics of respondents and their participation in the sustainable mangrove programs are related. The findings are shown in the succeeding tables.

Table 3 presents the test of difference on the level of knowledge, attitudes, and participation of the respondents when grouped according to sex. As shown in the table, there exists a significant difference between the extent of participation on mangrove conservation and maintenance activities of the respondents when grouped according to their sex while knowledge of mangrove conservation, attitude towards mangrove rehabilitation, participation in mangrove production activities, participation in mangrove rehabilitation, and participation in community training/ meetings are not significantly different.

Table 3. Test of Difference on the Level of Knowledge, Attitudes, and Participation of the Respondents when Grouped According to Sex.

Knowledge, Attitude, and Practices Towards Mangrove	Grouping Variable				df	t value	p-value
	Male (n= 37)	Std. Dv.	Female (n=43)	Std.Dv			
1. Knowledge of Mangrove Conservation	3.36	0.54	3.28	0.39	78	0.78	0.440 ns
2. Attitude towards Mangrove Rehabilitation	3.84	0.54	4.01	0.74	78	-1.19	0.238 ns
3. Participation in Mangrove Production Activities	3.56	1.34	3.35	1.25	78	0.71	0.480 ns
4. Participation on Mangrove Conservation/ Maintenance Activities	3.92	1.16	3.19	0.96	78	3.09	0.003*
5. Participation in Mangrove Rehabilitation	3.50	1.04	3.18	0.82	78	1.53	0.131 ns
6. Participation to Community Training/ Meetings	2.51	0.54	2.32	0.66	78	1.38	0.172 ns

Legend: *= significant at 0.05 level
**= significant at 0.01 level
NS= not significant

The significant difference is shown on participation in mangrove conservation and maintenance activities with the computed p-value of 0.003 implicating higher extent of participation of male over their female counterpart. This finding leads to accepting the hypothesis that there exists a significant difference when grouped according to sex. The finding may be attributed to the assumption that men in coastal communities are in charge in fishing they do understand better the benefits of mangrove conservation than women since mangroves are home to a large variety of fishes and other aquatic resources as sources of their livelihood. The implication of this finding suggests that there is to come up with an intervention program informing and empowering women on their role in mangrove conservation in Gonzaga, Cagayan, Philippines.

Moreover, Siar (2003) conducted a study in Palawan, the Philippines describing that women value different resources than men and depend on different mangrove products where men value fish living in offshore reefs. Likewise, Mohs (2006) suggests that unequal power relations can lead to the marginalization of women and can prevent their unique and valuable perspectives on mangrove and natural resource management from being considered. Contrary to the finding of his study, Zorini *et al.*, (2004) made an observation that mangrove users who endanger the forest are men. Implying that because men destroy the mangroves, women are inclined to protect them. This is in line with the assumption that women are more caring for the environment. Because women are benign

environmental stewards, it suggests that women's use of mangroves should not be modified.

In the previous study of Sittikityothin (2000) who investigated relevant factors affecting people's different decision in participation to mangrove program. Findings showed the moderate level of the participation in the conservation and rehabilitation of the mangrove forest among coastal communities revealed that there were 3 types of participation: opinion participation, project planning participation, and project implementation participation. Factors which had a significant effect on participation in mangrove conservation were sex, occupation, community group's member, knowledge and understanding of mangrove.

The results presented in Table 4 indicated the test of difference on the level of knowledge, attitudes, and participation of the respondents when grouped according to the selected communities. Results revealed that there exists a significant difference in the extent of knowledge, attitudes, and participation of the respondents.

The findings lead to rejecting the null hypothesis of this study. This study also shows no significant difference in the knowledge on Mangrove Conservation, Attitude towards Mangrove Rehabilitation and Participation in Mangrove Production Activities of the respondents when grouped according to their coastal communities. Significantly, respondents from *Brgy. Tapel* has the higher extent of participation than those from *Brgy.*

Caroan on mangrove conservation/ maintenance activities (p-value of 0.000), participation in mangrove rehabilitation (p-value of 0.002) and participation to community trainings/ meetings (p-value 0.008). The higher awareness of the respondents from *Brgy. Tapel* is attributed to the higher number of male respondents who exhibited a high level of participation in mangrove conservation activities. As an implication of this finding, it is important for both community members to have

very good knowledge regarding their roles on mangrove because it affects their values towards mangrove resource and eventually affects their willingness to be involved in conservation efforts initiated by Cagayan State University. Schultz (2000) asserts that a group of people with a high sense of environmental responsibility will show a good attitude towards the environment and recognize the importance of nature and the environment.

Table 4. Test of Difference on the Level of Knowledge, Attitudes, and Participation of the Respondents when Grouped According to Communities.

Knowledge, Attitude, and Practices Towards Mangrove	Grouping Variable				df	t value	p-value
	Tapel (n= 25)	Std. Dv.	Caroan (n=55)	Std.Dv.			
1. Knowledge of Mangrove Conservation	3.45	0.44	3.26	0.47	78	1.68	0.097 ns
2. Attitude towards Mangrove Rehabilitation	3.96	0.55	3.92	0.70	78	0.21	0.831 ns
3. Participation in Mangrove Production Activities	3.44	1.32	3.45	1.29	78	-0.05	0.963 ns
4. Participation on Mangrove Conservation/ Maintenance Activities	4.16	0.90	3.24	1.09	78	3.71	0.000 **
5. Participation in Mangrove Rehabilitation	3.80	0.73	3.11	0.94	78	3.24	0.002 *
6. Participation to Community Training/ Meetings	2.67	0.72	2.29	0.51	78	2.72	0.008 *

Legend: *= significant at 0.05 level
**= significant at 0.01 level
NS= not significant

Table 5. Analysis of Variance on the Level of Knowledge, Attitudes, and Participation of the Respondents when Grouped According to Age.

Knowledge, Attitude, and Practices Towards Mangrove		Sum of Squares	df	Mean Square	F	Sig.
1. Knowledge of Mangrove	Between Groups	1.771	8	.221	1.028	.423 ns
	Within Groups	15.283	71	.215		
	Total	17.054	79			
2. The attitude towards Mangrove Rehabilitation	Between Groups	8.567	8	1.071	3.005	.006 ns
	Within Groups	25.307	71	.356		
	Total	33.874	79			
3. Participation in Mangrove Activities	Between Groups	31.026	8	3.878	2.739	.011 ns
	Within Groups	100.524	71	1.416		
	Total	131.550	79			
4. Participation in Mangrove Conversion/Maintenance Act	Between Groups	30.363	8	3.795	3.987	.001*
	Within Groups	67.587	71	.952		
	Total	97.950	79			
5. Participation in Mangrove Rehabilitation	Between Groups	16.011	8	2.001	2.676	.013 ns
	Within Groups	53.104	71	.748		
	Total	69.115	79			
6. Participation to Community Training/ Meetings	Between Groups	7.417	8	.927	3.009	.006 ns
	Within Groups	21.879	71	.308		
	Total	29.297	79			

Legend: *= significant at 0.05 level
**= significant at 0.01 level
NS= not significant

The data presented in Table 5 shows the analysis of variance on the level of knowledge, attitudes, and participation of the respondents when grouped according to age. Results show that there is indeed a significant difference on the extent of knowledge,

attitudes, and participation of the respondents when grouped according to their age brackets. Thus, the null hypothesis of the study is rejected. This study also reveals that Knowledge on Mangrove, Attitude on Mangrove Rehabilitation, Participation in Mangrove

Activities, Participation in Mangrove Rehabilitation, Participation to Community Training/ Meetings do not spell significant difference on the age profile of the respondents.

The difference in the extent of knowledge, attitudes, and participation of the respondents is seen in their participation in mangrove conservation and maintenance activities with the computed p-value of 0.001. This means that age spells significant difference on the perception towards sustainable mangrove program. The result of post hoc Tukey HSD confirmed that middle age group had the highest level of participation towards mangrove conservation. Age maturity of respondents plays a role in the willingness to mangrove conservation. Hence, the older the people

the more aware they are of the conservation status of mangrove programs. This implies an emphasis on the need to tap older people to initiate mangrove conservation. In the study of Pillemer *et al.* (2011), they confirmed that older people can make major contributions to solving environmental problems. Likewise, Barket *et al.* (2012) note that older people are generally aware of resource consumption and would like their habitat and community to be more sustainable. They can, therefore, play a positive role in engaging in sustainable activities. Additionally, environmental volunteerism creates opportunities for social integration in later life, offering meaningful engagement in predictive activities while providing volunteer resources to promote environmental stewardship.

Table 6. Analysis of Variance on the Level of Knowledge, Attitudes, and Participation of the Respondents when Grouped According to their Length of staying in their Residence.

Knowledge, Attitude, and Practices Towards Mangrove		Sum of Squares	df	Mean Square	F	Sig.
1. Knowledge of Mangrove	Between Groups	3.683	8	.460	2.445	.021
	Within Groups	13.371	71	.188		
	Total	17.054	79			
2. The attitude towards Mangrove Rehabilitation	Between Groups	6.454	8	.807	2.089	.048
	Within Groups	27.420	71	.386		
	Total	33.874	79			
3. Participation in Mangrove Activities	Between Groups	31.277	8	3.910	2.768	.010
	Within Groups	100.273	71	1.412		
	Total	131.550	79			
4. Participation in Mangrove Conversion/Maintenance Act	Between Groups	30.704	8	3.838	4.052	.00*
	Within Groups	67.246	71	.947		
	Total	97.950	79			
5. Participation in Mangrove Rehabilitation	Between Groups	17.283	8	2.160	2.959	.006
	Within Groups	51.832	71	.730		
	Total	69.115	79			
6. Participation to Community Training/ Meetings	Between Groups	5.334	8	.667	1.975	.062
	Within Groups	23.963	71	.338		
	Total	29.297	79			

Legend: *= significant at 0.05 level
**= significant at 0.01 level
NS= not significant

As gleaned from Table 6. It presents the Analysis of Variance on the Level of Knowledge, Attitudes, and Participation of the Respondents when Grouped According to their Length of staying in their Residence. The findings of the table showed that there exists a significant difference when grouped according to the length of residency along Participation in Mangrove Conversion/Maintenance Act with the computed p-value of 0.001 spelled significant difference. Thus, the null hypothesis of the study is rejected. Results of Post Hoc Tukey HSD test showed that those respondents who have long years

of residency compared to those with shorter years of residency have the higher assessment level of their awareness and perception on sustainable mangrove program. This can be explained that length of residence is associated to the level of participation on mangrove conservation.

This finding confirms Kamaruddin *et al.* (2015) that the strongest variables that had an association with mangrove participation were having a longer duration of residence and age. Further, Zsoka *et al.* (2013) also confirmed that other factors such as social norm,

financial resources, and other psychosocial conditions can affect participation in environmental programs. This finding indicates that public awareness may become the basis of capacity to participate in pro-environmental behavior and is considered the first step to a change towards acting pro environmentally.

Table 7. Analysis of Variance on the Level of Knowledge, Attitudes, and Participation of the Respondents when Grouped According to their Distance of Residence.

Knowledge, Attitude, and Practices Towards Mangrove		Sum of Squares	df	Mean Square	F	Sig.
1. Knowledge of Mangrove	Between Groups	1.377	6	.229	1.068	.389
	Within Groups	15.677	73	.215		
	Total	17.054	79			
2. The attitude towards Mangrove Rehabilitation	Between Groups	7.105	6	1.184	3.229	.007
	Within Groups	26.769	73	.367		
	Total	33.874	79			
3. Participation in Mangrove Activities	Between Groups	31.313	6	5.219	3.801	.002*
	Within Groups	100.237	73	1.373		
	Total	131.550	79			
4. Participation in Mangrove Conversion/Maintenance Act	Between Groups	32.174	6	5.362	5.951	.000**
	Within Groups	65.776	73	.901		
	Total	97.950	79			
5. Participation in Mangrove Rehabilitation	Between Groups	18.618	6	3.103	4.486	.001*
	Within Groups	50.497	73	.692		
	Total	69.115	79			
6. Participation to Community Training/ Meetings	Between Groups	4.576	6	.763	2.252	.048
	Within Groups	24.721	73	.339		
	Total	29.297	79			

Legend: *= significant at 0.05 level
**= significant at 0.01 level
NS= not significant

Table 7 presents that Analysis of Variance on the Level of Knowledge, Attitudes, and Participation of the Respondents when Grouped According to their Distance of Residence. The data reveals that there is a significant difference on the extent of participation in Mangrove Activities (p value = .002), Participation in Mangrove Conversion/Maintenance Act (p value = .000), and Participation to Community Training/ Meetings (p-value = 0.001) when grouped according to a distance of residence. The result of Post Hoc Tukey HSD test showed that respondents living in proximity from the conservation areas favored mangrove conservation strategies than those who live in longer distances. This can be explained that the closer the people to the mangrove areas they manifest more dependence to livelihood in the mangrove. Thus, stakeholders who live closest to the mangrove ecosystem attribute more importance to the ecological benefits. In the study of Hema & Devi (2014) confirmed that coastal communities living near manor areas are dependent on the mangrove areas for living. This finding implicates the effective role of in conservation effects where the effort should be concentrated on awareness creation program.

Conclusion

This study generally assessed the Level of Knowledge, Attitudes, and Participation in Mangrove conservation among two selected coastal communities of Gonzaga, Cagayan, Philippines. Most of them were female, young and middle-aged groups of population dominate the two coastal communities with fishing as a major economic factor contributing to the income of the residents. As to education, the majority of them have a low level of education. Length of residence also showed the dominance of the young and middles aged groups of the population residing in the area. With regards to distance from the mangrove areas, most of them are residing near the mangrove reserve as an indication of possible livelihood dependency of the people. It was found out that respondents from both coastal communities have a "high extent" level of knowledge, attitude, and participation towards mangrove benefits, conservation,

and rehabilitation. Consequently, it is evidential that participation of both groups of respondents to community training and meetings was generally in a low-level extent implying necessary intervention. Correspondingly, the test of difference showed that male respondents have the higher extent of participation over the women counterpart. The finding may be attributed to the assumption that men in coastal communities are in charge of fishing and they do understand better the benefits of mangrove conservation. Meanwhile, the middle age group had the highest level of participation in mangrove conservation. This explains that age maturity of respondents plays a role in the willingness to mangrove conservation. Also, the respondents who have long years of residence and living in proximity from the mangrove conservation areas have a higher level of their awareness and perception of sustainable mangrove program. This generally implies that gender, age, years of residence, and proximity of mangrove areas play important roles in public perception towards sustainable mangrove conservation programs in Gonzaga, Cagayan, Philippines.

Recommendations

Based on the conclusion of the study, the following are recommended that: (1) there is a need to carry out more campaigns and promotions to make the mangrove program more recognizable by the communities of Gonzaga, Cagayan which can help to establish more positive perception towards the importance of mangrove management to the ecosystem. (2) Provision of adequate proper education, IEC training, capacity building to communities and stakeholders to increase community awareness and participation; (3) effective gender mainstreaming of mangrove conservation in the area is needed; (4) Harmonization of programs, projects, activities for mangrove conservation plan by strengthening multi-sectoral partnership with the community people, barangays, Local Government Unit of Gonzaga, DENR, DA and Cagayan State University to promote information dissemination to mangrove conservation; (5) adaption of this research output to provide technical assistance to coastal communities and other stakeholders. Finally, (6) further studies should be conducted to validate the findings of this study.

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