

Implication to Environmental Education of Indigenous Knowledge and the Ecosystem of Upland Farmers in Aklan, Philippines

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Abstract—This paper defined the association between the indigenous knowledge, cultural practices and the ecosystem its implication to the environmental education to the farmers. Farmers recognize the need for sustainability of the ecosystem they inhabit. The cultural practices of farmers on use of indigenous pest control, use of insect-repellant plants, soil management practices that suppress diseases and harmful pests and conserve soil moisture are deemed to be ecologically-friendly. Indigenous plant materials that were more drought- and pest-resistant were grown. Crop rotation was implemented with various crop seeds to increase their disease resistance. Multi-cropping, planting of perennial crops, categorization of soil and planting of appropriate crops, planting of appropriate and leguminous crops, allotting land as watershed, and preserving traditional palay seed varieties were found to be beneficial in preserving the environment. The study also found that indigenous knowledge about crops are still relevant and useful to the current generation. This ensured the sustainability of our environment and incumbent on policy makers and educators to support and preserve for generations yet to come.

Keywords—Cultural practices, ecosystem, environmental education, indigenous knowledge.

I. INTRODUCTION

TODAY the world is facing the reality of the inevitability of climate change brought about by the use of modern technology. Much of this modern technology comes from the developed countries. However, its debilitating effect is felt by all of us, whether we come from a first world or third world country.

Indigenous knowledge, traditional, endogenous or classical knowledge [1] refers to knowledge accumulated through experience and transmitted from generation to generation. Farmers acknowledge that the sustainability of the ecosystem is the basis of their continued wellbeing.

Its debilitating effect is felt by all, whether we come from a first world or third world country. In the Philippines, all have felt nature's destructive power- in Panay island during the passage of Typhoon Fengshen also termed locally as Typhoon Frank in June 2008 [3] and Typhoon Haiyan or locally known as Typhoon Yolanda [4] particularly, in the Visayas it left many lives and countless properties lost. Today, the Visayans are still in the process of rebuilding their lives, even more than a few year after Frank and Yolanda's wrath.

Humanity is confronted by complicated problems such as diminishing natural resources and deteriorating ecosystems services because of threats arising from unprecedented growth

and consumerism [2]. People cannot deny the fact that plants, animals and microorganisms support life on earth, in the form of supporting, regulating, provisioning and cultural services [5], [6]. Climate change has already been found to affect the functioning, appearance, composition and structure of ecosystems.

First world and developing countries need to be cognizant and responsive to this threat to our environment. To address these threats, natural and social sciences have contributed through discovering generating and applying knowledge about ecosystem conservation and restoration and by creating stronger policies and practices of sustainable development [2], [7]. Communities have shown [7] in the past and increasingly today that they can collaborate for long-term resource management. It is important that the knowledge-practice-belief complex of indigenous peoples regarding biodiversity conservation is fully acknowledged and utilized in order to effectively manage ecosystems and biodiversity [8].

In Scotts paper [9] on sixteenth-century Visayan food and farming, he found that Visayans lived in permanent settlements, an evidence that their swiddening techniques were not destructive. It is a favorable balance between their numbers and the land available to them permitted new swiddens to be made in the secondary growth on abandoned swiddens without cutting into virgin woodlands. In the paper it was pointed out that an environment which was able to carry a sparse Visayan population that burned off a small portion of its cover every year. In the paper of [10], also observed that farmers in Central Panay have high respect for nature. They do not go about wantonly destroying their environment. They even went to as far as hiring a shaman to perform the rituals that would appease spiritual beings.

The Trousdale thesis paper [11], uses an innovative and promising approach for sustainable tourism planning based on the multiple objective decision analysis in Guimaras Island, in Western Visayas. The paper of Steward [12] referred to this concept as cultural ecology. They stated that different environmental contexts shape the cultural development of a community. Also mentioned in the paper of Stewards [13]. Upland people develop a unique social and economic beliefs and practices or culture that is different from the lowlanders. Rewarding Upland Poor for Environmental Services (RUPES), as mentioned in the paper of Villamor [14], is a program operating on its third year in the Philippines. It has a two-pronged goal: to conserve the environment and at the

same time, to alleviate poverty in the community. The program and its partners tested and developed environmental service reward (ESR) mechanisms in various areas of the country. These include strategies such as carbon sequestration, watershed and biodiversity protection, and landscape beauty in (a) Batigulan, Negros Occidental; (b) Sibuyan, Romblon; (c) Bakun, Benguet; and (d) Kalahan, Nueva Vizcaya. Please areas depend highly on their existing forests and would benefit in knowing about environmental services (ES).

The people inhabiting the twenty-first century could learn much lesson from our ancestors on how indigenous knowledge could help preserve the environment. Their practices were sustainable such that it ensured that our ecosystem could provide for the needs of today's and future generations. The research [2] found that local knowledge systems contribute to biodiversity conservation and preservation of ecosystems services, tropical ecological and biocultural rehabilitation introduced in [15], sustainable water management, genetic resource conservation and management of other natural resources, as well as in ecosystem restoration and adaptive management. In Aklan, *kaingin* a slash and burn farming method farmers have been observing traditional beliefs and practices which are a reflection of an environmental world view rooted in their culture [16]. But, increasing population pressure and higher social cost due to higher social expectation could eventually make people adopt technology that ultimately degrade the environment. The upland farmers closer contact with lowlanders seems to have influenced them to adopt the ways of the lowland farmers in applying fertilizer and pesticide to increase palay yield. Social scientists have already proven that fertilizer and pesticide use in farming contribute to pollution, which in turn are part of the drivers of climate change. This paper is intended to identify the different indigenous knowledge used by upland farmers in relation to environmental education in the province of Aklan. Determine if its ecologically - friendly and ecologically-destructive. Also to find how IK could be integrated in teaching students to improve their awareness on environmental conservation and protection.

The paper is organized as follows: methodology is discussed in section II, results and discussion in section III, and we conclude our work in section IV and give recommendations in section V.

II. METHODOLOGY

A. Research Design

A descriptive research design using a qualitative approach thru direct observation and interview is used. Qualitative research enables to describe the phenomena of interest in great detail, in the original language/context of the research participants and come up with generalized ideas through gathered data.

B. Topographical Area

The study was conducted in the Province of Aklan in the Philippines where majority of its people are engaged in agriculture particularly in farming. The province is subdivided

TABLE I
 DISTRIBUTION OF FARMER-RESPONDENTS ACCORDING GENDER

Barangay	No. of respondents
Monlaque, Ibajay	
Male	4
Female	2
Aparicio, Ibajay	
Male	2
Female	1
Cabugao, Altavas	
Male	1
Cortes, Balete	
Female	1
Ogsip, Libacao	
Male	2
Alas-as, Madalag	
Male	1
Female	1
Tamokoe, Tangalan	
Male	3
Total	18

into 17 municipalities; but on the basis of this study the researcher only limits the farmer-respondents being chosen from six (6) municipalities who solely practiced upland farming using traditional knowledge. The said municipalities were Ibajay, Altavas, Balete, Libacao, Madalag and Tangalan. Fig. 1 shows the location of the study.

C. Sampling Design

This study used the purposive sampling technique. It is one of the most common sampling strategies in qualitative research that determines the group of participants according to preselected criteria relevant to a particular research question. Thus, this technique is appropriate for the study because it focuses on the indigenous knowledge practiced by the local people in Aklan and their actual experiences in upland farming.

D. Respondents of the Study

Out of eight (8) farmers interviewed five (5) were males and three (3) were females, as shown in Table I.

E. Statistical Design

The data gathered from the study were documented and analyzed qualitatively analysis on the basis of answering the research objectives. Extensive field notes which were subsequently coded and analyzed in a variety of ways based from the responses of the respondents using the Key Informant Interview (KII) and In-depth interviews.

III. RESULTS AND DISCUSSION

A. Indigenous Knowledge That Are Ecologically-Friendly

1) *Use of Indigenous Pest Control*: Upland farmers used *eagpit* a type of mousetrap made from bamboo with *lingkad* (dried copra) as bait to control rats. To drive away the *maya* a native birds in the locality, farmers hanged *papalid* a fern genus or *banog nga bunot* a mock eagle made from coconut husk. Also tin cans or anything that make sounds, such as biscuit cans and tin plates, were tied to a string and controlled



Fig. 1 Location map of the study, with position symbol are the location of respondents

by a man from a *payag* or *bugawan* a makeshift hut while shooting the birds. The locals referred to this as *uylog* since the noise and the swaying movement of the string drove the birds away from their rice field.

Another means was the *tawo-tawo* a scarecrow made from *liay it niyog* made up of dried coconut leaves and dressed with worn-out clothes of a farmer. This is usually installed during night time by the farmer himself by walking directly to the spot without looking behind; otherwise, the wild birds would notice the surrogate farmer and they would not get scared. When plants were on the panicle-bearing stage, farmers hanged spoiled fish or any seafood that was fishy smelling on a pole posted around the *kaingin*. These attracted the pests, which the farmers then collected and burned. An upland farmer in Madalag said that before he practiced *panueo it tanangaw* using torch light to get rid of the bug. Upland farmers always made rounds on their field everyday. When rice stalks were observed to be turning gray, they were pulled off and brought home to be hanged above their *dapog* a cooking area in the house with the belief that this will drive away evil which cast doom on the rice plants.

2) *Spirit of Cooperation*: The spirit of cooperation was very much visible among most of today's traditional farmers. When a *kumpare* a name-call to a friend who served as godfather to the baptism or wedding of one's child schedules his farm preparation, neighbors would come to extend their help for free. Some called this *sagibin*, others considered it as *dagyaw*. With a *sag-ob nga tuba* mean a volume of tuba or coconut wine inside a bamboo pole and *sumsuman* a dish prepared to eaten with *tuba*, heavy work became lighter through this cooperative effort. A somewhat likeness was noted by [9] of farmers in the sixteenth century. He found that farmers, by exchange labor, took turns in doing the farm work from planting to harvesting, with the owner feeding them all. However, this form of mutual help system was slowly being eroded because the market economy had reached the uplands.

3) *High Respect for Nature and Unseen Spirits*: Aklanon upland farmers had high respect for nature and unseen spirits. A *medico* (quack doctor) was hired to perform a ritual to negotiate with unseen spirits who are believed to be owners of the land to relocate somewhere else. A *sagda* an offering in the form of a butchered pig or chicken was offered in exchange for the negotiation. Farmers respected nature because of its

power over them. Nature's wrath would be unleashed to those who failed to observe them. The modern phenomenon of flash floods or landslides may mean God's wrath for the *kaingin* farmers.

4) *Respect for Rice Grains*: A key informant said *ga sunggod ro paray* which meant that rice grains would leave the farmer and move to a neighbor's *tambobo* a grain house if the farmer's household would not observe the traditional way of harvesting and postharvest care to the *palay* or rice grains. An informant said that rice grains could get angry and run away, hence, must be treated with respect because *palay* possess *dunggan* a consciousness or spirit. This belief ensured that care must be observed in handling the *palay* grains. Use of Insect-Repellent Plants. In the preplanting rituals, insect-repellant plants, such as *lampunaya* (mayana), *tabako* (tobacco), *tangead* (lemon grass), and *euy-a* (ginger) were planted ahead of the *palay* grains. These plants smell repelled pests.

5) *Multi-Cropping and Inter-Cropping*: Aside from *palay*, their main crop, farmers also planted corn, gabi, beans, squash, cassava, banana and some other perennial plants. In fact, corn was planted ahead of the *palay* as corn could be harvested earlier, which answered their need for a substitute for rice. Coconut and hemp were also planted to augment the family's income as prices of these products were high. The farmer also ensured not to leave the land bald or without vegetation for they were aware of the destructive effect of heavy rains on the top soil. Legumes, such as mungo, string beans and the like were believed to enhance the fertility of the soil as well as being a source of food and or income.

6) *Living in Harmony with Nature*: *Kaingin* farmers believed that *bata nga taeon* a virgin forest lands should not be converted to *kaingin* yet. Upland areas that had been used as *kaingin* for about three to five farming seasons need to be vacated for vegetation to regrow. Once abandoned, this area can again be cultivated after seven years. This is in accordance to time and season. According to the paper [17], to ensure fertility of the land, a season of rest was given to the earth. It was a season of waiting until the land was ready and nature could nourish it.

7) *Categorization of Soil and Planting of Appropriate Crops*: According to a farmer, crops were not just planted anywhere. Skilled farmers could easily identify the type of soil (e.g., *bukaeay*, *napo*, *tikud*) and the appropriate crop suited to the type of soil. For instance, cassava grew well in a *tikud* type of soil and that frequent planting of corn would make the soil *tikud*. Farmers also left the rice stalks during the *gao* (harvest) to decompose. From the paper [17], it is mentioned that planting of legumes was a way of nourishing the earth and so was the utilization of farm, plant and animal wastes as natural fertilizers. Some used leaves from madre de cacao, threshed rice stalks, rice hulls, corn cobs and chicken dung.

8) *Preserving Traditional Varieties of Bisaya and Other Upland Varieties*: In the absence of modern technology of germ-plasm banking, the upland community had demonstrated that they were the original keeper of many rice varieties. In the upland areas of Libacao, farmers identified twenty-seven rice varieties while farmers in Ibajay added nine more.

B. Ecologically-Destructive Practices

1) *Cutting of Trees*: In general, the underbrushing and consequent burning of the *kaingin* meant the cessation of the flora and fauna in the site. Although the area can naturally regenerate, the increasing number of households practicing *kaingin* farming will, in aggregate, destroy a large area of forest. The Aklan upland is part of a biodiversity conservation program of the United Nations Development Program, thus, there is a need to integrate this concern with the upland communities.

2) *Use of Modern Fertilizers and Pesticides*: Upland farmers have started adopting the practices of the lowland farmers. An informant observed that pests attacking upland rice crops were the same with paddy rice. Unknowingly, they were applying ecologically destructive pest management method.

3) *Short Observance of the Fallow Period*: Most upland farmers were applying three to four years of fallow period. Thus, lands used as *sulit* after a shorter period of rest reduced fertility and consequently resulted to poor harvest. The land may eventually become *cogon* land. Inheritance practice fragmented the land. Hence, sons would have a smaller size to cultivate. This land constraint contributed to a shorter observance of the fallow period. Watershed Destruction. Headwaters were observed to have run dry upon transforming the area to *kaingin*. In general, farmers had a limited understanding of the function of watersheds.

4) *Planting Fewer Varieties of Bisaya*: The preferences of consumers drive the farmers to plant the varieties that were in high demand. This increasingly market-driven production of *Bisaya* resulted in the preservation of few varieties that had markets in the lowland and the extinction of other varieties unless a mitigating measure is set up in place by the government.

C. Indigenous Knowledge and Its Implication to Environmental Education

Using cultural ecology as a framework, upland indigenous knowledge is understood as the accumulated product of the people's ways to adapt to their upland environment. This has served them well in the past and will continue into the future. Indigenous knowledge that are ecologically-friendly need to be preserved and transmitted to our students. They should be taught to value and appreciate the rich culture of our upland communities. Indigenous knowledge may yet be our answer to prevent the continuous degradation of the environment, and hopefully, mitigate the debilitating effects of climate change.

IV. CONCLUSION

The upland farmers have been observing traditional beliefs and practices which are a reflection of an environmental world view rooted in their culture. They possess an ecologically-sound farming practices, such as being the community-based gene bank of rare rice varieties. Their indigenous knowledge need to be preserved since these practices have helped maintain our ecosystem until now. It must be noted that our ancestors have been doing *kaingin*

farming as evidenced by the writings of the early Spanish missionaries in the sixteenth century. This proves that upland farming is sustainable. However, these practices are gradually overtaken by socio-economic factors like the effect of market forces, demographic changes, rising cost of living and higher social expectation. Such forces will ultimately kill the desirable traditional practices of upland farmers.

V. RECOMMENDATION

The national and local government units should recognize, support, and preserve the indigenous ecological knowledge of the upland communities and ensure that these are transmitted to the present and future generations through the formal and informal school systems. The researchers recommend the documentation of indigenous knowledge and its use in natural resource management. The upland communities should be given a chance to participate in these activities hand-in-hand with government agencies like the Department of Environment and Natural Resources, Department of Agriculture, Department of Agrarian Reform and the local government units. Folk ecological knowledge and wisdom need to be maintained and to create new contexts for their continued practice with the help of educational institutions, teachers, students and non-government organizations working in collaboration with each other. Develop clear instructional materials on traditional knowledge systems to be used in schools and in extension programs to impart information on the value and threats to indigenous knowledge systems. Craft curriculum and methods to integrate traditional knowledge into formal education systems of agencies, researchers and practitioners who work together with communities. Enhance the indigenous and spontaneous community spirit and leadership of the tribal elders in the upland communities. The government needs to support measures to mitigate the effects of *kaingin* by designing educational and technical programs for upland farmers and their children while preserving the unique aspects of upland culture and practices.

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