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The Indigenous Practices and Climate Change Responses of Ati and Suludnon Farmers in Iloilo, Philippines

ABSTRACT

Climate change has become a major threat to the livelihoods of many farmers in the Philippines, particularly among the indigenous groups. It has been recognized that traditional knowledge is an important source of information for climate change adaptation, for embedded into it are coping strategies evolved through and passed on to generations. This study documented through key informant interviews, focus group discussions and farm visits the indigenous knowledge for climate change adaptation of the Suludnons and Ati in Iloilo. Since 2003, their communities experienced climate change as manifested by strong typhoons, landslides, and the various forms of crop and human diseases. Their responses to climate change include biodiversity-based cropping systems, changes in cropping calendar, use of indigenous varieties, consumption of non-traditional/wild foods, indigenous warning systems and diversified income sources. Both indigenous groups are beneficiaries of government and non-government projects, grants and agricultural trainings where they learned new farming technologies. The traditional practices combined with the adoption of selected agricultural technologies have helped the have helped the Suludnon and the Ati groups become become sustainable and climate-resilient farming communities amidst the adverse impact of climate change on their lives.

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INTRODUCTION

The changes in climate have serious global impacts in the recent years. Developing countries and island states are the most vulnerable to these climatic changes (*Yumul et al. 2011; Méheux et al. 2007; Yumul et al. 2008*). This is because developing countries have fewer resources to ensure the security of communities despite the impacts of climate change; while island states are vulnerable because of sea-level rise (*Yumul et al. 2011*).

The Philippines being an archipelago and developing country makes it vulnerable to climate change. There is an average of 20 tropical cyclones that enter the Philippine Area of Responsibility (PAR) every year (*PAGASA-DOST 2011*); the strongest of which was Typhoon Haiyan, locally known as Yolanda, which claimed 6,300 lives, and caused damage to infrastructure amounting to around PHP 89 billion. According to the Food and Agriculture Organization of the *United Nations* (*2014*), it caused losses to agriculture across the nine affected regions - including Iloilo in Panay Island- and threatened the nation's food security. Food security exists when all people at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs, and food preferences for an active and healthy life (*FAO 2008*).

Climate change threatens food production in several ways: temperature increase and rainfall pattern change affect crop yield and physiology; sea-level rise inundates crop-growing areas; and extreme rainfall leads to crop and farm damage (*Lasco 2012*). The Philippine economy is heavily based on agriculture, and farmers are under

the greatest threat from climate change. Among the most vulnerable sectors are the upland farmers, consisting of 20-24 million Filipinos, who have very limited resources and depend on rain for their everyday living (*Pulhin 2009*). Comprising a significant part of this population are the indigenous peoples, who inhabit the least fertile and most marginal lands as a consequence of historical, social, political and economic rejection and exclusion (*Macchi et al. 2008*).

Indigenous groups by virtue of their centuries-old interaction with their natural environments have developed ways to cope with the changing climate in the form of adaptation. *Adger et al.* (*2003*) defined adaptation to climate change as the adjustment of a system to moderate the impacts of climate change, to take advantages of new opportunities or to cope with the consequences. *Srinivasan* (*n.d.*) presented various forms of indigenous knowledge in agriculture-based climate change adaptation. These include: Spatial and temporal climate risk management strategies through intercropping, mixed cropping, mixed land use, etc.; Cultivation of more than one type of grain staple; Cropping pattern decisions based on local predictions of climate and varying planting dates based on complex cultural understanding of weather; Re-terracing of collapsed slopes, changes in land use to match slope stability, and agricultural deintensification following landslides; and indigenous soil and water conservation. He discussed options for integrating indigenous knowledge in climate change adaptation strategies in Asia and the Pacific.

Indigenous knowledge has many conceptual names in English: "folk knowledge", "local knowledge or wisdom", "non-formal knowledge", "indigenous technical knowledge", "traditional ecological knowledge" or "traditional knowledge" and "indigenous heritage" (*Battiste 2010*). These terms are used interchangeably in this study. Indigenous knowledge is knowledge developed over time and handed down from generation to generation, often by word of mouth (*Warren 1991; Warren 1992*). *Grenier* (*1998*) describes indigenous knowledge as "stored in peoples' memories and activities and is expressed in stories, songs, folklore, proverbs, dances, myths, cultural values, beliefs, rituals, community laws, local language and taxonomy, agricultural practices, equipment, materials, plant species, and animal breeds. IK is shared and communicated orally, by specific example, and through culture."

Tauli-Corpuz and Lynge (*2008*) presented the contributions of indigenous people in addressing the impacts of climate change. "At least 370 million indigenous people throughout the world are practicing mostly sustainable, carbon-neutral, or even carbon-negative lifestyles, which have sustained them over thousands of years, thereby contributing to the reduction of carbon dioxide in the atmosphere. "As stewards and custodians of the world's biodiversity, cultural diversity, and traditional ecological knowledge, indigenous peoples can contribute meaningfully to more appropriate and sustainable adaptation measures"

Little has been done to explore the contributions of indigenous knowledge on climate change research. Countries that are heavily dependent on agriculture production for their economy have recognized that extreme events brought about by climate change like heavy rainfall and drought are challenging crop production. The livelihood of farmers in Ethiopia, for example, had been affected by frequent drought (*Mengistu 2011*). The African Sahel region likewise, has suffered drought dating back into the centuries. Local populations in the region have integrated their indigenous knowledge systems with formal scientific knowledge on climate change to develop mitigation and adaptation strategies to reduce their vulnerability to drought (*Nyong and Elasha 2007*). *Eguru* (*2012*) also emphasized the need to integrate modern approaches to strengthen IK in climate change adaptation and resilience. *Eguru* (*2012*) also found that IK of farmers in Uganda have predicted rainfall using the observed changes in the following: intensity of the East-West blowing winds, color of cloud formation of the East and plant traits. The process of integrating IK related to hydro-meteorological hazards and climate change with science was demonstrated through a project implemented among coastal and small island communities in Indonesia, Timor Leste, and the Philippines. Local and indigenous knowledge was classified into four categories: the first category includes the IK that can be explained by science, such as are observation of celestial bodies, observation of environment like wind direction, formation and location of clouds, plant and animal behavior, material culture such as housing, food eaten during food scarcity and other protective measures during storms and drought. Category two are those on "faith-based beliefs, traditional rituals, legends and songs" These do not have scientific explanation but are being practiced by the communities to build resilience. Category three are the IKs which are related to climate change and prediction of disaster, like the restlessness of fish before a typhoon but no scientific explanation. Category four includes howling of dogs as an omen for a disaster. Similar to Category 3, there is no scientific basis, but more so, these observations do not have anybearing on actual disaster events. (*Hiwasaki et al. 2014*) Local

and indigenous knowledge are a vital source of environmental data and therefore need to be utilized by scientists, practitioners, and policy makers (G*reen et al. 2010; Riedlinger and Berkes 2001; Hiwasaki et al. 2014*) On the other hand, *Berkes* (*2009*) believes that traditional knowledge should be dealt with caution and be treated as a process not as a content since in the context of global environmental change, many elders have not previously experienced climate change and perhaps the changes being observed now is also a novelty for this group.

Baars (*2011*) in discoursing "Experiential Science" recognizes the knowledge of farmers based from experience and the need to integrate them in research projects in agriculture. *Rudinas et al.* (*2013*) believed that farmers could play a major role in addressing climate change. Having developed ways to cope with the changing climate in the past in the form of adaptation strategies, especially in agriculture, "there is a need to recover indigenous knowledge and share it in a larger context" (*FAO 2010*). Being a multi-ethnic, multi-cultural, and multi-lingual society, different groups from various places within the country differ in their ability to adapt to climate change. Hence, there is an urgent need to document and communicate IK-related climate change adaptations (CCA) for proper understanding and dissemination of effective adaptation measures. This study, thus, documented the indigenous knowledge focusing on climate change adaptation and manifested in crop production systems, that have made two indigenous groups in Iloilo- the Suludnons and the Ati, food self-sufficient despite their vulnerable agroecosystem. The use of indigenous practices and technologies is largely limited by lack of their documentation, and thus, the need to build strong awareness programs to appreciate indigenous knowledge systems and its role in enhancing household food security (*Agea et al. 2008*).

MATERIALS AND METHODS

This research was part of the research project on "Documentation of Indigenous Knowledge (IK) for Climate Change Adaptation," funded by the Department of Agriculture- Bureau of Agricultural Research (DA-BAR), a government agency. This project involved several indigenous farming communities and Iloilo was one of the research sites. A three-stage process of selecting indigenous climate change adaptation strategies for documentation was implemented. First, geographical areas all over the country that have long borne the brunt of the impacts of climate change were identified. Second,the indigenous adaptation strategies were documented, and third, these strategies were classified according to commonalities derived across the different indigenous groups. Formal linkages with the National Commission on Indigenous Peoples (NCIP), state colleges and universities (SCUs), and Provincial Agriculture Office (PAO) in the different project sites were established: In the case of documentation of indigenous climate change adaptation strategies of the Suludnons and Ati farmers of Iloilo, partnerships were formed with the local NCIP and the West Visayas State University (WVSU). All past, actual, and existing indigenous knowledge (IK) for climate change adaptation were documented in textual and visual forms. Free and prior informed consent (FPIC) were obtained through a notarized document written in the local language to make sure that the people understood what the project was all about and their roles in it. Documentation was done using three methods: in-depth key informant interviews, focus group discussions, and the actual observations of farming activities and community life. Secondary data were gathered to substantiate the findings of the primary data collected, and findings were presented to the Suludnons and Ati for validation.

RESULTS AND DISCUSSIONS

Study Sites in Iloilo, Philippines

Lambunao is a first class municipality, which is about 41 km north of Iloilo City (the provincial capital) with geographic coordinates of 11° 3' 17" N, 122° 28' 33" E (**Figure 1**). The municipality of Lambunao is around 40,710 ha subdivided into 73 barangays. Barotac Viejo is a 3rd class municipality about 52 km northeast of Iloilo City. It has a total land area of 18,578 ha. The Municipality of Barotac Viejo is subdivided into 26 barangays with a population of 41,470 as of 2010.

The two tribes have been living in the same locations where their ancestors first resettled. The residential and farming sites are part of the tribes' identity. Most, if not all residents, are related to one another, either by blood or by marriage. Cohesiveness is very apparent and is maintained through the tribes' shared cultural traditions.

The Ati

The oldest man named Tatay Biro, who learned about the Barangay Lipata, Barotac Viejo while hunting, found that the place was abundant in food. Tatay Biro then enticed the tribal group to live in the area. *Kaingin* (slash and burn method) was practiced for three consecutive years to clear the area, and when the area was ready for settlement, Tatay Biro together with several men named

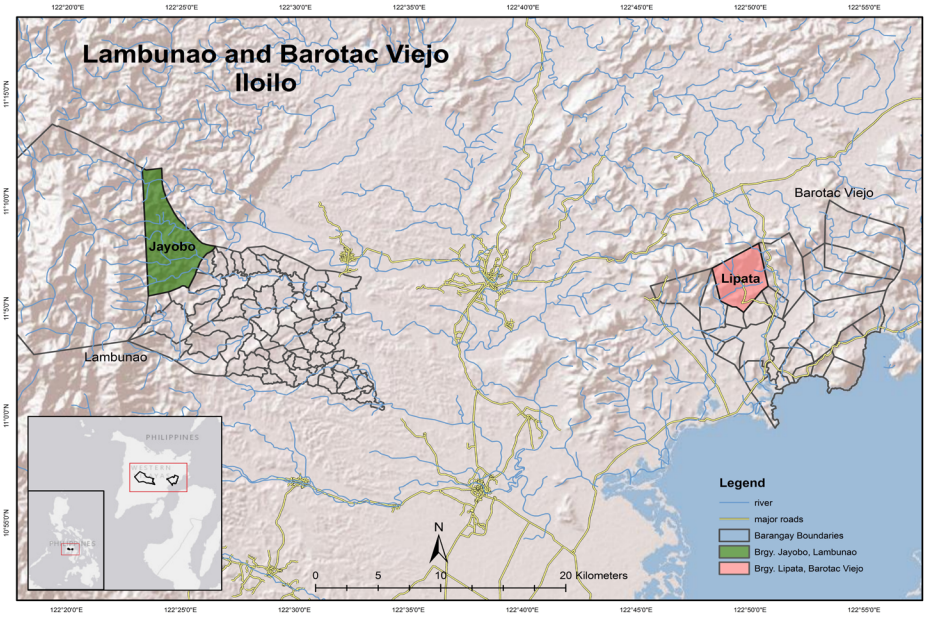

Figure 1. Location map of the Suludnon tribe in Barangay Jayobo, Municipality of Lambunao and Ati tribe in Barangay Lipata, Municipality of Barotac Viejo.

Sivero, Lucendo, Feliciano and Agustin sought the permission of the then Mayor of Barotac, Viejo to stay in the place. The Mayor granted the request of the Ati people.

In 1980, the Peace Corp, taught the Ati people how to plant trees and coffee (*coffea* spp.). The Ati later applied for stewardship contract for the area. At present, the Ati claims at least 200 ha of watershed area, 60 ha of which was utilized for the Integrated Social Forestry project of the University of the Philippines Los Banos (UPLB) and 140 ha were distributed to the members of the tribe at 3 ha household^{-1}. Another 200 ha are being utilized as nursery for coffee. Lately, other Ati members from various places in the country moved to Lipata and were welcome to settle in the 100 ha that remained undistributed.

The Ati people received support from different local government units (LGUs) and non-government organizations (NGOs). The Ati were also recipients of an extension program of the Development Bank of the Philippines (DBP) called Progress through Economic Socio-Agricultural Agroforestry Cooperation Extension (PEACE)- Upland Development Program (UDP), which started in 2000. The education component includes functional literacy aimed at teaching reading and writing, which are two skills specifically needed in voting during election period, and in understanding doctor's prescriptions. Moreover, the Ati were taught to understand human nature, the significance of wedding, ways of living, and the role in the community. The Ati skills in vegetable production, goat raising, native chicken production, and weaving were further enhanced for the purpose of improving their income. The Ati were also encouraged to plant high value fruit trees like lanzones (*Lansium domesticum*), rambutan (*Nephelium lappaceum*), durian (*Durio zibethinus*), and pomelo (*Citrus maxima*) through a program funded by the DBP. This was implemented by the West Visayas State University (WVSU) with support from the Mayor and barangay captains (village leaders) in the surrounding barangays.

The Suludnons

There are 167 households with an estimated 1600 individuals living in barangay Jayobo, Lambunao residents used to be called bukidnon, which came from the word bukid meaning "mountain." In the past, Suludnons took it negatively when the tribe was called 'Bukidnon' because of the connotation that mountain people were uncivilized and illiterate. But as time passed, the negative meaning seemingly disappeared and the Suludnons are no longer offended to be called 'Bukidnon' because of the recognition of its rich cultural heritage.

Suludnons usually farm 2 ha of land located 1-2 km away from their houses. The Suludnons practice kaingin with abaca (*musa textilis*), banana, coffee, and vegetables as the main crops. During *kaingin*, the Suludnons limit and select the trees to be cut. This is done to establish firebreaks which will prevent the spread of to flames. The Department of

Environment and Natural Resources (DENR), as part of forestry policy implementation, has warned the tribe regarding the kaingin practice, but the Suludnons continued it because the tribe lack the necessary farming tools and draft animals like carabao. Another major crop planted by the Suludnons is coffee. The tribe also grow crops that are not sold commercially, but are planted for family consumption. These crops are gabi, sweet potato (*Ipomoea batatas*) and cassava (*Manihut esculenta*).

There were a total of 124 farmers who became beneficiaries of the assistance given by the reforestation project of DBP and WVSU. Interested farmers were given fruit tree seedlings with the condition that the harvest would be shared- 70% of the sales went to the farmers, and the remaining 30% to the WVSU. Seedlings were distributed to the farmers as part of the reforestation project. These seedlings were lanzones (*Lansium domesticum*), rambutan (*Nephelium lappaceum*), durian (*Durio zibethinus*), and pomelo (*Citrus maxima*); and trees like gmelina (*Gmelina arborea*) and mahogany (*Swietenia macrophylla*).

Barangay Jayobo of the Suludnons occupies land owned by the government through the Western Visayas State University (WVSU). As Indigenous Peoples (IPs), they benefit from the PEACE Program (Progress through Economic, Socio-cultural Agro-Forestry Cooperative Extension) through which 28 were given US$ 475 year[-1] and granted scholarships. Around 14 students have graduated through the help of such scholarship program.

The Climate

Both Barotac Viejo and Lambunao, Jayobo have Type III climate, characterized by no pronounced maximum rain period with a dry season lasting only for one to three months. either during the periods from December to February or from March to May (*PAGASA n.d.*). From 1980 to 2009, the mean monthly maximum temperature was between 30 and 32°C, during the months of April and May (**Figure 2**). But in 2000 to 2009, this temperature range was 30°C, higher from October to December, indicating a warmer climate. For the mean total monthly precipitation, it was higher during the months of May and June in 2000 to 2009 as compared to the previous years.

Climate Change Impacts

Experiences of the Ati. Climate change had affected the livelihood of the Ati. Warmer climate and higher precipitation was felt in the last nine years (2004-2012). Drought condition brought about by El Niño damaged fruit tree seedlings including bananas[1]. Excess water due to frequent rains had the same adverse affects on bananas. Under waterlogged soil condition, bananas are easily uprooted due to shallow roots penetration.

[1]Banana requires good drainage because it is susceptible to waterlogging that causes anoxic soil condition. Specifically in heavy (clay) soil, excess water after a heavy rainfall could damage the root system and contribute to the susceptibility of bananas to Fusarium wilt disease. (https://www.bioversityinternational.org/fileadmin/_migrated/uploads/tx_news/Infomusa__The_international_magazine_on_banana_and_plantain_974.pdf)

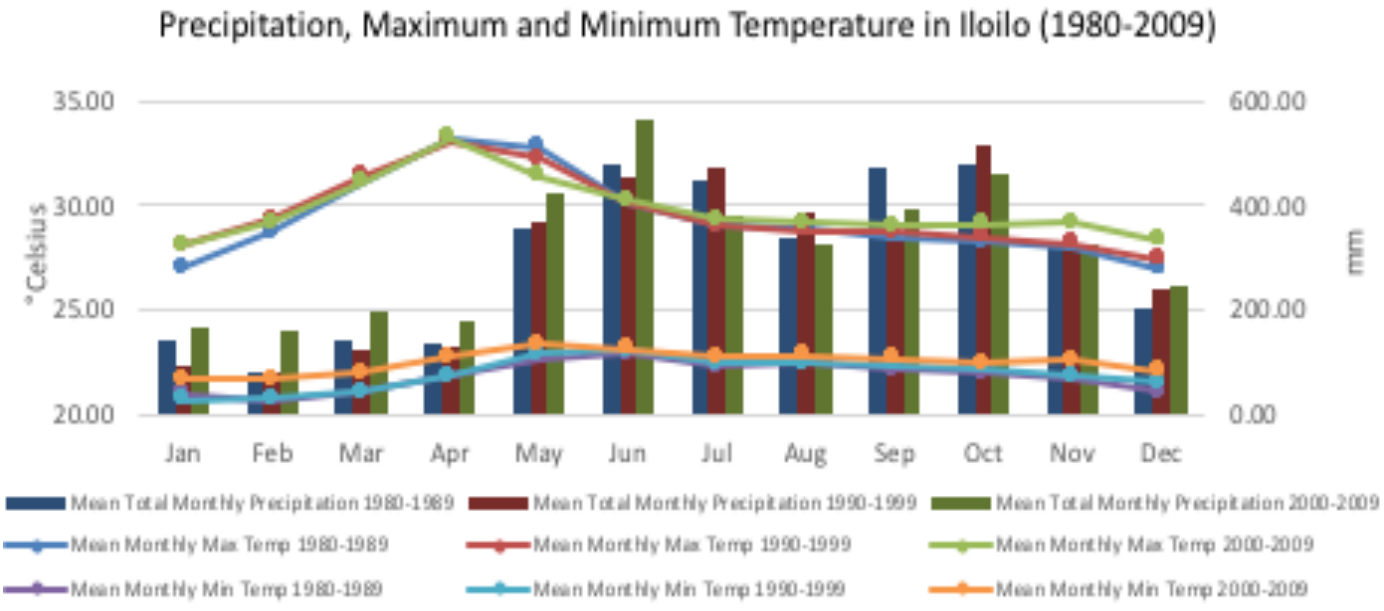

Figure 2. Mean total monthly precipitation and mean monthly maximum and minimum temperature in Iloilo from 1980 to 2009 (Source: http://cfs.ncep.noaa.gov/cfsr).

There was observed occurrence of stronger typhoons since the early 1980s, the strongest of which in the most recent years was typhoon Yolanda (international name : Haiyan) in November 2013. The timeline of calamities experienced by the Ati tribe, shared during a workshop held in Los Banos, Laguna, Philippines (**Figure 3**) shows the major typhoons that damaged their crops and houses.

The unpredictable weather condition is described in many ways. For example, rain occurs on a clear day, or in the absence of thick dark clouds used as indicator of rain. High temperature is experienced during the day and low temperature at night. Avian flu, an epidemic that affected severely their backyard chickens, was believed to have been caused by these sudden change of temperature and weather conditions.

Other observations include flooding of rivers, and floodwaters unlike before that heavy rainfall would not bring about change in the water level of the river. In October 2011, the rivers overflowed due to continuous and heavy downpour. This is being attributed to the siltation in river beds that is caused by soil erosion. The flashfloods took away the lives of five Aeta children. Charcoal making in the area is also being blamed for frequent flooding, for this economic activity involves cutting of trees.

Experiences of the Suludnons. The common observation was all typhoons which occurred after the June 2008 Typhoon Frank (international name: Feng Shen) were stronger. It was during this typhoon when landslide and flooding lasted for two days. Similar to the experiences of the Ati of Barotac Viejo, the strongest typhoon was typhoon Yolanda. Since then, the farmers have observed abnormal and unpredictable weather conditions. According to one farmer, 175 of the total 350 durian trees died, only 30 out of 45 pomelos survived, and 800 out of the 1000 lanzones trees survived. The landslides were occurring in more frequency and in shorter intervals in the last six years (2007-2013). For every landslide, more or less 200 mats of bananas are destroyed which is tantamount to the reduction of yield. There was landslide incident where at least 1 ha of banana plantation was lost. Aside from landslides, yield decreased due to banana bunchy top virus (BBTV) which affects 40% of the crop. Yield from banana is now only about 15% of what they used to harvest, i.e., from 6 *karga* (load) to only 1-2 *karga* month^{-1}. (**Figure 4**). Similarly, yield of coffee was also reduced from 1,000 kg harvest^{-1} before 2007 to 150 kg in 2016.

Pest and disease occurrence also increased and caused yield decline in several crops. Rice was affected by tungro virus while sweet potato by potato scab. Rodents also attacked cassava and sweet potato. Yield decline was also due to defoliation of coffee and fast growth of weeds. Aside from the effects on crops, animals are also affected by climate change. Mortality on domestic chickens is a common occurrence. Climate change-related diseases such as cough and colds also affect the children. However, the emergence of new and dangerous diseases make traditional herbal medicines no longer effective.

Climate Change Adaptation

One of the major results of the research project on Documentation of Indigenous Knowledge for Climate Change Adaptation was deriving commonalities (or themes) among the indigenous farming practices, which are found in the succeeding discussion to categorize climate change adaptation.

Change in cropping calendar, working time in the field and crop management. The unpredictable weather as characterized by warmer climate, higher precipitation

Figure 4. Suludnon farmers with *karga* of bananas.

Figure 3. Timeline of strong typhoons experienced by the Ati Tribe in Iloilo.

and occurrence of drought has forced the Ati to change their cropping season. Land preparation which was usually done during December and January has been moved to February and March thus planting of upland rice changed from March and April to May. The changes in the cropping calendar was shared by Rachel Mateo and Lolita Tizon, an Ati and Suludnon, respectively, in a sharing workshop held at he University of the Philippines Los Banos in 2016 (**Table 1**).

To avoid the adverse effects of extreme temperature and heavy precipitation, the Suludnons have also changed planting month of common crops (**Table 2**).

The El Niño phenomenon is also attributed to climate change. In preparation to this extreme event, the Suludnons see to it that they are done with planting root crops like cassava, taro (*Colocasia escalenta*), and sweet potato in November. It is also customary for the Suludnons to bury their cassava tubers (only those with smooth and not damaged skin are selected) near the river/stream to prolong their storage and shelf life.

Biodiversity-based farming system. The Ati tribe practices biodiversity-based farming system. Planting different types of crops ensures continuous food supply and income throughout the year and reduce vulnerability to climate change impacts, particularly on economic aspects. The common crops cultivated were coffee, rootcrops such as sweet potato (*Ipomea batatas*), ube (*Dioscorea alata*), cassava (*Manihot esculenta*), and taro (palao or Palawan gabi,), corn (*Zea mays*), banana, coconut, vegetables, and fruits such as pineapple (*Ananas comosus*), papaya (*Carica papaya*), jackfruit (*Artocarpus heterophyllus*), star apple (*Chrysophyllum cainito*), mango (*Mangifera indica*), soursop (*Annona muricata*). Most of these crops and fruits were sold to buy rice since the tribe does not plant it. Bamboos were also present in the area and are sold for US$ 0.68 to US$ 1.24 each during times of crisis.

Table 1. Change in planting month(s) of the common crops planted by the Ati of Barotac Viejo, Iloilo.

Crop	From	To
Upland rice	March and April	May
Coffee	June	July
Banana	August	September
Sweet Potato	October	November
Cassava and Ube	May	June
Palaw (gabi)	April	May
Vegetables	May	June

Table 2 .Change in planting months of common crops planted by the Suludnons. (source: J.A. Brillon, WVSU).

Crop	From	To
Upland rice	March	April
Coffee	July	August
Banana	June	July
Sweet Potato	August	September
Cassava	August	September
Ube	July	August
Vegetables	May	June
Peanuts	May	June

Similar to the Ati, the Suludnon tribe generally practice biodiversity-based farming systems to ensure availability of food and income throughout the year. This is a common practice among indigenous peoples.Their cash crops were banana and coffee and the tribe plant sweet potato and cassava for home consumption. Crops like corn, pineapple, coconut, ube, and fruit trees like star apple, berba (*Rodius edulis*), papaya, and jackfruit are sold for other household needs.

The Suludnons used to plant abaca, but when the crop was infected with bunchy top virus, the tribe shifted to planting banana intercropped with coffee. There were at least three banana varieties being planted in the area and sold in Iloilo City. Inspite of the slump of the price of bananas, Suludnon farmers continue growing them because the tribe believe that Jayobo soil is best for growing bananas.

The Suludnons practice coffee rejuvenation which is done by cutting the stem one to two feet above the soil surface. When new branches have grown, the tribe select only the best three branches, while the others are cut. However, compared to a plant grown from seedling, the tribe observed that the rejuvenated plant has shorter life span and produce much lower yield. Frequent ring weeding was practiced in coffee production by cutting the weeds and the residues are placed around the coffee trees to serve as mulch and source of nutrients when decomposed. In growing banana and coffee, the Suludnons did not apply inorganic fertilizers instead the tribe use the ashes from burnt weeds during the kaingin as additional source of nutrients for their coffee trees.

Continuous use of local/indigenous varieties that are resistant to climate hazards. The Suludnons and Ati use traditional upland rice varieties. Some of these are c*aporcas, sulig, malido, asuzena, putot* (not aromatic), *kapigsik,* and *tresmarias*, which are usually harvested

infour months. There are some farmers who use a modern variety of rice called Baridad 64 or IR 64.

Use/consumption of non-traditional wild foods in times of scarcity. Another climate adaptation is the custom of consuming non-traditional wild foods in times of food scarcity. During lean months, the Ati eat kayos (wild poisonous yam, *Dioscorea hispida*) and rima-rima, non-traditional foods that grow abundantly in the area. These root crops are poisonous if not prepared properly before consumption. They also eat *miro* (wild ants), *bao* (turtle), *banago* (snail), *kagang* (crabs), *ilahas* (wild chicken) and *baboy damo* (wild pig). The local and scientific names of other non-traditional foods and their uses, were derived from sharing sessions during the January 2016 workshop (**Table 3**).

Aside from changing the cropping pattern as a form of climate change adaptation, the Suludnons have several adaptations strategies to avoid experiencing food scarcity. The tribe hunt and eat *usa* (deer), *baboy damo* (wild pig), *ilhas* (wild chickens), *bao* (turtle) and *uhog* (wild fish). The tribe also eat wild fruits like *tagimot* (orange-like strawberry), *urokaw* (similar to lansones), *saging-saging* (similar to sweet bananas), *panghi* fruit (*Pangium edule*), *untes* (*Solanum nigrum*), *sariri* (*Cucurma* sp.), and *pusay* (*Allium tuberosum*) (**Table 4**). The tribal communities hunt and gather wild food using the conventional bow and arrow and hunting dogs. Wild plants were commonly gathered in the idle lands not far from the tribes' farms.

Indigenous climate hazards indicators and warning systems. The feeling of being cold during warm days was used by the Ati tribe to predict the onset of the August 2015 El Nino phenomenon. This was also used as a sign to postpone the planting of rice and corn.

Having a close relationship with nature, the Suludnon had through the years developed keen observation to the tribe's environment. The behavior of animals and the changes in plant characteristics are what the tribe observed in the surroundings. The emergence of the orange flowers of the dapdap tree (*Erythrina* sp.) signals the onset of the rainy season. When these flowers are shed, the opposite happens, i.e., it signals the onset of the dry season. The presence of many fireflies on the *biri* tree (*Ficus cumingii*) signals that flood and landslides may occur. The fruit of this tree is edible. Positions of the moon and other heavenly bodies are interpreted in relation to their farming activities. For example, the sideways position of the moon (*tagilid ang buwan*) signals the coming of food scarcity. Cold weather, on theother hand, signals the coming of warm/hot weather and vice versa.

Table 3. Non-traditional or wild foods of the Ati.

Scientific name	local name	uses
Solanum nigrum	*Untes*	It is not cultivated and is considered a weed because it grows anywhere. It is more flavorful when *pusay* (*Allium* sp.) and salt is added, wrapped in banana leaves and broiled using charcoal. It can also be mixed with boiled mungbean or with fish. Untes is also used as medicine for goiter. The leaves are heated and applied to the affected part. The juice can be extracted and used to relieve hang-over.
Curcuma spp.	*Sariri*	The leaves are cooked with salt and eaten as vegetable.
Allium tuberosum	*Pusay*	Drinking a concoction from boiled roots is an alternative medicine for fever. For ease in the coming out of teeth, this is rubbed on the gums of six-month old babies.

Table 4. Non-traditional or wild foods of the Suludnons.

Scientific name	local name	uses
Pangium edule	*Panghi*	This is mainly used as fish poison. The fruit is boiled, sliced, soaked in flowing water for two nights before it can be eaten. The boiled fruit tastes like smoked coconut meat and is eaten together with boiled sweet potato and cassava.
Solanum nigrum	*Untes*	Similar use as that of Ati (**Table 3**)
Cucurma spp.	*Sariri*	This grows profusely along the riverbanks. This is also the survival food during the time when they were on the run from Japanese soldiers. The rhizome, which is pink in color, is delicious when cooked with coconut milk. Boiled roots are used as medicine for stomachache caused by barang or "black magic". The leaves are not itchy when it is not stirred during the process of cooking.
Allium tuberosum	*Pusay*	Similar use as that of Ati (**Table 3**)

Diversification of sources of income. Farming is not always a productive livelihood for the indigenous people. While some plant root crops for food consumption and sell the excess harvest, the tribes still do farm work like weeding and planting for others. The tirbe lease a land to a capitalist or businessman and at the same time, the members will work in that leased land with pay. Other tribe members also do road construction works.

Among the Ati people, off-farm work include basket weaving basket weaving for women and handicrafts like wallets and hats made of nito (*Lygodium circinnatum*), uway (rattan; *Calamus* spp. and banban (*Donax cannaeformis*), which grows naturally in the area (**Figure 5**). Usually, there are more women doing the weaving because men do the farm work. The Taytay sa Kauswagan (TSK) is a group that looks for buyers and where to sell the products. In one month, a tribe member can earn up to US$ 33.75 to US$ 67.51. Through the help of the Department of Agrarian Reform (DAR) and the LGU of Barotac Nuevo, the tribe members were trained how to make export quality products from 2005-2006. For quality control, DAR, LGU and TSK gave the tribe a project grant. Men, on the other hand, are being hired as farm laborers in nearby sugarcane plantation, or as tricycle drivers. Other off -farm work being done by both genders were wild orchid gatherers in the forest, and selling charcoal. Although it is prohibited, there were some Ati who were still into charcoal making.

Indigenous Rituals and Beliefs. For the Suludnons and Ati, education is a pride. Along with getting a formal education, they still practice cultural traditions: They follow certain rituals before they conduct farming-related activites. The Ati still practice Bayanihan or dagyaw which is consciously being passed on to their children. This cooperative practice is seen in activities like layering of soil to make terraces near the irrigation area. Another cultural practice is the building of an altar before kaingin where they offer food like *ibus* (sticky rice wrapped in young coconut leaves), *suman*, and *alupi* (cassava wrapped in banana leaves). Like the Suludnons, the Ati request blessings to the river spirits. During harvest, they use kayog, a triangular blade with wood as handle, as a harvesting tool in upland rice (**Figure 6**). Creating no sound as a sign of respect for the rice is observed. It is believed that low yield is due to too much noise produced during harvesting. After harvest, they do not eat the freshly harvested rice unless they get the permission from their ancestors. Their first harvest is a celebration of thanksgiving where they offer animals depending on the size of their family. The children are consciously being encouraged to practice their culture and traditions by participating with their elders in ritual dancing and preparing traditional foods. Because of the inflow of outside influence and technologies, however, traditions and rituals are, however, slowly fading away.

Indigenous structures. The Ati reinforces houses before calamities by building kurob or low huts to prevent roofs from being blown away during strong typhoons. The tribe was told to build houses far from the river and members also learned to evacuate during typhoon warning and trained the community residents to do rescue work.

Figure 5. An Ati woman weaving handicrafts for sale (Left) and a sample of their products (Right).

Figure 6. *Kayog*, a harvesting tool used in upland farming.

The Suludnons and the Atis have both received external help from the government and non-government institutions. Since the tribes live in high-risk communities; the members were used to be characterized as self-help resilient farming communities. However, because of climate change, these communities face increased hazards and are increasingly becoming fragile.

CONCLUSIONS AND RECOMMENDATIONS

Climate is very important in farming, but its changes also have a significant effect on farming as a livelihood. Due to the climate change described by the Atis and Suludnons as abnormal and unpredictable, the tribes have experienced reduced yield of the main crops- coffee and bananas. The tribes believe that changes in climate have occurred because the earth is old; i.e., "The earth is like a human being; the older it becomes, the weaker it gets".

The Ati and Suludnon tribes generally have climate change adaptation practices in the form of change in cropping calendar, working time in the field and crop management; biodiversity-based cropping system because planting various crops ensures more or less continuous food supply and income throughout the year; Continuous use of local/indigenous varieties that are resistant to climate hazards; Use/consumption of non-traditional wild foods in times of scarcity, with them hunting and gathering wild food using the conventional bow and arrow and dogs; Diversification of sources of income; and indigenous rituals and beliefs. Following the categories of *Hiwasaki et al.* (*2014*), the indigenous knowledge on adaptation and mitigation strategies of Ati and Suludnon tribes fall under categories 1 where there is a scientific explanation for their practices and Category 2 where there is no scientific explanation but the practices had helped the tribal communities to be resilient to typhoons.

In general, the indigenous farming practices of the Suludnons and Atis are characteristically sustainable. The tribes do not produce crops on a commercial scale except for coffee and banana. The combination of indigenous and mainstream scientific knowledge of agricultural and food production systems ensure food security for the Suludnons and Ati households. The ratio of the land area to the population is just enough to maintain the balance in the supply and demand for the crops in which a combination of farming, livestock-raising and engaging in handicrafts (Ati) have sustained the needs of the respective communities.

The two tribal groups have great respect to the elders who also advise them on their farming practices. In spite of the many traditions which they tried to keep, they are compelled to some extent to modify and transform some old ways. Both groups in Iloilo have been very receptive to new technologies introduced by the government and non-government agencies. The tribes also displayed a high level of awareness of climate change and its impacts on the farms and other forms of livelihood. Climate change has provided them the impetus to modify and transform some of their old farming practices while at the same time, they learn to grow alternative crops as a coping mechanism to minimize their vulnerabilities to the calamities which has become more frequent in the recent past.

Indigenous and other local peoples generally live in isolated communities, but have little or no influence over local and national decision-making on issues related to climate change. These people are rarely considered in academic, policy and public discourses on climate change. This is ironic because the tribes' livelihoods depend on natural resources that are directly affected by climate change, and they are very often in economically and politically very marginal areas in diverse and fragile ecosystems. One major policy challenge is to make sure that lessons from indigenous knowledge and experiences are informing emerging climate change policy process. This needs to be done, not after the policies are developed, but at the formative stage. To this end, the following recommendations relating to adaptation policies and programs at the local and national levels have been drawn from the perspective of the indigenous peoples involved in the project: Engage indigenous and local peoples representative(s) in planning and advisory councils on climate change mitigation and adaptation and disaster risk reduction; support initiatives for the collection, identification, maintenance, multiplication, evaluation and promotion of indigenous (wild) food materials at national and community levels; promote

and support collaborative research and action between indigenous and local peoples and research/academic institutions; sustain, enhance and support sustainable livelihood diversification support to local and indigenous peoples and communities; and institutionalize policies and support (including provision of incentives) to indigenous and local peoples and communities who are conserving and maintaining indigenous/local varieties of crops and fish, and animal breeds.

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