

## **BIBLIOGRAPHY**

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## **ABSTRACT**

The study was conducted to identify climate change awareness in Gueday and its effects to the indigenous knowledge, system, and practices on the agricultural cycle. Specifically, it aimed to distinguish the observed climate change indicators by the people of Gueday; distinguish the effects of climate change on agricultural cycle of Gueday; and to identify adaptive mechanism exhibited by the people to cope up with climate change.

'*Mensapit*' elders were sought in a focused group discussion. Interview schedule were used with twenty- two farmers. Meanwhile, secondary data were collected to substantiate interviews and these were analyzed and interpreted in a narrative description. It was found out that the people of Gueday were aware of climate change basing on parameters they have observed.

The changes in weather conditions had remarkably affected the indigenous agricultural life of the people because of the absence or unprecedented presence of environmental indicators that signify appropriateness of an agricultural activity. These had



forced the farmers to work and individually decided on what they perceive best as the right time to do an agricultural activity. In this light, even the customary rituals were not practiced reverently since the people were forced to attend to their farms. The cultural value of the people is degrading and the communal way of farming is disintegrated. Low yield in agricultural production is another consequence of climate change although heirloom varieties of rice was found to be the most tolerant as described by both respondents.

It is hereby recommended that extensive research on the impact of climate change that concerns bio- physical characterization, socio- economic profiling, vulnerability assessments, and socio- cultural study such as IKSP documentation may be examined to provide the people, the local government units of barangay Gueday and the Municipality of Besao, and extension workers properly distinguish a framework for development programming and policy making. Water source improvement may also be prioritized by concerned agencies since water inadequacy is one of the seen worse effects of climate change.



## INTRODUCTION

### Rationale

The life of indigenous people is anchored on their deep relationship with their environment. In this principle, they have developed agricultural knowledge, system, and practices that are rooted with such correlation to nature. In the process, indigenous peoples in agricultural communities have ascertained a cycle that is appropriate to the weather patterns they have long observed and experience.

Indigenous peoples are the least contributor to climate change. Yet, they are the most vulnerable to the impacts of the extreme weather conditions brought about by the onslaught of climate change (BSU- SPICAC, 2010).

Climate change is the significant alteration in the average set of weather conditions that a certain region experiences (Asian Development Bank, 2008). The changes may have been driven by the Earth's internal processes, external forces, and/or more recently, by human activities (IPCC, 2007). Global warming is the eventual effect of such changes which results to either loss or relocation of different plant and animal species that are especially used for indigenous agricultural customs; and temperature change that affects water availability.

Climate change affects agricultural practices that have been established by the Indigenous Peoples since time immemorial. It was mentioned in the Guide on Climate Change and Indigenous Peoples (Tebtebba Foundation, 2008) that climatic changes create adverse impacts on the traditional livelihoods and their ecosystem that result to loss of



knowledge, innovations, and practices associated with these livelihoods and ecosystems. In such manner, the agricultural life of Indigenous Peoples is considerably affected as much as their systems and practices are threatened.

In the Philippines, significant alterations in the weather patterns are becoming more evident. The country has experienced temperature spikes brought about by climate change (Presidential Task Force on Climate Change, 2009). Moreover, other climate indicators like extreme precipitation and sea level variations which in turn impacts agriculture through crop yields, irrigation demands; forestry by changes in forest productivity, forest composition; water resources through variability of water supply and quality; coastal areas by erosion of beaches, inundation of coastal areas; species and natural areas through shifts in ecological zones, loss of habitat and species; as well as health impacts through infectious diseases, air quality- respiratory illnesses and water- related mortality, are becoming adverse as described by Rincon and Virtucio (2008). Other hazards also threaten agricultural production, including geophysical such as earthquakes, climatological particularly droughts, hydrological such as floods, as well as meteorological specifically storms and typhoons (Imperial, 2008).

Also, onslaught of extreme weather conditions like prolonged and unexpected rain, severe typhoons, and variance in temperature affects largely the presence of species. Unpredictable weather patterns create confusion and instability in the customary practices that are relevant to agriculture because environmental indicators may not show during the time that could have been appropriate in a developed agricultural system. This is supported by Tebtebba Foundation (2008) disclosing that it will be more difficult to elders to practice



and pass their traditional ecological knowledge to the next generation in consideration to migration or loss of species.

Climate change exacerbates the difficulties already faced by vulnerable indigenous communities, including political and economic marginalization, loss of land and resources, human rights violations, discrimination and unemployment (UNPFII, 2012). Indigenous peoples, being directly affected to the pressures of climate change and historically to respond to it (UNU-IAS, 2008), are the most marginalized sector in terms of being heard and appraised in the process of policy making.

The Indigenous community of Gueday, Besao, Mountain Province have established an agricultural cycle on which they base their agricultural activities through environmental indicators. These indicators signify appropriate agricultural activity for them to carry out to assure bountiful harvest. Lonogan (2006) described that the agricultural calendar of Gueday, or of the Agawa people as a whole, is divided into partitions that are named after an occurrence of a natural event like that of flowering of trees, or of tadpoles starting to develop their legs, or of the sun seen sitting at the top of the towering rocks in Mt. Ambaonbato and consequently emitting different colors of rays, and etc. This is their way of communicating with nature, to which their agricultural life is entrenched.

With the blitz of climate change, agricultural practices of the indigenous people in Gueday, Besao, Mountain Province may have been affected. The alterations in the weather patterns would have significant influence to occurrence of environmental indicators which in turn impacts their agricultural cycle, and therefore distress the pass on of the tradition that they have nearly perfected through years of observance.



This research then looked into climate change and how it affects the agricultural life of the people of Gueday, Besao, Mountain Province particularly by examining the impact on the indigenous knowledge, system, and practices observed in the agricultural cycle. The study also determined adaptation response of the farmers of Gueday to the possible effect of climate change.

### Statement of the Problem

In order to determine climate change awareness and its effect on the indigenous knowledge, systems and practices in the agricultural cycle of the Gueday, Besao, Mountain Province, this research answered the following:

1. What are the observed climate change indicators by the people of Gueday, Besao, Mountain Province?
2. What are the effects of climate change to the indigenous agricultural cycle of Gueday, Besao, Mountain Province?
3. What is the adaptation mechanism exhibited on indigenous agricultural cycle of the people of Gueday, Besao, Mountain Province from the impacts of climate change?

### Objectives of the Study

The study aimed to identify the impact of climate change on the IKSP in the agricultural cycle of the Gueday, Besao, Mountain Province. Specifically, it aimed to:

1. enumerate the climate change indicators experienced by the people of Gueday, Besao, Mountain Province;



2. determine the effects of climate change in the indigenous agricultural cycle of the Gueday, Besao, Mountain Province; and,
3. identify the adaptive mechanism exhibited on the indigenous agriculture of Gueday, Besao, Mountain Province from the impacts of climate change.

### Importance of the Study

This study, “Climate change awareness and its effect on the Indigenous Knowledge, Systems, and Practices in the Agricultural Cycle of the Gueday, Besao, Mountain Province”, bear findings that may be useful in the pursuit of knowledge on the impact of climate change scenarios affecting the life of the indigenous peoples.

The findings may be used by communicators and researchers in conveying extension and development programs in response to the impacts of climate change in the locality of Gueday, Besao, Mountain Province. The data that would be produced may also be used as basis for policy making and/or appraisal on climate change that best suit the needs of the people of Gueday in relation to agriculture. Researchers may also use the data that may be gathered in the effort to understand more the indigenous peoples’ adaptability and vulnerability which becomes a factor in the changes in the culture of the indigenous peoples.

The findings of the study may also be used by institutions especially the Local Government Unit (LGU) of Besao, Mountain Province in an attempt to formulate framework in saving the cultural practices that has been developed and nearly perfected throughout time, bearing in mind that these Indigenous Knowledge, Systems, and Practices are relative to survival, not only of the people but of bio- diversity.



In this light, this research generated data that would at least help towards the revelation of ideas to and for Barangay Gueday, government line agencies especially the Department of Agriculture (DA) and the Department of Environment and Natural Resources (DENR), communicators, and development workers regarding proper actions in the face of the threat of adverse climate change effects.

### Scope and Limitations of the Study

This proposed study focused to the generation and analysis of data on climate change awareness and its effect to the Indigenous Knowledge, System, and Practices in the agricultural cycle of Gueday, Besao, Mountain Province. However, the research is limited in finding perspectives of elders and farmers on climate change and in what extent does it affect the indigenous agricultural cycle of Gueday.

The findings of the study do not reflect the climate change impact of the whole of the Agawa sub tribe since it was conducted only in one of the five barangays of the Sub-tribe's settlement. Further, the stipulation of the research did not include bio- physical characterization and socio- economic profiling that is important in defining climate change vulnerabilities. The limited time and resources of the researcher are two of the many factors that indicated the scope.

On the other hand, the research has dwelt on climate change development issue but has limited scope on the communication aspect of the people regarding the phenomenon.





## REVIEW OF LITERATURE

### Climate Change

Climate change is the significant alteration in the weather patterns in a given period of time. Its effect may be experienced worldwide but the level of its impact depends on a certain region around the globe. As Asian Development Bank (2008) puts it, climate change is the significant alteration in the average set of weather conditions that a certain region can experience. The change may have driven by earth's internal processes, external forces, and/or more recently, by human activities (BSU-SPICCCAC, 2010). Earth's natural variability, as identified by NOAA-NWS (2012) is related to interactions among the atmosphere, ocean, and land, as well as changes in the amount of solar radiation reaching the earth. However, the 2007 assessment report of the Intergovernmental Panel on Climate Change (IPCC), as cited by the NOAA-NWS (2012) provides that "the most of the observed increase in the globally averaged temperature since the mid-20<sup>th</sup> century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations." Global warming is the eventual result of climate change. It is an effect of certain naturally occurring gases, such as carbon dioxide (CO<sub>2</sub>) and water vapor (H<sub>2</sub>O) that trap heat in the atmosphere causing a green house effect. But the human induced activities such as burning of fossil fuels , like oil, coal, and natural gas is adding CO<sub>2</sub> to the atmosphere.

The IPCC (2007) has reported that the global average, surface temperatures have increased by about 0.74°C over the past hundred years. However, the warming has been neither steady, nor the same in the different seasons or in different location.



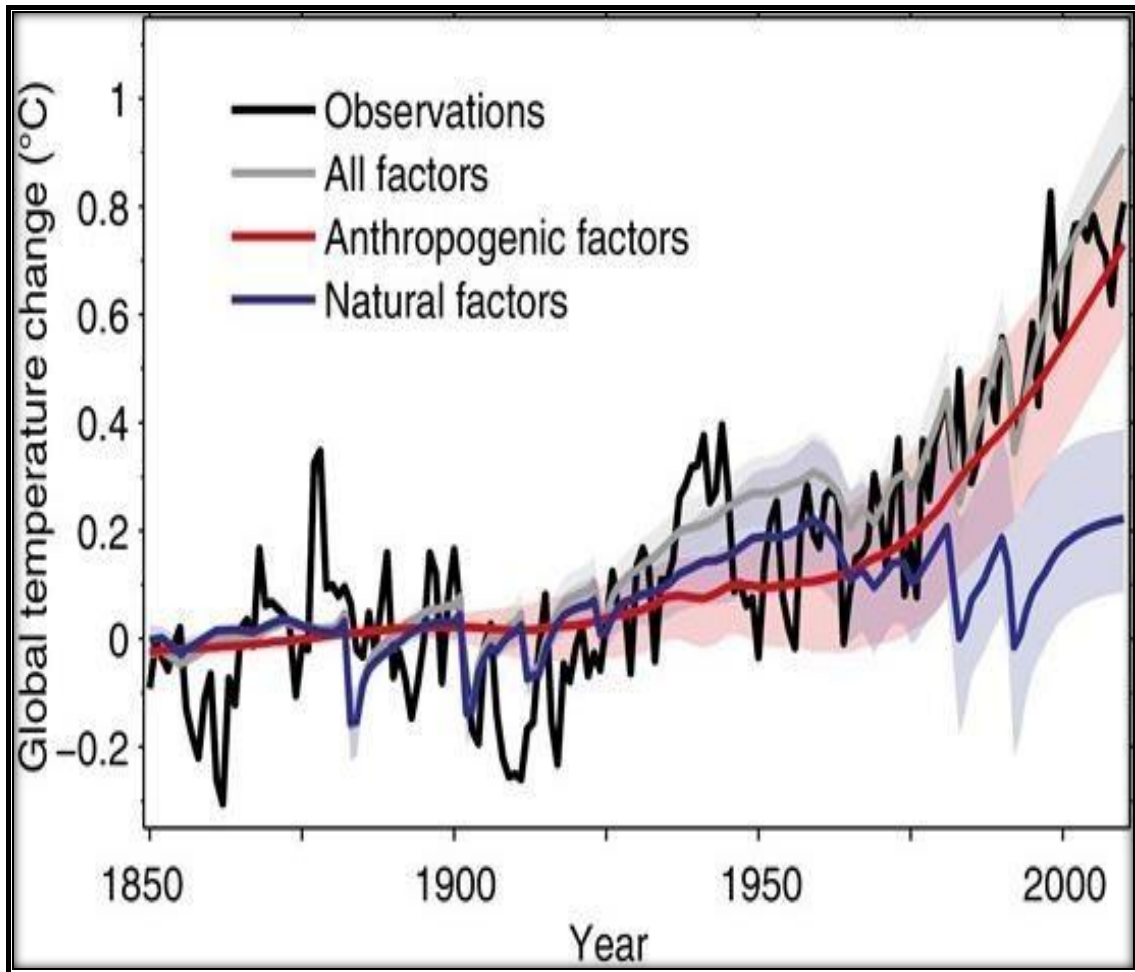


Figure 1. IPCC graph showing the global surface temperature from 1850- 2000. IPCC on their Fourth Assessment Report (AR4) in 2007 concludes that most of the observed increase in global average temperatures since the mid-twentieth century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations. It is extremely unlikely that global climate change of the past 50 years can be explained without external forcing, and very likely that it is not due to known natural causes alone

Concerned and isolated alike; scientists, government agencies, environmental advocates, different organizations, and the United Nations, are studying mitigation and adaptation strategies so that people may cope up with the effects of climate change.

Presently, more and more people are turning into the so called “climate change activist” as massive awareness is being published through so that the whole of the globe would have participatory approaches for the climate change mitigation and adaptation.

The United Nations has formed a Convention on Climate Change (known as UNFCCC) that sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases (UNFCCC).

In the Philippines, campaigns and forums are from time to time organized through local and foreign efforts. Independent studies are also being done specially in certain locality because the Philippines topography dictates uneven effect of climate change. This means that the country is experiencing the effects of climate change but the impact varies from one locality to another (Presidential Task Force for Climate Change, 2009). For instance, the capital town Manila is not experiencing a significant average variation in annual mean temperature as compared to other provinces (PAGASA) as cited by BSUSPICACC (2010). However, the Philippines National Framework Strategy on Climate

Change (NFCC) has ascertained an increase in the country’s annual average temperature. Based on reports prepared by PAGASA, the NFSCC (2010) revealed a projection of 0.9°C- 1.2°C warming around the country by 2020. Higher temperatures are generally expected for all the regions of the country by 2050, doubling the rates for 2020, having therefore warming projection rate of about 1.7°C- 3.0°C. With this projection, the agriculture sector is one of the most vulnerable to its impact.



## Climate Change and Agriculture

The agriculture sector is among the most vulnerable to climate change impacts. Climate change vulnerability is defined by TEBTEBBA Foundation (2008) as the degree to which a system is susceptible to injury, damage, or harm. It is also characterized by the potential of that system to be harmed physically and/or psychologically. It signifies effect not only to biophysical characteristics but also the socio- economic life of communities.

Agriculture is highly sensitive to climate variability and weather extremes, such as droughts, floods and severe storms (DA- PIPC). This will surely affect the rice production of the country, and even meal habits considering that rice is the main staple crop of the country. Imperial (2008) said that “it is undeniable that climate change impacts agriculture and food security”.

Agriculture is being threatened by climate change, which is primarily manifested in the changing intensity and length of the rainy season and average rainfall in the Philippines (Carroll, 2010). Other hazards also threaten agriculture, including geophysical such as earthquakes, climatological particularly droughts, hydrological such as floods, as well as meteorological specifically storms and typhoons (Imperial, 2008). “Sea level rise means salt intrusion into agricultural areas. Floods, drought, temperature rise, typhoons, and erratic weather patterns affect the suitability of land and water for different food production. These also alter the incidence of pest and diseases, which is more likely to increase.



Table 1. The risk and adverse impacts of climate change in Agriculture as identified by Department of Agriculture- Policy and Implementation for Climate Change (DA- PIPCC)

RISK		ADVERSE IMPACT
CHANGING WEATHER PATTERNS	<input type="checkbox"/>	<input type="checkbox"/> Failure on crop establishment <input type="checkbox"/> Poor crop Yields <input type="checkbox"/> Increased energy costs and reduced harvest in poultry and hog production
LANDSLIDES	<input type="checkbox"/>	<input type="checkbox"/> Destruction of upland agriculture systems <input type="checkbox"/> Collateral damage to lowland agriculture, aquaculture, coastal fishery resources, settlements, and infrastructure
SEVERE SOIL	<input type="checkbox"/>	Soil nutria depletion
EROSION	<input type="checkbox"/>	<input type="checkbox"/> Siltation of irrigation systems, rivers and streams <input type="checkbox"/> Increase occurrence of dust storm especially during El Nino events
FLOODS	<input type="checkbox"/>	<input type="checkbox"/> Destruction of crops and fisheries in flood- prone areas <input type="checkbox"/> Destruction of post harvest facilities and farm to market roads <input type="checkbox"/> Destruction of livestock houses in flood prone areas <input type="checkbox"/> Destruction of residence <input type="checkbox"/> Loss of life <input type="checkbox"/> Loss of farm inputs, machinery, implement <input type="checkbox"/> Hunger and capital loss among farmers
DROUGHT	<input type="checkbox"/>	<input type="checkbox"/> Significant reduction in yield and crop losses <input type="checkbox"/> Water shortage <input type="checkbox"/> Heat stress on people and farm animals <input type="checkbox"/> Increased energy cost to poultry and hog raisers
INCREASED PEST PRESSURE	<input type="checkbox"/>	<input type="checkbox"/> Crop losses <input type="checkbox"/> Livestock losses <input type="checkbox"/> Aquaculture losses
STRONG WINDS	<input type="checkbox"/>	<input type="checkbox"/> Lodging of rice and corn, fruit trees, plantation crops, and others <input type="checkbox"/> poultry and pig pen destruction <input type="checkbox"/> Destruction of residence and fishing vessels
	<input type="checkbox"/>	Loss of life



## Other Climate Change Indicators and its Impacts

Climate change indicators are the manifestations to the alterations in set of weather conditions. Indicator is defined by the Merriam dictionary (2012) as a sign, index or symptom of something; or simply a measurement that shows the condition of a system. Thus, climate change indicators are signs strictly associated with particular environmental conditions that its presence is indicative of the existence of these changing set of weather conditions.

Climate change is expected to have adverse impacts on many sectors at different ecosystems in a landscape (Espaldon, 2008). According to Rincon and Virtucio (2008), climate change is mostly felt through crop yields, irrigation demands; forestry by changes in forest productivity, forest composition; water resources through variability of water supply and quality; coastal areas by erosion of beaches, inundation of coastal areas ; species and natural areas through shifts in ecological zones, loss of habitat and specie as well as health impacts through infectious disease, air quality-respiratory illness and water-related mortality. Tebtebba Foundation (2008) affirms that the climate change cause significant change in forest growth, modifying the functioning, fertility of soils and composition of forests. With the current issues on climate change and bio- diversity, both cultural diversity and biological diversity are endangered (Toledo, 2000 as cited by Tebtebba Foundation, 2008).

The Department of Agriculture reported Climate Impact Assessment for Philippine Agriculture in December, 2011 whereas, “the weather systems that influenced the country’s climate during December were Northeast (NE) monsoon, ridge of High



Table 2. Spatial impact of global climate change in Philippine agricultural sector as determined by DA-PIPC

EVENTS	CLIMATIC IMPACT	SOURCE/ASSUMPTION
Rainfall	Decrease by 20 percent, but increase in intensity. Increase risk of soil erosion and occurrence of landslides.	○ ○ ○ IPCC 2007 Godilano, E.C 2005 FAO(2006)
Rainy Days	Decrease rainy days but intensity will be higher than normal, growing periods may shorten by approximately 30 days.	○ ○ Resonzweig and Parry, 1994 IPCC 2007
Cyclone	Increase intensity and occurrence and may trigger landslides and flooding of coastal areas.	○ IPCC 2007
Maximum temperature	Increase by three percent, more frequent and persistent El Nino episodes, and increased evaporation. Crop duration shortened between one and four weeks. Drought will be longer and more intense.	○ ○ IPCC 2007 NOAA, 2007
Flooding	Increase flooding depth, frequency, intensity, and several landslides. Submergence of coastal communities and coastal erosion.	○ IPCC 2007, Brakenridge, G.R. and Anderson, E. (2004) ○ Dartmouth Flood Observatory USA(2009)
Ground Water Potential (GWP)	Decrease water availability, poor quality, and salt intrusion.	○ ○ ICC 2007 Godilano, E.C. 2005
Cloudiness	Upward trend can alter geographic distribution of pest and disease. Increase in total cloud cover, decrease photosynthesis. Clouds regulate of sunlight received by the surface and so influence evaporation from the surface, which in turn influences cloud formation.	○ ○ Elliott, 1995 Rind, 1998 ○ ○ NOAA, 2007 NASA Water Vapor



Pressure Area (HPA), tail end of the cold front, wind convergence, Low Pressure Area (LPA) and one tropical cyclones TS “sending” (December 15-18), ranked first for the top ten (10) 2011 Philippine Destructive Tropical Cyclone with the most number of deaths totaling to 1,257 as reported by the National Disaster Risk Reduction and Management Council (NDRRMC). The cities of Cagayan de Oro and Iligan in Region X suffered the most. Affected areas were regions VI, VII, IX, X, XI, CARAGA and ARMM.”

### Climate Change Awareness in Indigenous Communities

Indigenous peoples’ communities are among the most vulnerable to climate change. But throughout time, they have survived in their settlement since they have adapted of the changing weather conditions over time. Tebtebba Foundation (2008) puts this thought in a statement: “we, the indigenous peoples, have long observed and adapted to the climatic changes of our communities for tens of thousands of years”. This could stipulate that indigenous peoples are aware of the occurrence of climate change.

In the case of Gueday, the people have used environmental indicators like birds and plant species that tell them the appropriateness of agricultural activity. The change in climatic conditions then could be ascertained by determining their observations in the occurrence of these indicators.

### Climate Change and Indigenous Peoples

While climate change affects everyone, it will probably hit the most vulnerable groups the worst. Indigenous Peoples, according to the Tebtebba Foundation (2008), are among the first to face direct adverse consequences of climate change, partly owing to their close relationship with the environment and its resources. Indigenous Peoples from





different parts of the world- whether in industrialized or developing countries- echo concerns about the impact of climate change in the survival of their communities (OHCHR, 2008). Indigenous Peoples have the least contribution to the identified human activities that fosters climate change. However, the Indigenous people's life is deemed affected of the impact of climate change.

Foremost is that, the indigenous Knowledge, Systems, and Practices (IKSP) that has been developed since time immemorial is now inconsistent with climatic conditions that it has been designed with. The OHCHR (2008) has quoted a participant during the permanent forum discussing UN Development Group Guidelines on Indigenous Peoples

Issues, saying “our age- old cultivation method, which entirely depends on rainfall, has been suffering due to changing weather patterns and a decrease of forest land. Climate change is at its onslaught that it has taken its toll on the source of livelihood of the Indigenous Peoples.”

Second, the places where Indigenous Peoples are dwelling in highly vulnerable in weather extremes. The Indigenous Peoples are mostly living in coastal and highland communities of where extreme climatic conditions create worse impacts. In Benguet, the BSU- SPICAC (2010) has proved that the province is highly vulnerable to adverse impacts of climate change. Biophysical characterization was conducted and showed that the province is highly exposed to soil erosion. It was also found that with the eventual onslaught of severe typhoons, excessive rainfall, and prolonged drought, the socio-economic life of the Benguet People is at risk. This can also be true to Agawa, Besao given the similarities of biophysical characteristics of Benguet and Mountain Province.



Climate change exacerbates the difficulties already faced by vulnerable indigenous communities, including political and economic marginalization, loss of land and resources, human rights violations, discrimination and unemployment (UNU-IAS, 2008).

Climate change exacerbates the difficulties already faced by vulnerable indigenous communities, including political and economic marginalization, loss of land and resources, human rights violations, discrimination and unemployment (UNPFII, 2012). Indigenous peoples, being directly affected to the pressures of climate change and historically to respond to it (UNU-IAS, 2008), are the most marginalized sector in terms of being heard and appraised in the process of policy making.

### Indigenous Knowledge, Systems, and Practices (IKSP)

IKSP, also referred to as Indigenous Technological Knowledge (ITK) pertains to the specific cluster of an aspect of a certain culture that is shared communally by people using the complex whole of that particular culture. Espaldon (2008), said that “Indigenous knowledge, also referred to as traditional or local knowledge, is embedded in the community and is unique to a given culture, location or society.” TEBTEBBA Foundation (2008) further said that IKSP has been developed outside the formal educational system, and that enables communities to survive.

Prill (1997), as cited by Dang- ay (2010) on the other hand, defined cultural beliefs and practices as the rational acts, rituals, and economically performed by old folks most especially among the pagans and Non- Christians within the society which consists of learning ways of acting, feeling, and thinking that originated from tribes. UNESCO (2012) characterized IKSP as “being those generated within the communities; culture specific; basis for decision making and survival strategies; concerns critical issues of human and



animal life; natural resource management based on innovation, adaptation, and experimentation; and IKSP is oral in rural in nature”.

### IKSP on Agriculture in Gueday

Agriculture of the Agawa Sub- Tribe is mainly for domestic consumption. Staple crop is rice and other more important crops are taro and sweet potato. This is supported by municipality of Besao website (2012) as it indicates that “rice yields are for domestic consumption, although some has wider farms with relatively high produce would sell their irik, but the income source of the people is not from rice production.”

Kingat, the first who discover Agawa and the organizer of the first inhabitants of the locality is honored in folklores for his commitment in formulating the best system and practices for a high yield rice production results. Since they settle to their new *ili*, rice plants do not grow well, yielding minimum produce. Kingat is not contented so he tried every system he knew and devised a new practice, but with the same results. The unsatisfied Kingat had the planned to go back to Ba- ang, his old *ili*, to seek resolution and recommendation from his grandfather and the council of elders there.

Leon Lonogan in 2006 has retold the folklore in his book: *The sunset at sunrise: The Birth of Agawa Tribe*. The writer discussed Kingat’s plight and the resolution that has been established. As retold by Lonogan, Kingat met a strange man, whom he later recognized as inabigan. This inabigan has instructed Kingat to observe the sun in Dap- ay Aw-aw in Gueday every sunrise if it will perfectly sit in the towering rock of Mt. Amboanbato. This will mean the best time to sow seeds in the seedbeds.



Following the recommendation of the inabigan to Kingat, the early inhabitants of Agawa has developed an agricultural cycle. The cycle includes twelve partitions of one agricultural year. Each partitions completes the cycle of the faces of the moon as seen from the Earth. Moreover, environmental indicators such as flowering and/or fruiting of some plants and presence of some animal species are considered as signs of new month in that agricultural cycle.

Lonogan (2006) further stressed that “In the early indigenous system of the Agawa People in dividing year into months, they did not have specific dates to start counting dates into a month. They just figured out that a month has come to date basing on the indicators in the environment they have observed for a particular time in the year. The whole of agricultural cycle starts in the celebration of the Linnapet, just after the sun was observed in the Dap- ay Awaw to be perfectly sitting on the towering rock of Amboanbato. Agricultural activities end in Tiway, the eleventh month, but it is noteworthy that Adog was included as part of the agricultural cycle to complete the 12 months partition. Lonogan stressed that “the Adog is an integral part of the agricultural system and is important in the agricultural cycle because the elders and the people observe the occurrence of the indicators that will signify New Year, hence, another cycle.”

The agricultural cycle of the early Agawa people has been developed with planting native varieties as their cultivar. These suits the climatic conditions observed through the years of practicing the cycle and could have been a perfect agricultural strategy if these climatic conditions are not changing in time.



## Operational Definition of Terms

*Adaptability.* It refers to the ability, capacity, or capacity to adapt to climatic stimuli.

*Adaptation.* It refers to the adjustments being incurred to cope up with the effects of climate change.

*Agricultural calendar.* It refers to the schedule of agricultural activities which Gueday follows by which they base from environmental indicators.

*Agricultural cycle.* Refers to the agricultural system developed by the people of Gueday divided into twelve partitions of a year. Names of each partition are named after an occurrence of natural event.

*Apo.* It is a term used to refer to the elderly respondent of the study.

*Climate change.* It refers to the alterations in the set of weather conditions that a certain region experience.

*Climate change indicators.* It refers to the manifestations strictly associated with particular environmental conditions that its presence is indicative of the existence of these [changing set of weather] conditions.

*Crops.* It refers to the plants that are planted by the people of Gueday. Rice is the staple crop of Gueday, Besao, Mountain Province while other main crops planted are sweet potato, sugarcane, and taro.

*“Ili’.* It refers to settlement of a group of people, living together as a community.



*Inayan*. It is a law of being. It integrates the conscience and fear of following evil and/or going against what is right and just.

*IKSP*. stands for Indigenous Knowledge, System, and Practices.

*Mitigation*. response strategy to climate change, and can be defined as measures that reduce the amount of emissions (abatement) or enhance the absorption capacity of greenhouse gases (sequestration).

*'Mensapit'*. A wise and well respected elder who is resorted for conflict resolutions and community cultural affairs.



## METHODOLOGY

### Locale and Time of the Study

This study was conducted in Gueday, Besao, Mountain Province from January to March 2012. Barangay Gueday is bounded in the North by the Boasao forest (by Maeng, Abra in the farther North), on the South by Barangay Agawa (also known as Nabanig), on the west by Tamboan (Tubo, Abra in the farther west), and in the east by Baga-an, Sagada. Gueday is originally known as Agawa. The name Agawa is derived from the term

*'I- gawa'*, pertaining to the people in the olden times that lives beyond the Blackberry Mountain Gawa. *'I- gawa'* later on became Agawa. In 1920, a school was constructed in Nabanig and was named Agawa Elementary School. Nabanig during those times is one of village of Barangay Agawa that also includes other villages that now evolved into barangays namely; Ambagiw, Lacmaan, Tambuan, Dandandac, and the old Agawa. All of these villages belong to the Agawa Sub- tribe since the settlers originated from the old Agawa.

In 1954, another school building was constructed in Day- ocan, but was named Gueday Primary School in honor to Dap- ay Gueday. By 1971, Nabanig and Agawa became separate barrios and so they were registered with the name of the schools constructed in the localities. Nabanig then became Barangay Agawa, while Agawa became Barangay Gueday.

The study was conducted in Gueday since it is here where the agricultural cycle of the Agawa Sub- tribe was distinguished.





Figure 2. Map of Mountain Province showing the location of Besao.



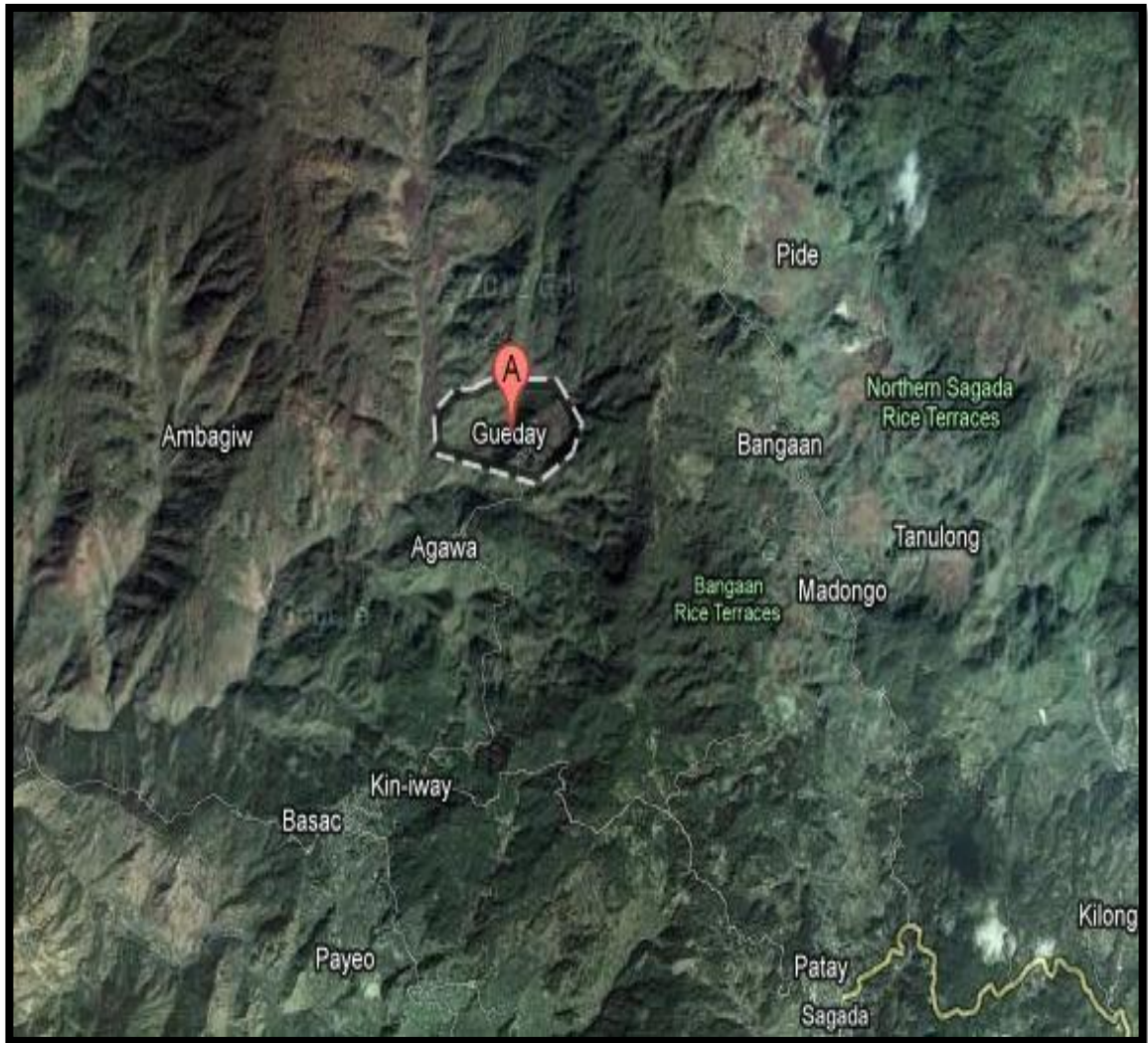


Figure 3. Satellite Map of Gueday and its vicinity

## Respondents of the Study

There are two sets of respondents during the duration of the study. First set are key informant which are the elder- respondents and the second set are 22 farmer- respondents. Both respondents are native of Gueday. Five elder- respondent were gathered for a key informant interview. They were qualified based on their '*mensapit*' stature. They are Mauricio "Doligan" Ganaden, Soliba Li-o, Ganer Bagsiyao, Matthew Oyard, and Kitoyan Tungpo-en. Their age bracket are from 50 to 85 years old.

The term '*mensapit*' refers to the elders who lead the celebration of community based rites and rituals. They are the ones who set appropriateness of what is necessary and what is not with regards to setting dates and specifics on community ritualistic celebrations and conflict resolutions.

The '*mensapit*' type of elder does not necessarily come with age but with knowledge and experience of community indigenous knowledge, system, and practices. One should also be well reverent and respected. The highest form for a person to be respected is when they exhibit integrity.

There were also 22 farmer respondents who were sampled using a snowballing purposive technique where one respondent is recommended by the other. Farmer-respondents were required to be aware of Indigenous Knowledge, Systems, and Practices and a farmer. Their age bracket are 35 to 68 years old.



## Data Collection

Guide questions were used for the five elders gathered in a Focus Group Discussion (FGD). An interview schedule was also prepared and used for face to face interviews to the 22 farmers. Snowballing purposive sampling was utilized by the researcher where one farmer- respondents were recommended by one after the other.

Farm level categories by Reilly (1995) as cited by Mark W. Rosegrant of Climate Protection Programme for Developing Countries (CCPPDC, 2008) were used to know adaptation responses of the farmers on climate change. Secondary data were acquired through Efren Dalipos, Weather Observer I of the PAGASA Baguio City Observatory.

## Data Gathered

The data gathered includes the climate change indicators experienced by the people of Gueday, Besao, Mountain Province; the effects of climate change in the indigenous agricultural cycle of the Gueday, Besao, Mountain Province; and, the adaptive mechanism exhibited on the indigenous agriculture of Gueday, Besao, Mountain Province from the impacts. The researcher also obtained data from DOST- PAGASA, specifically records on normal climatological values for temperature, rainfall distribution per annum, and occurrence of cyclones and tropical storms.

## Data Analysis

The data and information gathered were summarized, consolidated, and presented through narrative description.



## RESULTS AND DISCUSSIONS

### Climate Change Awareness

Both elder and farmer- respondents said that they are aware of climate change. All of them believe that there are changes in weather patterns based on specific parameters such as temperature, rainfall, and wind and cyclone occurrence. These were ascertained through continuous observation of the locality's weather conditions.

### Observed Climate Change Indicator

*Altered Temperature.* All of the respondents said that there is a significant alteration of temperature in Gueday. Generally, both the respondents believe that temperature in Gueday have significantly gone warmer these days. This corroborates with IPCC (2007) report that the global average, surface temperatures have increased by about 0.74°C over the past hundred years.

Depot and Pacsay, farmer respondents concur that the temperature of Gueday is warmer nowadays because of the presence of a crab species in rivers, which they claim have come from Ilocos.

*“Ad kasin, maid gaki ay magtek asnad kad- an tako ay id baba nan kadan na. Ngem maawawni et tinmikkid da ad Kayan (Tadian), dadat dinmukkos ad Besao, dadat et unuden nan ginawang et dummukkos da id Payeo dadat et nawada asnad Agawa. Siya et di nan nangsukalan nan ipogaw ay pinmupoos nan batawa. Et talaken di, ay sinapon Kabunian ay siya nan nangsukalan nan ipogaw asna ay pinmupoos tay apay nga tinmikkid et ad asna nan gaki? Ay no baken laeng ngen asnan dagem ya et kaneg et ad id baba nan asna*



*isnan puos na*” (Way back before, big crabs are settle in lowlands, but not in Gueday. But later on, they climbed up to Kayan, Tadian, then crossed to Besao, and have followed the river going up to Barangay Payeo. Time passed and they are here in Agawa. That is then the proof for the people to say that the world has gone warmer because why does those big crab came and survive here? If only not to the wind is that, the temperature here in Gueday might be like that of the lowlands which is relatively hotter).

The elder- respondents, said that the coldest part of the year is during November to January, sometimes extending to mid- February, noting December as the coldest. Farmer- respondents witnessed years with occurrence of (andap), usually in December, but claimed that for the recent years, they have experienced frost only once, and in the month of January.

On the other hand, farmer -respondent Baggiwa described the change in weather experience as follows: “*Ado nan katawetawen ay maandapan di mula. Isnan pay wanwani et maidet di as maila, wada laeng nan namingsan asnan napalpalabas ay tawen. Waay siya ngen di nan ikakan na nan ninbaliwan di klima ay adi et kakagtek. Wada nan tawen ay tumuweng nan tingnin, amed asnan Disyembre, wada es nan tawen ay keg asnan napalpalabas ay tawen ay adi kalikna nan tingnin na ay asnan et Enero et matingtingnin. Esang di as ninbaliwan di paniyempo asnan wani*” (There were years that we often experienced frost. However for the recent years, it has occurred only once. That might be the change in climate. December is usually the coldest part of the year but for the recent years, we have not felt the chill. We experience it in January instead. That is one of the change in climate that we can ascertain). This was agreed by all of the elder- respondents that there is significant alteration in temperature of Gueday basing on the occurrence of



cold winds that is now experienced in January. They also attest that they have worn thicker jacket normally in December, but for the recent years, in the month of January.

*Unpredictable Rainfall.* All of the elder- respondents said that occurrence of rainfall, its strength and distribution in a year is unpredictable. Farmer respondents said that the timing of rain is unprecedented while it is likely to be stronger. The elder- respondents observed that for the past years, precipitation occurrence has been lesser but when it rains it is more likely to be more intense. This concurs with the assumption of IPCC (2007), as cited by DA- PIPC, ascertaining that there is decrease of 20 % rainfall but its intensity will grow higher than normal.

*Erratic winds and occurrence of cyclone/tropical storms.* All of the elder- respondents said that there are significant changes in yearly wind patterns and occurrence of tropical cyclone. However, they said that wind intensity from June to September is due to the influence of the occurrence of typhoons. This reflects the normal values of PAGASA on cyclonic data affecting the Philippines which provides 11 out of 19 cyclones or 57. 89% for the duration of June to September.

There were no quantifying data to explain changes in the number of cyclones that have affected Gueday but observations by elder- respondents provides cyclones occurrence is stronger, but the number seems lesser. Farmer- respondents also attest that that there are times they hear from radio that cyclones affect the region, but contrastingly, their weather is normal.

According to the elder- respondents, Gueday normally experience strong winds for ordinary days without influence of cyclone/tropical storm from October to December



coming from the North East. But there is significant alteration in yearly wind patterns as narrated by both respondents. Further, the elder- respondents said that for the past years, the normally strong winds are not felt during the last two months of the Gregorian calendar. All of the farmer- respondents attest that instead of November to December, the strong winds are felt in January instead. Baggiwa, farmer- respondent, stressed that *“nan katingninan ay paltin di tawen et sinan Disyembre, ay tiyempon di napigsa ay dagem. Ngem isnan idwani et maidet unay malikna as dagem isnan Disyembre ay nan et Enero nan kaliknaan na* (the coldest part of the year is during the windiest month, of December, but is now experienced in January).

However, wind would continue to occur in the locality and tends to blow strong. Five farmer- respondents said that this is because the wind is looking for an I- agawa whom have fought the winds (Table 3). This was explained in a folklore narrated by Baggiwa, Paksay, Aluyen, as confirmed by Banisa and Makgui- ing in separate individual interviews.

Table 3. Folklore of Agawa, *“Nan Namgama- an nan I- Agawa Sin Dagem”* (The Agawa Warrior Who Fought the Winds, on the cause of windy climate in their locality

VERNACULAR TEXT	ENGLISH TRANSLATION
<p><i>Id kano sangadom, mayengyeng nan ili ad Agawa. Mappay nan muy- muyong ya tapin di esek tay maid pango ya dagem si men pakawas. Ngem asnan kalunogan di agew, wada et nan atakdag ay bilig ay kinngadan si Gang- a ay kaeegyat nan dagem. Et no iitan, menwedawed nan batang, maspak nan panga, dampay men a yuweng nan kakadnge-an na.</i></p>	<p>In the olden times, Agawa was a very serene place. Fruit bearing trees were in abundance and other crops bore much giving the people rich harvest because there never had been any winds, storms, or typhoons experienced in this area. However, on the west side of the village is a high mountain called Gang- a. One could hear howls, could see trees sway while twigs and branches virtually breaks.</p>



## Effects on the Indigenous Agricultural Cycle

The elder respondents said that agricultural production in Gueday involves an agricultural cycle. Crops involved in the agricultural cycle are rice, taro, and sugarcane. Other crops include banana, peanut, and sweet potato which are planted in the kaingin. It was also observed that beans, tomato, lettuce, pechay, onions, and other crucifers are planted in swiden farms but are produced for household consumption.

However, farmer- respondents informed that in the parts of Masemeyeo, farmers cultivated potato, bell pepper, cabbage and beans in a wider land area and products are sold in Kin-iway, and in Sagada during market days. Farmer- respondents said that vegetable farming as livelihood was introduced by individuals who immigrated to the locality by the virtue of intermarriage.

Elder respondents added that agricultural rice farming still remains as the main source of livelihood. This is supported by the Besao Website (2013), indicating that

“rice yields are for domestic consumption; although some has wider farms with relatively high produce, the income source of the people is not from rice production”.

*Changes in agricultural cycle.* The elder- respondents said that the changes in weather patterns have forced the people to individually decide on planting patterns based on what they think is best to produce high yield. All of the farmer- respondents also confirmed that the traditional agricultural calendar is not being followed nowadays. This is also true to household survey of BSU- SPICCAC (2006) in Benguet where majority of their respondents are no longer basing their agricultural activities to the indigenous agricultural





calendar. The disruption of the indigenous agricultural calendar is one of the many noted impacts of climate change on indigenous communities (Tebtebba Foundation, 2008).

Elder-respondents described that the indigenous agricultural calendar of Gueday is based on observed environmental indicators which varies from presence of bird species, flowering of trees, and the setting of the sun in Ambaon-bato. This substantiates the findings of Lonogan (2006) citing that natural indicators or what the people of Gueday observe in their environment, is where they base an appropriate agricultural activity.

In this context, the people of Gueday have named months on what they see that occurred since the early settlement in the locality. These then forms the agricultural year of the Agawa people, making twelve partitions like that of the Gregorian calendar. Table 4 shows the agricultural calendar of Gueday and presence of indicators today, which was counterchecked with the findings of Lonogan. It also shows the environmental indicators and if these indicators are still seen nowadays.



Elder- respondent said that like the weather, environmental indicators especially birds are even inconsistent. The respondents also affirm that *kiling* and *tiwayan* bird species are erratic; sometimes they are present sometimes not during the specific months. They said that when they show in Gueday, the birds are not in normal population, most often, lesser. *“Nan ayam nan mangibasaran as menmulaan. No wada nan tiwayan, ipagtek na ay tiyempon et di panagmula si lakat. No pay es bumala nan kiling et ipagtek na ay mid et lemlem si kasin umdan. Ngem adi et kakagtek, adi et en kaawatan nan umalian da ay no ngen mid kalendaryo asnan wani et waay adi et kagtek no ngan di ikakan nan tiyempo”* (Birds are special indicator of important agricultural activities because their presence indicate that the weather is now suitable for planting. The tiwayan- bird signals fortunate time to plant taro, while the kiling- bird bring news that there are no more typhoons to come. However, their presence is inconsistent that only if there is no modern calendar, we might be caught unconscious that it is appropriate to do a specific activity).

This manifests generalization of Tebtebba Foundation (2008) that the loss or migration of culturally important species will make it more difficult for elder- respondent and the indigenous communities to practice and pass their traditional knowledge to the next generation.

Both the respondents reiterated that since environmental indicators are inconsistent and the weather is erratic, farmers individually decide on farming activities. This resulted in dramatic change in the agricultural cycle. Pacsay, a farmer- respondent even declared that the indigenous agricultural cycle seems have no sense due to the fact that farmers do farming activities on their own. In this way, the sense of the indigenous agricultural cycle as a community tradition is degrading. This was also affirmed by the elder- respondents

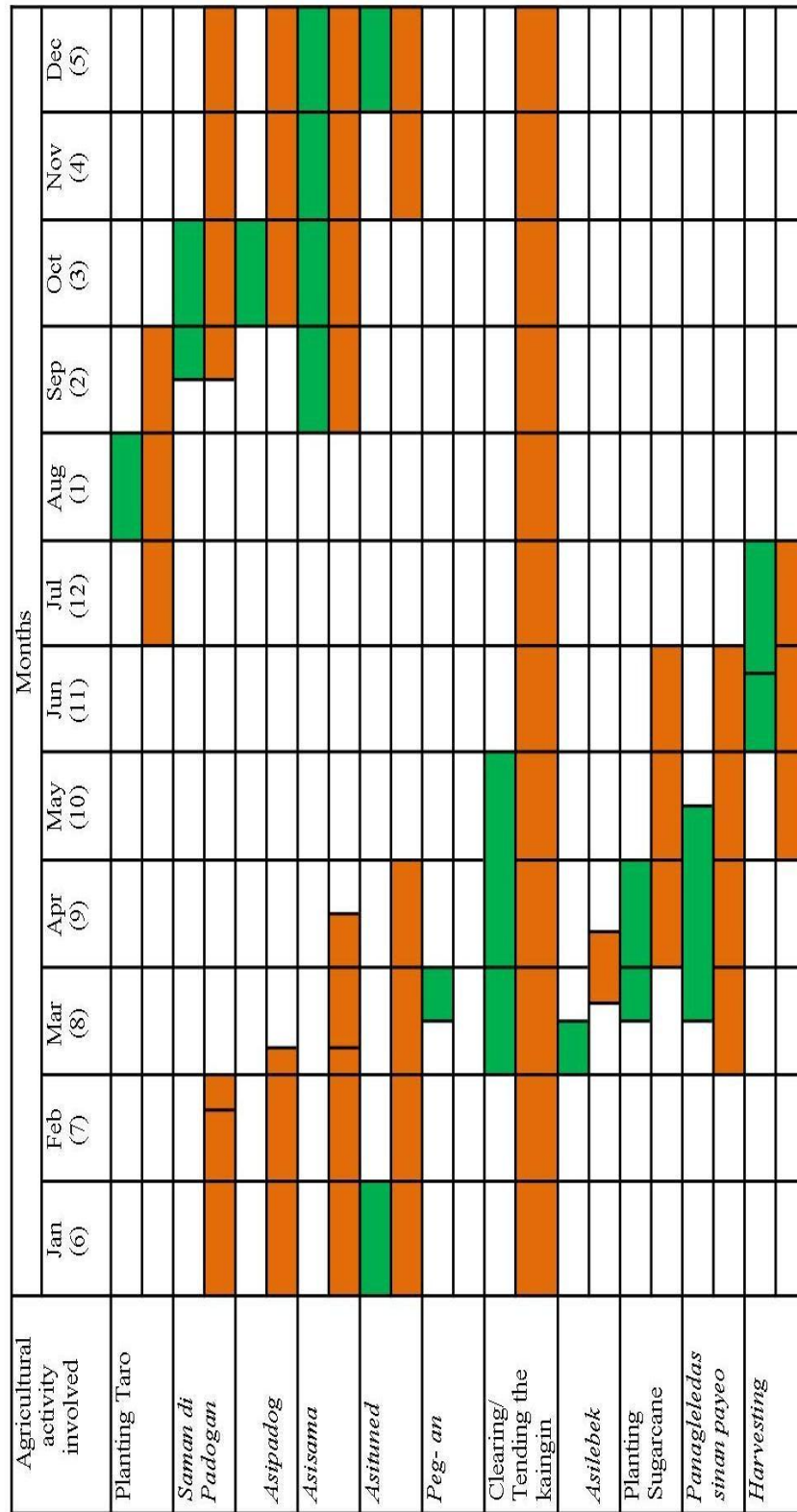


saying that “*nabakas nan ikakkan nan ili tay nan ikakkaka- an nan esa ya esa et downan sinarsarili- an. As manet kinaykayatan nan enda menpadogan wenno menmulaa- an. Mammammid et nan ulnos nan ipogaw ay ma- obbo tay was in di esa ay mangikamakam as kayten na ay ikkan* (Community values in farming is undignified because individuals are becoming selfish, working on their own. They decide individually on what they think is the right time to sow seeds or to plant. The spirit of community working and helping one another is being lost)”.

Figure 4 shows the Gantt chart of agricultural activities in a year and the changes that occurred. According to the elder- respondents, the cycle of agricultural year starts in the month of August. When everybody has finished harvesting rice for the preceding year and rituals including the *a- aw* prayer is done, the community will plant *lakat* (taro) in the fields. When most of the farmers have finished planting taro, the people will call for ‘*obayan di lakat*’ which is mostly celebrated in August 15.

After five days observance of ‘*obaya*’, people will then plant taro. But the most importantly the celebration of ‘*obayan di lakat*’, signals commencement of another year of agricultural cycle since people are again to plow the rice field. “*Mailugi nan kaigagatan nan sama asnan malpasan nan obayan di lakat. Mailugi es kasin nan mensam- an nan ipogaw asnan pay- payeo da, ta wada di esa kasin mamulaan as kasin anien isnan umdan ay tawen* (Plowing of the rice field starts again with the end of the feast of taro. It is another year to till the land where rice is planted, and will be harvested in the coming year)”. The elder- respondents said that by August 20, people will resume their swidden works but others will start plowing the rice fields located ‘*id dogo na*’ (in





Legend:  Original Agricultural Practice  Change in Agricultural Practice

Figure 4. Gantt chart showing agricultural activities in the year and the changes that occur



the Northern part of the *ili*). They normally plow the rice terraces here the earliest since it is the farthest from the Gueday.

Moreover, the elder- respondents said that by the month of September, seedbeds are prepared. While this month is known to be the time of fiercest cyclones, the people raise their heads in Langsayan every sunrise to see if the sun perfectly sets on the rock Ambaonbato. If it happens, then it signals the people that it is appropriate to sow rice seeds. The people also celebrate *kasilapet*, festivity of making and sharing a pounded glutinous rice sandwiched with *mani* (peanut), *etag*(salt preserved meat), *kaling* (mud fish) or the mixture of those. Add to it the presence of *kiling* (bird) that signifies that there will be no typhoons that will be coming anymore; farmers are assured that their sowed seed will be robust and bountiful. These sowed seed bear good transplants 45 days to two months so that transplanting is done at December to January. By the end of July the people have finished harvesting their rice crop.

However, this is not being followed these days. As weather forecasting through environmental indicators does not apply, individuals decide to try to scheme on their own the farming activities. It is notable that the farming activities in the agricultural calendar are distortedly distributed throughout the calendar year. This reflects worsening effect of climate change. As narrated by Paksay, a farmer- respondent, “the worst impact of climate change is the disintegration of the people of their sense of being in a community. The spirit of doing work communally is fading.

On the other hand, both elder and farmer respondents are aware of emigration of people to look for better opportunities in other places. continued that the youth, especially those who are sent to school has bigger tendency to out- migrate from Gueday since farming



these days is not promising. Soliba, an elder respondent said that “*kumaan da et nan ippogaw ad ili ad Besao ta enda umanap si gawgawis ay kataguan* (people go to other places to look for better opportunities). In a nutshell, all of the elders affirm to a statement that it is important to save the traditions of the ‘*ili*’ in facing the challenges posed by climate change.

Another pressing challenge is that, the cultural values of the people are degrading. The elder- respondents said that throughout time, some of the ritualistic celebrations of the *ili* are not being practiced nowadays since the people are not participating well. They blame this to the individualistic farming where individuals decide to do farming activities by what they perceive best as to coping up with the changing weather patterns. Table 5 shows the ritualistic celebrations involved in the agricultural cycle. It is notable that some are not being practiced at present and some of the customary laws.

Further, the essence of the rituals are not respected so that the people still go to farms even though it is prohibited as mandated in the ritual. This is especially manifested during *obaya* which is usually celebrated every *begnas* and in significant events during the people’s agricultural life.

The elder- respondents said that “*Nan obaya et kadawyan na ay lima ay agew, wenno epat tay dadat iboknagan isnan ikalima ay agew. Maite- e di, ngem isnan idwani et adi ka-obayaan nan ippogaw tay amey da kayet sumipot*” (*Obaya* is celebrated in five days. People are not allowed to go to the farm for that duration, excluding the fifth day which is ritualistic that they are permitted to go. But today, people still go to the farm whenever they like).



Table 5. The ritualistic celebrations involved in the agricultural cycle

Celebration	Ritaulistic celebrated	Description	Time	Present Observance
<i>A- aw</i>		Offering chicken in rice granaries to thank for good harvest. It is celebrated simultaneously before because harvest is also simultaneous.	After harvest	It is not simultaneous since harvest is not simultaneous.
<i>Begnas di Lakat</i>		The people celebrate the raising of taro. One pig is offered in <i>papatayan</i> in to thank the Creator and to ask for prosperity. Taro is a staple crop in the olden times.	As soon as <i>lakat</i> is planted Usually August 15. The whole duration is five days.	Although the people participate during the <i>begnas</i> , they still tend to go to their farms even though it is prohibited.
<i>Obayan di linapet</i>		The people celebrate the ' <i>kasilapet</i> ' as their thanksgiving. The ' <i>Kasilapet</i> ' is celebrated as soon as the sun sits atop the towering rock in Ambaon- bato in langsayan. ' <i>Obaya</i> ' is observed three days	Last week of September.	The indicator is not resorted since there are years that it is cloudy during sunrise. But the rituals push through and the <i>obaya</i> is celebrated every September 30.
<i>Begnas di tuned</i>		The people celebrate <i>begnas</i> in reverence to the blessings they received and to pray that the rice they have just transplanted will grow and produce bountiful harvest. ' <i>asituned</i> ' ' <i>Obaya</i> ' is observed five days.	January when most of the people have finished ' <i>asituned</i> '	It is seldomly celebrated nowadays since transplanting is not simultaneous. Transplanting is supposed to be finished this time but presently farmers extend until April.
<i>Begnas: Sangubod di Asilebek</i>		The people celebrate <i>begnas</i> during the time of sugar milling. ' <i>obaya</i> ' is celebrated five days	April	The extent of ' <i>obaya</i> ' is not observed since water is mostly scarce



Table 5. continued...

during this time so farmers tend to go to the farm and fix irrigation

<i>Begnas: Sedam / Letab di ani</i>	The people celebrate the last begnas for the agricultural year. Three days 'obaya' is observed.	June	It is seldomly celebrated nowadays since transplanting is not simultaneous. Transplanting is supposed to be finished this time but presently farmers extend until April.
<i>Obayan di Sanga- ili</i>	A cleansing ritual used to protect the <i>ili</i> against illness like feveand colds; and pest attacks especially of rats.	When necessary	Elders said that there is no sense of celebrating since people do not abide with the law of

'obaya'. Rats have attacked the rice fields for the past years but 'sanga- ili' was not celebrated.

*Effect on agricultural production.* Elder and farmer respondents alike said that change in weather patterns provide low yield. The only positive impact identified by the farmers is that they observed faster growth of plants owed to higher temperature and longer exposure to sun due to occurrence of lesser rain.

Figure 6 presents the duration of rice production now requires only four to five months after transplanting for 'bayag' rice varieties and three months or more after transplanting 'biit' varieties after transplanting. Rice transplant is grown 1.5 to 2 months which means that the whole duration of planting 'bayag' rice varieties can be at 5.5- 7 months while 4.5 or more with 'biit' varieties.

Other climatic changes as identified by both the respondents such as





unpredictable timing, lesser, but more intense rainfall; stronger and change in the patterns of winds; and lesser but stronger cyclone causes negative effect in agricultural production is shown in Table 6.

Varieties	Number of Months												
	1	2	3	4	5	6	7	8	9	10	11	12	
'Bayag'													
'Biit'													

Color	Description
	Duration of Growing Transplant
	Normal duration after Transplanting
	Change in duration after transplanting



Rice cultivars, as identified by both elder and farmer respondents, are generally divided into two types: the 'bayag' and the 'biit' varieties. Elder-respondents said that originally, bayag varieties are heirloom varieties called 'ginolot', that requires 10 to harvest. In around 1990's, people adapted new type of 'bayag' varieties called apolog and walay acquired from the Department of Agriculture. On the other hand, 'biit' varieties are fast growing varieties that requires only 7- 8 months to harvest. Elder- respondent further said that these varieties were mostly introduced by the Department of Agriculture but some were acquired through recommendation from 'kakabagyan' or 'kakailiyan' in other 'ili'. This was supported by the farmer- respondents, saying that the acquisition of the cultivars were from other farmers, either 'kabagyan' or 'kailiyan' in the same or other ili, who have tried planting the variety and have evidently good produce. These 'biit' varieties are: 'taiwan', 'intan', 'topeng', 'nabbasi', 'matiko', 'yangaw', 'backshot', 'gobyerno', 'pokpoklo', 'matatag', 'masde', 'pita', and 'senora'.

Figure 5. The change in the duration of rice production Table 6. Effect of climate on agricultural production

Change in Climate	Effects	
	Positive	Negative
1. Higher than normal temperature	- Faster growth of rice	-Higher infestation of pest -Forest cover tends to dry -Drying up of water sources especially springs and streams. -Higher absorption potential of ground -Rice paddies were not cultivated anymore, as in 'naadiyan-an'



2. Unpredictable timing, lesser, but more intense rainfall

-Rice panicles will fall that cause minimal harvest due to intense rain. - Rice seeds will grow roots while still in the panicle.

3. Change in patterns of winds; and lesser but more intense cyclones

-Flowers, buds, and young stem shatters and could break because of strong rain.

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-Creates inadequate water situation because of unpredictable yet lesser rain.

-Rain fed kaingin remains unwatered -Forest cover dries affecting food availability for carabaos, and other animals living there. -Higher pest infestation because pests go to farms and kaingin to feed (*'umali da maki- kaan'*) -

Drying up of water sources especially springs and streams

-Higher absorption potential of ground -Rice paddies were not cultivated anymore, as in *'naadiyan- an'*

-Shattering of flowers, rice panicles, and breaking of transplants and young stem.

-Uprooting of plants especially banana

-*'Kungao'*, rice plants has no fruit left.



On the other hand, pests also attack crop yields, bearing minimal production for the farmers. The higher population density of rodents and the change in earth worm especially to rice which is the main crop of Gueday. Table shows the effects on agricultural production.

behavior and morphology are perceived to be one of the eventual effects of climate change as assumed by the respondents. This result to devastation of crops and some rice paddies. Pest concentration tends to be denser with the onslaught of climate change. This concurs with the study of BSU- SPICCAC (2010) in Benguet that farmers observed occurrence of crop pests are more numerous; their frequency and intensity is increasing with the abnormality of weather patterns.

The major pest that attacked crops as determined by elder- respondent and the farmer respondents are rodents. The occurrence of plant diseases like yellowing with scattered spots which is closely associated with rice mosaic, and fungus attack in sugar cane, beans, and other crops are but claimed to be isolated cases since the occurrence of the diseases does not persist all year round or in every cropping season. Rodents are pointed by the farmer- respondents to be the main problem in rice production. Since the beginning of the new millennium, the elder- respondent observed that rat population are increasing year by year and the level of casualty is devastatingly increasing. They declared that for the past years, they have a very minimal production. *“Asnan payeo ay makagapas ka as enem ay kaban ay irik et adim et patiyen no mapabalam nan tulo wenno epat mentes ay epdas enemy nan otot. Agyaman ka pay no waday duwa ay kaban si maalam”* (In rice paddies where you can harvest six cavans of rice seeds you might only collect less than four). Some



farmer- respondents also declare that rats attack their *agamang* (granary) while two of the farmer- respondents claimed that rats eat and/ or steal eggs laid by hens.

Sugarcane is also being attacked by rats injuring plants with cuts and sometimes cuts the plant all throughout. On the other hand, the elder- respondent and farmer- respondents also consider birds as pests although they have a sort of respect to this kind of creature since their presence indicates may weather condition. Lonogan (2006) have determined some kinds of birds that are locally known to indicate what weather is expected, which in turn helped the people of Gueday in the olden times ascertain a favorable agricultural cycle.

Elder- respondent believe that the surprising attack of doubling population of rats is because rats are attracted by abundant food offered by farms. “*Waay ud binmasbasit nan kaen da asnan bilig* (food might be inadequate for them in the forest”. In the accounts of Lonogan (2006), the forest in the North of Gueday known as Buasao is a *mapagpag* a hunting ground and offers abundant wildlife including hunting animals, berries and fruit trees. But with precipitation potential decreasing IPCC (2007), as cited by DA- PIPC, and with longer days of drought and temperature extremes (Tebtebba Foundation, 2008) cause significant change in forest growth, modifying the functioning, fertility of soils and composition of forests (Tebtebba Foundation, 2008). Hence, rodents has the higher tendency to attack farms since the availability of food in the forest is decreasing, while the natural predator- prey balance of the ecosystem has destabilized.

But what is surprising is to the respondents is the mutation of *keang* (earth worm) in Gueday. Farmers have not considered this kind of creature in the past years as pest but its effect to plants these days are devastating. Makgui- ing, a farmer-respondent said that his *payeo* (rice paddies) was eroded because of the earthworm making holes and



penetrating to the deep corners of the *payeo*. “*Aye pay nan ikkan nan keang ay manglukaw asnan payeo et lubot isnan anga na. Siya et pay nan luboten di danom et dowan et midugos ya magday* (Earth worms make holes in rice paddies which the water penetrate. In turn, the soil softens and the pressure from the water pushes the rice paddies to erode)”. The same story happened in Ifugao, where the African nightcrawlers were pointed as the cause of erosion of many rice paddies in 2006. This was asserted by Bareja (2011) in a crop farming review, stating that worms have eroded the terraces by burrowing into the walls and causing leaks as these were also found damaging the roots of germinated seeds.

According to the respondents, big earth worms before usually measure four to five inches the biggest. The concentration of the vermicast is low in an average rice paddy. It may feed on roots but not necessarily deplete it which is the case today. “*Asnan ita, kaeegyat nan kinadakdakke di keang tay no mabalin et umiso asnan pal- paliking. Umat pay et amey si duwan depa nan kaanando na. No waday kaya- en di manok et adi da kaen tay ayaka man di as kadakdake, aped da lang tultulan dadat taynan*” (Earthworms are bigger these days, with a diameter comparable to that of a little finger. It even turned longer measuring two palms. Once a chicken finds one, it does not feed on it but just leaves it whole).

### Adaptation Mechanism Responses to Climate Change

Coping mechanism. To cope up with the challenges of climate change, the elders said that the people should be more persistent with the old agricultural cycle. “*Nan mang- agas asnan ikakkan na ay adi kaawatan nanklima ya batawa et nan ipogaw ay*





Figure 4. Big earthworm



Figure 5. The researcher measured the length of the stick using two one- hundred peso bill that was used in measuring the earth worm since measuring equipment is unavailable. *menbinadang asnan sumyaan. Tay siya din an natudingan ay ainikikkan nan aamam- a anggana ad kasin et sumya met ay natago da*” (The cure for this erratic conditions of weather is the people to brace themselves and continue helping each other at all cost.

Because it is for this reason that our ancestors have lived and begot generations). They hope that the people will realize that the solution for poor yields is because they do not follow the agricultural calendar anymore.

This was agreed by Aluyen, saying that the agricultural cycle is an important social mechanism that binds the people together. *“Et ulay kuma no maidet maila as ayam ay mangibagas nan ipogaw ad kasin as esa da ikkan, maituloy kayet kuma ay mapati nan deey kinnasin ay maik- ikan tay gawis id sangadom tay mauulnos nan umili”* (The people should maintain abiding to the agricultural cycle because it was observed that the people are united as community before).

The elder- respondents believe that the continuous observance of customary laws on spring and forest is the best way to adapt to the impact of climate change. The customary laws have it that the springs should be well kept and maintained free from contaminants. On the other hand, the forest is guarded from fire. These laws were institutionalized on the belief that when the springs are contaminated or the mountains of Koyegyeg and Mui- ong is burnt, children will be attacked by rashes. In the early 1980s, the mountain of Mui- ong was burnt and children were suddenly attacked by *‘bultong’*. The same story happened when a carabao was unguarded and accidentally go to a spring to drink.

Those events would be seen by science as unrelated but it reveals more of the deep interrelationship of indigenous peoples to their environment. Banay explained that the customary law is a social mechanism that instills to one the value of spring and forest.

As Doligan concurs, *“tay into pay ud nan magapwan di mausal ay danom no malugitan nan ubbog ya masgeb nan bilig?”* (where then can we source out potable water when springs are contaminated and mountains unguarded from fire).





Farm Level Adaptation. Elder and farmer respondents alike have determined some of these that they applied and observed. These are farm level adaptation which is the responses of the farmers of the effects of climate change as defined by Reilly (1995) as cited by Mark W. Rosegrant of Climate Protection Programme for Developing Countries (CCPPDC, 2008)

*Variety adaption.* Elders also believe that to cope up with climate change impacts, the 'ginolot'- a heirloom rice varieties should be propagated and if possible, to become the dominant crop. This is because while the people enjoy the promising 'biit' varieties, the warmer temperature in Gueday makes the heirloom 'ginolot' to be competent in supplying household demands in shorter period of time. They said that "*Kinayat nan ipogaw nan biit tay paspas nan kaapitan na. ngem gedan masukalan ay siya bassit nan maapit tay adi na kaya nan dagem ya udan no duwan da umali*" (people have adapted to 'biit' varieties because it can be harvested in a shorter period of time. But it cannot withstand weather extremes like that of harsh wind and strong rain that makes a farmer harvest too little).

This is the same with the observation of farmers that the 'bayag' varieties are the only varieties of rice that can withstand unexpected strong rains and winds. Soliba said that "*Siya kayet obpay nan kagawisan tay umali nan napigsa ay udan ya dagem et adi kaetdag nan pagey*". (Heirloom varieties are still the best rice varieties since rice grains will not fall and can withstand strong rains and winds). This was affirmed by the rest of the elder-respondents stating that "*Gawis tet- ew no siya nan imulan di umili tay gedan inmap- aptik dadlo nan kaapitan na tay pinmupuos ngalud nan batawa*"(The 'bayag' varieties now grow faster because of warmer temperature so why not plant it instead).



The findings corroborates with the statement of Department of Agriculture- Mountain Province Provincial Office as reported by Lapaan (2012) that heirloom varieties are still the most appropriate cultivar for indigenous farming communities since these have been tested over time and it is tolerant to micro- climatic changes.

*Fertilizer Adaption.* Farmer- respondent observed that the soil does not need more types of fertilizer such as those synthetic since they do not see any problem with regards to soil fertility. Dalay- on affirms in a statement that “*gawis pay lang nan daga ad asna*” (the soil here is still fertile).

*Opening New Lands.* The tendency of the people is not to extend given that crop yields, especially of the staple crop rice, tends to be lesser with the effect of higher pest incidence due to altered temperature, unpredictable rainfall and erratic winds and cyclones. Farms are left untilled instead and others emigrate from the ‘*ili*’ to seek greener pasture.

*Irrigation Equipment Adoption.* The researcher observed during ocular inspection that water pipes and water hose are used by some farmers to irrigate their farms. Irrigation technology dominant is the ‘*payas*’ (irrigation canal). Dalay- on claims that the use of water hose and pipes as irrigation is to water rice paddies whose direct water source have dried up. Water then is sourced out through water hose and pipes from spring and stream that have still abundant water flow

*Fertilizer Adoption.* Elders said that “*adi kasapulan nan teken ay abono tay baknang kayet nan daga. Ababono- an ud nan umili nan sip- sipoten da gedan asnan lugam ya sabsabong ay enda nilidasan*” (other type of fertilizer is not needed since the soil is still rich. People fertilize the soil with the vegetation they cleared in the surrounding). This is called ‘*tunek*’, direct composting method utilized by the farmers.



## SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

### Summary

The study was conducted to identify climate change awareness in Gueday and its effects to the indigenous knowledge, system, and practices on the agricultural cycle. Specifically, it aims to identify the awareness of Gueday to climate change; distinguish the observed climate change indicators by the people of Gueday; distinguish the effects of climate change on agricultural cycle of Gueday; and to identify adaptive mechanism exhibited by the people to cope up with climate change.

To guide the researcher to meet the objectives, five elders who are '*mensapit*' were gathered into a focused group discussion. Twenty- two farmers aging not less than 35 years old were also interviewed. On the other hand, secondary data were collected from the PAGASA weather bureau in Baguio City in many parts of this research. It was found out that the people of Gueday are aware of climate change basing on parameters they have observed. These are alteration in temperature, which is generally higher nowadays and the modification of coldest month of the year from December to January, unpredictable, stronger, but less occurrence of rainfall; and change in patterns of winds; and lesser but more intense cyclones.

It was found out that these changes in weather conditions have remarkably affected the indigenous agricultural life of the people because of the absence or unprecedented presence of environmental indicators that signify appropriateness of an agricultural activity. These have forced the farmers to work and individually decide on what they perceive best as the right time to do an agricultural activity. In this light, even the customary rituals are not



practiced reverently since the people are forced to attend to their farms. The cultural value of the people is degrading and the communal way of farming is disintegrated.

Agricultural production was generally affected with the onslaught of climate change, farmers produce virtually low yield. Pest infestation has also increased; water is inadequate with lesser incidence of rainfall and drying up of water source; and some farms were left untilled.

Elders said that while it is normal for the people to attend to farms to cope up with unprecedented weather patterns, the people must still remember to abide with the communal customary practices “because it is that tradition that enabled their forefathers to survive.

Farmers have adapted to *biit* varieties but elder and farmer respondents ascertained that it is still best to grow heirloom varieties since it is more tolerant from virtual effects of climate change. The people have not adapted to other types of fertilizers since they believe that their soil is still fertile because of the practice of *tunek*. Land expansion were not made for the past years. In fact, some other farms were left untilled because of the inadequacy of water. On the other hand, some farmers are using water hose and pipes to irrigate their farms.

### Conclusions:

Based on the findings, the following conclusions were drawn:

1. The people of Gueday are aware of climate change basing on weather parameters they have observed.



2. There are parameters set by the people of Gueday in identifying climatological changes in their community.
3. The indigenous agricultural cycle of Gueday has been remarkably modified with unprecedented environmental indicators.
4. Water inadequacy is posing problem because of the drying of water resources and lesser rainfall incidence. Some farms are left untilled because of inadequacy of water.
5. The observance of ritualistic celebrations is modified and some of the practices are not adhered.

### Recommendations

Based on the conclusions, the following recommendations were formulated:

1. Water irrigation improvement may be prioritized by the Local Government Unit to help alleviate the threats posed by climate change.
2. Extensive research on the impact of climate change that concerns bio- physical characterization, socio- economic profiling, vulnerability assessments, and socio- cultural study such as IKSP documentation may be examined to provide the people, the local government units of barangay Gueday and the Municipality of Besao, and extension workers a dynamic situational analysis of the phenomenon that affects the locality.
3. Integrated program planning may be established to include the people of the locality in ascertaining knowledge in designing framework for development programming and policy making.



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