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Community Leaders' Knowledge and Perceptions about Biodiversity and Conservation Method in Misamis Oriental, Mindanao, Philippines

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ABSTRACT

The very heart of sustainable growth and the one that ensures life for this changing world is Biodiversity. The study's main focus was to evaluate the community leaders' knowledge and perceptions about biodiversity and conservation method in Misamis Oriental, Mindanao, Philippines. The study was conducted in the two cities and twenty three municipalities. The mixed-methods design (cross-sectional descriptive survey) was used in the study. A total of 1,685 assessment data were collected from 1,688 interviewees (male and female). The results showed that more than 50% of the community leaders were found to have above mastery level in their knowledge and had shown positive perception, respectively, regarding biodiversity conservation. Therefore, many community leaders were able to get the expected change in knowledge and perception about conservation of biodiversity resources.

Keywords: biodiversity, conservation, community leaders, perception, resources

INTRODUCTION

How the general public understands the biodiversity term and concept is an essential question for both science communication and policy making: How people view biodiversity-related issues is based on the concepts they have developed in interaction with their social and environment (Buijs, 2005).

Conservation of species and ecosystems has become increasingly important in the 21st century. Several challenges that the society is facing today that include

the decline in wildlife numbers and species, and habitat destruction. Loss of habitat, illegal poaching of wildlife, and lack of awareness of conservation have contributed to the loss of biodiversity (Ausden, 2007; Mackay, 2002; Meadows & Meadows, 1999; Woodroffe et al., 2005).

Humans are part of the natural environment, but as a species, humans are also fabricating its most recent threats. The challenge to overcome this dichotomy is at the heart of the biodiversity crisis (Evemden, 1992; Livingston, 1996). Humans and their activities reach across the globe in their impacts on biodiversity (Wilkinson, 2002).

Over the past three decades, there has been a global paradigm shift in biodiversity conservation approaches from exclusive Protected Areas (PAs) towards people-centered conservation. This has encouraged the development of community-based conservation across the world, promoting reconciliation between livelihood improvement and biodiversity conservation (Makupa, 2013).

Balancing conservation goals and needs of local residents is always challenging (Shrestha, 2015). Solving environmental challenges will require an environmentally literate citizenry, equipped with ecological knowledge, pro-environmental attitudes, problem-solving skills, and motivation toward environmentally responsible behaviors (Stevenson, 2014).

According to Armitage, 2003; Gadgil, Berkes, & Folke, 1993; Kellert et al., 2000 as cited in Amador (2014), the role of traditional and local knowledge has also become important in catalyzing new ways of managing environmental resources.

Protection of tropical forests in human-dominated landscapes can often produce conflict between conservation goals (e.g., biodiversity conservation) and local needs (Pfeffer, Schelhas, & Day, 2001; Pfeffer et al., 2006; Schelhas & Pfeffer, 2005). Concerns that global efforts to maintain biodiversity are in conflict with those to reduce poverty have been increasing (Sanderson & Redford, 2003).

Biodiversity refers to the number and variability of living organisms, which includes genetic diversity (diversity within species), species diversity (between species), and ecosystem diversity (between ecosystems). It also combines human and cultural diversity, which can be affected by the same drivers as biodiversity, and which has impacts on the diversity of genes, species and ecosystems (Niles, 2009). As stated by McNeil and Shei (2002), cited in Sajise (2005), biodiversity is the heart of sustainable development and the life insurance in itself.

Several previous studies of rural communities in developing countries have found that access to conservation-related benefits can positively influence local

attitudes (Infield, 1988; Lewis et al., 1990; Saharia, 1982). On the other hand, an attitudinal survey conducted in Botswana by Parry and Campbell (1992) found that rural people held negative attitudes toward conservation despite receiving ample benefits.

OBJECTIVES OF THE STUDY

The major purpose of the study was to assess the community leaders' knowledge and perceptions about biodiversity and conservation method in Misamis Oriental, Mindanao, Philippines.

METHODS

The study was conducted in the 2 cities and 23 municipalities in the Province of Misamis Oriental, Mindanao, Philippines (Figure 1). Research protocol was strictly observed in the study. Written informed consent was also obtained from the respondents. The mixed methods design (cross-sectional descriptive survey) was used in the study, wherein the descriptive survey was used in collecting data from the respondents and in assessing the community leaders' knowledge and perception on biodiversity conservation. The assessment was addressed to the community leaders from the 2 cities in Misamis Oriental. The sample size is a total of 1,685 assessment data, which were collected from 1,688 interviewees. After the researcher collected the quantitative data, they were tabulated and analyzed using frequency and percentage. Furthermore, the data collected through interview, observation, and focus group discussions were incorporated into the quantitative data, which were used to support each other. Qualitative analysis, using the identified key concepts, was done for content analysis.

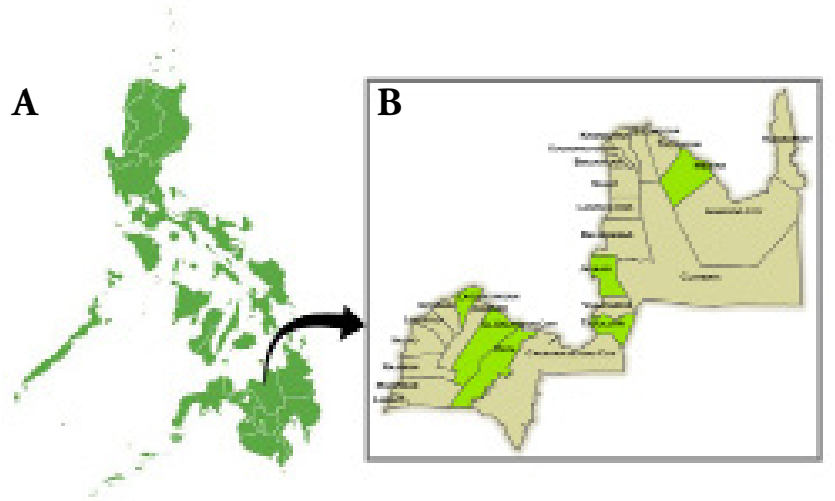

Figure 1. Study site. A) Philippines and B) Misamis Oriental Province (Source: A. 365psd.com/images/istock/philippinesmap, B. http://misamisoriental.gov.ph).

RESULTS AND DISCUSSION

The tables presented summarize all of the data that were used to evaluate the level of knowledge and perception towards biodiversity and conservation techniques of the community leaders.

Assessment of community leaders' level of knowledge about Biodiversity Conservation (both open and closed-ended questions)

The respondents were asked to select Yes/No/Not Sure in the questionnaire to answer the close-ended questions and to respond to the open-ended questions such as defining biodiversity and biodiversity conservation, identifying threats to biodiversity, describing the importance of biodiversity conservation, and others.

The Below Mastery Level (Below 50%) and the Above Mastery Level (Above 50%) were used to find the community leaders' level of knowledge on biodiversity conservation (Wendeye, 2009). If the majority of the respondents (above 50%) answer correctly the questions, it would indicate that they have above level mastery level (above 50%) knowledge, but if the majority of them

(below 50%) answer incorrectly, this would mean that they have below mastery level (below 50%) knowledge.

Closed-ended question result data

Table 1

Community leaders' level of knowledge about biodiversity conservation (close-ended questionnaire).

QUESTION	Respondent responses					
	Yes		No		Not sure	
	F	(%)	F	(%)	F	(%)
1. Biodiversity is the extent to which an ecosystem contains different species	1618	96.02	50	2.967	17	0.010
2. Biodiversity users as a human well-being	1642	97.45	32	1.899	11	0.007
3. Biodiversity conservation refers to the practice of protecting and preserving the abundance and variety of all spades.	1637	97.15	43	2.552	5	0.003
4. Deforestation has negative impact on the biodiversity resources.	1682	99.82	2	0.119	1	0.001
5. It is always better to repair an ecosystem rather than to replace it.	1408	83.56	254	15.074	23	0.014
6. Climate change cannot control through biodiversity conversion	258	15.31	1403	83.264	24	0.014
7. Protection of species and varieties of species will not support biodiversity.	108	6.41	1568	93.056	9	0.005
8. Conversion of biodiversity resource has negative effect on human development.	742	44.04	936	55.549	7	0.004
9. Food security and Biodiversity resource conservation does not have any Relation.	645	38.28	1028	61.009	12	0.007
10. Maintaining habitat is fundamental to conserve species.	1348	80.00	332	19.703	5	0.003
11. Loss of biodiversity in one area destroys the natural balance elsewhere.	336	19.94	1347	79.941	2	0.001

Table 1 continues

QUESTION	Respondent responses					
	Yes		No		Not sure	
	F	(%)	F	(%)	F	(%)
12. Conservation means keeping and protecting a living environment.	1671	99.17	12	0.712	2	0.001
13. Loss of bio diversity causes flooding, shortage of food, air pollution and global warming.	458	27.18	1215	72.107	12	0.007

Table 1 reveals that majority of the respondents were able to answer correctly most of the questions, specifically questions 1, 2, 3, 4, 5, 7, 9, 10, and 12. This means that the community leaders have above mastery level (more that 50%) knowledge on biodiversity and conservation method and therefore possess the basic knowledge on biodiversity and some of its conservation methods. They also have knowledge about biodiversity in terms of it being a variety of life in the ecosystem, in which its use is for human well-being; that they recognize the need to protect varieties of species and its abundance to support biodiversity conservation. The leaders are also aware that deforestation threatens the natural habitat of forest organisms resulting to loss of biodiversity. It was also revealed in the study that the community leaders strongly agree to the relationship between biodiversity and food security, because the biodiversity feeds the world. The leaders also firmly believed on the thought that it's always better to repair an ecosystem rather than to replace it, which is a concept of environmental rehabilitation. The study of Holl et al. (1995) supports that public understanding of environmental issues is critical to the success of conservation efforts.

On the other hand, Table 1 further reveals that more than 50% of the respondents incorrectly answered questions 6, 8, 11, and 13. This means that their knowledge on biodiversity conservation, loss, and conversion are below the mastery level. The following are the statements that were answered incorrectly: Climate change cannot control through biodiversity conversion; Conversion of biodiversity resource has negative effect on human development; Loss of biodiversity in one area destroys the natural balance elsewhere; and Loss of biodiversity causes flooding, shortage of food, air pollution and global warming. From these, it can be fully understood that the community leaders lack general knowledge on the loss of biodiversity, as well as relationship of biodiversity with the environment and human well-being. This indicates that the education and information campaign of the government agencies did not lead to the expected

change in the community leaders' knowledge with regard to issues between climate change and biodiversity conversion including its loss and conservation. For the government to attain its aim, useful tools such as communication, education, and public awareness need to be strengthened. The need to enhance the strategies on information and education of biodiversity and conservation methods may ensure that it will reach down to the lowest strata in the community in order to improve and broaden the knowledge of the people and community leaders. This is because a well informed and educated society contributes a lot in the conservation, preservation and protection of the environment. According to Trong Trai et al. (2001), having low perception of one society has negative impact in the conservation of biodiversity resource.

Open ended-question result data

Table 2

Community leaders' written statements regarding their knowledge about Biodiversity Conservation

QUESTIONS	Respondent responses							
	CA	%	PA	%	WA	%	NA	%
1. What is biodiversity and how to conserve it?	679	40.30%	80	4.75%	875	51.93%	51	3.027%
2. List threats of biodiversity in your area?	545	32.34%	25	1.48%	1094	64.93%	21	1.246%
3. List the importance that we obtain from biodiversity?	1208	71.69%	26	1.54%	437	25.93%	14	0.831%
4. What type of strategies used in biodiversity conservation?	654	38.81%	17	1.01%	1006	59.70%	8	0.475%
5. List the site that is used for conservation of biodiversity in your local area?	880	52.23%	248	14.72%	545	32.34%	12	0.712%
6. Please name at list five endemic plants and animals of Misamis Oriental?	531	31.51%	78	4.63%	322	19.11%	754	44.748%

Note; - CA = Correct Answered; PA= Partially Answered; WA = Wrong Answered; NA= Not Answered

Table 2 shows that the community leader's level of knowledge on the general concepts of biodiversity and biodiversity conservation is below the mastery level. Only item 3 on the importance of biodiversity was correctly answered by 71.69% of the community leaders (more than 50% of the respondents) while items 1, 2, 4, and 5 were answered incorrectly by more than 50 % of the respondents. On

the other hand, item 6, on knowledge and identification of endemic species, was not answered. It means that they have no idea about endemic species.

The community leaders answer to the importance of biodiversity mostly focused on the benefits they got from biodiversity, most of them said "biodiversity gives us food and water", "biodiversity gives us medicine, it heals us", "biodiversity gives us shelter", "biodiversity gives us clothing", "biodiversity provides us livelihood".

The knowledge of community leaders on forest ecosystem like the forest provide goods such as food, timber, and medicines made them recognized the important benefit of biodiversity. Medicinal plants are very rich in the forests of Misamis Oriental. Herbal plants used by locals as cure of their sickness are also evident in the place. Marine ecosystem in the same province also provides fish and eco-tourism which became a livelihood for residents in the area. Livelihood such as selling livestock, fruits and vegetables, coconut farming, vegetable growing, tobacco farming, wood carving, furniture making, herbal medicine manufacturing are among the source of income by some residents and other community leaders. As cited in the study of Turner-Erfort (1997), many reasons have been cited for protecting biodiversity (Ehrlich & Ehrlich, 1981; Norton, 1986; Wilson, 1988; Noss & Cooperrider, 1994; and Meffe & Carroll, 1994) agree that the loss of biodiversity, species, and habitats is a serious threat to the environment and to human welfare.

Result of assessment of community leader's perception towards biodiversity conservation are summarized and presented in Tables 3 and 4.

The analysis of the items was made in terms of issues related with the use of biodiversity resource, issue of responsibility, issue of reasons of biodiversity loss and issue of sustainable development about biodiversity conservation and the results of perception items are analyzed using frequency and percentage score.

Results of Assessment of community leaders perception towards biodiversity conservation particularly on the issue related to use and responsibility of biodiversity conservation are summarized and presented in Table 3.

Table 3

Community leader's perception towards biodiversity conservation (particularly issue related to use and responsibility of biodiversity conservation)

QUESTION	Respondent responses									
	SA	%	A	%	U	%	D	%	SD	%
1. I believed that planting of trees use to protect climate change and biodiversity conservation	1360	80.712%	278	16.499%	1	0.0593%	42	2.493%	4	0.237%
2. I believe that the loss of biodiversity would affect out survival of life since Biodiversity is critical to human survival.	1398	82.967%	241	14.303%	5	0.2967%	18	1.068%	23	1.365%
3. I perceive that Forest clearance for agriculture or development is justifiable even if it affects Biodiversity resources.	32	1.899%	45	2.671%	78	4.6291%	652	38.694%	878	52.107%
4. I think no need to bother about biodiversity resources as far as we secure our food any source.	65	3.858%	36	2.136%	35	2.0772%	598	35.490%	951	56.439%
5. I believe that Biodiversity resource loss does not have any impact on the socioeconomic and stability of environment in the Philippines.	23	1.365%	35	2.077%	67	3.9763%	748	44.392%	812	48.190%
6. I agree that Biodiversity Conservation should mainly be the responsibility of the government rather than the local community.	43	2.552%	57	3.383%	35	2.0772%	589	34.955%	961	57.033%
7. I believe that community leaders should not spend time to control biodiversity resources.	40	2.374%	52	3.086%	23	1.3650%	592	35.134%	978	58.042%
8. According to my opinion individuals should be paid if they participate in biodiversity conservation activity.	51	3.027%	36	2.136%	23	1.3650%	612	36.320%	963	57.151%
9. Conservation of biodiversity is not a matter that concerns me.	278	16.499%	98	5.816%	58	3.4421%	793	47.062%	458	27.181%
10. As the community leaders have little capacity to conserve their Biodiversity resources they should not be blamed.	322	19.110%	65	3.858%	45	2.6706%	725	43.027%	528	31.335%
11. Once the biodiversity is exposed for reduction, it is wastage of time to conserve and Protect it.	242	14.362%	56	3.323%	32	1.8991%	825	48.961%	530	31.454%
12. As citizens you have responsibility to participate voluntarily activities that are concerned with conservation of biodiversity.	1488	88.309%	135	8.012%	48	2.8487%	12	0.712%	2	0.119%

Note: - SA= strongly agree, A=agree, SD= strongly disagree, D=disagree, U= undecided
Community leader's perception on issues related to use and responsibility of biodiversity conservation is favorable

An overwhelming result of above 80% in items 1, 2, and 12 is shown in Table 3. Community leaders strongly agreed that planting trees could prevent climate change and help biodiversity conservation. The leaders are convinced on the importance of biodiversity to life survival. The leaders also strongly agreed and recognized their role and responsibility in biodiversity conservation. This can be attributed to the massive information, education campaign of the different national agencies, non-government organizations and local government units on biodiversity awareness and conservation. It is evident that the community leaders possessed the basic knowledge and understanding of biodiversity; conservation of biodiversity resources. The uses of biodiversity as provider of air, water, clothing, and shelter. The leaders further agreed that biodiversity soothes and provides income to millions.

In items 5, 9, 10, and 11, less than 50% of the community leaders strongly disagree on the statement that biodiversity resource loss does not have any impact on the socioeconomic and stability of environment in the Philippines and conservation of biodiversity doesn't concern them and they should not be blamed for they have little capacity to conserve Biodiversity resources. There is also a strong disagreement on their part which they are not convinced that once the biodiversity is exposed for reduction, it is wastage of time to conserve and protect it. In items 3, 4, 6, 7, and 8, more than 50% of the community leaders strongly disagree on the idea that biodiversity conservation is the main responsibility of the government. They also strongly disagree that Forest clearance for agriculture or development is justifiable even if it affects biodiversity resources more so with paying individuals who participate in biodiversity conservation activity. Not spending time to control biodiversity resources and not bothering about it so long as food could be secured is abhorred by the community leaders. The result further shows that community leaders in Misamis Oriental in terms of environmental concern have developed this sense of social responsibility and social value towards biodiversity conservation and they are aware of associated problems relating to environment. The findings support the study of Shrestha (2015) about the Role of Environmental Education for Biodiversity Conservation. Some believe that protected areas are a safe paradise for wildlife and should continue to play a critical role in conserving wildlife (Joppa et al., 2008; Karanth et al., 2009, 2011; Terborgh, 1999), others suggest that ignoring social, political, and economic challenges that surround protected areas is not realistic or viable (Wells & Brandon, 1993; West et al., 2006). Thus, balancing conservation goals and needs of local residents is always challenging. According to Hunter et al. (2002),

humanity still has a collective interest in conserving biodiversity and is best solved together with global collective efforts.

Table 4

Community leaders' perception about biodiversity conservation (issue related to contribution of biodiversity conservation for sustainable development and reasons of loss of biodiversity)

QUESTION	Respondent responses									
	SA	%	A	%	U	%	D	%	SD	%
1. Human are superior to other species, for this reason they have the right to manipulate biodiversity to their will.	1360	80.712	278	16.499%	1	0.0593%	42	2.493%	4	0.237%
2. As far as Charcoal is needed the community need not worry about Biodiversity resources.	1398	82.967	241	14.303%	5	0.2967%	18	1.068%	23	1.365%
3. There is no harm in clearing forest land as far as the present generation satisfies its own need and as far as technology is progressing.	32	1.899	45	2.671%	78	4.6291%	652	38.694%	878	52.107%
4. As Philippines is rich in biodiversity resource there is no need to worry about biodiversity conservation.	65	3.858	36	2.136%	35	2.0772%	598	35.490%	951	56.439%
5. Conservation of biodiversity is far more important to care for the present generation than to think for the benefit of future generation.	23	1.365	35	2.077%	67	3.9763%	748	44.392%	812	48.190%
6. Biodiversity resources should be exhaustively utilized for human advantage at any cost.	43	2.552	57	3.383%	35	2.0772%	589	34.955%	961	57.033%
7. I believe that Biodiversity loss is not an environment threat in the Philippines.	40	2.374	52	3.086%	23	1.3650%	592	35.134%	978	58.042%
8. I do not want forest lands and parks to be regulated. People should be able to do what they want to do with this biodiversity resource.	51	3.027	36	2.136%	23	1.3650%	612	36.320%	963	57.151%
9.Biodiversity conservation does not have any economic value for our country.	278	16.499	98	5.816%	58	3.4421%	793	47.062%	458	27.181%
10.Different species are valued only because they are economically valued.	322	19.110	65	3.858%	45	2.6706%	725	43.027%	528	31.335%

Note: - SA= strongly agree, A=agree, SD= strongly disagree, D=disagree, U= undecided

Results of the assessment of community leaders perception towards biodiversity conservation particularly on issues related to contribution of biodiversity conservation for sustainable development and reasons of loss of biodiversity are summarized and presented in Table 4.

The result showed that community leader's perception towards human manipulation of biodiversity is evident. About 80% of the respondents strongly agree that superiority of human over other species vested them the right to manipulate biodiversity. This particular opinion most likely is being influenced by their knowledge on the acts of human which contributed to biodiversity loss. People have impact on nature, they are considered to be both a problem and solution to biodiversity loss. As a problem, irresponsible human practices contribute to biodiversity loss. As a solution, humans have the knowledge, expertise, and resources to conserve biodiversity. It can also be seen on the table that the statement, "As far as Charcoal is needed the community need not worry about Biodiversity resources", is highly favored by the community leaders. It could be inferred that the community leaders need awareness and in depth knowledge on the effect of charcoal to biodiversity loss due to forest degradation. This is supported by the study of Sedano et al. (2016) whose findings revealed that charcoal production is a main contributor of forest degradation.

On the contrary, the perception of community leaders could have been influenced by the actual practiced of charcoal making in the Province and there is no biodiversity loss due to the fact that charcoal in Misamis Oriental are made of coconut shell and as inhabitants of one of the top five coconut producing provinces in the country, with 102,622 hectares of land planted with coconut, coconut farming is so huge and charcoal making is a livelihood of some community leaders (Bureau of Agricultural Statistics, 2018). The community needs not to worry about biodiversity resources in this case because no cutting of trees has been done in the making of charcoal and forest depletion is avoided resulting to biodiversity conservation.

There is no harm in clearing forest land as far as the present generation satisfies its own need and as far as technology is progressing. As the Philippines are rich in biodiversity resource there is no need to worry about biodiversity conservation. Biodiversity resources should be exhaustively utilized for human advantage at any cost. I believe that Biodiversity loss is not an environment threat in the Philippines. I do not want forest lands and parks to be regulated. People should be able to do what they want to do with this biodiversity resource. Biodiversity conservation does not have any economic value for our country. Different species are valued

only because they are economically valued. Conservation of biodiversity is far more important to care for the present generation than to think for the benefit of future generation. According to the National Biodiversity Strategy and Action Plan (2005), biodiversity conservation is very important since the human being is widely benefited from biodiversity and it is fundamental for the development of socio-economic and stable environment.

CONCLUSIONS

It can be concluded that the current initiatives of the government in informing and educating citizens up to the lowest level of local government units has not brought the expected change in knowledge and perceptions among the community leaders on biodiversity and biodiversity conservation. Education conducted to deepen the Community leader's awareness and understanding on the impact to ecosystem of loss of biodiversity just like climate change, pollution and other major forms of environmental stress needs to be strengthened.

RECOMMENDATIONS

1. Continued effort should be conducted to raise community leader's level of knowledge and perception by properly addressing biodiversity conservation issues through effective provision of biodiversity conservation education in the community;

2. Ensure direct involvement of community leaders in strengthening local efforts to protect biodiversity and the benefits it provides; and

3. Potential adverse effects on biodiversity should be given emphasis in educating community leaders specially those searching for solutions to other pressing environmental problems.

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