**Strengthening Capacities for Climate Risk Management and Disaster Preparedness in Selected Provinces of the Philippines (Bicol Region)**
**TCP/PHI/3203 (D)**

# SITUATION ASSESSMENT REPORT

CENTRAL BICOL STATE UNIVERSITY OF AGRICULTURE
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# FOREWORD

The project "Strengthening Capacities for Climate Risk Management and Disaster Preparedness in Selected Provinces of the Philippines (Bicol Region)" was implemented by the Food and Agriculture Organization (FAO) of the United Nations and the Department of Agriculture (DA) of the Philippines in response to the request of the DA for technical and financial support to undertake an overall needs assessment and to design a rehabilitation plan in Bicol after three typhoons hit the Bicol region in 2006. In a span of 10 weeks, from September to November 2006, the Bicol region was ravaged by three typhoons, with typhoon Reming (International name Durian) as the strongest and most destructive. The region was severely affected by strong winds and rain that brought in 466 mm of rainfall, damaging 18,786 hectares of rice land valued at Php 153.8 million.

The key thrust of the project assistance was on building capacity within the DA Regional Field Unit, PAGASA, local government authorities, farmers and fisher folk's groups and other key stakeholders who are actively involved in disaster risk management in the pilot areas in the aspects of climate change adaptation and disaster preparedness. Thus, an assessment of the current situation of the disaster management system in the region down to barangay level was deemed necessary.

The situation assessment covered three major concerns: 1) physical/environmental situation focusing on the local hazard context, socio economic conditions focused on gender roles and livelihoods; and current agricultural land use in the context of DRR in the pilot barangays; 2) existing vulnerability context particularly of the groups most vulnerable to disasters, their capacity and coping strategies; their existing agricultural practices (crops, livestock, fisheries, forestry, homestead, etc.), and their access to the natural resource base, agricultural inputs, services and other assets; and 3) an assessment of the institutional DRM system in the pilot sites.

The findings reported in this assessment study were generated from primary sources, which include inputs/ feedback from the Municipal Agriculturists and Agriculture Technicians, Planning Officers, Barangay Officials, farmers and fisherfolks, women and youth, representatives of the academe, NGOs, line agencies of the government and other key informants; and the secondary data sources from the records/documents of municipality, barangay, and from the provincial and regional offices of the DA. Participatory approaches in data generation were adopted like Focus Group Discussion, Key Informant Interview, Participatory Rapid Appraisal, and formal survey.

The findings on climate patterns were presented from the national, regional to provincial scenario, however, discussions on the socio-economic context with emphasis on gender roles, livelihoods, hazards, coping strategies and DRM system's analysis were presented by pilot area.

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**ACRONYMS**

| | |
|---|---|
| ADB-WB | Asian Development Bank-World Bank |
| AEZ | Agro-ecological zone |
| BAFC | Barangay Agriculture and Fisheries Council |
| BFAR | Bureau of Agricultural Research |
| BAR | Bureau of Agricultural Research |
| BAS | Bureau of Agricultural Statistics |
| BHW | Barangay Health Workers |
| BNS | Barangay Nutrition Scholars |
| CBSUA | Central Bicol State University of Agriculture |
| CDP | Center for Disaster Preparedness |
| CIRCA | Center for Initiatives and Research on Climate Adaptation |
| CNDR | Corporate Network for Disaster Response |
| CSSAC | Camarines Sur State Agricultural College |
| CRAM | Community Risk Assessment Methodology |
| DA | Department of Agriculture |
| DENR | Department of Environment and Natural Resources |
| DILG | Department of Interior and Local Government |
| DOST | Department of Science and Technology |
| DRM | Disaster Risk Management |
| DRR | Disaster Risk Reduction |
| DRRNet | Disaster Risk Reduction Network |
| DSWD | Department of Social Welfare and Development |
| EMB | Environmental Management Bureau |
| EMI | Earthquake and Megacities Initiatives |
| ENSO | El Nino Southern Oscillation |
| FAO | Food and Agriculture Organization of the United Nations |
| FGD | Focus Group Discussion |
| GDP | Gross Domestic Product |
| GIS | Geographic Information System |
| GOs | Government Organizations |
| HHs | Households |
| HRVCA | Hazard, Risk, Vulnerability and Capacity Assessment |
| IIDRM | International Institute for Disaster Risk Management |
| IIRR | International Institute of Rural Reconstruction |
| IP | Indigenous People |
| IPCC | Intergovernmental Panel for Climate Change |
| ITC | Institutional Technical Capacity |
| KII | Key Informant Interview |
| LGUs | Local Government Units |
| MFPs | Minor Forest Products |
| MGB | Mines and Geo-Sciences Bureau |
| NAMRIA | National Mapping and Resource Information Authority |
| NDCC | National Disaster Coordinating Center |
| NEDA | National Economic and Development Authority |

| | |
|---|---|
| NGOs | Non-Government Organizations |
| NSCB | National Statistical Coordination Board |
| NSO | National Statistics Office |
| OCD | Office of Civil Defense |
| PAGASA | Philippine Atmospheric, Geophysical and Astronomical Services Administration |
| POs | Peoples Organizations |
| PNRC | Philippine National Red Cross |
| PRA | Participatory Rural Appraisal |
| RIC | Rural Improvement Club |
| SB | Sangguniang Bayan |
| SLR | Sea Level Rise |
| ST | Study Team |
| STY | Super Typhoon |
| TY | Typhoon |
| UNDP | United Nations Development Fund |
| WB | World Bank |
| WBI | World Bank Institute |

# 1. INTRODUCTION

## 1.1 Background

The Philippines is highly vulnerable to climate change because of its physiographic and geographic characteristic. This condition is further exacerbated by the fact that it is a developing country, characterized by low level of economic development and poor access to resources.

Majority (70%) of the country's cities/municipalities are situated along the 36,289 kilometers of coastline with most of its people depending on marine resources and agriculture for livelihood. Unfortunately, these livelihood systems are most vulnerable to climate change.

According to the IPCC, the worsening condition of the global climate "would cause further warming and induce many changes in the global climate system during the 21st century". This projection will further increase the vulnerability of the Philippines to various disasters. Climate change can also aggravate the present socio-economic burdens experienced by Filipino families like hunger, water scarcity, and vulnerability to health risks due to spread of vector-based insect-borne diseases, such as malaria and dengue. It also increases the country's vulnerability to extreme weather related events like stronger typhoons, droughts, and heavy precipitation, a condition that will further increase the disparity of living standards between the rich and the poor sectors of society. Moreover, it will marginalize further the condition of indigenous peoples (IPs) whose customs and livelihood systems are deeply rooted in the well-being of the environment.

Though climate change and natural disasters in the region affect all sectors, its impact is worst in the agriculture sector. This is due to the increased occurrences of El Nino Southern Oscillation (ENSO) and La Nina events, which result in drought and extreme rainfalls respectively. In 2006 alone, for the first time in the history of the Philippines, three extremely violent typhoons brought havoc to the country. Typhoon *Reming* was considered the most violent and destructive, affecting all the six provinces of the Bicol Region, destroying 18,786 hectares of rice areas at varying development stages, costing 153.8 million pesos and affecting the normal economic way of life of a hundred of farmers. The agriculture losses from natural hazards are enormous (e.g. reduced agricultural production, destroyed crops, diminished soil fertility). The costs of losses substantially vary between various years as some of them result from unpredictable and variable events. These costs are likely to increase overtime due to global climate change that seems to particularly affect Bicol region, which is comparatively more vulnerable due to its geographic location, climate and fragile land use pattern.

Agricultural production in the whole Bicol region and associated rural livelihoods are at risk due to recurrent natural disasters and climatic irregularities. The impacts of climate change on the country's agriculture sector can consequently affect food security, livelihood/income sources and settlement patterns in both the rural and urban areas. Migration is projected to increase from rural to urban areas, increasing its population density and its vulnerability to climate change. Statistics show that around 60% of the Philippine population is

concentrated in the urban areas and the impacts of climate change can further worsen its present condition- like problems related to sustainable land use, infrastructure, access to potable water and health services, and waste management, among others. In this context, a project with financial and technical support from the Food and Agriculture Organization (FAO) was launched in 2009 to strengthen the capacities of selected communities in the Philippines for climate risk management and disaster preparedness. The project specifically aims to (1) improve the early warning system of PAGASA, (2) build the capacity of local government, (3) implement community based disaster risk management plans, and (4) introduce good practice options in crop production, aquaculture, fishing practices and water management measures for climate risk mitigation.

According to the Project Implementation Approach, the situational assessment of the pilot barangays is the first task to be carried out, in order to collect basic information about the communities' vulnerability to climate risks and the factors determining their vulnerability, as well as to identify and assess existing adaptive responses to climatic risks by the local population. In line with this approach, the project began with a situational assessment study, which has been carried out in all the nine barangays. This report outlines the background, objectives, study process, methods, findings and recommendations made on the basis of the situation assessment in the pilot barangays.

### 1.2 Objectives of the Study

The general objective of the situational assessment is to determine the Disaster Risk Management (DRM) system in the Bicol Region with specific focus on the agriculture and fishery sector policies and organizations in the Pilot Barangays ( see Table 1). It also aims to appraise livelihood vulnerability of community people, which has been exacerbated by the current problems and future risks posed by climate change, and to identify the local adaptive and coping responses to the changing climatic conditions.

Specifically, it aims to describe in detail the:

1. Physical/environmental situation and parameters influencing or influenced by the local hazard context; socio economic framework conditions; and current farming systems/practices in the selected municipalities; and if available existing land use plans in view of DRR;
2. Existing vulnerability context applying livelihood profiling methodology to characterize:
    a) the groups most vulnerable to disasters including their existing annual food balance;
    b) their capacity and coping strategies;
    c) their existing agricultural practices (crops, livestock, fisheries, forestry, homestead, etc.), and
    d) their access to the natural resource base, agricultural inputs, services and other assets; and
3. The institutional DRM system (regional, provincial, municipality, barangay level) based on the FAO guide for DRM systems analysis methodology.

The analysis led to concrete recommendations relating to: a) strengths, weaknesses and opportunities for improvement of the local institutional set-up and regulatory frameworks for improved DRR; and b) needs for location specific technical options and technologies for improved risk prevention and preparedness.

## 2. METHODOLOGY

### 2.1 The Assessment Process

The study used a progressive system of assessment consisting of four (4) phases (**Figure 1**). This methodology was adopted from similar studies supported by FAO. **Table 1** also shows the methodological approach used in the assessment process.

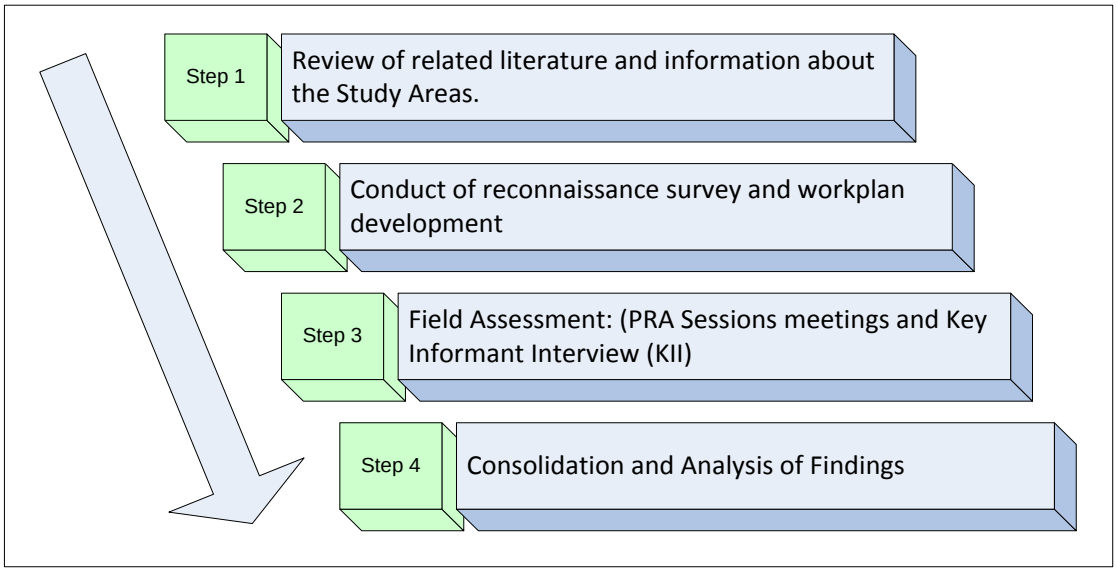



Figure 1 Assessment progression

Table 1 Objectives, analytical issues, methods, and data sources

| No. | Objectives | Analytical Issues | Methods/ Tools Used | Data Source |
|---|---|---|---|---|
| 1 | Determine the physical/environmental situation and parameters influencing or influenced by the local hazard context; socio economic framework conditions; and current farming systems/practices in the selected municipalities; and if available existing land use plans in view of | Physiography<br>Rainfall<br>Soil<br>Land Types<br>Socio economic profile<br>Major Cropping System/ farming practices<br>Agricultural Land Use | Secondary data review<br>Internet Search Engine | DENR (MGB)<br>DA<br>DA-BAR<br>PAGASA<br>NSO<br>IPCC<br>Manila Observatory webpage<br>Phil-GIS Society Webpage |

| No. | Objectives | Analytical Issues | Methods/ Tools Used | Data Source |
|---|---|---|---|---|
| | DRR; | Major Crops | | Typhoon2000 webpage<br>NDCC webpage |
| 2 | Assess local perceptions of climate hazard, past and present climate risk/impact and perception about future climate risks | Local perceptions of climate hazard<br>Local perceptions of impacts of various climate risk/hazards | Focus Group Discussion (FGD)<br>Key Informant Interview (KII)<br>HRVCA exercise<br>Ranking and Scoring<br>Seasonal Calendar plotting | Actual field data gathering<br>Local constituents |
| 3 | Analyze current farming systems / practices in selected municipalities | Farming systems/ fishing practices | FGD<br>KII<br>Secondary data review | Actual field data gathering<br>Local constituents<br>Field observation |
| 4 | Determine existing vulnerability context applying livelihood profiling methodology and existing coping mechanism to climate change | Local adaptation/ coping mechanisms currently being practice | FGD<br>KII | Actual field data gathering from local constituents |
| 5 | Assessment of the institutional DRM system | Role and capacities of local institutions, organizations and community to adapt to changes in climate<br>Disaster management interventions being practiced | FGD<br>KII<br>Secondary data review | Actual field data gathering |

## 2.2 Review of Related Literatures and Information about the Pilot Sites.

Existing records, written publications and other sources of information were used to gather baseline information about the pilot sites. These are information on geo-physical and socio-economic features of the pilot sites, climate change adaptation related guidelines and publications in the Philippines, other relevant literature and secondary sources of information.

The main sources of information include data gathered from the LGUs, DENR (MGB, EMB & NAMRIA), DA (BAR & BAS), DOST-PAGASA and NSO. In addition information from related

studies supported by the IPCC, UNDP, ADB-WB, FAO and related information from the WebPages of the Manila Observatory, Phil-GIS Society, Typhoon2000 and NDCC webpage were also consulted and used.

## 2.3 Conduct of Reconnaissance Survey and Work Plan Development

This phase of the study was conducted during the last quarter of 2009. Through this phase, the Study Team (ST) was able to:

- Familiarize with the local situation of the project sites;
- Explain the purpose of the study to the stakeholders, mainly the community.
- Gain the support and cooperation of community leaders and probable participants of the next phase;
- Validate on the ground the data gathered during the previous phase;
- Prepare a work plan for the next phase, and
- Identify and study the vulnerable groups in the Pilot Areas

## 2.4 Field Assessment

The field assessment was carried out to assess and evaluate livelihood situation, climate change related hazard, risk and vulnerability conditions and institutional capacity of the local and regional government and private organizations working in the Pilot Areas.

### *2.4.1 Assessment Tools*

Different tools were used in the field assessment phase. These include Participatory Rural Appraisal (PRA) sessions, Focus Group Discussions (FGD) for preparing livelihood seasonal calendar, Risk and Hazard Mapping exercises, and identification of vulnerable sectors and groups, Key Informant Interviews (KII) for institutional assessment and livelihood groups profiling.

#### 2.4.1.1 *Selection of Assessment Participants*

Representatives from the following sectors were pre-identified by the project staff for the assessment:

- Farmers
- Fisher folks
- Women/Youth
- Non-Government Organizations (NGOs)
- Peoples Organizations (POs)
- Academe
- Local Government Units (LGUs)
- Department of Agriculture (DA)

#### 2.4.1.2 *PRA Sessions*

The PRA sessions were conducted to elicit information from the various sectors in the pilot areas and the participants were categorized based on assessment methodologies as shown in **Table 2**.

Table 2 Categories of PRA session participants.

| No. | Methods | Category of Participants |
|---|---|---|
| 1 | FGD for preparing livelihood seasonal calendar | • Farmers<br>• Fisher folks<br>• Women/Youth<br>• Non-Government Organizations (NGOs) |
| 2 | FGD for Risk and Hazard Mapping exercises and identification of vulnerable sectors and groups | • Farmers<br>• Fisher folks<br>• Women/Youth<br>• Non-Government Organizations (NGOs) |
| 3 | Hazards history & their impacts, hazard associated risks for agriculture & allied sectors, local coping mechanisms & their institutional assessment | • Farmers<br>• Fisher folks<br>• Women/Youth<br>• Non-Government Organizations (NGOs)<br>• Old records from Municipalities and other sources |
| 4 | FGD and KII for institutional assessment | • Non-Government Organizations (NGOs)<br>• Peoples Organizations (POs)<br>• Academe<br>• Local Government Units (LGUs)<br>• Department of Agriculture (DA) |

#### 2.4.1.3 *Livelihood Groups Profiling*

The following methods were used to carry out this assessment process.

- Classification and ranking through FGD
- Characterization through small group discussion and brainstorming
- Seasonal occupation assessment

## 2.5 Consolidation and Analysis of Findings

The study team used the standard analytical process (descriptive statistical analysis, including prioritization and ranking) in analyzing qualitative and quantitative data/ information gathered during the different phases of the study, using MS Excel.

In analyzing geographically referred information, ArcView 3.2a, Geographical Information System (GIS) software was used.

Maps downloaded from Google Earth were also used in combination with photographs taken during the field to make the presentation of the findings more visual and meaningful.

## 2.6 Sources of data and information

Data and information from various government and non-government organizations available in the form of reports and related studies were gathered and used to describe the pilot areas.

The main sources of information are presented in **Table 3**.

Table 3 **Sources of secondary data.**

| Information | Source |
|---|---|
| Climatic data | DA-BAR, PAGASA, IPCC, Manila Observatory webpage, Typhoon2000 webpage, NDCC webpage |
| Agricultural information | DA, DA-BAR |
| Census data | NSO |
| Soil data | DA, DA-BAR |
| Socio-economic data | NSO, Local socio-economic profile |

## 3. RESULTS AND DISCUSSION

### 3.1 Physiographic Setting: Geographical locations of the Pilot Sites

The pilot areas are generally located on the eastern and middle part of the country and lie between 122°30’ and 124°30’ east longitude and between 13°30’ and 12°30’ north latitude. These are all located in the Bicol Region, within the municipalities of Buhi in the province of Camarines Sur, Guinobatan in the province of Albay, and Gubat in the province of Sorsogon (**Figure 2**).

The project covers nine (9) pre-selected barangays namely: (1) Igbac, (2) San Buenaventura and (3) San Ramon in the municipality of Buhi; (4) Masarawag, (5) Mauraro and (6) Minto in Guinobatan; and (7) Ariman, (8) Bagacay and (9) Rizal in Gubat (**Table 4**)

The specific geographical settings of the Pilot Sites are presented in succeeding sections.

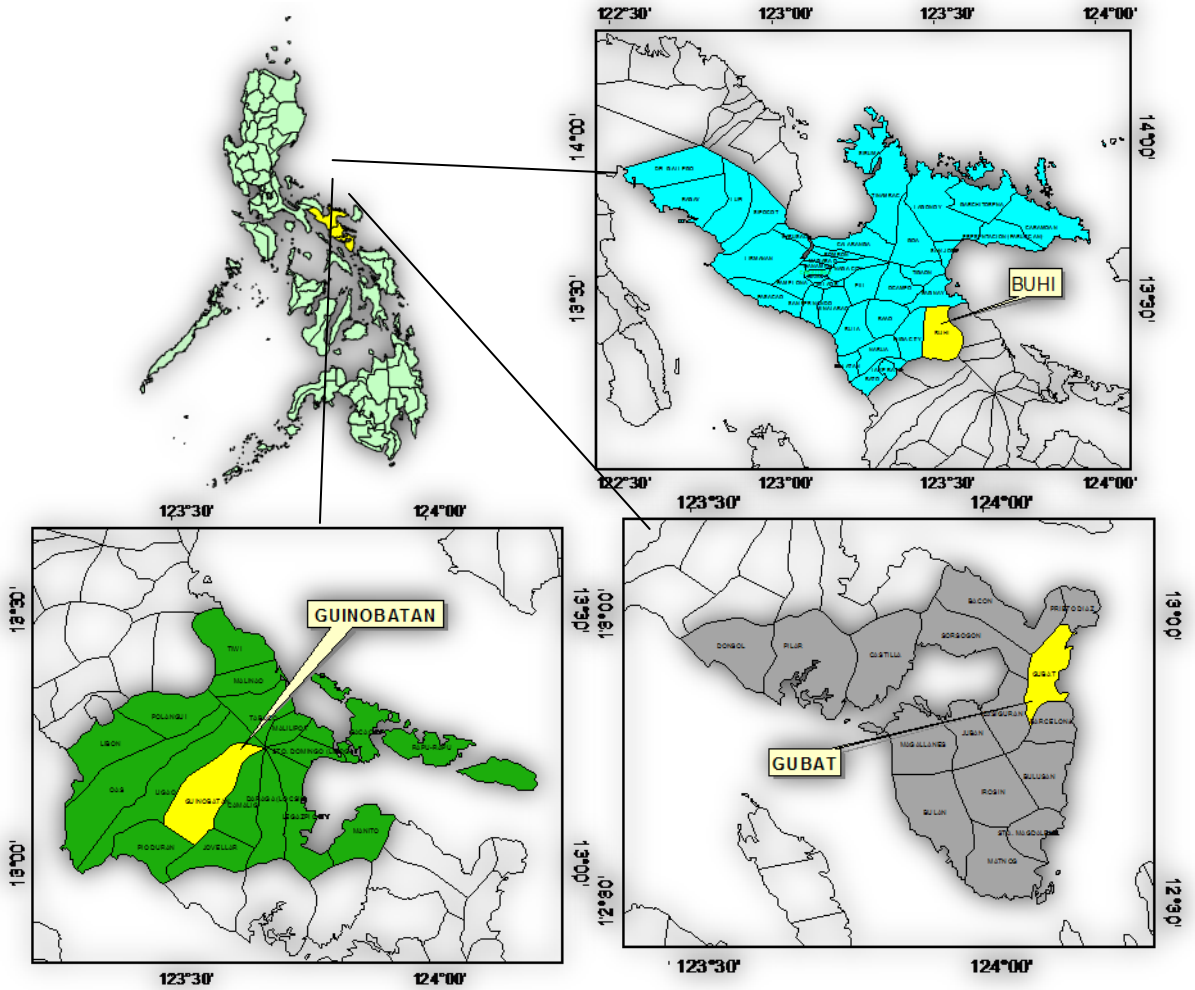



Figure 2 **General location map of the pilot sites**

Table 4 **The pilot areas of the project.**

| | Barangay | Municipality | Province |
|---|---|---|---|
| 1. | Igbac | Buhi | Camarines Sur |
| 2. | San Buenaventura (Pob.) | | |
| 3. | San Ramon | | |
| 4. | Masarawag | Guinobatan | Albay |
| 5. | Mauraro | | |
| 6. | Minto | | |
| 7. | Ariman | Gubat | Sorsogon |
| 8. | Bagacay | | |
| 9. | Rizal | | |

## **3.2** Topography

General topography of the areas varies in terms of slope characteristics. There are three prominent slope categories constituting almost 80% of the entire area. These are level to nearly level (25.08%), undulating to rolling (23.13%) and rolling to moderately steep (31.37%). These characterize the municipality of Buhi and Gubat where these prominent slopes cover 64.27% and 95.19% of the municipal land areas respectively (**Table 5**).

Table 5 **Slope Classes of Buhi, Camarines Sur and Gubat, Sorsogon**

| Class | Description | Percentage | |
|---|---|---|---|
| | | Buhi | Gubat |
| **0-3** | **Level to nearly level** | **15.80%** | **48.79%** |
| 3-8 | Gently sloping to undulating | 13.48% | 4.81% |
| **8-18** | **Undulating to rolling** | **19.76%** | **25.23%** |
| **18-30** | **Rolling to moderately steep** | **28.71%** | **21.17%** |
| 30-50 | Steep | 13.85% | 0.00% |
| > 50 | Very steep | 0.22% | 0.00% |
| Water | Water | 8.18% | 0.00% |
| | Total | 100.00% | 100.00% |

On the other hand, the prominent slopes of Guinobatan are slightly different from the two other municipalities. Comprising 86.99% of its surface are the following slope classes: gently sloping to undulating (18.36%), undulating to rolling (24.41%), and rolling to moderately steep (44.22%)(**Table 6**). This indicates that the municipality is well drained.

Table 6 **Slope classes of Guinobatan, Albay.**

| Class | Description | Percentage |
|---|---|---|
| | | |
| 0-3 | Level to nearly level | 10.64% |
| **3-8** | **Gently sloping to undulating** | **18.36%** |
| **8-18** | **Undulating to rolling** | **24.41%** |
| **18-30** | **Rolling to moderately steep** | **44.22%** |
| 30-50 | Steep | 1.26% |
| > 50 | Very steep | 0.61% |
| Water | Water | 0.50% |
| | Total | 100.00% |

### 3.3 Soil Characteristics

Clay, clay loam, silty clay loam and sandy clay loam are the prominent soil types in the pilot sites. The soil of Buhi is generally clay loam (85.71%). In Guinobatan 91.12% of soil is clayey with majority of the area having clay loam (56.51%) and Clay (34.61%). The soil type of Gubat, being a coastal municipality, is dominated by silty clay loam (58.68%) and sandy clay loam (30.03%), which comprises 88.71% of the municipality (**Table 7**).

Table 7 **Soil characteristics in the pilot areas**

| Type | Percentage | | |
|---|---|---|---|
| | Buhi | Guinobatan | Gubat |
| Loam | | 2.02% | |
| **Clay** | | **34.61%** | 2.36% |
| **Clay Loam** | **85.71%** | **56.51%** | |
| Gravelly Clay Loam | | 0.20% | |
| Silt Loam | 12.19% | | |
| **Silty Clay Loam** | | | **58.68%** |
| **Sandy Clay Loam** | | | **30.03%** |
| Hydrosol | | | 6.78% |
| Beach Sand | | | 2.15% |
| Undifferentiated | 2.10% | 6.66% | |
| Total | 100.00% | 100.00% | 100.00% |
| % of Prominent Soil | **85.71%** | **91.12%** | **88.71%** |

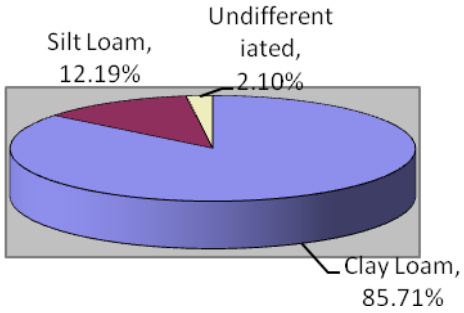



**Figure 3 Soil characteristics of Buhi, Camarines Sur**

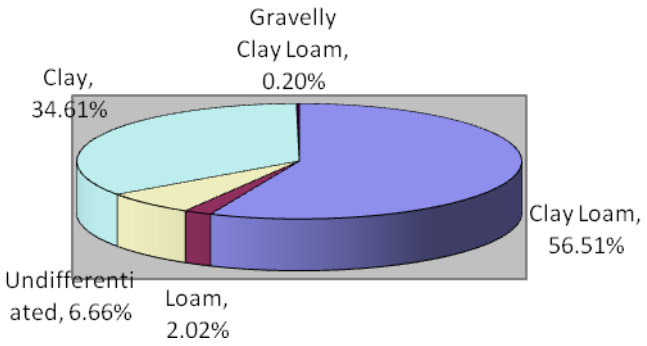



**Figure 4 Soil characteristics of Guinobatan, Albay**

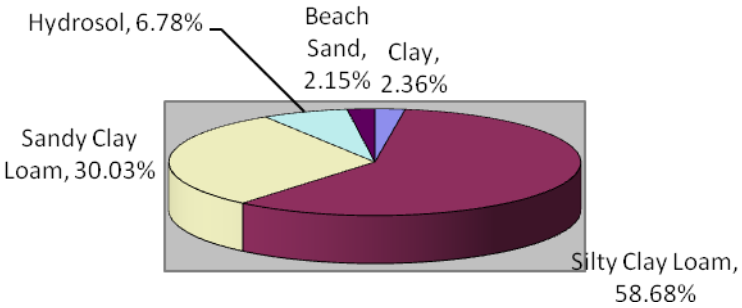



**Figure 5 Soil characteristics of Gubat, Sorsogon**

### 3.4 Land Cover and Land Use

**Table 8** describes the major land cover of the Pilot Areas. The major land cover of Buhi includes crop land mixed with coconut plantation (35.31%), cultivated area mixed with brush land/grassland (24.00%), and arable land planted mainly for cereals (rice and corn), sugarcane, vegetables and other field crops (22.90%).

**Table 8** Land use of the pilot areas.

| Land Use | Percentage | | | % of Total |
|---|---|---|---|---|
| | Buhi | Guinobatan | Gubat | |
| Open canopy, mature trees covering < 50 percent | 4.49% | | | |
| Arable land, crops mainly cereals and sugarcane | 22.90% | 6.47% | | 9.79% |
| Coconut plantations | 6.44% | 30.11% | 70.66% | 35.74% |
| Crop land mixed with coconut plantation | 35.31% | 5.50% | 13.87% | 18.23% |
| Cultivated area mixed with brush land/grassland | 24.00% | 57.37% | 5.37% | 28.91% |
| Grassland, grass covering > 70 percent | | 0.21% | | |
| Other barren land | | 0.35% | | |
| Fishponds derived from mangrove | | | 1.34% | |
| Mangrove vegetation | | | 6.67% | |
| Coral Reef | | | 2.10% | |
| Lake | 6.86% | | | |
| Total | 100.00% | 100.00% | 100.00% | 92.66% |
| % Prominent Land Use | 82.22% | 87.48% | 84.53% | |

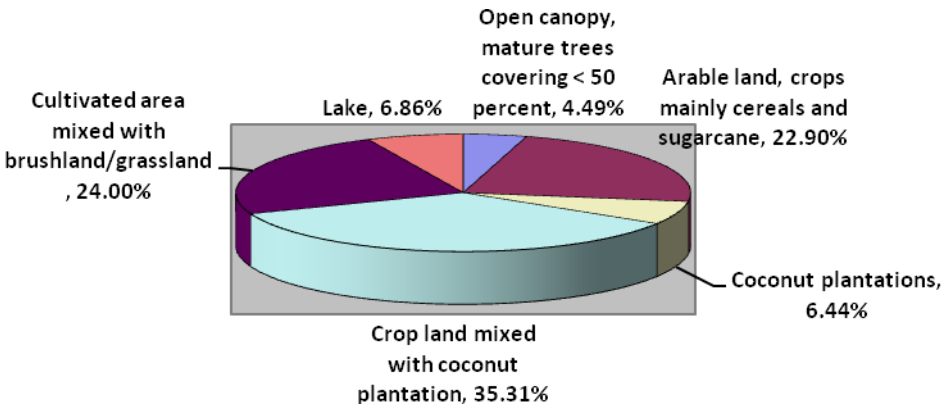



**Figure 6 Land use of Buhi, Camarines Sur**

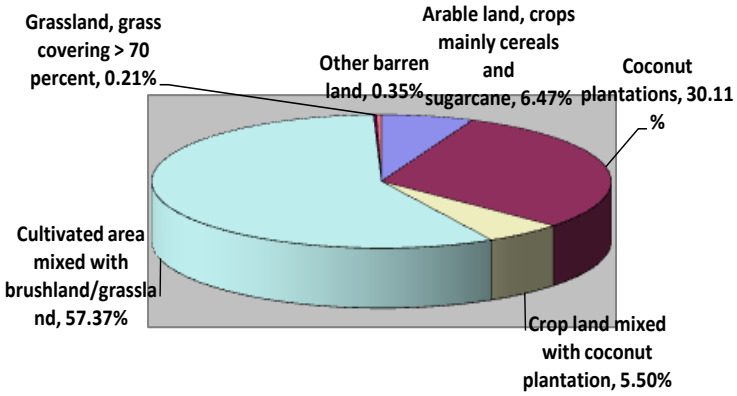



**Figure 7 Land use of Guinobatan, Albay**

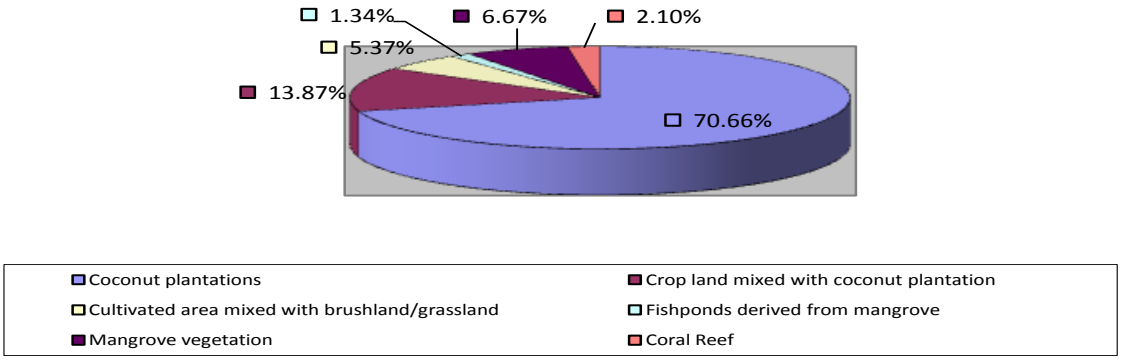



**Figure 8 Land use of Gubat, Sorsogon**

These prominent land covers consist 82.22% of Buhi. In Guinobatan, cultivated area mixed with brush land/grassland constitute majority (57.37%) of land cover, followed by coconut plantations (30.11%) with an aggregate area of 87.47%. Gubat's land cover is dominated by coconut plantations (70.66%) with small portion of crop land mixed with coconut (13.87%) representing 84.53% of the municipality. Overall, these prominent land covers constitute 92.66% of the entire Pilot Sites.

## 3.5 Climatic Parameters

Data from the nearest PAGASA stations were used to describe the climatic conditions in the pilot sites. Climate description covers surface temperature, rainfall pattern and typhoon occurrence.

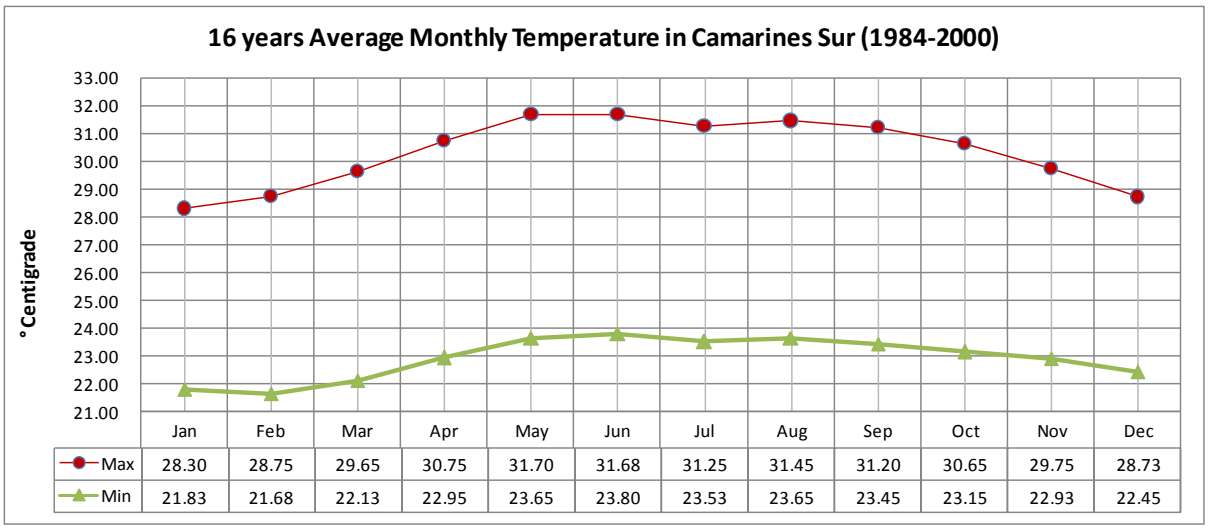
Sources of information on surface temperature include the 16 years (1984-2000) data from CSSAC/CBSUA PAGASA agro-meteorological station located in the Province of Camarines Sur, the 35 years (1965-2000) data from Legazpi City PAGASA agromet station for Albay and the 35 years (1965-2000) data from Catarman, Samar PAGASA agromet station for the province of Sorsogon.

To describe the latest rainfall trend in the Pilot Barangays, the eight (8) years (2001-2008) data from the same PAGASA stations were used.

Analyses of typhoon trends were based on the uploaded data from the PAGASA and Typhoon2000.com websites.

### *3.5.1* Surface Temperature

Annually, the highest average surface temperature in the province of Camarines Sur is 31.70°C recorded in the month of May. The lowest was recorded in the month of February at 21.68°C. During the dry season (Dec-Apr), the highest average surface temperature in the province is 30.75°C and the lowest is 21.68°C while in the wet season, highest average is 31.70°C and the lowest is 22.93°C (**Figure 9**).




| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max | 28.30 | 28.75 | 29.65 | 30.75 | 31.70 | 31.68 | 31.25 | 31.45 | 31.20 | 30.65 | 29.75 | 28.73 |
| Min | 21.83 | 21.68 | 22.13 | 22.95 | 23.65 | 23.80 | 23.53 | 23.65 | 23.45 | 23.15 | 22.93 | 22.45 |

Figure 9 **Average monthly maximum and minimum temperatures in Camarines Sur**

For the province of Albay, the highest and lowest recorded average surface temperatures for the period covered were 32.40°C in May and 22.30°C in February, respectively. Highest and lowest average temperatures during the dry season (Dec-Apr), were 31.30°C and 22.30°C, while during the wet season, these were recorded at 32.40°C and 23.40°C respectively (**Figure 10**).

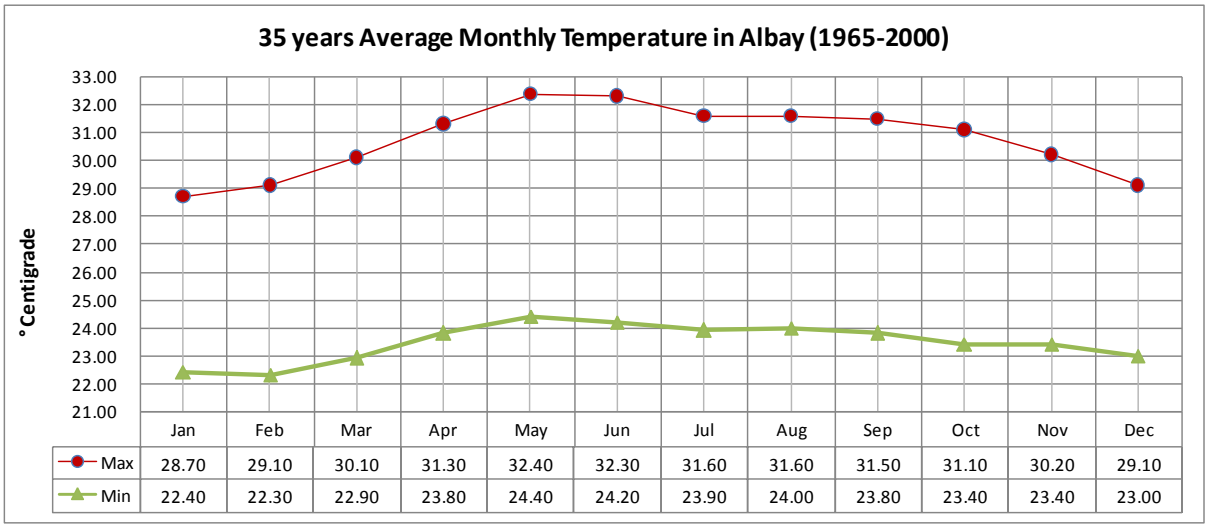



Figure 10 **Average monthly maximum and minimum surface temperatures in Albay**

In Sorsogon, recorded maximum average temperatures were almost the same with that of Albay at 32.60°C in the months of May, June and August. The lowest recorded average surface temperature was 21.9°C in February to March (**Figure 11**).

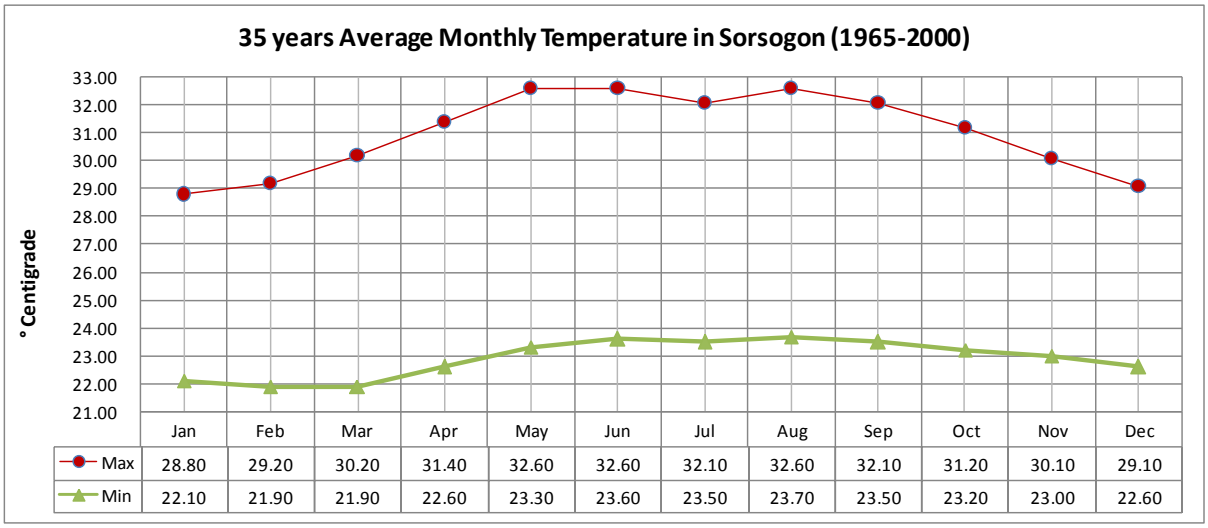



Figure 11 **Average monthly maximum and minimum surface temperatures in Sorsogon**

Comparing the average surface temperatures in the three provinces covered by the project, it can be noted that the coolest province is Camarines Sur.

### *3.5.2* Rainfall Pattern

#### 3.5.2.1 Number of Rainy Days/Month

The number of rainy days is crucial in crop production as this is an indicator of how the amount of rainfall is spread in a month affecting crop growth and yield. In the province of Camarines Sur, the highest and lowest number of rainy days recorded in a month was 15 and 10; 26 and 14 in Albay; and 22 and 12 in Sorsogon, respectively (**Table 9**). It can be noted from the table that there were more rainy days recorded during the dry season, which made the region green even during dry months.

Table 9 **Number of rainy days in the pilot sites.**

| Province | No. of Years Recorded | Average Number of Rainy Days per Month | | | | | |
|---|---|---|---|---|---|---|---|
| | | Monthly Average | | Dry Season | | Wet Season | |
| | | High | Low | High | Low | High | Low |
| Camarines Sur | 16 | 15 | 10 | 15 | 10 | 13 | 12 |
| Albay | 35 | 26 | 14 | 26 | 15 | 24 | 16 |
| Sorsogon | 35 | 22 | 12 | 22 | 13 | 18 | 13 |

#### 3.5.2.2 Amount of Rainfall

The amount of rainfall is also very important in crop production especially in areas where irrigation facilities are not sufficient.

**Figure 12** shows a graph of the 16 years (1984-2000) average monthly rainfall in the province of Camarines Sur. The highest amount recorded was during the month of November with 305.95 mm and the lowest during the month of March with 50.09 mm. The figure also reveals that from the month of January to April, the province received less than 100.00 mm of rainfall, which means that within the dry season it was only during the month of December that the province received sufficient amount of rainfall with an average of 217mm per month.

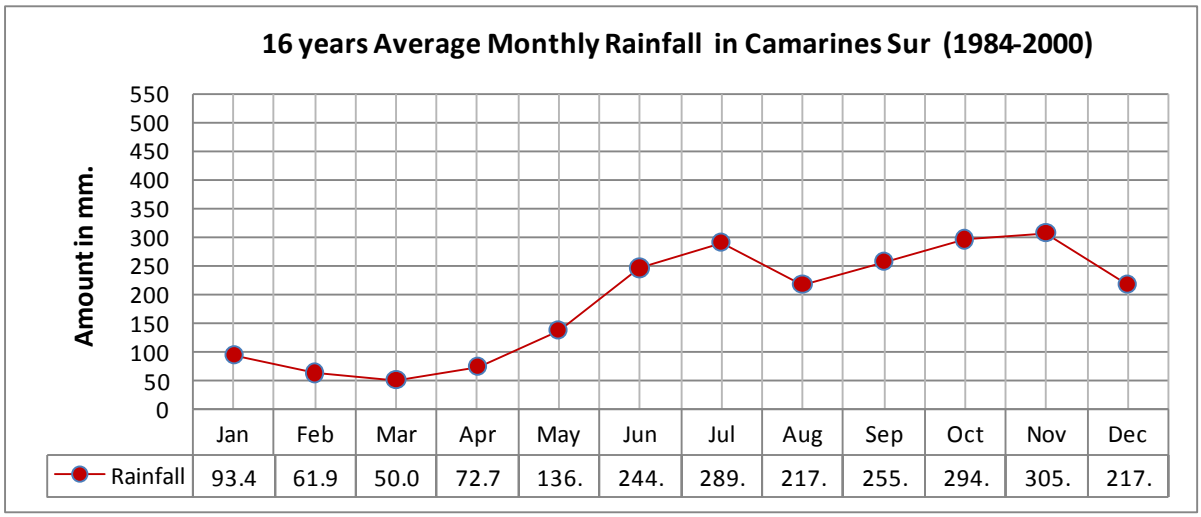



Figure 12 **Average monthly rainfall in Camarines Sur**

**Figure 13** shows a graph of the 35 years (1965-2000) average monthly rainfall in Albay, which is more than 100.00 mm year round. The highest amount of rainfall was experienced in December (515.60 mm) and the lowest in the month of April (146.80 mm). The figure also reveals that Albay province received more than 200.00 mm of monthly rainfall from June to January.

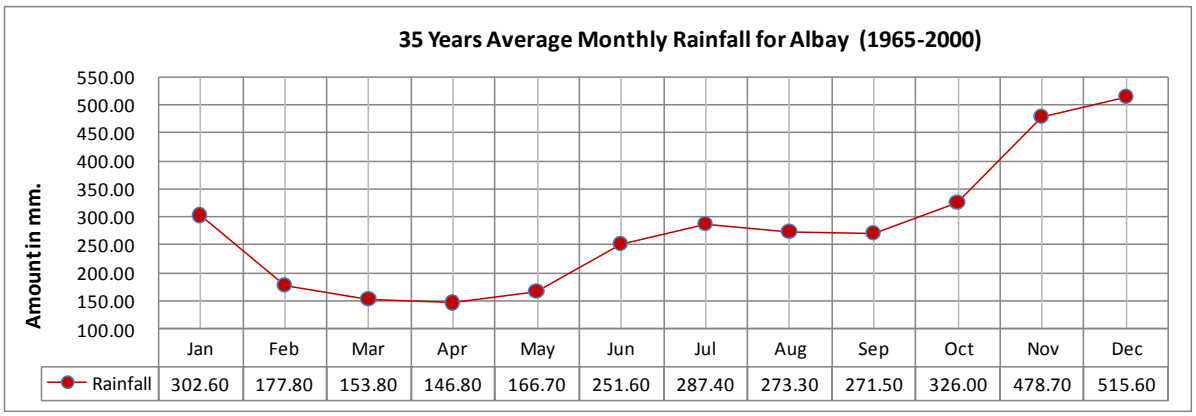



Figure 13 **Average monthly rainfall in Albay.**

**Figure 14** shows a graph of the 35 years (1965-2000) average monthly rainfall in Sorsogon indicating similar pattern with that of Albay. The highest amount falls in December (539.20 mm) and the lowest in the month of April (134.80 mm). The figure also reveals that Sorsogon starts receiving more than 200.00 mm of rainfall from September to February.

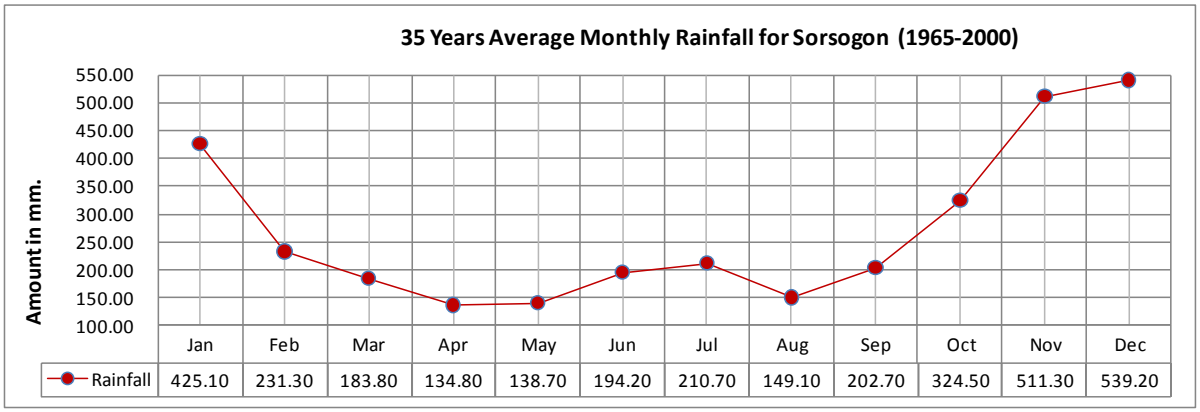
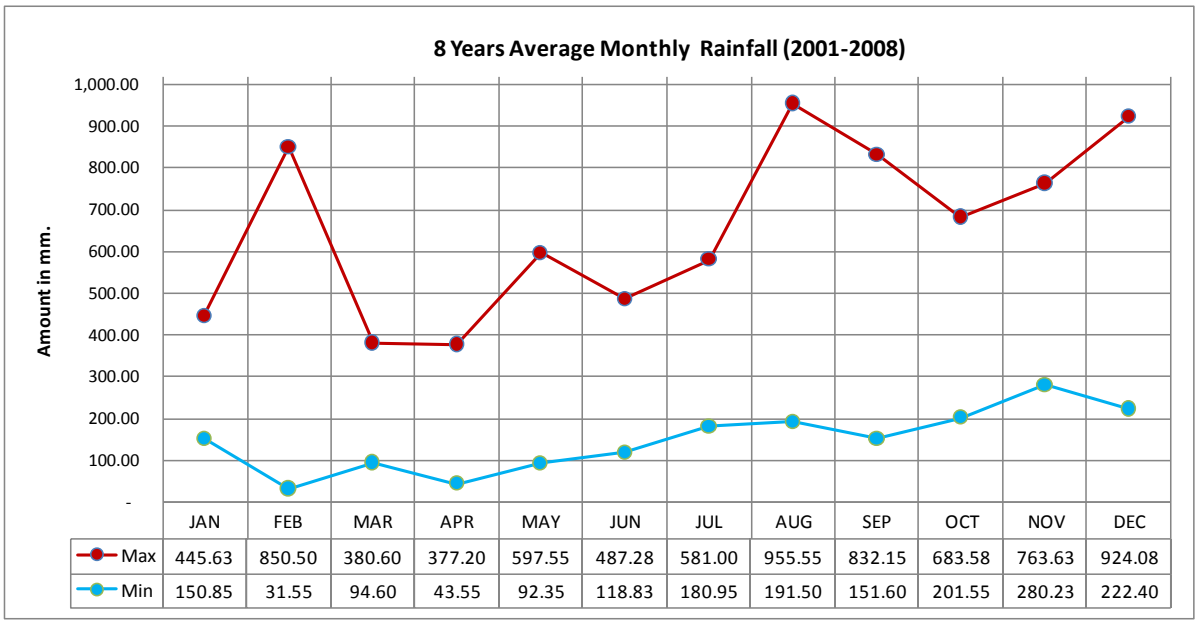



Figure 14 **Average monthly rainfall in Sorsogon**

**Figure 15** shows the 8 years (2001-2008) average maximum and minimum monthly rainfall in the three pilot sites. During this period the peak amount of rainfall in all municipalities studied was observed during the months of August (955.55 mm), December (924.08 mm) and February (850.50 mm). The amount of rainfall was also lowest in the months of February (31.55 mm) and April (43.55 mm). It is important to note that between February to May, the amount of rainfall was below 100 mm.




| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Max | 445.63 | 850.50 | 380.60 | 377.20 | 597.55 | 487.28 | 581.00 | 955.55 | 832.15 | 683.58 | 763.63 | 924.08 |
| Min | 150.85 | 31.55 | 94.60 | 43.55 | 92.35 | 118.83 | 180.95 | 191.50 | 151.60 | 201.55 | 280.23 | 222.40 |

Figure 15 **Average monthly rainfall in the three pilot sites.**

### *3.5.3* Typhoon Pattern and Occurrence

The graph **(Figure 16)** below shows the cumulative number of weather disturbances that had either landed or crossed the country within the past 5 years (2005-2009).

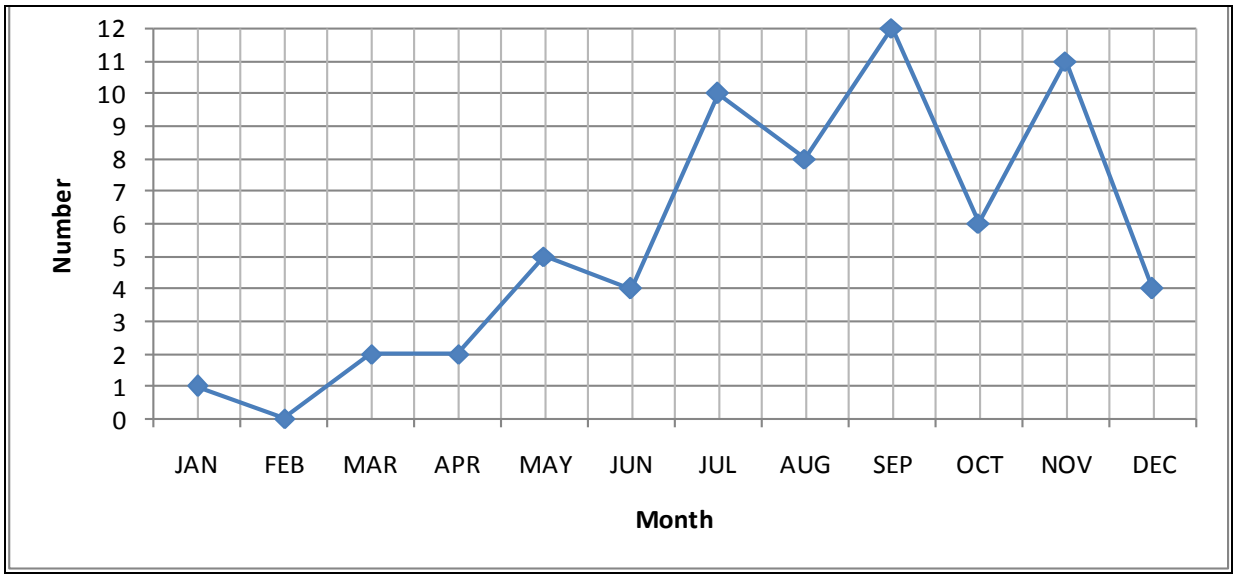



**Figure 16 Cumulative number of Tropical Cyclones or Weather Disturbance that had either landed or crossed the Philippines for the past five years (2005-2009)**

The ten (10) most intense typhoons that affected the Bicol Region occurred from 1988 to 2006. Half of these occurred during the months of October and November. The typhoons

with the highest wind speed (more than 200 km/hr) were experienced in the Bicol Region during the months of October and November. The most intense typhoon ever recorded that affected the Bicol Region was super typhoon Reming (Durian) in the year 2006 with wind speeds of up to 320 km/hour.

Table 10 **Ten most intense typhoons that landed in the Bicol Region since 1988.**

| Category / Name (Local/Int'l) | | Year | Inclusive Dates | Highest Wind Speed Recorded in km/hr |
|---|---|---|---|---|
| 1. | STY REMING (Durian) | 2006 | Nov. 26 - Dec. 1, 2006 | 320 |
| 2. | STY ROSING (Angela) | 1995 | Oct. 30 - Nov. 4, 1995 | 260 |
| 3. | STY LOLENG (Babs) | 1998 | Oct. 15 - 24, 1998 | 250 |
| 4. | TY UNSANG (Ruby) | 1988 | Oct. 21 - 26, 1988 | 215 |
| 5. | STY DINDO (Nida) | 2004 | May 13 - 19, 2004 | 185 |
| 6. | TY MILENYO (Xangsane) | 2006 | Sep. 25 - 30, 2006 | 180 |
| 7. | TY YONING (Skip) | 1988 | Nov. 03 - 12, 1988 | 175 |
| 8. | TY MONANG (Lola) | 1993 | Dec. 02 - 07, 1993 | 170 |
| 9. | TY UNDING (Muifa) | 2004 | Nov. 14 - 21, 2004 | 130 |
| 10. | TY SALING (Dan) | 1989 | Oct. 06 - 13, 1989 | 120 |

## 3.6 Key features in Agriculture

A major part of the land in the pilot areas (3,964.18 hectares or 77.53%) is devoted to Agriculture (**Table 11**). Almost half (41.86%) is devoted to coconut production and about one fourth (24.82%) to rice production. In terms of area devoted to agriculture across pilot sites, Barangay Masarawag in Guinobatan is the largest with 796 hectares of agriculture land, of which 64.89% is devoted to coconut production; Barangay Igbac in Buhi is next with 711 hectares of agricultural land, of which 70.32% is devoted to coconut production; and Barangay Bagacay in Gubat Sorsogon has the highest agricultural area in the municipality measuring 450.3 hectares, of which 68.51 % is utilized for coconut production. The largest area for rice production is in Barangay Mauraro covering 445.61 ha followed by Masarawag with 222.75 ha, Igbac with 200 ha and Bagacay with 127 ha.

Table 11 **Areas devoted to agriculture in the pilot sites.**

| Municipality/ Barangay | Total Land Area | Total Area Devoted to Agriculture | % of Agricultural Area (AA) | Area Devoted to Rice Production | % of AA devoted to Rice Prodn | Area Devoted to Coconut Production | % of AA devoted to Coconut Prodn |
|---|---|---|---|---|---|---|---|
| **Buhi, Cam. Sur** | | | | | | | |
| Igbac | 824.50 | 711.00 | 86.23% | 200.00 | 28.13% | 500.00 | 70.32% |
| San Buenaventura | 32.98 | 14.00 | 42.45% | 10.00 | **71.43%** | 1.00 | 7.14% |
| San Ramon | 468.00 | 423.50 | **90.49%** | 10.00 | 2.36% | 400.00 | **94.45%** |
| **Guinobatan, Albay** | | | | | | | |
| Masarawag | 859.00 | 796.00 | **92.67%** | 222.75 | 27.98% | 516.50 | 64.89% |
| Mauraro | 655.00 | 562.00 | 85.80% | 445.61 | **79.29%** | 110.39 | 19.64% |
| Minto | 869.00 | 400.50 | 46.09% | 0.50 | 0.12% | 400.00 | **99.88%** |
| **Gubat, Sorsogon** | | | | | | | |
| Ariman | 238.72 | 225.53 | **94.47%** | 98.32 | **43.60%** | 88.00 | 39.02% |
| Rizal | 584.46 | 381.35 | 65.25% | 89.35 | 23.43% | 236.00 | 61.89% |
| Bagacay | 581.54 | 450.30 | 77.43% | 127.45 | 28.30% | 308.52 | **68.51%** |
| TOTAL | 5,113.20 | 3,964.18 | **77.53%** | 983.98 | **24.82%** | 1,659.41 | **41.86%** |

In terms of percentages, the barangays where most of the lands are devoted to agriculture include Ariman (94.47%), Masarawag (92.67%) and San Ramon (90.49%). Barangay Mauraro of Albay has the highest (79.29%) percentage of agricultural area devoted to rice production while Minto has the largest (99.88%) percentage area devoted to coconut production.

## 3.7 Key features in Fisheries (from the assessment report of Dr. Plutomeo Nieves)

Bicol has 94 coastal municipalities with 1,067 coastal barangays and a coastline that measures 3,116.1 kilometers. It has four major fishing grounds: the San Miguel Bay, Ragay

Gulf, Lagonoy Gulf and Sorsogon Bay measuring a total of 1,666.28 square kilometers. For commercial fisheries, BFAR has recorded a total of 1,264 licensed fishermen; 139 licensed gears; 250 operators and 389 fishing vessels. The municipal fisheries' profile has recorded 102,058 fishermen; 20,678 motorized banca, 32,045 non-motorized banca. The fishing gears commonly used include: bagnets, purse seine, Danish seine trawl and ring net (Bicol Agricultural Profile 2010). Meanwhile the fisheries production of the region for 2009 BAS data totaled 273,563.45 metric tons or 3.98% change over that of 2008; 65,364.23 for commercial fisheries; 139,165.3 for municipal fisheries and 69,033.88 for aquaculture(Bicol Agricultural Profile 2010).

Fish is a very important food item in the diet of Bicolanos because Bicol Region is surrounded by the fish habitat and fisheries is of paramount importance to its economy. The fishing industry has contributed to livelihood, employment and income of the people benefiting from it. However, resource management and conservation is not well known among the Bicolanos, particularly those in extreme poverty.

As in most other areas in the Philippines, fishing in Bicol Region is characterized by declining fish catch and higher fishing efforts. This was confirmed by NSCB (2005) that reported a drop of 3.5% in fish production in 2004. In 1995, similar observation was reported (Soliman, et al., 1995 and 1999) that 12 out of 15 major commercially important species are heavily exploited (Soliman et al., 1999). Furthermore, the Lagonoy Gulf-Resource and Ecological Assessment report reveals that 4 out of 7 species cited was found highly exploited largely with the use of gill net (Soliman et al., 1995). Record of fish extraction showed a 20mt/km2 /yr level (Soliman, et al., 1997) in San Miguel Island and 9.3mt/km2 /yr in the entire gulf (Soliman, et al., 1995). In addition, the observed appearance of less preferred species and disappearance of large economically important species indicates symptoms of ecosystem overfishing. This situation might even be worse than expected as the population might double over the next 10 years without effective gulf-wide management in place. Despite this sad reality, agriculture, fishery and forestry sectors absorbed 40.3% of the total employed persons in 2004 (NSCB, 2005).

Fishing operations are seasonal as they are affected by the southwest monsoon (November to March) and northeast monsoon (June to October). Fishing is generally good from April to May. Fisheries in the areas is characteristically multi-species, hence fishing utilizes multi-gear predominantly gill-net (palutang, pangki, palundag, and largarete), bag nets, seine nets and hand lines for catching tunas, small pelagic, large demersal and coral reef fishes. Tuna and tuna-like fishes, grouper, round scads, coral fishes, siganids, rabbit fish, anchovy, snapper, parrot fish, mackerel, mullet, big eyed scads, cobia, and sardinella, are the most frequently caught fish. Other marine products harvested by gleaning during low tide include sea cucumber, crabs, squids, cuttlefish, octopus and other economically important invertebrate species.

The major fishing grounds are Lagonoy Gulf in Albay, San Miguel Bay and Ragay in Camarines Sur, Sorsogon Bay, and Asid Gulf in Masbate.

In the aquaculture sector, the most important cultured species in the region are milkfish (Chanos chanos), tilapia (mainly Oreochromis niloticus and their hybrids), tiger shrimp (Penaeus monodon), mudcrab (Scylla serrata), and green mussel (Perna viridis). Seaweed farming (Kappaphycus and Eucheuma) is also very popular in most coastal areas. Minor

cultured species include catfish (Clarias gariepinus and C. batrachus) and carps (Cyprinus carpio and Aristhyctis nobilis).

Various types of farming systems are used, with the dominant culture system being brackish water pond culture. In freshwater, tilapia fish cage farming is the most popular with Lakes Buhi and Bato in Camarines Sur as the main farming area. Recently, however, mariculture has been promoted by the Bureau of Fisheries and Aquatic Resources (BFAR).

## 4. SPECIFIC DESCRIPTION OF PILOT AREAS

Primary and secondary data were gathered from a number of sources and used to describe specific features like location, population, socio- economic condition, hazards and risks of the municipalities and barangays of the pilot areas.

For the purpose of this study, the following headings and sub-headings were also used in the narrative presentation.

1. General location and description of the Municipality
2. Specific description of the barangays in terms of:
    a. Location and accessibility
    b. Land, Agricultural and Fishery Practices
    c. Socio-Economic Features including livelihood groupings and gender roles
    d. Hazards and Threats

Maps, Tables, Images and Photo-Documentation were also included in the description to supplement the textual presentations.

## 4.1 The Municipality of Buhi

Buhi is located in the southwestern tip of the province of Camarines Sur. It is bounded on the east by Mt. Malinao, on the west by Mt. Asog, on the north by Sagñay-Buhi mountain ranges and on the south by the low-lying ranges of Polangui, Albay, with the following coordinates: 13 degrees 25' 32.4" north latitude and 123 degrees 30' 49.1" east longitude. The municipality is 75 kilometers and 53 kilometers away northeast of Legaspi City and south of Naga City, respectively.[1]

In general, Buhi has a mountainous and hilly surface. The area located south of the lake has gently rolling topography.[2] Mt. Malinao (5,538 ft.) and Mt. Asog (4,852 ft) dominate the town's surface terrain where the highest elevation is 1.143m and 1.584m above sea level respectively. The total land area of 18,378 hectares is within the watershed is declared as protected area by virtue of Presidential Proclamation No. 573 and Executive Order no. 224. All other areas are devoted to agriculture, quarry, and human settlement. Higher slopes in the east and north of Lake Buhi are predominantly forests and secondary brush land.[3]

According to the Guinness Book of World Records, Lake Buhi is home to the world's smallest edible fish locally known as "Sinarapan" (Mystychtis Luzonensis).[4]

Buhi as of 2000 records has a total population of 67,757, with 34,272 males and 33,485 females. With an annual growth rate of 1.8, the estimated population in 2010 is around 79,953. Its vulnerable group, ageing between 0-17 is estimated to be 38,152, which is 48% of the total population, while the older group ageing above 65 years is estimated to be around 3,489. Total household as of 2000 records is 13,238 giving an average family size of 5. Out of 13,238 households, 4,296 or 32% own at least 1 parcel of land and 2,926 or 22% own agricultural land. The literacy rate in Buhi is 91.7%.[5]

Three barangays of Buhi were selected for the project namely: Igbac, San Buenaventura, and San Ramon.

Based on the modified Corona's System of Climate Classification, the municipality of Buhi has two climatic types, Type 2[6] and 4[7] (**Figure 18**), and is characterized by two Agro-Ecological Zones (AEZ 2-Warm sub-Humid Tropics and AEZ 3-Warm Humid Tropics) based on FAO Classification (**Figure 19**).

[1] Buhi, Camarines Sur from Wikipedia, the free encyclopedia. (n.d.). Retrieved from http://en.wikipedia.org/wiki/Buhi,_Camarines_Sur
[2] Ibid.
[3] Ibid.
[4] Ibid.
[5] Buhi Municipal Profile, 2000
[6] Type 2 -characterized by the absence of a dry season but with a very pronounced maximum rain period from November to January
[7] Type 4 - characterized by a more or less even distribution of rainfall throughout the year

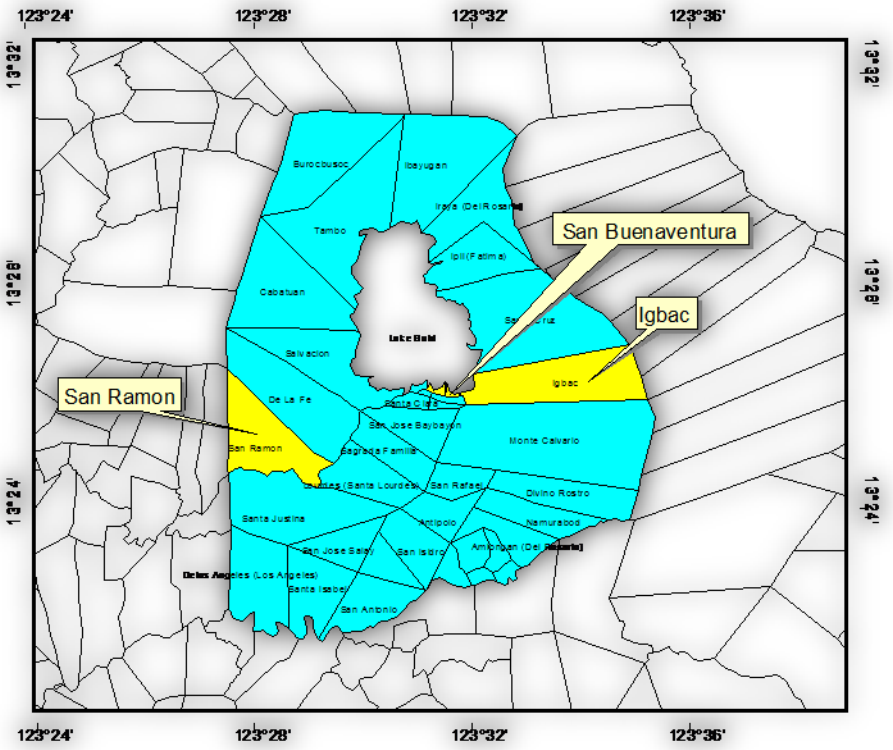



Figure 17 **Map of Buhi, Camarines Sur**

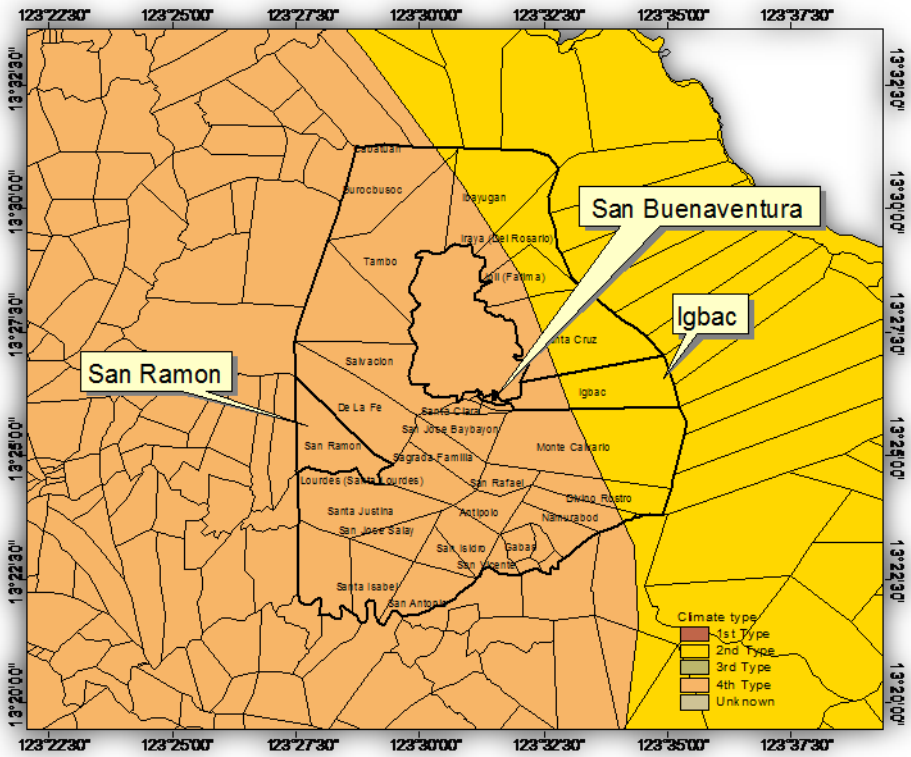



Figure 18 **Climate Map of Buhi, Camarines Sur**

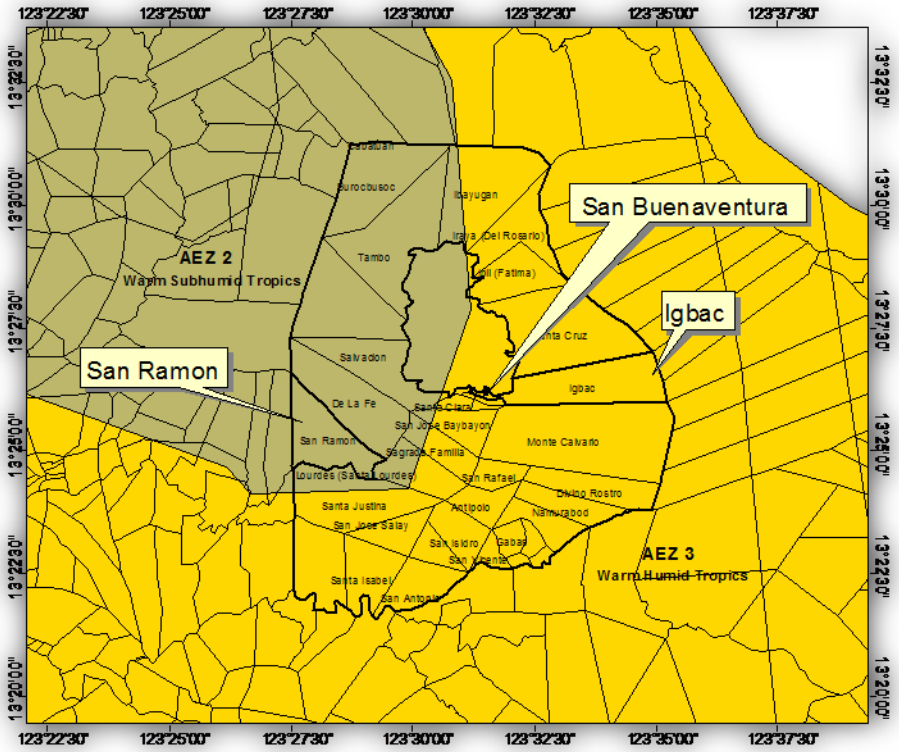



Figure 19 **Map showing the agro-ecological zone (AEZ) of Buhi, Camarines Sur**

### *4.1.1* Barangay Igbac

#### 4.1.1.1 Location and Accessibility

Barangay Igbac is one of the mountainous barangays of Buhi located on its eastern portion. It is approximately 7 kilometers from the town proper and is accessible by any means of land transportation. (**Figure 20**)

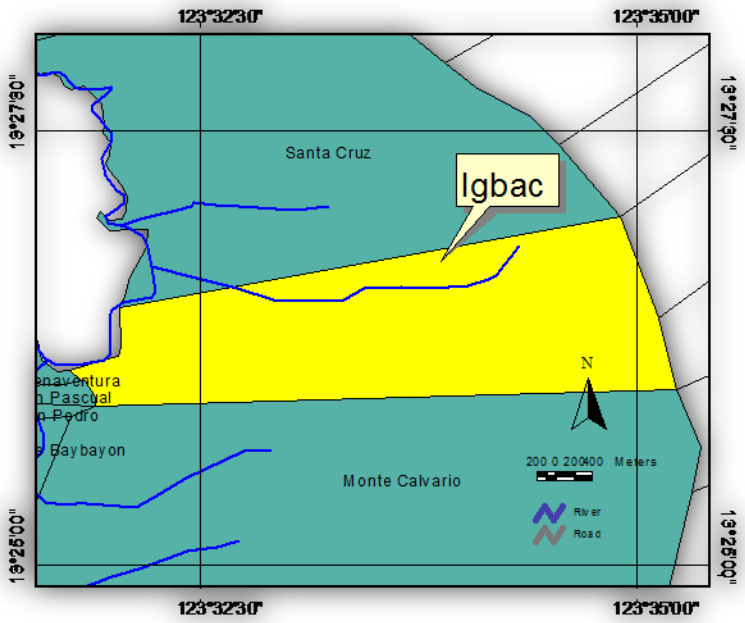



Figure 20 **Map of Barangay Igbac**

#### 4.1.1.2 Land and Agricultural Practice

The total land area of Barangay Igbac is 824.50 hectares and around 86.23% of which is devoted to agriculture. Clay Loam (locally known as Tigaon series) is the prominent soil type of the barangay. The general terrain is rolling to steep slope, hence it is highly prone to severe erosion and landslide.

The upland area which comprises majority of its land area is planted to coconut trees (Cocus nucifera) with understorey vegetation like banana (Musa sp), abaca (Musa textiles) and sporadically scattered fruit trees like guava, avocado and bread fruit. Some other understorey vegetation includes anahaw (Livistona rotundifolia), and rootcrops like upland gabi (Colocasia esculenta) and sweet potato (Ipomea batatas). Open sloping areas are usually utilized for the cultivation of rainfed upland rice (Oryza sativa). Flat areas on the other hand are mostly irrigated hence devoted to rice, which is grown as monocrop and corn (Zea maize) which is grown alternately with peanuts and sweet potato. (**Table 12** and **Figure 21**).

Table 12 **Production calendar of major agricultural crops in Barangay Igbac (Source: PRA Sessions)**

| Major Crops | Month | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | J | F | M | A | M | J | J | A | S | O | N | D |
| | Dry | | | | | Wet | | | | | Dry | |
| **Rice-Upland** | | | | | ■ | ■ | ■ | ■ | ■ | ■ | | |
| **Rice-TPR** | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| **Corn-Green** | | ■ | ■ | ■ | ■ | | | | ■ | ■ | ■ | ■ |
| **Coconut** | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| **Rootcrops** | ■ | ■ | ■ | ■ | | | | | | | ■ | ■ |
| **Vegetables** | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |

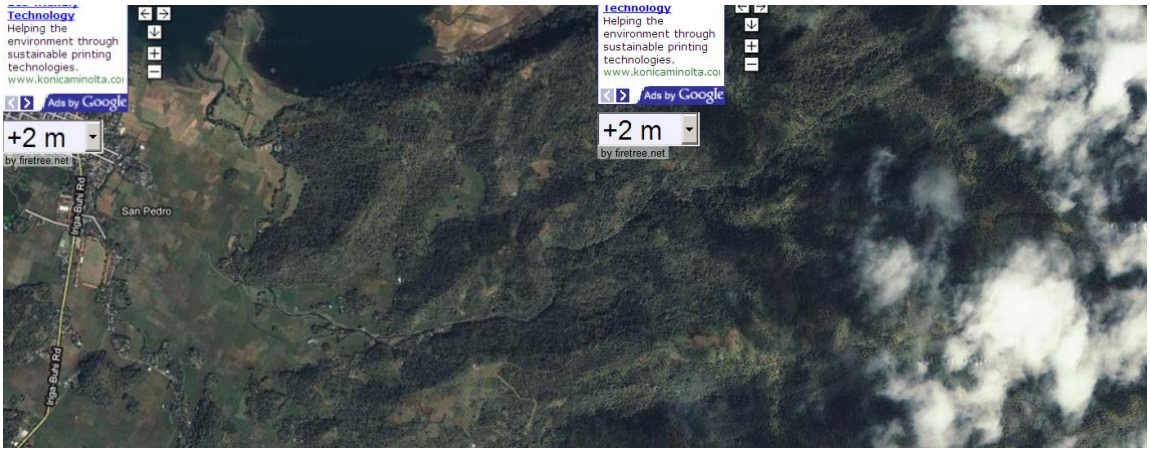



Figure 21 **Satellite photo of a portion of Barangay Igbac**[8]

Figure 22 **Picture showing coconut plantation with understorey crops in the upland areas of Igbac**

[8] Sea Level Rise Map (n.d.). Retrieved from http://www.quickprofiler.com/Sea_Level_Rise_Map/default.aspx

Figure 23 **Another picture showing coconut plantations with understorey crops of banana and some rootcrops in the upland areas of Igbac**

Figure 24 **Picture showing the rice fields with bananas along side the low-lying areas in Igbac**

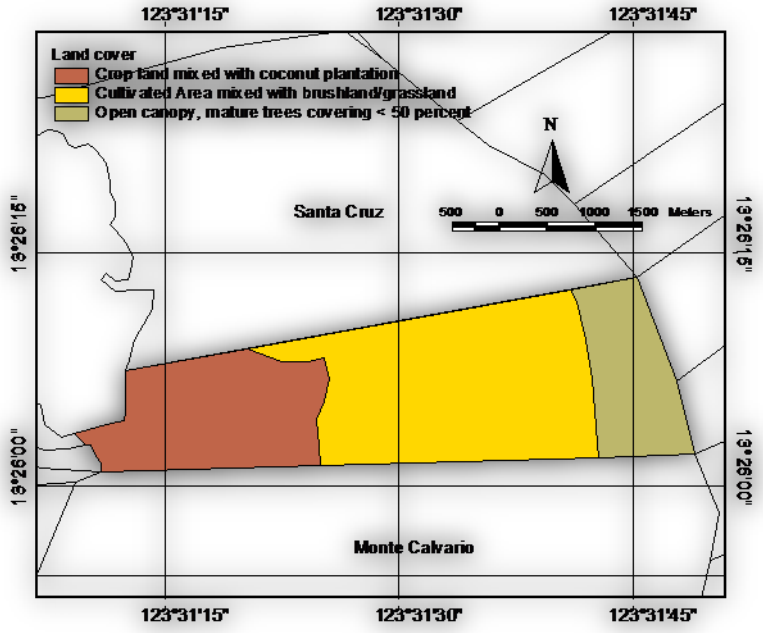



Figure 25 **Land cover map of Igbac**

In upland areas, farmers usually practice relay cropping during the dry season by planting root crops after harvesting rice. Application of chemical or inorganic fertilizer is a common practice in the area. Most of the farmers are tenants or stewards; hence they don't own the land they are cultivating.

#### 4.1.1.3 Socio-Economic Features

Igbac has 263 households with a total population of 1,547 as per 2009 records. It has 803 (51.9%) males and 744 (48.1%) females, around half of them (724 or 46.8%) are within the age range of 0-17 years; 74 or 4.8% are above 60 years old and 2 are differently able. Only 444 or 28% had the chance to study and of this number 255 or 57% reached only elementary level, 107 or 24% reached secondary level, 48 or 11% reached tertiary level and 32 or 7% attended vocational course. Its population density is barely 2 individuals per hectare of land. Majority of its constituents belong to the group of Indigenous People (IPs) locally called "Agta".

There are existing institutions, organizations and service providers in the barangay. There is a daycare center and elementary school; there are also organizations like the Barangay Agriculture and Fishery Council, Rural Improvement Club, Barangay Nutrition Scholars, Women's Organization, Farmers' Organization and the Sangguniang Barangay. Their modes of communication include cellular phone, radio, TV and newspaper.

Gender roles. In agriculture, gender roles are shared; both women and men take charge of animal production (carabao, cattle, swine, chicken and ducks), and crop production. Marketing of products is usually women's role.

Livelihood. Aside from producing rice, corn, and vegetables, people are also engaged in alternative means of livelihood. Some are into livestock and poultry raising (cow, carabao, goat, swine and poultry); others are into copra making; charcoal production; gathering and selling of minor forest products (MFPs[9]) like bamboo and firewood; spear fishing; and re-trading of agricultural produce.

An average family in Igbac earns a monthly income of Php 5000 (US$ 113) and below, an amount sufficient to cover non-food item expenses since most of the food items are readily available in their farms.

Out of the total population of 1547, 497 or 32% are engaged in various livelihood activities. The farmers represent the biggest group, followed by wage laborers, businessmen/traders; and the least are the fisher folks (**Table 13**).

Table 13 **Livelihood groupings in Barangay Igbac (Source: Result of KII)**

| Groups | Number | Percentage (%) |
|---|---|---|
| Farmers | 220 | 44.27 |
| Wage laborer | 157 | 31.59 |
| Business man/Trader | 50 | 10.06 |
| Service holder / Public and private employee | 20 | 4.02 |
| Fisher folks | 10 | 2.01 |
| Others | 40 | 8.05 |
| **Total** | **497** | 100 |

#### 4.1.1.4 Hazards and Threats

River swelling and flash flooding are the two common threats or hazards of Barangay Igbac and these usually result in destruction of agricultural areas near and along the river. Heavy rainfall from monsoon and typhoons caused these threats and hazards.

The barangay was also not spared from the drought caused by El Nino phenomenon during the early part of 2010 which was experienced throughout the country.

Being a mountain barangay, strong winds are the major hazard of Barangay Igbac. When typhoon Reming hit the country in 2006 most of the coconut trees in the barangay were damaged and it took more than two years for the crop to recover.

### *4.1.2* Barangay San Buenventura

#### 4.1.2.1 Location and Accessibility

Located on the southern portion of Lake Buhi, Barangay San Buenaventura is one of the smallest and the oldest lakeside barangay of the municipality. It is the center of commerce

[9] MFPs

of the municipality where most of the government offices are located and community services are available. (**Figure 26**)

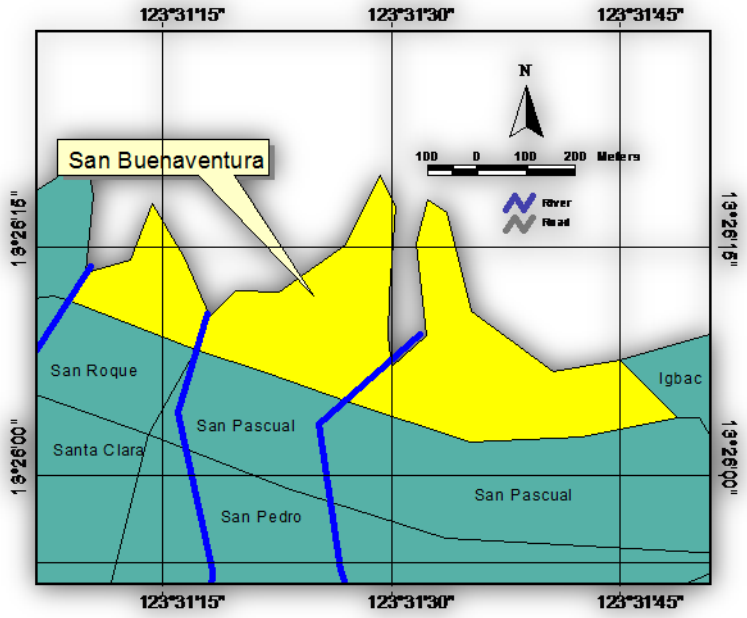



Figure 26 **Map of Barangay San Buenaventura**

#### 4.1.2.2 Land and Agricultural Practice

The total land area of San Buenaventura, commonly called San Buena is only 32.98 hectares and yet 42% of this is devoted to agriculture. Clay loam is the common soil type of the barangay and its terrain is generally flat. The agricultural area is mostly devoted to rice, corn and root crop production and these are located along the Siminlong River that bounds the Eastern portion of the barangay. (**Figures 27-31**)

Fish culture, which is the major source of livelihood of San Buena residents, is carried out through fish cages operation in the lake. Commercial feeding is a major practice in the culture of tilapia (Nilotica) in lake Buhi and this practice is believed to have polluted the lake, which is now classified as class E. Farmers, who are very few in number, were also observed to be quite used to applying inorganic inputs to sustain and increase their production.


Figure 27 **Satellite photo of a portion of Barangay San Buenaventura** [10]

**Figure 28** Picture showing the lakeside of San Buenaventura which is planted with rice during the rainy season

[10] Ibid.7.

**Figure 29** Picture showing an agricultural area in San Buenaventura which is usually flooded

Figure 30 **Another picture showing the prominent land cover and land use of San Buenaventura**

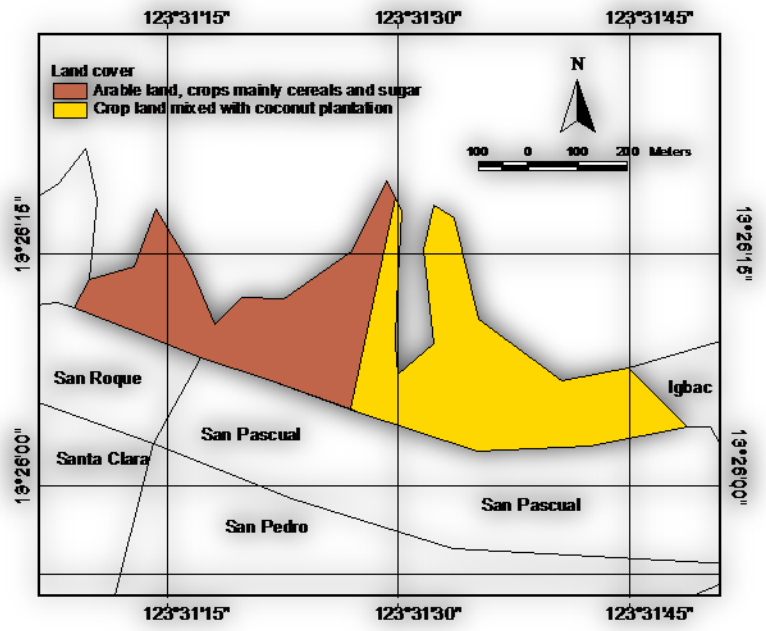



Figure 31 **Land cover map of San Buenaventura**

#### 4.1.2.3 Socio-Economic Features

With 450 households, San Buenaventura's total population as of 2009 estimate is 2,532. It has 1250 males and 1282 females. Vulnerable population include 856 (33.8%) children below the age of 17 years, 219 (8.6%) above 60 years old and 46 (1.8%) differently abled. Its population density is barely 2 individuals per hectare of land. Monthly average income is also very minimal, but sufficient to cover the average family expenses.

Access to education is made possible through the Barangay's partnership with the Department of Social Welfare and Development (DSWD). The barangay operates a Day Care Center through a locally hired, volunteer-teacher who is paid an honorarium by the barangay. The center offers a free half day pre-school education programme held at the ground floor of the new multi-purpose building. Non-formal education is also implemented by the Department of Education, offering an Alternative Learning System of education for the out-of-school youth in the Barangay. Classes are conducted only on weekends at the Day Care center. There are also secondary and tertiary schools in the barangay and a gymnasium, which can be used as evacuation centers.

For their health concerns, the barangay is covered by the Rural Health Unit 1 of Buhi. A midwife is the regular staff and is being assisted by five (5) Barangay Health Workers (BHW) and three (3) Barangay Nutrition Scholars (BNS). The BHW's and BNS's are paid an honorarium by the barangay. There is a 6-bed capacity hospital in the barangay. Residents also avail themselves of the services of alternative healers such as *albolario, paratambal, and parahilot*. Residents usually go to these healers first before going to the health center or Doctors.

Gender Roles. Productive roles, which include production of goods and services for consumption and trade (farming, fishing, animal production, etc), getting relief assistance like seeds and livestock are usually men's roles. Reproductive roles like caring of children and sick members of the family, maintenance of house, giving health education to the family and marketing are mainly women's role, while securing food, fetching water, cooking, giving first aid are shared roles; evacuating family and others, guarding the house, animals and other properties, and repairing the house after calamities are men's role.

Livelihood. Fishing and peddling of lake products like fresh tilapia (*Oreochromis niloticus niloticus*) are the major sources of livelihood of the families in the barangay. The upper class, however, have other opportunities such as service employment or going into business. Poor families who have no fish cage are the watchmen of big fish cage operators receiving a minimum of P 100.00 or US$ 2.3 for a whole day's work. Other types of livelihood include trading, buy-and-sell of food and beverage, small groceries, transport operation and other non-agriculture types of livelihood.

Majority of San Buenventura's population (50.64%) are engaged in some major livelihood activities with the wage laborers as the biggest group (287 or 36.33%). There are also more fisher folks than farmers in the barangay (**Table 14**).

Table 14 **Livelihood groupings in Barangay San Buenaventura (Source: Result of KII)**

| Groups | Number | Percentage (%) |
|---|---|---|
| 1. Wage laborer | 287 | 36.33 |
| 2. Service holder / Public and private employee | 166 | 21.01 |
| 3. Business man/Trader | 150 | 19.00 |
| 4. Fisher folks | 96 | 12.15 |
| 5. Farmers | 66 | 8.35 |
| 6. Others | 25 | 3.16 |
| **Total** | **790** | **100** |

#### 4.1.2.4 Hazards and Threats

Slow-onset, rapid-onset of floods and flash flooding are the main hazards of Barangay San Buenaventura. Flooding is naturally caused by heavy rainfall brought about by monsoon rains and typhoons. The situation is further aggravated by local policies that control the normal flow of flood water. Instead of draining fast, flood water is controlled in order not to cause secondary flooding in the downstream low lying municipalities.

The hazard affects not only the rice farmers, but also the other livelihood groups for it disrupts the normal economic activities along the lakeshore. Elementary schools had to temporarily close its operation and wait until the floodwater drains out. Flooding also leads to the emergence of water borne diseases putting families living in flooded areas at high risk.

Most recently, the whole municipality of Buhi suffered great loss in people's investments due to fish kills. Water hyacinth now covers 90% of the lake, and a report of Binoya, et.al.[11] in 2007 indicated that the lake is dying, thus threatening the main source of livelihood of residents of San Buenaventura and the whole of Buhi.

### *4.1.3* Barangay San Ramon

#### 4.1.3.1 Location and Accessibility

San Ramon is also one of the mountainous barangays of Buhi located on the south western portion of the municipality (**Figure 32**). It is around 8 kilometers away from the town proper and can be reached via any land transportation passing through a combination of cemented, asphalt and gravel road and a hanging cable bridge (**Figure 33**). The smallest fish in the world, Sinarapan (Mistichthys luzonensis), can also be found in its lakelets, the Manapao and Katugday lakes.

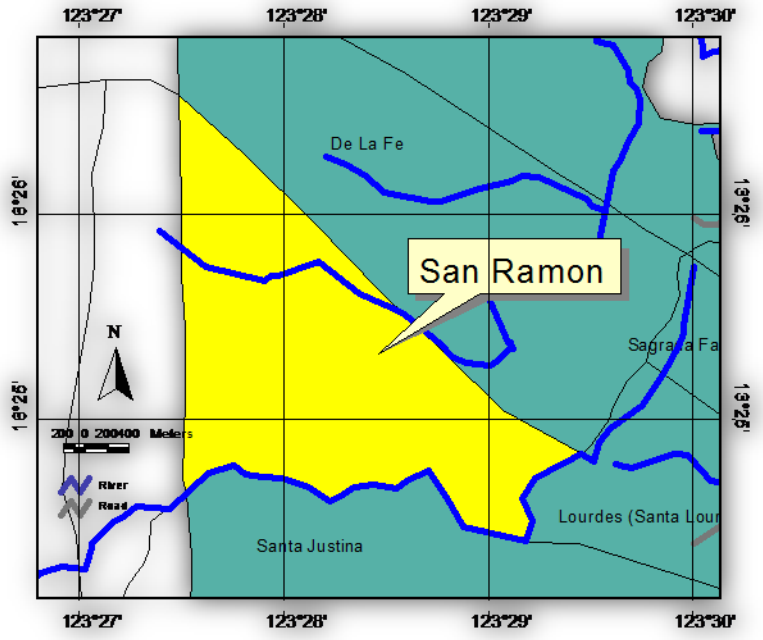



Figure 32 **Map of Barangay San Ramon**

[11] Binoya, Cely, Estralla, A, dela Trinidad,J. Llesol, C and Osea, G. 2007. Agroecosystem's Analysis for the Sustainable Development of Lake Buhi. SEARCA.

Figure 33 **Hanging bridge connecting San Ramon to the main access road.**

#### 4.1.3.2 Land and Agricultural Practice

The barangay has a total land area of 468 hectares and its terrain is generally mountainous and prone to erosion. Vegetative cover is good with sparsely scattered trees and fruits trees. A large portion (90%) of this area is planted with coconut trees, in combination with understorey crops like anahaw, banana, upland rice, sweet potato and cassava (Manihot esculenta).

The lowland agricultural area, however, is usually devoted to either rice or corn production. Other open areas are planted to backyard crops which include vegetables like okra (Abelmoschus esculentus), eggplant (Anum melongena L.), tomatoes (Lycopersicon esculentum), and pole sitao (Vigna unguiculata). Bamboo plants were also observed along the river side (**Table 15** and **Figures 34-37**).

Application of commercial “inorganic” fertilizers was observed to be a common practice of the farmers.

San Ramon is also known as the Sinarapan Sanctuary in the Municipality of Buhi because of Manapao Lake. There are two (2) other lakelets in San Ramon namely Kimat lake and Katugday lake also with Sinarapan. Barit River is also part of this barangay.

Table 15 **Production calendar of major agricultural crops in Barangay San Ramon (Source: PRA Sessions)**

| Major Crops | Month | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | J | F | M | A | M | J | J | A | S | O | N | D |
| | Dry | | | | | Wet | | | | | Dry | |
| **Rice** | | | | | | | | | | | | |
| **Corn-Green** | | | | | | | | | | | | |
| **Coconut** | | | | | | | | | | | | |
| **Vegetables** | | | | | | | | | | | | |

**Figure 34** Picture showing bamboo crop along riverbanks of San Ramon

**Figure 35** Picture showing the newly harvested rice fields in the low-lying areas of San Ramon

Figure 36 **Picture showing coconut plantations intercropped with vegetables and other field crops in the upland rainfed areas of San Ramon**

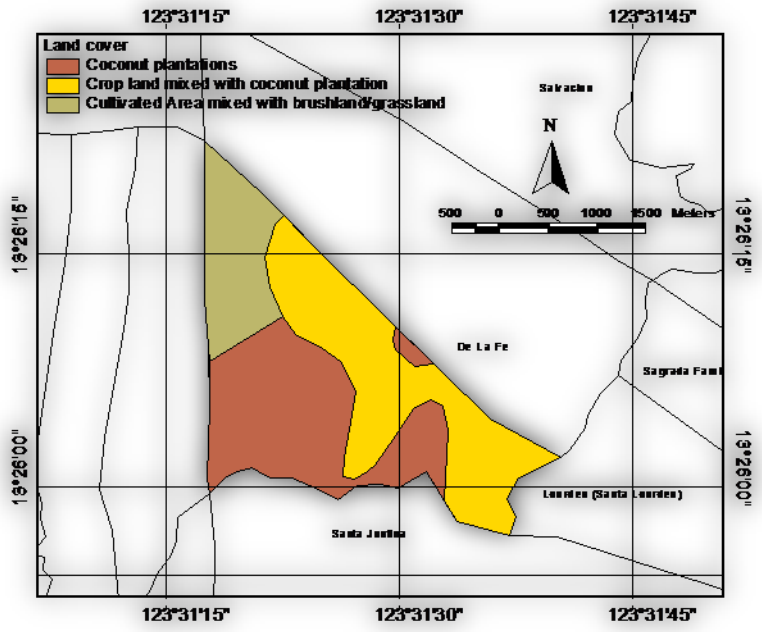



Figure 37 **Land Cover Map of Barangay San Ramon**

#### **4.1.3.3** Socio-Economic Features

San Ramon has a total population of 1,363 as of 2009 with 714 males and 649 females. The vulnerable groups consist of 646 (47.4%) children below 15 years old and 46 or 3.4% above 60 years old. There are 279 households with a mean family size of 4.88. Its population density is 3 individuals per hectare of land. Like in Igbac, majority of the residents are Indigenous People (IPs) locally called "Agta". The majority has temporary dwellings since

they don't live permanently in one place; they keep on moving from one place to another in search of food.

Barangay San Ramon has one elementary school, one Day Care Center, and one Kinder School. Due to poverty and compulsion for early employment, only 50% of school age children attend school. It has also a barangay hall and a police outpost.

Gender Roles. In agriculture and fisheries, roles are shared. Women usually take care of small ruminants (goat), swine and poultry. They also grow vegetables, upland rice and rootcrops. Men take care of large ruminants (carabao and cattle) and are engaged in lowland rice production and fishing. Reproductive roles like taking care of children and sick, cleaning and maintaining the house, washing, cooking, educating children on health, giving first aid and marketing are women's roles; fetching of water, collecting fuelwood, making evacuation plans, disseminating warnings, evacuating family members, watching over animals and properties and repairing house after calamity are men's roles. Findings imply that gender roles in the barangay are still highly stereotyped for women and men.

Livelihood. Majority (51%) of the population belongs to the major livelihood groupings. The farmers constitute the largest group representing 36% while the fisher folks consist of 16%; the service employees are the smallest group with only 4% (**Table 16**).

Table 16 **Livelihood groupings of Barangay San Ramon (Source: Result of KII)**

| Livelihood Groups | Number | Percentage (%) |
|---|---|---|
| 1. Farmers | 230 | 35.88 |
| 2. Wage laborer | 190 | 29.64 |
| 3. Fisher folks | 100 | 15.60 |
| 4. Business man/Trader | 66 | 10.30 |
| 5. Fuel wood gatherers and others | 30 | 4.68 |
| 6. Service holder / Public and private employee | 25 | 3.9 |
| **Total** | **641** | **100** |

#### 4.1.3.4 Hazards and Threats

Rapid-onset flooding or flash flooding is the main hazard of Barangay San Ramon, which usually results in secondary hazards like landslide and heavy erosion destroying crops planted in the low-lying areas.

Strong wind associated with a typhoon is the next major hazard in the area, and based on the experience of residents, the degree of damage due to disasters is enormous. Most of the coconut trees and other permanent crops became unproductive for more than a year after typhoon Reming hit the region in 2006.

## 4.2 Municipality of Guinobatan

Guinobatan is one of the municipalities of the province of Albay that lies at the foot of the famous Mayon Volcano, with its northern tip located on the mouth of Mayon. Guinobatan is bounded on the south by the mountain ranges of Pio-Duran, on the west by the City of Ligao and on the east by the municipalities of Camalig and Jovellar. It has the following coordinates: 13 degrees 19' 30.4" north latitude and 123 degrees 59' 45.1" east longitude. The municipality is 16 kilometers and 65 kilometers away northwest of Legaspi City and southeast of Naga City, respectively. Three barangays of the municipality were chosen for the study, namely Masarawag, Minto and Mauraro (**Figure 38**).

Guinobatan's population above five years old as of the 2000 census was 62,434 with 31,217 males and 31,217 females. With an annual growth rate of 1.8, the estimated population for this age group in 2010 is around 73,445. Its vulnerable group 10-20 years old is estimated to be around 16,750, while the older group ageing above 65 years old is estimated to be around 3493. Total number of households as of 2000 is 14,154. Out of this number, 8875 or 63% are using charcoal and firewood for cooking; 37% use close and open pit toilets and 850 or 6% do not have toilets; 2,888 or 20% own at least 1 parcel of land and out of this, 2,196 or 70% own agricultural land. The literacy rate is 93.82%.

The municipality has two climatic types, Type 2 and 4 (**Figure 39**), and is characterized by two Agro-Ecological Zones, AEZ 2-Warm sub-Humid Tropics and AEZ 3-Warm Humid Tropics based on FAO Classification. (**Figure 40**)

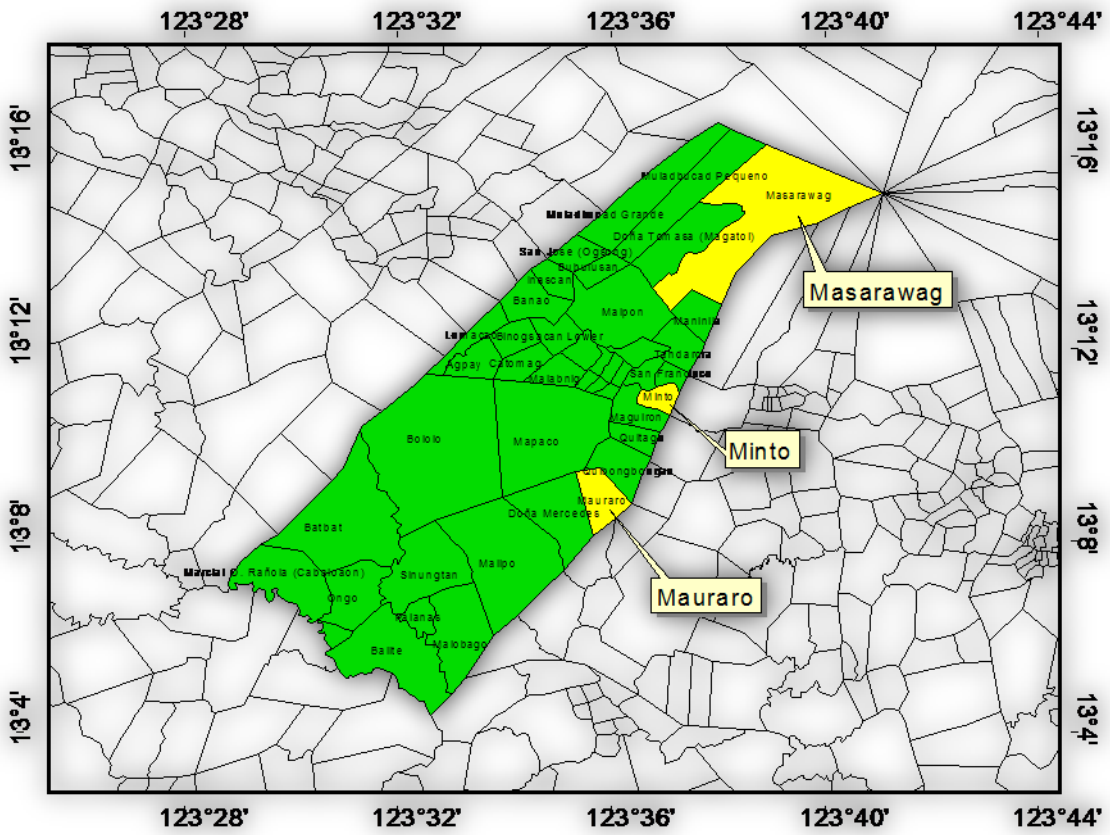



Figure 38 **Map of Guinobatan, Albay**

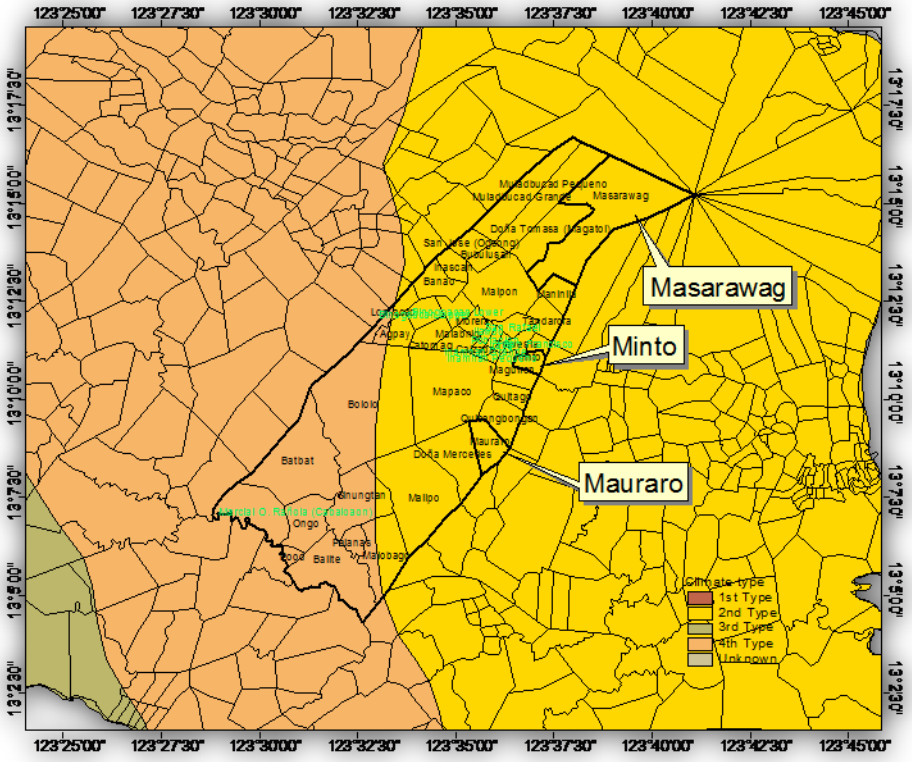



Figure 39 **Climate Map of Guinobatan, Albay**

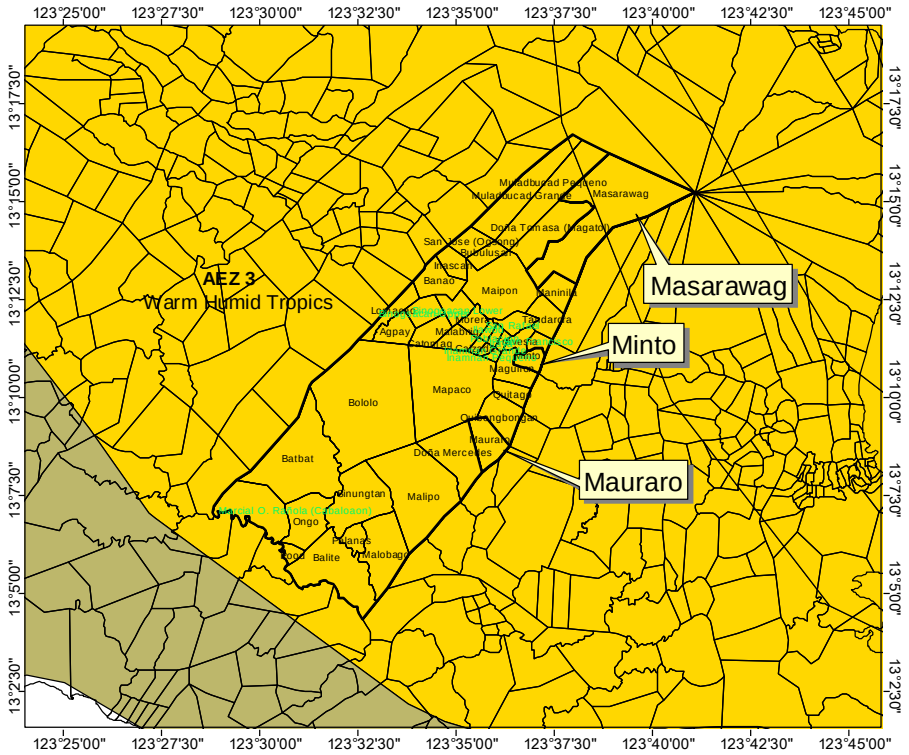



Figure 40 **Agro-ecological Zone (AEZ) Map of Guinobatan, Albay**

### *4.2.1* Barangay Masarawag

#### 4.2.1.1 Location and Accessibility

Barangay Masarawag lies on the eastern part of Guinobatan and is 6 kilometers away from the town proper. It lies at the foot of the famous Mt. Mayon Volcano. The northeastern tip of the barangay actually ends at the mouth of the volcano (**Figure 41**).

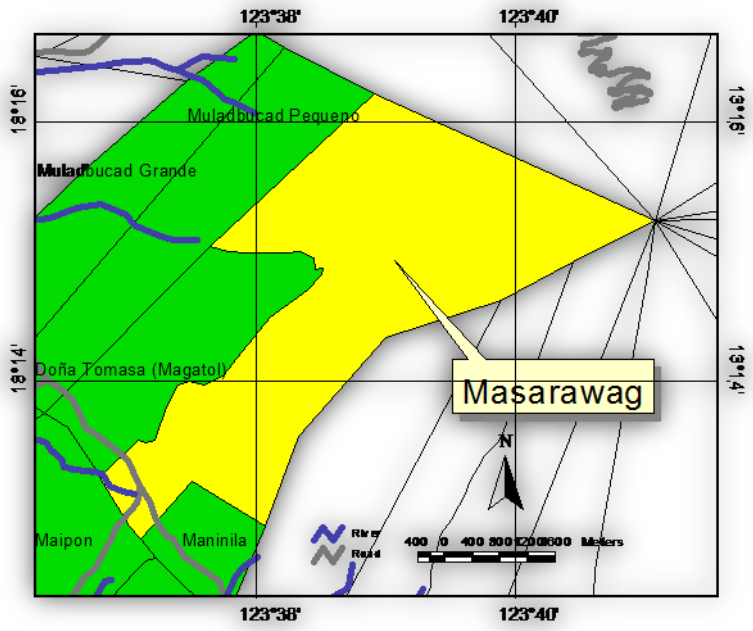



Figure 41 **Map of Barangay Masarawag**

#### 4.2.1.2 Land and Agricultural Practice

Of the 859 hectares total land area of Masarawag, 795.96 hectares or 92% is devoted to agriculture. The majority of the farmers are landowners. Agricultural areas are mostly utilized for lowland irrigated rice production and corn production (**Table 17**). Some areas are also utilized for coconut, vegetable and abaca production (**Figures 42-45**). Farmers practice include plowing, harrowing and weeding and application of inorganic fertilizers particularly in rice, corn and vegetable production using complete, urea and ammonium sulfate. They also apply chemical pesticides to these crops. Mechanized farming is also applied in rice production.

Table 17 **Seasonal calendar of major agricultural crops in Masarawag (Source: PRA Sessions)**

| Major Crops | Month | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | J | F | M | A | M | J | J | A | S | O | N | D |
| | Dry | | | | Wet | | | | | | Dry | |
| **Rice** | | | | | | | | | | | | |
| **Corn-yellow/white** | | | | | | | | | | | | |
| **Corn-Green** | | | | | | | | | | | | |
| **Coconut** | | | | | | | | | | | | |
| **Vegetables** | | | | | | | | | | | | |
| **Abaca** | | | | | | | | | | | | |

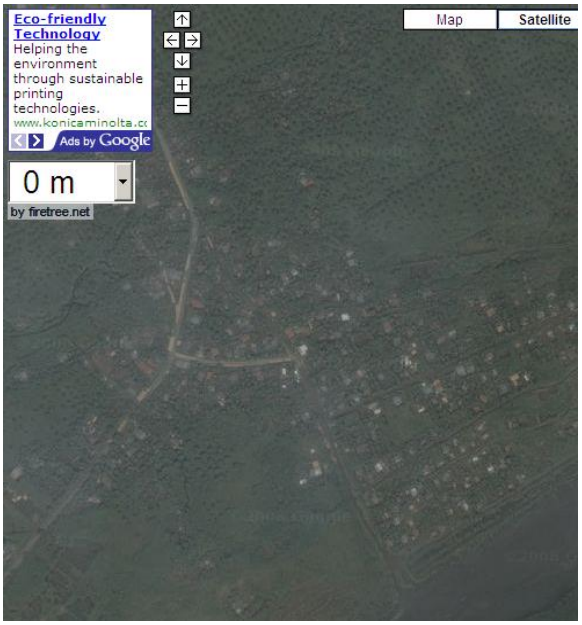



Figure 42 **Satellite photo of a portion of Barangay Masarawag** [12]

[12] Ibid.7.

Figure 43 **Picture showing the residential areas of Barangay Masarawag**

Figure 44 **Picture showing the crop mixes in the upland areas of Barangay Masarawag**

Figure 45 **Another picture showing the crop mixes of Masarawag with bananas and vegetables planted near houses and coconut plantations in surrounding areas**

#### 4.2.1.3 Socio-Economic Features

Masarawag's total population as of 2009 estimate is 3,984 with 2034 males and 1,950 females. The average household size is 6. The vulnerable groups include 1202 (30.2%) children below 15 years old, 166 or 4.2% above 60 years old, and 12 (0.3%) differently abled. Its population density is barely 4 individuals per hectare of land. It has a literacy rate of 90%. The average farm size is ½-1 hectare and the average monthly family income is Php 6,000.[13]

There are facilities for basic education in the barangay, one health center and a chapel. Potable water supply is available in the barangay.

Gender Roles. In agriculture, most of the tasks are done by men. Women assist men in raising swine and poultry.

Livelihood. Of the total population, 29.76% belong to the major livelihood groupings. Farmers constitute the largest group (38%) who are engaged in crop production, including rice grown as monocrop, coconut, abaca and fruit trees as permanent crops, and corn alternately grown with root crops, and vegetables. They are also engaged in animal raising, including carabao, cattle, horse, goat, swine, chicken, duck and turkey. Some women are involved in food processing, (**Table 18**).

Table 18 **Livelihood groupings of Barangay Masarawag (Source: Result of KII)**

| Groups | Number | Percentage (%) |
|---|---|---|
| Farmers | 456 | 38.16 |
| Wage laborer | 334 | 27.95 |
| Service holder / Public and private employee | 235 | 19.67 |
| Business man/Trader/buy and sell | 125 | 10.46 |
| Others (OFW, Handicraft maker, etc) | 45 | 3.76 |
| **Total** | **1,195** | **100** |

[13] Barangay profile of Masarawag, 2009

#### 4.2.1.4 Hazards and Threats

Lying at the foot of an active volcano pose Masarawag highly vulnerable to all types of secondary hazards associated with volcanic eruption like lahar/pyroclastic flow, ashfall, mudflow and landslide. Lahar (lava) deposits along the slopes of the volcano is another major threat since these are carried downstream during heavy rainfall causing flooding and destruction of agricultural areas and other properties. Other hazards affecting agriculture include drought, pest and diseases and soil erosion.

### *4.2.2* Barangay Minto

#### 4.2.2.1 Location and Accessibility

Barangay Minto lies at the eastern portion of Guinobatan and is roughly 3 kilometers from the town proper. It is accessible by any means of land transportation (**Figure 46**).

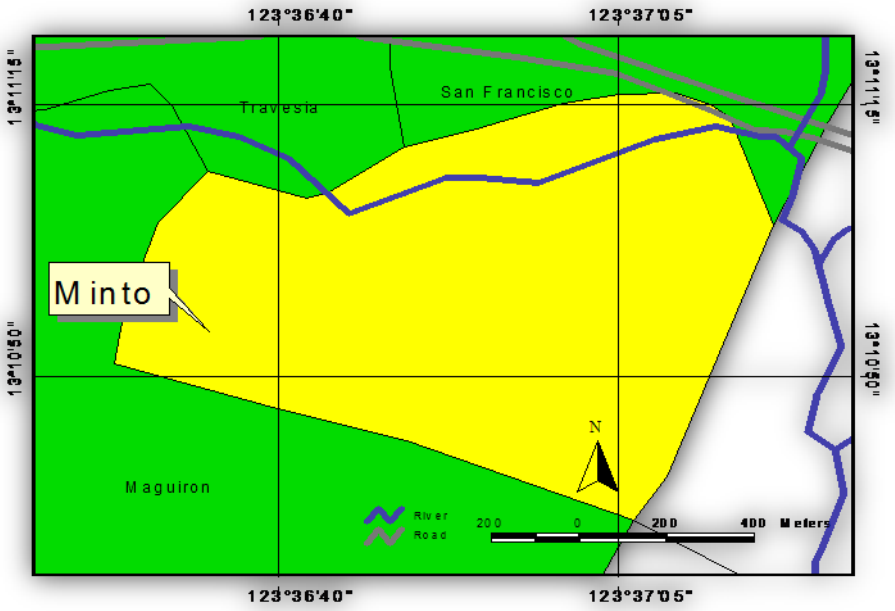



Figure 46 **Map of Barangay Minto**

#### 4.2.2.2 Land and Agricultural Practice

Minto's terrain is generally rolling with few moderately flat to flat areas. The most common soil type in the barangay is sandy loam. It has a total land area of 869 hectares, 400.5 hectares or 46.09% are devoted to agriculture, of which 400 hectares are utilized for the production of coconut in combination with other crops like banana, root crops and vegetables. Flat area (0.5 ha) is devoted to rice production. Crops are grown year round, except for root crops which are not grown in January and February (**Table 19** and **Figures 47-50**).

Table 19. **Seasonal calendar of major agricultural crops in Barangay Minto (Source: PRA Sessions)**

| Major Crops | Month | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | J | F | M | A | M | J | J | A | S | O | N | D |
| | Dry | | | | Wet | | | | | | Dry | |
| **Rice** | | | | | | | | | | | | |
| **Rootcrops** | | | | | | | | | | | | |
| **Vegetables** | | | | | | | | | | | | |
| **Coconut with Banana** | | | | | | | | | | | | |


Figure 47 **Satellite photo of a portion of Barangay Minto** [14]

[14] Ibid.7.

Figure 48 **Picture showing the various crop mixes in Barangay Minto**

Figure 49 **Another picture showing the prominent land cover of Barangay Minto**

Figure 50 **Picture showing rice crop alongside coconut plantation in Barangay Minto**

#### 4.2.2.3 Socio-Economic Features

Minto's total population as of 2009 estimate is 1,783 with 862 males and 921 females. The vulnerable groups consist of 701 (39.3%) children below 18 years old, 186 (104%) above 60 years old and 29 (1.6%) differently able. It has 394 households with an average HH size of 5. Literacy rate is 90%. Its population density is barely 2 individuals per hectare of land.

Social services available include one elementary school, one day care/health center and one barangay hall with outpost. There is potable water supply in the community.

Gender Role. Based on the analysis of the three major roles performed by women and men, it appears that the productive roles are shared by both, specifically on the production of agricultural crops like plants and animals, and earning cash. Preparing seed stocks is men's role, while getting relief goods after a disaster has occurred is women's role. Regarding reproduction, care of children and the sick, maintenance of the house, provision of health education and first aid are shared roles. Fetching water, cooking, marketing and cleaning the house are women's roles and fixing the house is men's role. Community managing roles are shared between women and men like attending community meetings, making evacuation plans, receiving and disseminating warnings. The shared security role is evacuating the family, while guarding the house, animals and HH properties are men's responsibilities.

Livelihood. Of the total population, 36.3% belong to the major livelihood groupings. Half of the working population are wage laborers, working mainly as construction workers (50%) followed by the farmers group who are producing coconut, root crops, rice, and vegetables (21%) (**Table 20**). Average family income per month is Php 6,000 or US$ 138.

Table 20 **Livelihood groupings of Barangay Minto (Source: Result of KII)**

| Groups | Number | Percentage (%) |
|---|---|---|
| Wage laborer | 295 | 50.26 |
| Farmers | 123 | 20.95 |
| Service holder / Public and private employee | 97 | 16.52 |
| Businessmen/Trader | 72 | 12.27 |
| **Total** | **587** | **100** |

#### 4.2.2.4 Hazards and Threats

Typhoon, volcanic eruption and the associated secondary hazards like flash flooding, slow-onset flooding, mudflow, and landslide are the common hazards in the area affecting mostly residents and farmers residing along the river. Farmers also mentioned plant pests and diseases as other major hazards.

### *4.2.3* Barangay Mauraro

#### 4.2.3.1 Location and Accessibility

Barangay Mauraro lies on the southern portion of Guinobatan and is roughly 5 kilometers away from the town proper (**Figure 51**).

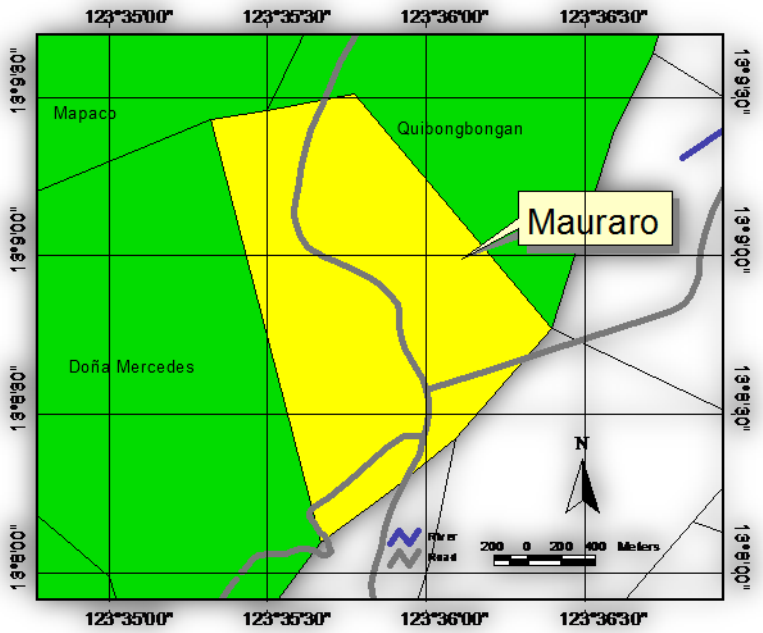



Figure 51 **Map of Barangay Mauraro**

#### 4.2.3.2 Land and Agricultural Practice

Mauraro's terrain is generally flat to rolling and a major portion (562 ha or 86%) of its total 655 hectare land area is devoted to agriculture. Out of this, 445.61 hectares are devoted to rice production while coconut production in combination with other crops occupies 110 hectares. Other crops produced include vegetables, rootcrops, corn and abaca which are grown year round (**Table 21**).

**Figures 52-54** shows a photo-documentation of prominent vegetative cover of Mauraro and **Figure 55**, a satellite imagery of the barangay.

Table 21 **Seasonal calendar of major agricultural crops in Barangay Mauraro (Source: PRA Sessions)**

| Major Crops | Month | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | J | F | M | A | M | J | J | A | S | O | N | D |
| | Dry | | | | Wet | | | | | | Dry | |
| **Rice** | | | | | | | | | | | | |
| **Rootcrops** | | | | | | | | | | | | |
| **Corn-Green** | | | | | | | | | | | | |
| **Coconut** | | | | | | | | | | | | |
| **Vegetables** | | | | | | | | | | | | |
| **Abaca** | | | | | | | | | | | | |

Figure 52 **Picture showing coconut as prominent land cover of Barangay Mauraro**

Figure 53 **Picture showing the lakeside which is part of the residential area of Barangay Mauraro**

Figure 54 **Another picture showing the crop mixes in the upland areas of Barangay Mauraro**

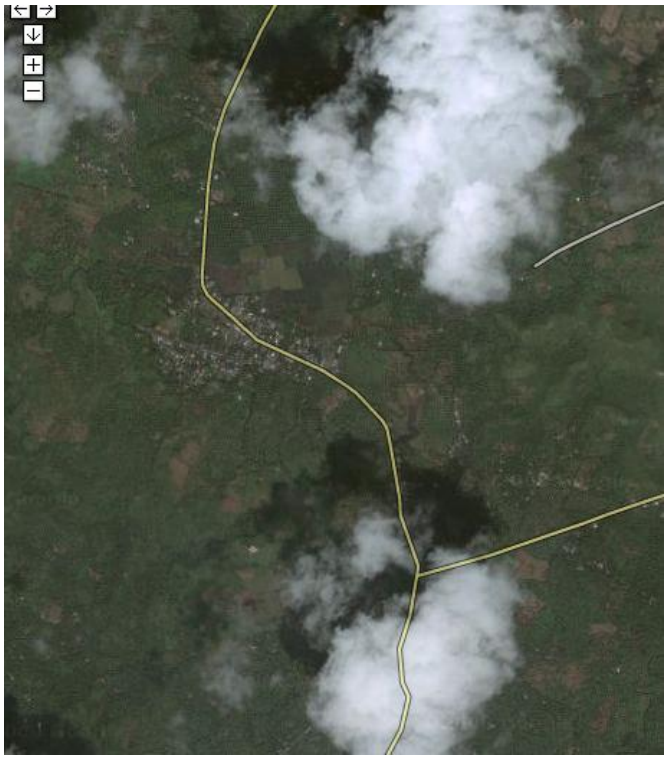


Figure 55 **Satellite photo of a portion of Barangay Mauraro**[15]

#### 4.2.3.3 Socio-Economic Features

Mauraro's total population as of 2009 estimate is 5879 with 2800 males and 3079 females. It has 919 HHs with a mean family size of 6. Its vulnerable population consist of 1461 (24.8%) children below 15 years old, 346 (5.8%) above 60 years old and 44 (0.7%) differently abled. Population density is barely nine individuals per hectare of land.

Available social services in the barangay include one elementary school, one high school, 2 day care/health centers and one barangay hall and outpost.

Gender Role. Women and men's roles are quite distinct and stereotyped in Barangay Mauraro. For the productive role, men take charge of the production of goods and in securing seeds and animal stock for agricultural production, while women take charge of ensuring rice availability at home. For the reproductive role, caring of children and the sick, giving first aid, heath education, cleaning, cooking and marketing are women's roles, while men take charge of gathering fuelwood, fetching water and repairing house after a disaster. For the community managing role, women are tasked to attend meetings, while men take charge of making evacuation plans, receiving and disseminating warnings, evacuating the family and ensuring safety of the house, animals and other properties.

Livelihood. About 1/3 (35%) of the total population in Barangay Mauraro constitute the major livelihood groupings. Those engaged in abaca handicraft had the biggest number,

[15] Ibid.7.

followed by the wage earners. The farmers constitute only 13% of the livelihood groups. (**Table 22**).

Table 22 **Livelihood groupings in Barangay Mauraro (Source: Result of KII)**

| Groups | Number | Percentage (%) |
|---|---|---|
| 1. Abaca Handicraft | 600 | 29.15 |
| 2. Wage laborer | 524 | 25.46 |
| 3. Service holder / Public and private employee | 430 | 20.89 |
| 4. Farmers | 274 | 13.32 |
| 5. Businessmen/Trader | 230 | 11.18 |
| **Total** | **2,058** | **100** |

#### 4.2.3.4 Hazards and Threats

Hazards associated with Typhoon are Mauraro's main threats. They occur during the months of August to December. Other important threats to agriculture which were identified by the community during the PRA sessions are pests and disease infestations and drought.

## 4.3 Municipality of Gubat

Gubat is one of the five municipalities in the province of Sorsogon lying along the coast of Sorsogon Bay. It is bounded on the north by the municipality of Prieto Diaz, on the south by the municipality of Barcelona and on the west by the City of Sorsogon. It has the following coordinates: 12 degrees 54' 30.4" north latitude and 124 degrees 11' 45.1" east longitude. The municipality is 63 kilometers and 29 kilometers away southeast of Legaspi City and east of Sorsogon City, respectively. Three (3) pilot barangays were also selected for the study, namely Bagacay, Ariman and Rizal (**Figure 56**).

As of 2000, the total population of Gubat is 52,663, with 26,945 (51.2%) males and 25,718 (49.8%) females. With a population growth rate of 1.8%, the estimated population of Gubat in 2010 is 62,142. The vulnerable groups consist of 23,442 (44.5%) children below 17 years old, and 4,666 (8.86%) above 60 years old. The municipality has reported 94.5% literacy rate. It has a total HHs of 10,876 with a mean family size of 5; majority of the HHs (6,293 or 58%) use charcoal and fuel wood for cooking, 2,342 (21.5%) of the HHs do not have water sealed toilets, 3,219 (30%) own land, 2,612 (81%) of whom own agricultural land.[16]

[16] Municipal profile of Gubat, 2000.

Under the Corona system of classification, Gubat belongs to climatic type 2 (**Figure 57**), with one Agro-Ecological Zone (AEZ 3-Warm Humid Tropics) based on FAO Classification (**Figure 58**)

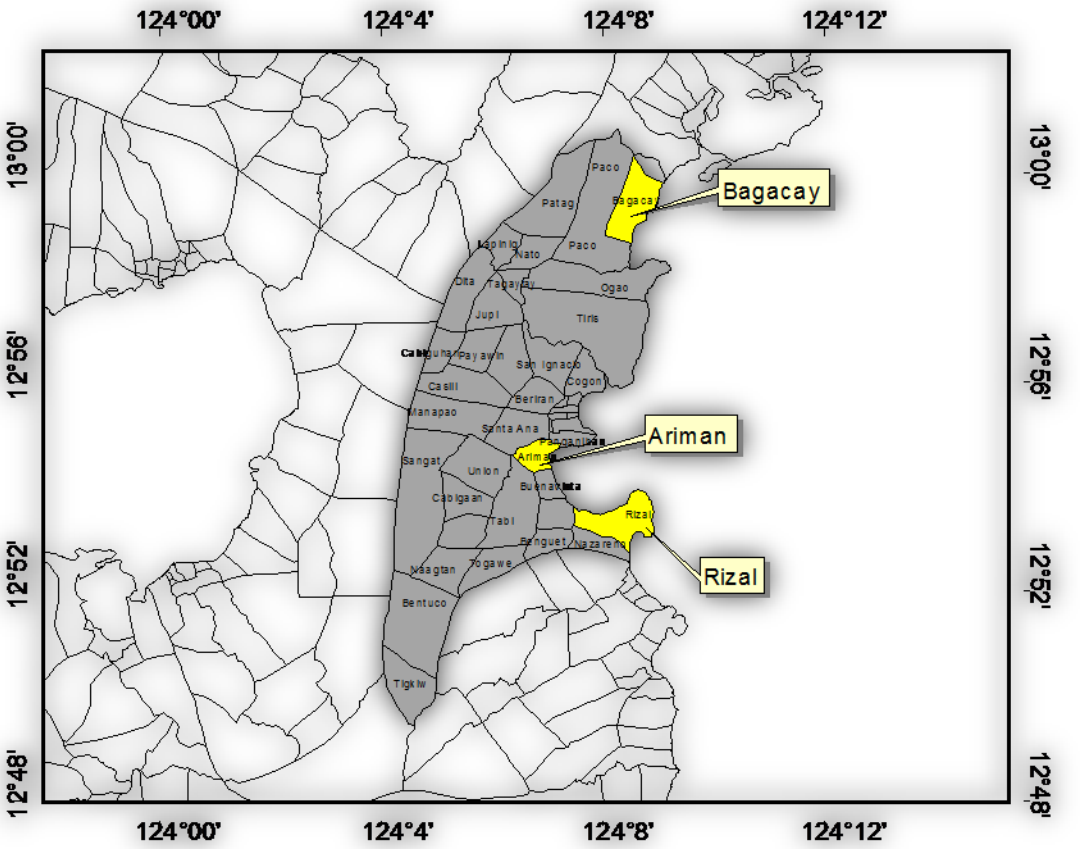



Figure 56 **Map of Gubat Sorsogon**

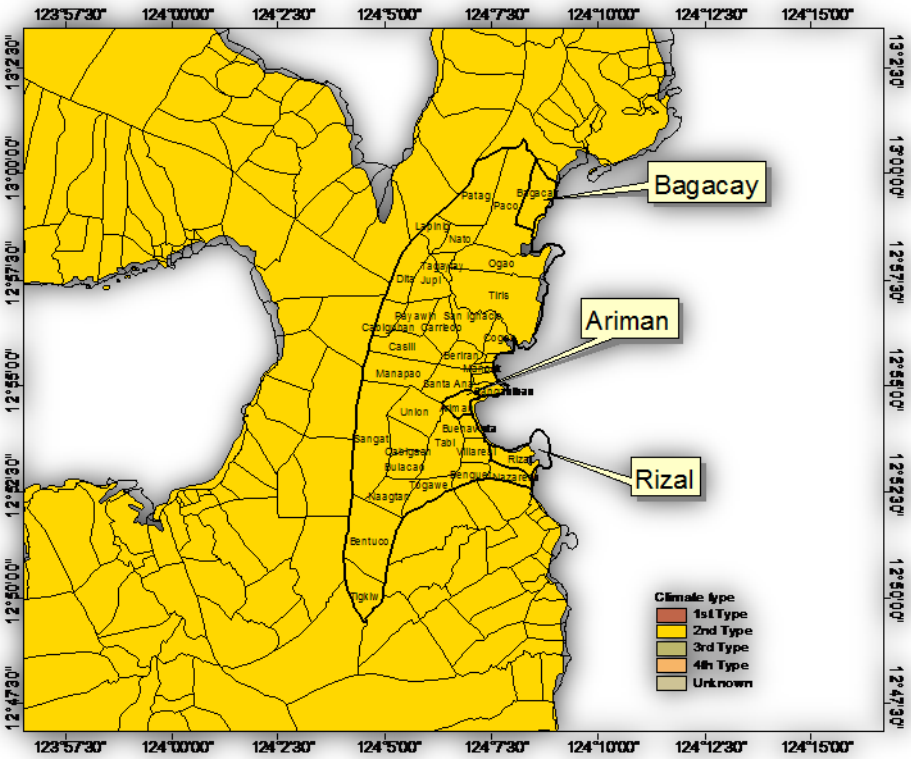



Figure 57 **Climate Map of Gubat Sorsogon**

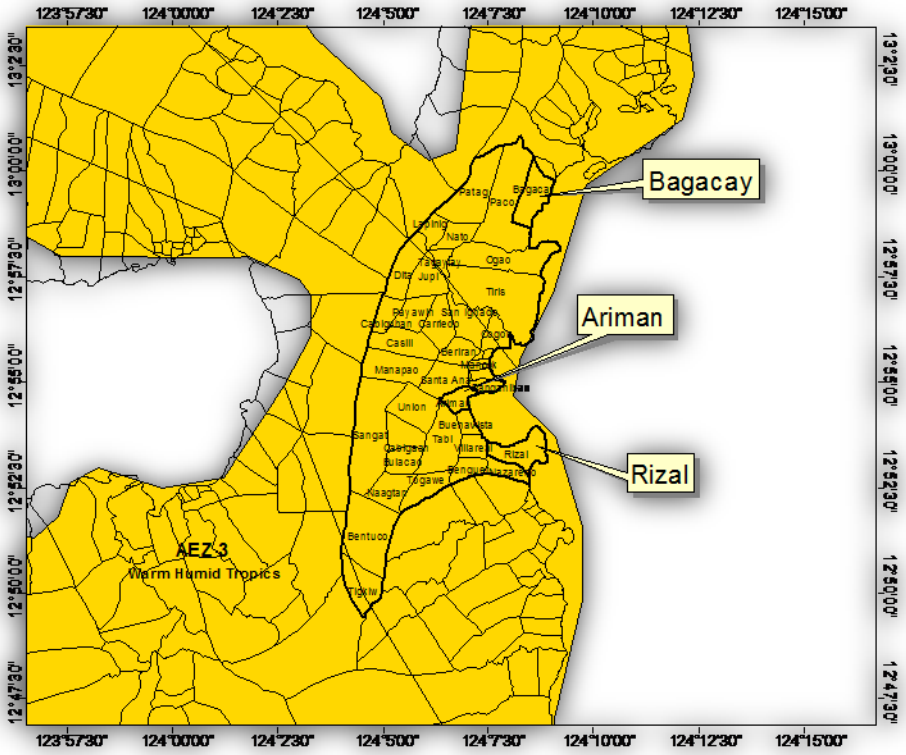



Figure 58 **Agro-ecological Zone map of Gubat Sorsogon**

### *4.3.1* Barangay Bagacay

#### 4.3.1.1 Location and Accessibility

Bagacay, a coastal barangay, is located in the northern part of Gubat and is 7 kilometers away from the town proper (**Figure 59**). It is accessible by any means of transportation.

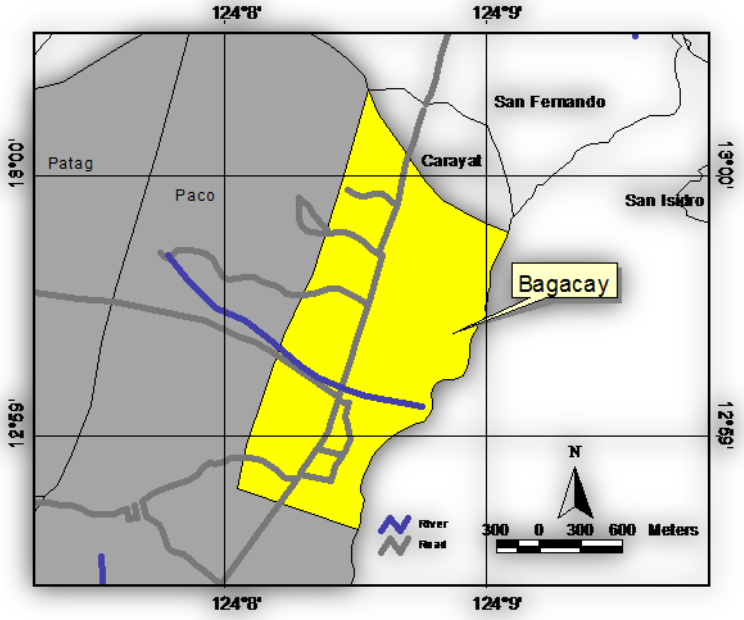



Figure 59 **Map of Barangay Bagacay**

#### 4.3.1.2 Land and Agricultural Practice

Bagacay has a total land area of 582 hectares. Majority (450.3 ha or 77.32%) of its arable land area is devoted to agriculture, 308.5 ha (68.5%) is planted to coconut in combination with other crops like corn, rootcrops and vegetables; and 127.45 ha. (28.3%) is devoted to rice. The major crops are grown year round except for corn (**Table 23**). Rice production technologies used, include transplanting method; varieties used are RC10 and NSIC 158. After upland rice, the farmers plant rootcrops. Pest problems (rats, stem borer, tungo and rice bugs) are controlled by trapping. For coconut pest – Brontispa, farmers treat the plant with systemic pesticide.

Table 23 **Seasonal calendar of major agricultural crops in Barangay Bagacay (Source: PRA Sessions)**

| Major Crops | Month | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | J | F | M | A | M | J | J | A | S | O | N | D |
| | Dry | | | | | Wet | | | | | | Dry |
| **Rice** | | | | | | | | | | | | |
| **Corn-yellow/white** | | | | | | | | | | | | |
| **Coconut** | | | | | | | | | | | | |
| **Vegetables/Rootcrops** | | | | | | | | | | | | |

**Figure 60** is a satellite photo showing the present land cover of Bagacay. **Figures 61-63** show some of the photo-documentation of the barangay.

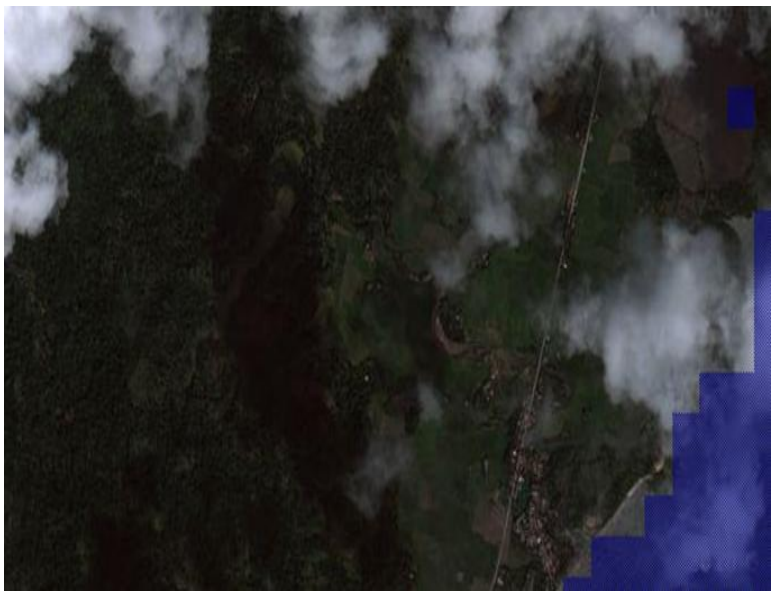


Figure 60 **Photo of a portion of Barangay Bagacay taken from a Satellite**[17]

Figure 61 **Picture of the vegetation cover of Bagacay**

[17] Ibid.7.

Figure 62 **Picture showing the coastline of Barangay Bagacay**

Figure 63 **Another picture showing the coastline of Barangay Bagacay**

#### 4.3.1.3 Socio-Economic Features

Bagacay's total population as of 2009 estimate is 3,397 with 1723 males and 1674 females. The vulnerable groups consist of 1086 (32%) children below 15 years old, 277 (8.2%) above 60 years old, and 54 (1.6%) differently able. Its population density is barely 6 individuals per hectare of land.

The social services available in the barangay which can serve as evacuation center during state of calamity include 1 school for basic education that can accommodate 1000 persons, 1 day care / health center which can serve 20 persons, a gymnasium that can accommodate 1000 persons, barangay hall that can accommodate 50 persons, 1 multipurpose building that can accommodate 400 persons and a church that can accommodate 200 persons. The school, day care/health center, gymnasium, barangay hall and church have comfort rooms, bathrooms and water supply. The community has also supply of potable water.

Gender Role. On the performance of productive roles, women and men share responsibility in earning cash for the family, however, on other tasks, they perform distinct roles. Women take charge of getting relief goods after a calamity, while men take charge of producing agricultural goods (crop and animals), preparing seed and animal stocks. On the reproductive roles, women perform the caring roles including caring for children and the sick, health education, cooking, cleaning and marketing, while men gather firewood, fetch water and repair house after a disaster. For the community managing and security role, except for attendance to organizational meetings which is done by women, all other tasks are shared by both women and men.

Livelihood. Coconut and rice farming are the main sources of livelihood. Secondary sources include backyard swine and chicken raising, fishing, home-based handicraft activities like shell-craft, candy-making, fish processing and vending.

A quarter (25.2%) of the barangay's total population is engaged in major livelihood activities. Farmers constitute the biggest group, followed by fisher folks (**Table 24**). The peak season for fishing is between the months of August and November, which are incidentally the typhoon months. Fisher folks also engaged in farming as laborers or daily wage earners during the lean season that usually falls within the first quarter of the year. There are also 7 farmers with fishpond in the barangay, while the rest of the 196 are fulltime fisher folks.

Table 24 **Livelihood groupings of Barangay Bagacay (Source: Result of KII)**

| Livelihood Groups | Number | Percentage (%) |
|---|---|---|
| Farmers | 249 | 29.86 |
| Fisher folks | 196 | 23.50 |
| Wage laborer | 180 | 21.58 |
| Service holder / Public and private employee | 123 | 14.75 |
| Business man/Trader | 56 | 6.71 |
| Other (OFW) | 30 | 3.60 |
| **Total** | **834** | **100** |

#### 4.3.1.4 Hazards and Threats

Hazards associated with typhoons are Bagacay's main risks. High tide accompanied by coastal flooding allows saline water to intrude and destroy agricultural areas leaving them unproductive for a long period. Other threats to agriculture are pests and diseases, drought, flash flooding, soil erosion and earthquake. Human induced hazards include illegal logging and child abuse.

### *4.3.2* Barangay Ariman

#### 4.3.2.1 Location and Accessibility.

Barangay Ariman is also a coastal barangay. It is located at the northern part of Gubat and is 7 kilometers away from the town proper. (**Figure 64**)

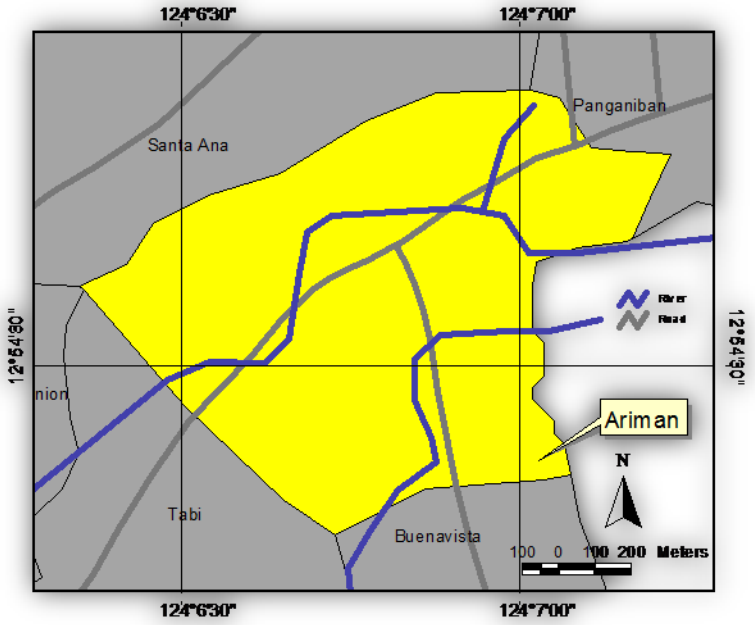



Figure 64 **Map of Barangay Ariman**

#### 4.3.2.2 Land and Agricultural Practice

Sandy Clay loam is the common soil type of Ariman and its terrain is characterized as flat. It has a total land area of 239 hectares, mostly (226 ha or 94.%) devoted to agriculture; 98 hectares (44%) are devoted to rice while 88 hectares (39%) are planted to coconut and other field crops like corn, vegetables and rootcrops, which are grown year round except corn (**Table 25** and **Figure 65-68**). Technologies adopted in agriculture are the same as in Barangay Bagacay, but there is one farmer in Ariman who is now adopting the broadcast method of planting rice.

Table 25 **Seasonal calendar of major agricultural crops in Barangay Ariman (Source: PRA Sessions)**

| Major Crops | Month | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | J | F | M | A | M | J | J | A | S | O | N | D |
| | Dry | | | | | Wet | | | | | | Dry |
| **Rice** | | | | | | | | | | | | |
| **Corn-yellow/white** | | | | | | | | | | | | |
| **Coconut** | | | | | | | | | | | | |
| **Vegetables/Rootcrops** | | | | | | | | | | | | |

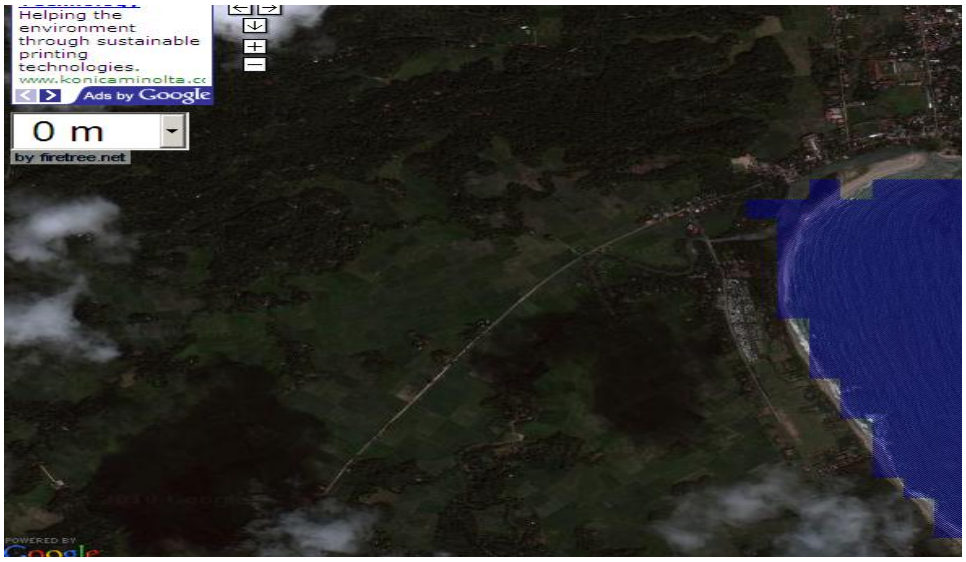



Figure 65 **Photo of a portion of Barangay Ariman taken from a Satellite**[18]

Figure 66 **Picture showing the shoreline of Barangay Ariman.**

[18] Ibid.7.

Figure 67 **Another picture showing the shoreline of Barangay Ariman.**

Figure 68 **Picture beyond (landward side) the shoreline of Barangay Ariman.**

#### 4.3.2.3 Socio-Economic Features

Ariman's total population as of 2009 estimate is 1,509 with 797 males and 712 females. Its vulnerable population consists of 512 (33.9%) children below the age of 17 years, 125 (8.28%) above 60 years old, and 25 (1.66%) differently able. Total number of households is 314 with a mean family size of 5. Out of 314 HHs, 241 (76.8%) do not have toilet. Its population density is barely 7 individuals per hectare of land.

Social services in the barangay include school buildings with capacity of 190 persons, and 1 health center which can accommodate 20 persons. Its source of potable water include community faucet, serving 38 HHs, and home faucet connected to 60 houses.

Gender Roles: In terms of the productive roles, women and men in Barangay Ariman shared most of the roles, except for securing rice stock and getting rehabilitation assistance like

seeds and animal stocks which are men's tasks. On reproductive roles, both women and men also share the tasks except preparing food which is women's role and repairing the house which is men's role. On community managing and security roles, all tasks are shared except for making the evacuation plan and guarding the house which are men's roles. The findings show that gender roles performed by women and men in barangay Ariman are less stereotyped compared to the other pilot sites.

Livelihood: Coconut and rice farming are the main sources of livelihood. Their secondary sources, just like Barangay Bagacay include backyard swine and poultry production, fishing, home-based activities like shell-craft and candy-making, fish processing and vending.

Almost half (700 or 46.39%) of the barangay's total population are engaged in major livelihood activities. Wage laborers followed by farmers constitute the biggest among the livelihood groups (**Table 26**).

Some fisherfolks engaged into farming as laborers or daily wage earners during the lean season that usually falls within the first quarter of the year.

Table 26 **Livelihood groupings of Barangay Ariman (Source: Result of KII)**

| Livelihood Groups | Number | Percentage (%) |
|---|---|---|
| Wage laborer | 288 | 41.14 |
| Farmers | 251 | 35.86 |
| Service holder / Public and private employee | 100 | 14.28 |
| Business man/Trader | 30 | 4.29 |
| Fisher folks | 21 | 3 |
| Others | 10 | 1.43 |
| **Total** | **700** | **100** |

#### 4.3.2.4 Hazards and Threats

Hazards associated with typhoon are Ariman's main threats. High tide accompanied by coastal flooding causes saline water intrusion and destroys agricultural areas. Other hazards include earthquakes, storm surges, drought and pests and diseases.

### *4.3.3* Barangay Rizal

#### 4.3.3.1 Location and Accessibility.

Another coastal barangay, Rizal is located in the southern part of Gubat and is 2 kilometers away from the town proper (**Figure 69**).

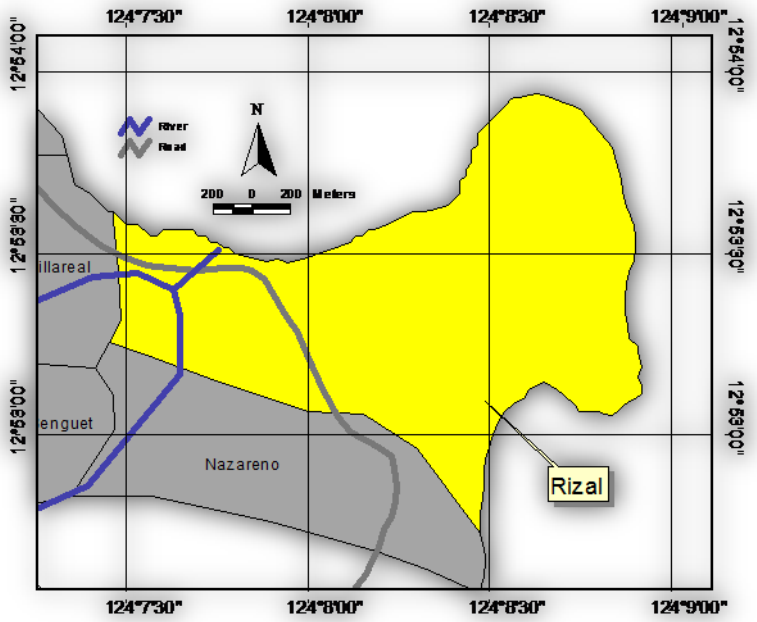



Figure 69 **Map of Barangay Rizal**

#### 4.3.3.2 Land and Agricultural Practice

Rizal's prominent soil type is sandy to silty clay loam and its terrain is generally flat. It has a total land area of 584 hectares. Majority (381 ha or 65%) of the land area is devoted to agriculture; 236 hectares are plated to coconut combined with other crops, and 89 ha (23%) for rice production. Other crops planted include corn, vegetables and root crops (**Table 27**). Coconut dominates the upland areas and rice production covers most of the lowland agricultural areas. Crops are usually grown year-round (**Figure 70**). Crop production practices are the same with those practiced by Bagacay and Ariman farmers.

Table 27 **Seasonal calendar of major agricultural crops in Barangay Rizal (Source: PRA Sessions)**

| **Major Crops** | Month | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | J | F | M | A | M | J | J | A | S | O | N | D |
| | Dry | | | | | Wet | | | | | | Dry |
| **Rice** | | | | | | | | | | | | |
| **Corn-yellow/white** | | | | | | | | | | | | |
| **Coconut** | | | | | | | | | | | | |
| **Vegetables/Rootcrops** | | | | | | | | | | | | |

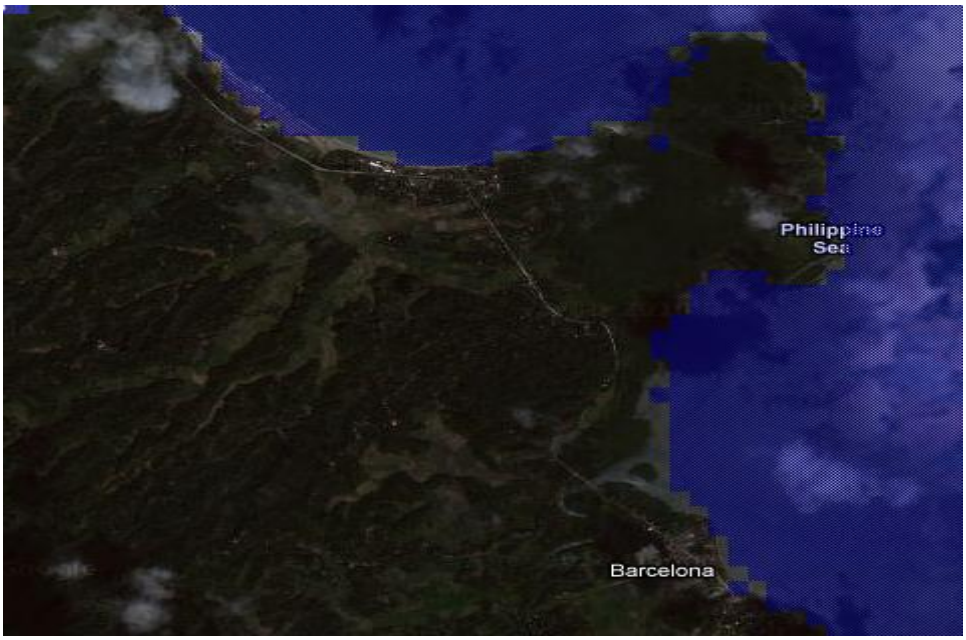



Figure 70 **Photo of a portion of Barangay Rizal taken from a Satellite**[19]

#### 4.3.3.3 Socio-Economic Features

Rizal's total population as of 2009 estimates is 2,775 with 1433 males and 1342 females. Its vulnerable groups consist of 1015 (36.5%) children below 15 years old and 29 (1%) differently able. Its population density is barely 4 individuals per hectare of land.

Social services in the barangay which can be used as evacuation center include school buildings which can accommodate 150 persons, 1 health/day care center with toilet and water supply, 1 barangay hall with the same facilities, and 1 hotel with toilet and water supply.

Gender Roles. Similar to Barangay Ariman, the productive roles performed by women and men in Barangay Rizal are shared, except for securing rice stock and getting rehabilitation assistance like seeds and animal stocks which are men's tasks. On reproductive roles, caring for the children and the household are shared roles; women are also tasks to perform other roles like cleaning the house, cooking, marketing and attending to the health requirements of the family. Men are tasked to fetch water, gather fuel wood and repair house in case of calamity. On community managing and security roles, all tasks are shared except for making the evacuation plan which they do not do yet.

Livelihood. Coconut and rice farming are the main sources of livelihood. Similarly with the two other barangays in Gubat, their secondary livelihood sources includes backyard swine and poultry raising, fishing, home-based handicraft activities, fish processing and vending. Rizal is also famous for its Beach Resorts which draw many tourists during summer.

Around one third (30.65%) of the barangay's total population belong to the major livelihood groupings with the farmers having the biggest number followed by wage laborers (**Table 28**).

[19] Ibid.7.

Fisher folks in the barangay also engaged in farming as an alternative source of livelihood by working as laborers or daily wage earners during the lean season.

Table 28 **Livelihood groupings of Barangay Rizal (Source: Result of KII)**

| Livelihood Groups | Number | Percentage (%) |
|---|---|---|
| Farmers | 355 | 44.38% |
| Wage laborer | 146 | 18.25 % |
| Shell craft maker | 140 | 17.5% |
| Fisher folks | 74 | 9.25% |
| Business man/Trader | 50 | 6.25% |
| Service holder / Public and private employee | 35 | 4.37% |
| **Total** | **800** | 100 |

#### 4.3.3.4 Hazards and Threats

The main natural hazards experienced by the people in Barangay Rizal include seawater intrusion to farms, soil erosion, floods, typhoon, storm surge, continuous rain, and pest infestation. Human induced hazards include illegal cutting of mangroves and illegal fishing.

## 5. RISK AND RISK PERCEPTION OF RESIDENTS IN THE PILOT SITES

### 5.1 Risks in the Pilot Site

The climate related and geological risks in the pilot sites were identified using the risk maps previously prepared by the Manila Observatory and the Department of Environment and Natural Resources.

### 5.2 Climatic/Weather Related Risk Factors

**Table 29** summarizes the climate/weather related risk ratings of the pilot sites. The main risks in the province are results of typhoon, increase in temperature, change in rainfall and the El Niño phenomenon. For typhoon related risk, Albay and Sorsogon are at very high risks. Due to climate change, abrupt changes in temperature and amount of rainfall are expected to happen in the near future, which can highly affect the said provinces. The risk maps also show that the pilot sites will not be much affected by changes in temperature. Change in rainfall will also put the provinces of Albay and Sorsogon at very high risk. The pilot sites however are also not much affected by El Niño. Combining all the factors, Albay and Sorsogon have very high risk, while Camarines Sur has high risk to weather related factors.

Table 29 **Climate/weather related risk ratings of the pilot sites (Provincial Level)**

| Province | Typhoon | Temperature Increase | Rainfall Change | El Niño | Combined Climate Disasters |
|---|---|---|---|---|---|
| Camarines Sur | High | Low | High | Low | High |
| Albay | Very High | High | Very High | Low | Very High |
| Sorsogon | Very High | High | Very High | Medium | Very High |

Source: Manila Observatory

## 5.3 Geological Related Risk Factors

**Table 30** summarizes the geological related risk ratings of the pilot sites. Findings show that the pilot sites are not so much affected by an earthquake, but earthquake induced shallow landslides are likely to happen in Camarines Sur and Albay. As far as tsunami and volcanic eruption are concerned, the provinces of Albay and Sorsogon are highly at risk. Combining these geophysical factors, Camarines Sur is at low risk, while Albay and Sorsogon have medium level risks.

**Table 30** Geological related risk ratings of the pilot sites (Provincial Level)

| Province | Earthquake | Earthquake Induced Shallow Landslides | Tsunamis | Volcanic Eruptions | Combined Geophysical Disasters |
|---|---|---|---|---|---|
| Camarines Sur | Low | High | Medium | Medium | Low |
| Albay | Low | High | High | High | Medium |
| Sorsogon | Medium | Medium | Low | High | Medium |

Source: Manila Observatory

## 5.4 Perceived Risks

The perceived risk of the community members were elicited during the FGDs and KII's. The Community Risk Assessment Methodology (CRAM) was employed in gathering the information and the following are their perceptions:

- The weather has changed; it's not the same as 30 years ago. They claimed that in the past they could rely on a cropping calendar and it was easy for them to tell whether the rainy season or the dry season was coming. They also pointed out that the abrupt changes in the weather made the cropping calendar completely unreliable. Rain fall is expected during dry months and dry spell occurred even in wet months and it gave them a big problem in terms of deciding when to plant and what to plant.
- Typhoons are becoming stronger and more destructive bringing along huge amount of floodwater and strong winds.
- Sea level rise: According to them, a large portion of the coastline was already lost over the years and if it continues, it will deprive them of the productive land along

the coastal areas. Coastal flooding coupled with sea water intrusion also continues to be a problem in agricultural areas near the coastline.

- During heavy rainfall, flash floods and river flooding continually affect agricultural areas near rivers.
- Pest incidence according to them has also increased, because of the changes in climate pattern.

## 5.5 Current Risk

Current risk factors are those hazards that are presently in existence or had been already experienced by constituents in the pilot areas that affect their agricultural production and other economic activities.

During the PRA sessions, for the municipal level, the participants identified these risks and ranked them based on the percentage of areas affected. For the barangay level, the causes of the risks identified were categorized based on the degree of impact using the following levels:

5 – Highest Impact

4 – Moderately High Impact

3 – Moderate Impact

4 – Moderately Low Impact

1 – Low Impact

0 – No Impact

### *5.5.1* Municipal Level Risks

In Buhi, strong typhoon wind (**Figure 71**) was identified as the main hazard that had much impact on agricultural production in the municipality. It was followed by flooding brought about by typhoon and heavy rains. Another hazard in Buhi is drought.

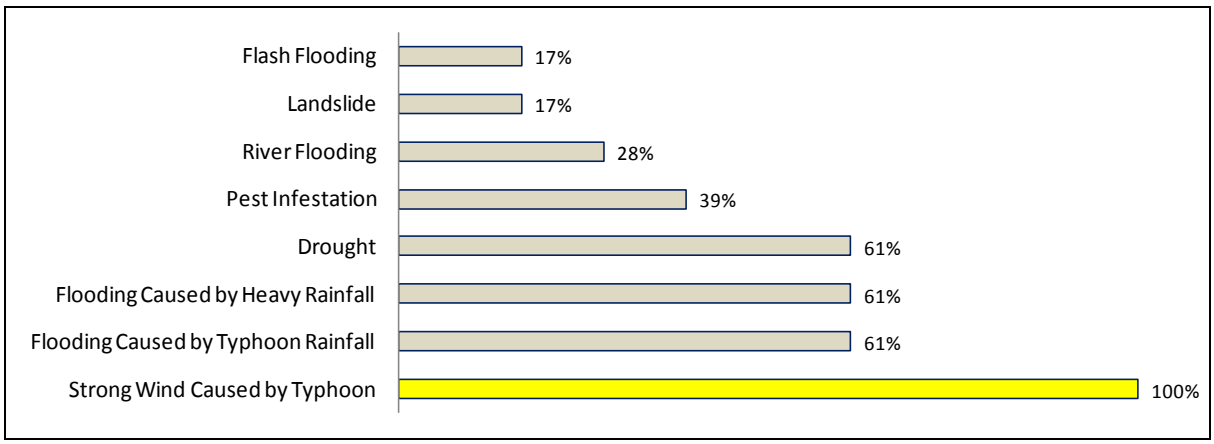



Figure 71 **Percentage of pilot area vulnerable to the different hazards in the Municipality of Buhi**

Guinobatan is also 100% vulnerable to strong typhoon wind (**Figure 72**) followed by ashfall, pest infestation and drought.

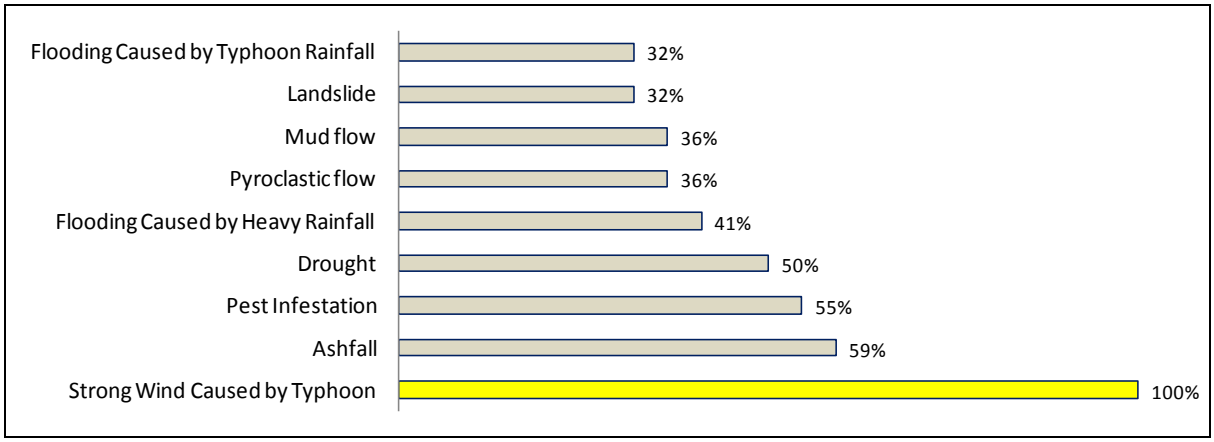



Figure 72 **Percentage of pilot area vulnerable to the different hazards in the Municipality of Guinobatan**

Gubat, just like the two pilot areas, is highly vulnerable to strong typhoon wind (**Figure 73**), followed by drought, coastal flooding, pest infestation. Tsunami and storm surge.

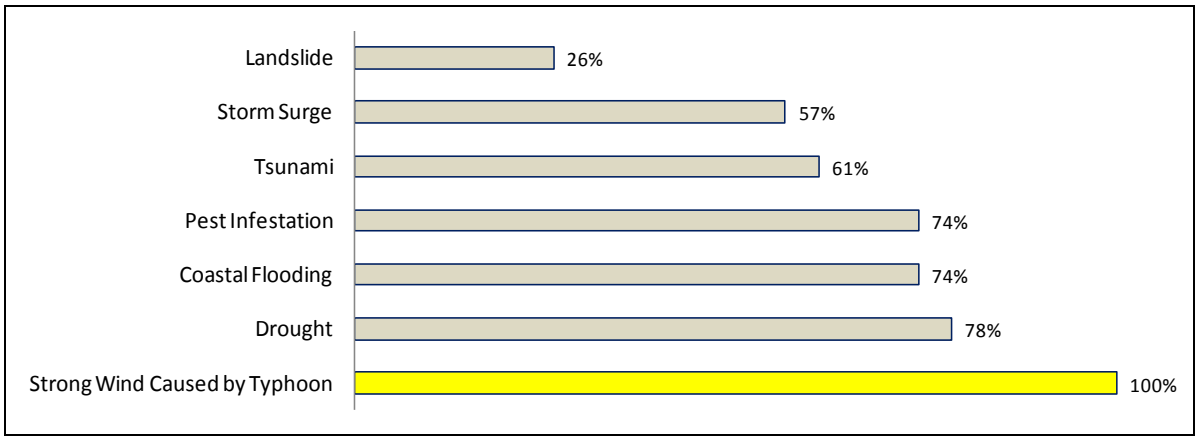



Figure 73 **Percentage of pilot area vulnerable to the different hazards in the Municipality of Gubat**

### *5.5.2* Barangay Level Risks

#### 5.5.2.1 Barangays in Buhi

The hazards having the highest impact in the pilot areas of Buhi are as follows: strong (typhoon) wind, flash flooding and soil erosion for Igbac (**Figure 74**); strong (typhoon) wind and flooding for San Buenaventura, (**Figure 75**) and drought and pest infestation for San Ramon (**Figure 76**).

Hazards having the least impact are: landslide for Igbac, drought for San Buenaventura, and landslide for San Ramon.

The succeeding figures show the intensity of impact of hazards to the community. As the intensity level goes up and the further from the center, the greater is the hazard and its corresponding impact to the elements at risks in the barangay.

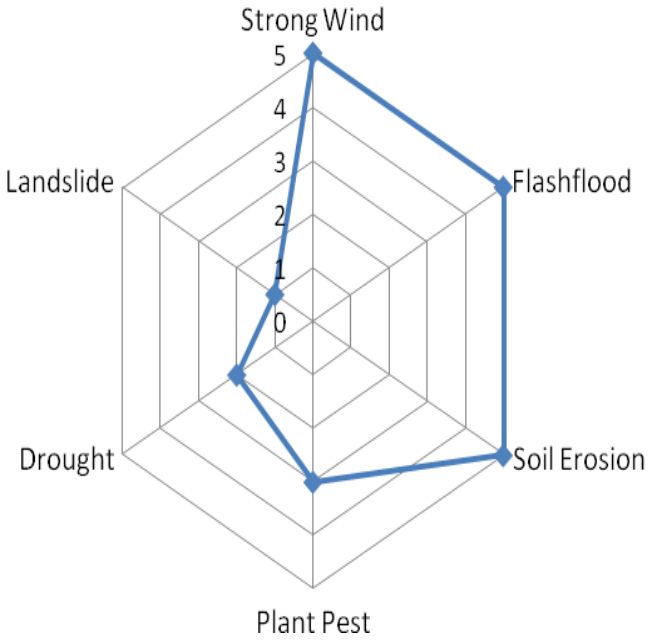



Figure 74 **Different hazards in Barangay Igbac of Buhi**

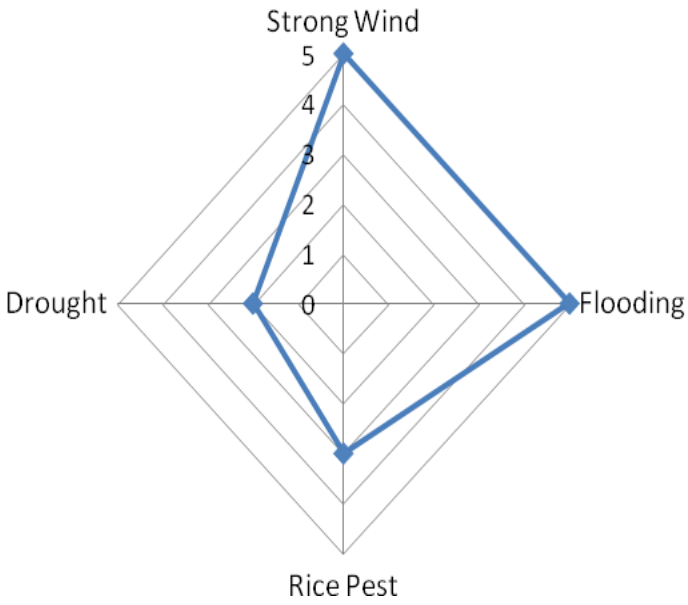



Figure 75 **Different hazards in Barangay San Buenaventura of Buhi**

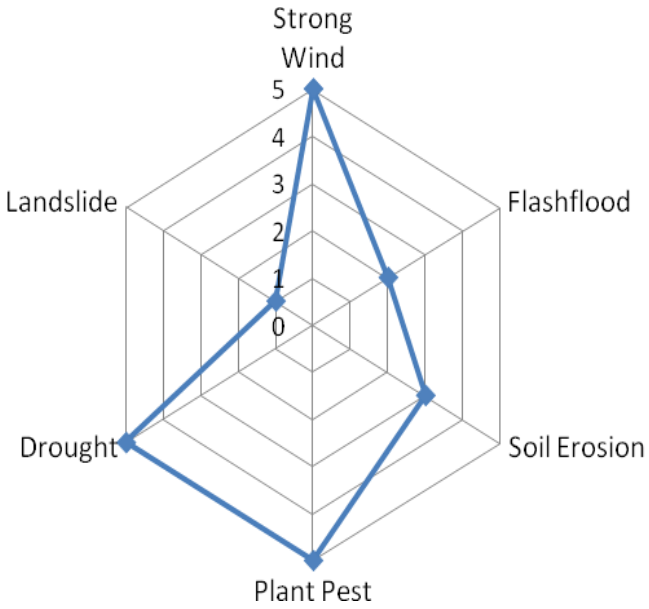



Figure 76 **Different hazards in Barangay San Ramon of Buhi**

### *5.5.3* Barangays in Guinobatan

The hazards having the highest impact in the pilot areas of Guinobatan are: strong (typhoon) wind, lahar flow and volcanic eruption for Masarawag (**Figure 77**); strong (typhoon) wind, plant and animal diseases, and drought for Mauraro, (**Figure 78**) and strong (typhoon) wind, flash flood and ashfall for Minto (**Figure 79**).

Hazards having the least impact are: soil erosion, drought, and plant pest for Masarawag and soil erosion for Minto.

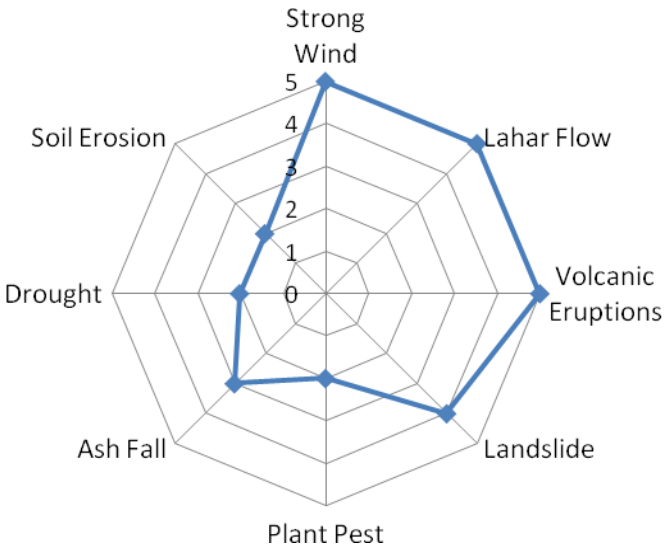



Figure 77 **Different hazards in Barangay Masarawag of Guinobatan**

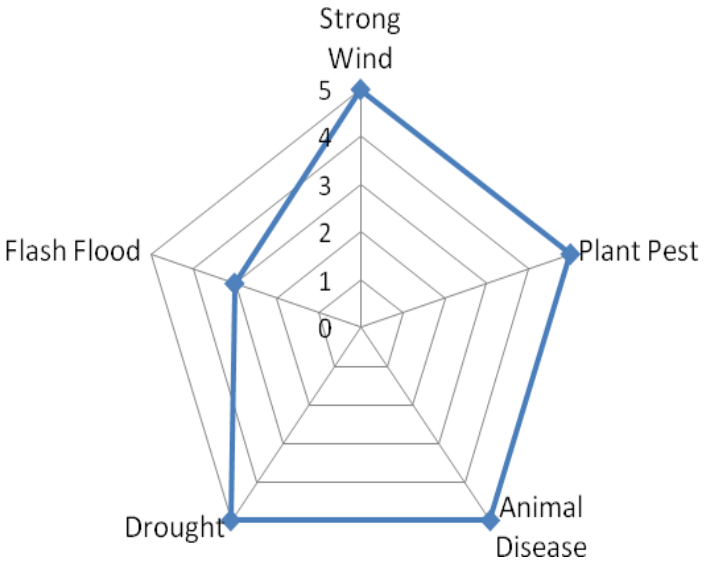



Figure 78 **Different hazards in Barangay Mauraro of Guinobatan**

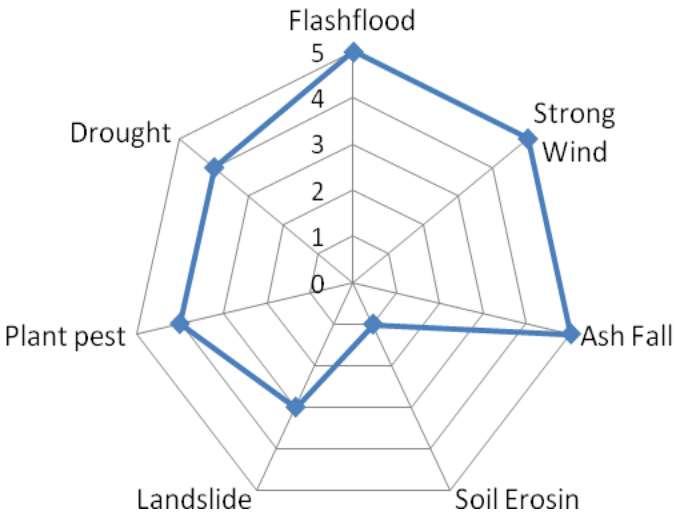



Figure 79 **Different hazards in Barangay Minto of Guinobatan**

### *5.5.4* Barangays in Gubat

The hazards having the highest impact in the pilot areas of Gubat are: strong (typhoon) wind, soil erosion, plant pest, and drought for Bagacay (**Figure 80**); strong (typhoon) wind and (coastal) flooding for Ariman, (**Figure 81**) and strong (typhoon) wind, plant pest and diseases and (coastal) flooding for Rizal (**Figure 82**).

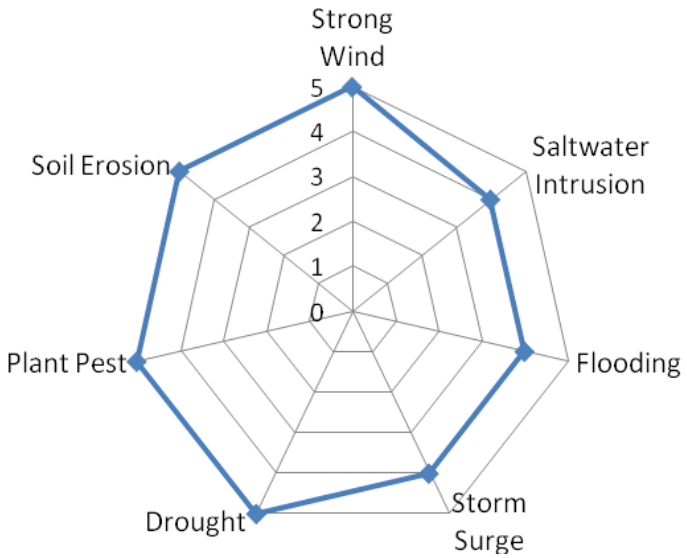



Figure 80 **Different hazards in Barangay Bagacay of Gubat**

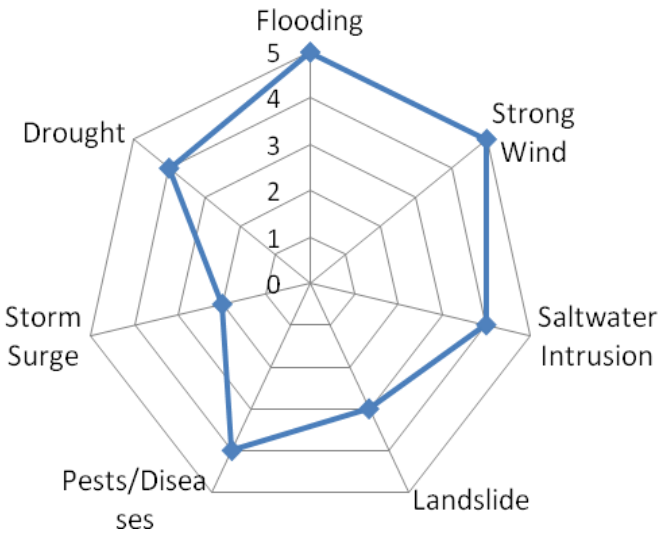



Figure **81 Different** hazards in Barangay Ariman of Gubat

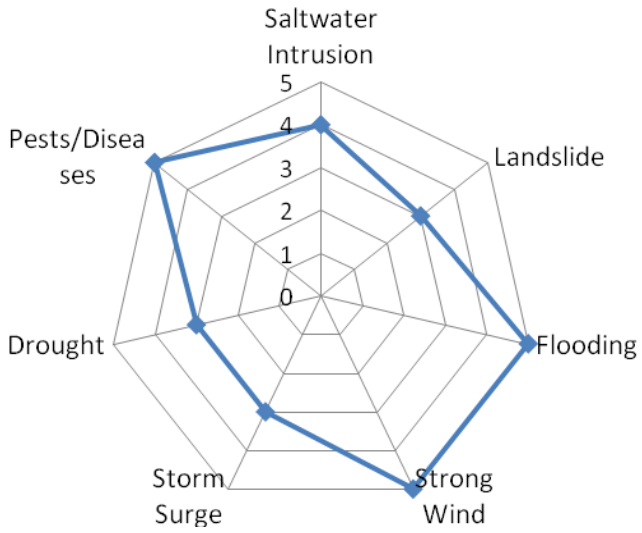



Figure 82 **Different hazards in Barangay Rizal of Gubat**

### *5.5.5* Risk Classification and Ranking

The PRA session participants were also asked to classify the risks as to climatic and non-climatic or induced type. The non-climatic risks were further classified into geological, human-induced, technological and biological type; and they finally ranked the risks based on their frequency, intensity and severity. The results of these exercises are shown in **Table 31**.

Table 31 **Local risks and their classification and ranking**

| Primary and Secondary Risk/Hazards | Rank | Classification/Rank | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Climatic | Rank | Non-Climatic | | | | | | | |
| | | | | G | Rank | HI | Rank | T | Rank | B | Rank |
| 1. Typhoon that results to secondary hazards like | 1st | ✓ | 1 | | | | | | | | |
| Coastal flooding | | | | | | | | | | | |
| Storm Surge | | | | | | | | | | | |
| Arroyo (mud/lahar) flooding | | | | | | | | | | | |
| River flooding | | | | | | | | | | | |
| Urban (Slow-Onset ,Rapid-Onset, Flash) flooding | | | | | | | | | | | |
| Landslide | | | | | | | | | | | |
| 2. Strong destructive wind due to Typhoon/Storm | 2nd | ✓ | 2 | | | | | | | | |
| 3. Excessive Rainfall that results to secondary hazards like | 2nd | ✓ | 2 | | | | | | | | |
| River flooding | | | | | | | | | | | |
| Urban (Slow-Onset ,Rapid-Onset, Flash) flooding | | | | | | | | | | | |
| Landslide | | | | | | | | | | | |
| 4. Volcanic Eruption that result to secondary hazards like | 4th | | | ✓ | 4 | | | | | | |
| Pyroclastic flow | | | | | | | | | | | |
| Ash fall | | | | | | | | | | | |
| Mud flow | | | | | | | | | | | |
| Landslide | | | | | | | | | | | |
| 5. Earthquake that results to secondary hazards like Tsunami | 5th | | | ✓ | 5 | | | | | | |
| 6. Drought | 2nd | ✓ | 2 | | | | | | | | |
| 7. Fire | 7th | | | | | ✓ | 7 | | | | |
| 8. Pest and Livestock Diseases | 3rd | | | | | | | | | ✓ | 3 |
| 9. Seawater level rise that will result coastal flooding | 6th | ✓ | 6 | | | | | | | | |

Non-climatic Risk Categories: G- geologic, HI – Human-induced, T – technology and B – Biological

The matrix revealed five climate related risks, which include typhoons – rank 1, strong destructive winds, excessive rainfall, drought – rank 2, and seawater level rise - rank six. Among the non-climatic risks, pest and livestock diseases – rank 3 were classified under biological risk, volcanic eruption – rank 4 and earthquake – rank 5 were classified under geologic risk, and fire – rank 7 was classified as human induced risk. It can be noted that no technology related risk has been identified so far.

### *5.5.6* Risk impact on Various Sectors

After identifying the hazards/risks, participants were also asked to give a statement for each and the results are shown in **Table 32**.

Table 32 **Risk statements of PRA participants**

| Hazard/Risk | Risk Statement |
|---|---|
| Typhoon | • Schooldays will be interrupted<br>• Farm areas will be destroyed<br>• Harvest will be greatly affected, either reduced or totally destroyed<br>• Daily wage laborers/workers will not be able to work or to find work<br>• Spread of disease<br>• Destruction of houses (properties)<br>• Difficulty to find food for those residing in the upland who are highly dependent on the natural environment<br>• Need to evacuate |

| Hazard/Risk | Risk Statement |
|---|---|
| | • Lifelines like the sources of water and electricity will be affected<br>• Death |
| Landslide | • Roads will not be accessible<br>• Destroy (abaca) plantations |
| Heavy Rainfall | • Will result in flooding<br>• Schooldays will be interrupted<br>• Affect farms and livestock<br>• Difficult for daily wage laborers/workers to be able to work<br>• Sickness |
| Pest | • Decrease in harvest<br>• Difficulty in finding sources of planting materials |
| Drought | • Difficult to find water for irrigation<br>• Decrease in harvest<br>• No harvest<br>• Will result in rice crop disease (Tungro) |
| Flooding | • Will result in water-borne diseases/pest<br>• Farms activities will be affected<br>• Destroy crops<br>• Schooldays will be interrupted<br>• Destroy irrigation system<br>• Roads will be impassable |

Results showed that typhoon was associated to 10 risk statements; flooding with six, heavy rainfall with five and drought with four risks. The above results confirm the findings that climate related risks were perceived by the PRA participants as the most hazardous risk factors. Risk statements in agriculture include destruction of farms/ crops, difficulty in finding food, occurrence of pests and diseases, absence of irrigation water in case of drought and limited to no harvest. Biological risk from pest and diseases infestation was associated with risks like decrease in yield and difficulty in finding planting materials. These risks must be addressed by introducing good practice options in agriculture and fisheries.

A matrix was also provided to the participants for them to determine the sectors that are vulnerable to the different hazards/risks identified and the results are shown in **Table 33**.

Primary and secondary hazards were presented and their physical/material and social impacts were determined through ranking. Findings showed that typhoons resulting in secondary hazards rank first in terms of their impact to the various sectors; this is followed by volcanic eruption resulting in secondary hazards, rank third is excessive rains.

On the economic sector, typhoons resulting to various secondary hazards affect people's means of livelihood, access to resources and their effective use of their lands. On the infrastructure and service sector, the most affected are people's access to roads and evacuation routes, as well as their houses, schools and facilities like roads and bridges, markets, water facilities and electricity are affected. Health facilities are also affected. On the human capital sector, the hazards result in mortality, diseases, and because it destroys

agricultural crops, it results in poor nutrition and eventual poverty in the populace. On the environmental sector, both the soil and water quality are equally affected by the identified hazards.

On the social sector, all the vulnerable groups, which include the young, elderly/women and the differently able, are equally affected by the hazards, especially typhoons, volcanic eruptions and excessive rainfall.

Table 33 **Impact of hazards on various sectors**

| Primary ans Secondary Hazards | Physical/Material | | | | | | | | | | | | | | | | | | | | | Social | | | Total Counts | RANK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Economic | | | | | | Infrastructure and Services | | | | | | | | Human Capital | | | | | Environ-mental Factors | | Vulnerable Groups | | | | |
| | Means of Livelihood | Productive Skills | Land | Water | Livestock | Access to Resources | Road/ Access Routes | Health | Facilities | Schools | Electricity | Communication | Transport | Housing/ Buildings | Mortality | Diseases | Nutritional Status | Population | Poverty Levels | Soil Quality | Water Quality | Young | Elderly | Diffrently Able | | |
| 1. Typhoon that will result to secondary hazards like | | | | | | | | | | | | | | | | | | | | | | | | | 42 | 1st |
| Coastal flooding | ✓ | | | | | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | | | | | | ✓ | ✓ | | | | | |
| Storm Surge | ✓ | | | | | ✓ | | | | | | | | | | | | | | | ✓ | | | | | |
| Arroyo (mud/lahar) flooding | ✓ | | ✓ | | | | | | | | | | | | ✓ | | | | | | | | | | | |
| River flooding | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | | | | | | | | | | | | ✓ | | | | | |
| Urban (Slow-Onset ,Rapid-Onset, Flash) flooding | ✓ | | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| Landslide | ✓ | | ✓ | | | ✓ | ✓ | | | | | | | | | | | | | ✓ | | | | | | |
| 2. Strong destructive wind due to Typhoon/Storm | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | 19 | |
| 3. Excessive Rainfall that will result to secondary hazards like | | | | | | | | | | | | | | | | | | | | | | | | | 26 | 3rd |
| River flooding | ✓ | | ✓ | ✓ | | ✓ | ✓ | | | | | | | | | | | | | | ✓ | | | | | |
| Urban (Slow-Onset ,Rapid-Onset, Flash) flooding | ✓ | | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| Landslide | ✓ | | ✓ | | | ✓ | ✓ | | | | | | | | | | | | | ✓ | | | | | | |
| 4. Volcanic Eruption that will result to secondary hazards like | | | | | | | | | | | | | | | | | | | | | | | | | 29 | 2nd |
| Pyroclastic flow | ✓ | | | | | ✓ | | | | | | | | ✓ | ✓ | | | | | | | ✓ | ✓ | ✓ | | |
| Ash fall | ✓ | | | | ✓ | ✓ | | ✓ | | | | | | ✓ | ✓ | ✓ | | | | | | ✓ | ✓ | ✓ | | |
| Mud flow | ✓ | | | | | ✓ | | | | | | | | ✓ | ✓ | | | | | | | ✓ | ✓ | ✓ | | |
| Landslide | ✓ | | ✓ | | | ✓ | ✓ | | | | | | | | | | | | | ✓ | | | | | | |
| 5. Earthquake that will result to secondary hazards like | | | | | | | | | | | | | | | | | | | | | | | | | 23 | |
| Tsunami | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| 6. Drought | ✓ | | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | | | | | | | | | | 5 | |
| 7. Pest and Livestock Diseases | ✓ | | | | ✓ | | | | | | | | | | | | | | | | | | | | 2 | |
| 8. Seawater level rise that will result coastal flooding | ✓ | | | | | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | | | | | | ✓ | ✓ | | | | 10 | |
| Total Counts | 18 | 1 | 10 | 4 | 4 | 16 | 11 | 5 | 6 | 6 | 4 | 2 | 6 | 9 | 6 | 5 | 2 | 2 | 2 | 8 | 8 | 7 | 7 | 7 | | |
| Rank | 1st | | | | | 2nd | 3rd | | | | | | | | | | | | | | | | | | | |

### *5.5.7* Perceived Seasonality of Risk

The participants were also asked to plot the seasonality of risks, based on their past experience and the results are shown in **Table 34**.

Table 34 **Seasonality of main risks**

| Primary and Secondary Risk/Hazards | Rank | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Typhoon | 1st | | | | | | | | | | | | |
| 2. Strong destructive wind | 2nd | | | | | | | | | | | | |
| 3. Excessive Rainfall | 2nd | | | | | | | | | | | | |
| 4. Drought | 2nd | | | | | | | | | | | | |
| 5. Pest and Livestock Diseases | 3rd | | | | | | | | | | | | |

The table above shows that climate related risks are seasonal. Typhoon and strong destructive winds usually occur from August to November, excessive rainfall starts from May to November, drought can be experienced starting December to April, but crop pest and diseases can occur anytime of the year, although there are some pests and diseases which are more prevalent during the wet season From these findings, it may imply that timing of planting can still be planned to avoid devastation from strong winds, typhoon and excessive rainfall. Crops can also be selected to fit the season in order to minimize the impact of climate related risks like pests and diseases, among others.

### *5.5.8* Future Risks

The local as well as global climatic condition is continuously changing and getting worse, hence the participants were also asked to determine the impact of the risks they think will be more prevalent in the near future. The responses are shown in **Table 35**.

It can be noted from the table below that the PRA participants are aware of the possible future risk scenario in the agriculture, forestry and fishery sectors, because of climate change and biological reasons. In agriculture, they mentioned the major losses in field crops and decrease in production of livestock, low to no yield, and risk in establishing plantation crops; in fisheries, they projected fish kill in inland fish culture, escape of fish from cages due to heavy rains and poor catch in open sea fishing; and in forestry, they mentioned major losses due to destruction of major tree or permanent crops.

To prevent these future risk scenarios from happening, appropriate mitigation measures should be put in place. Likewise, climate change adaptation practices must be identified, field tested, packaged and disseminated to ensure that farmers and fisher folks will know what to do to minimize the impact of climate change.

Table 35 **Perceived future risk scenarios in agriculture, forestry and fisheries.**

| Hazard | Vulnerable Sector | Climate Change Impact/Risk |
|---|---|---|
| 1. Typhoon | Agricultural crops | Major losses due to destruction of major crops, high risk in establishing plantation crops |
| | Livestock | Reduction in production |
| | Fisheries | Major yield loss from inland fish production area, huge reduction in the volume of catch from open seawater |
| | Forestry | Major losses due to destruction of major tree/permanent crops |
| 2. Strong destructive wind | Agricultural crops | Major losses due to destruction of major crops, high risk in establishing plantation crops |
| | Livestock | Reduction in production |
| | Fisheries | Huge reduction in the volume of catch from open seawater |
| | Forestry | Major losses due to destruction of major tree/permanent crops |
| 3. Excessive Rainfall | Agriculture | Major losses due to destruction of major crops |
| | Livestock | Reduction in production |
| | Fisheries | Fish in cages will escape reducing yield |
| | Forestry | Landslide will also lead to destruction of major tree/permanent crops |
| 4. Drought | Agriculture | Major losses due to destruction major crops |
| | Livestock | Reduction in production |
| | Fisheries | Abnormal water stratification can cause fish kill |
| | Forestry | Excessive heat will also lead to destruction of major tree/permanent crops |
| 5. Pest and Livestock Diseases | Agriculture | Minor losses due to destruction of major crops |
| | Livestock | Reduction in production |
| | Fisheries | Fish kill |
| | Forestry | Reduced productivity of major tree/permanent crops |

## 6. LIVELIHOOD PROFILES AND VULNERABILITIES

The profile of livelihood groups and their vulnerabilities were also identified during the PRA sessions.

### 6.1 Livelihood Groupings and Classifications

The distribution of livelihood groups in the pilot sites is shown in **Table 36**.

Findings show that there are five major livelihood groupings in the pilot sites which include wage laborers (33%), farmers (28%), service sector (14%), businessmen / traders (10%) and fisher folks (8%). Another 8% represents minor livelihood groupings, which include those in the manufacture of handicrafts and candies, post harvest processing and vending.

The pilot barangays with a higher number of farmers are: Barangay Rizal in Gubat with 44.38%, Barangay Igbac in Buhi with 44.27% and Barangay Masarawag in Guinobatan with 38.16%. The fisher's group is highest in Barangay Bagacay, Gubat with 23.5%, followed by San Ramon and San Buenaventura in Buhi with 15.6% and 12.15%, respectively. The wage laborer group is highest in Barangay Minto with 50.26%, followed by Barangay Ariman with 41.14%, and San Buenaventura with 36.33%. The service sector is highest in San

Buenaventura (21%), Mauraro (21%) and Masarawag (20%), while the businessmen/traders group was highest in San Buenaventura (19%), Minto (12%) and Mauraro (11%). Worth noting is Barangay Mauraro with 29% of their livelihood group engaged in abaca weaving and production of handicraft and Barangay Rizal for their shell craft and candy making, usually engaging women and children in their production activities.

Table 36 **Distribution of livelihood groups in the pilot sites.**

| Municipality and Barangay | Livelihood Grouping and Classification (%) | | | | | |
|---|---|---|---|---|---|---|
| | Farmers | Fisher folks | Service Holders | Wage Laborers | Businessman/ Trader | Others |
| Municipality of Buhi | | | | | | |
| 1. San Buenaventura | 8.35 | 12.15 | 21.01 | 36.33 | 19 | 3.16 |
| 2. San Ramon | 35.88 | 15.6 | 3.9 | 29.64 | 10.3 | 4.68 |
| 3. Igbac | 44.27 | 2.01 | 4.02 | 31.59 | 10.06 | 8.05 |
| Municipality of Gubat | | | | | | |
| 1. Ariman | 35.86 | 3 | 14.28 | 41.14 | 4.29 | 1.43 |
| 2. Bagacay | 29.86 | 23.5 | 14.75 | 21.58 | 6.71 | 3.6 |
| 3. Rizal | 44.38 | 9.25 | 4.37 | 18.25 | 6.25 | 17.5 |
| Municipality of Guinobatan | | | | | | |
| 1. Masarawag | 38.16 | | 19.67 | 27.95 | 10.46 | 3.76 |
| 2. Mauraro | 13.32 | | 20.89 | 25.4 | 11.18 | 29.15 |
| 3. Minto | 20.95 | | 16.52 | 50.26 | 12.27 | |
| Total | 239.03 | 65.51 | 119.41 | 282.14 | 90.52 | 71.33 |
| Percentage | 28% | 8% | 14% | 33% | 10% | 8% |

## 6.2 Vulnerability of the Different Livelihood Groups

The vulnerability of the different livelihood groups were described using physical and socio-economic factors.

- Physical Assets (farm size, irrigation facilities and availability of farm equipment, livestock pests and diseases, housing condition, etc.)
- Human Resources (literacy and level of education, knowledge and skills, availability of health facilities, health conditions, etc.)
- Socio-Economic Conditions (socio-economic status, access to decision makers, credit, market and other social services)

### *6.2.1* Farmers and Fisher folks

Farmers and fisher folks comprise 28% and 8% respectively of the total percentage of livelihood groups **(Table 36)**. The average area cultivated by rice farmers is 0.70 ha, 0.82 ha for corn farmers, 0.21 ha for vegetables and root crops, more than 2 and 5 hectares for coconut and abaca, respectively. A big portion of the pilot sites is devoted to agriculture (**Table 39**). Fishing is an alternative source for those residing near coastal areas and water bodies. Based on the feedback given during the PRA sessions, fisher folks are highly vulnerable to climatic induced hazards like flooding and risk associated with typhoon.

Fisher folks in the pilot sites either engaged themselves in open sea water fish harvesting or in other water-based production systems like backyard mud-crab fattening and fish cage

production of tilapia. They are mostly located in the coastal barangays of Gubat, Sorsogon and the lake in Buhi, Camarines Sur.

#### 6.2.1.1 Vulnerability Factors

The table below (**Table 37**) shows the nature of vulnerability of farmers and fisher folks in the pilot sites.

**Table 37** Nature of vulnerability factors affecting farmers and fisher folks in the pilot sites

| Group | Vulnerability Factors | Nature |
|---|---|---|
| Coconut growers | Typhoon damage | Climatic |
| | Pest damage | Non-Climatic |
| | High Labor cost | Non-Climatic |
| | Fluctuating prices | Non-Climatic |
| Rice farmers | Less to excessive rainfall | Climatic |
| | Flooding | Climatic |
| | Typhoon damage | Climatic |
| | Inequitable sharing of produced (90-10) | Non-Climatic |
| | Lack of Capital | Non-Climatic |
| Corn farmers | Less to excessive rainfall | Climatic |
| | Unreliable cropping calendar | Climatic |
| | Only 5% of harvest is for domestic use | Non-Climatic |
| | Pest | Non-Climatic |
| Vegetable farmers | Crop damage due to typhoon wind | Climatic |
| | Less to excessive rainfall | Climatic |
| | Small area (backyard) for domestic consumption | Non-Climatic |
| | Poor Market | Non-Climatic |
| Root crops farmers | Excessive rainfall | Climatic |
| | Low demand | Non-Climatic |
| Fisher folks | Excessive rainfall | Climatic |
| | Flooding | Climatic |
| Animal Raisers | High input cost (feeds) | Non-Climatic |
| | Animal disease | Non-Climatic |

Strong wind caused by typhoon was identified as most prominent (45%) vulnerability factor of coconut farmers. Strong wind affects most of the fruit bearing coconut trees by either destroying their leaves and other vegetative and reproductive parts like flowers or killing the whole plant. Damage due to pest infestation was the next factor followed by the high cost of labor for maintaining the plantation and the fluctuating market prices of coconut based products like copra (**Figure 83**).

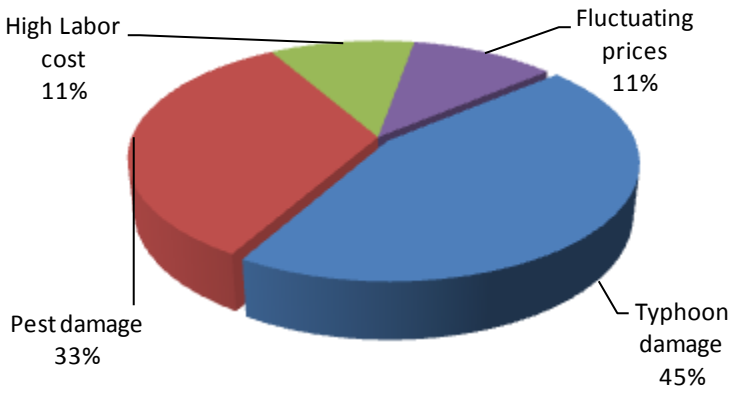



Figure 83 **Vulnerability factors of coconut growers**

For rice farmers, water unavailability and / or excessive amount of rainfall are considered as the most serious (37%) causes of their vulnerability. This is followed by inequitable sharing of harvest between the tenant farmers and the legal landowners where the present sharing would leave the farmer a small share of 10%. This is followed by factors related to lack of capital investment, damage to crops due to typhoon and flooding (**Figure 84**).

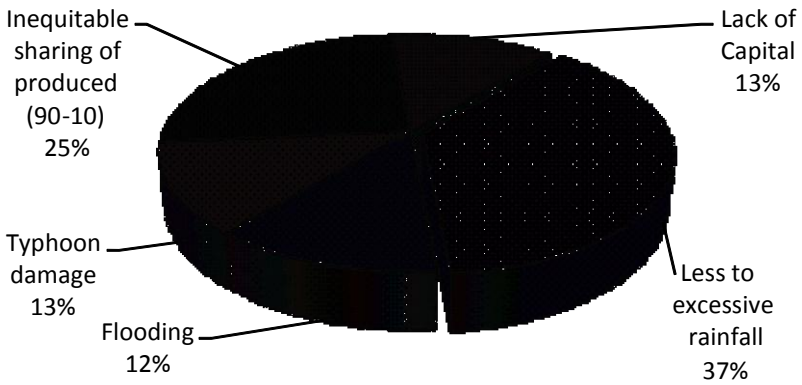



Figure 84 **Vulnerability factors of rice farmers**

Corn farmers are very vulnerable to their present system of utilizing their produce where they are only able to retain 5% of their harvest for domestic use. Damage due to pest infestation, the lack of and/ or excessive amount of rainfall and unreliable cropping calendar are the other vulnerability factors affecting corn farmers (**Figure 85**).

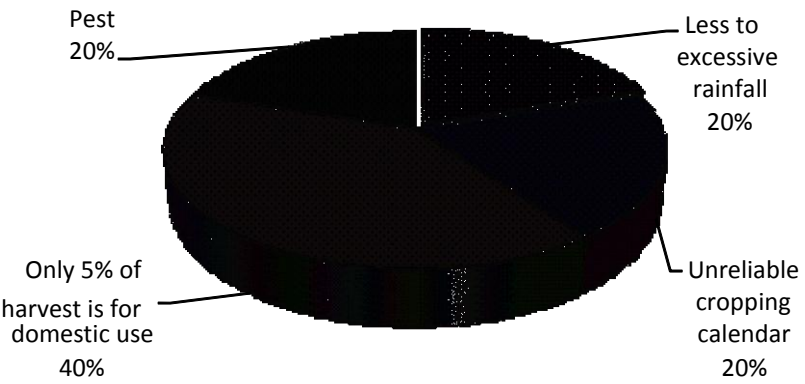



Figure 85 **Vulnerability factors of corn farmers**

Damage to crops due to typhoon and the small area devoted for growing vegetables, only for domestic consumption, make this sector vulnerable. This is followed by the less to excessive amount of rainfall and poor marketability of the produce (**Figure 86**).

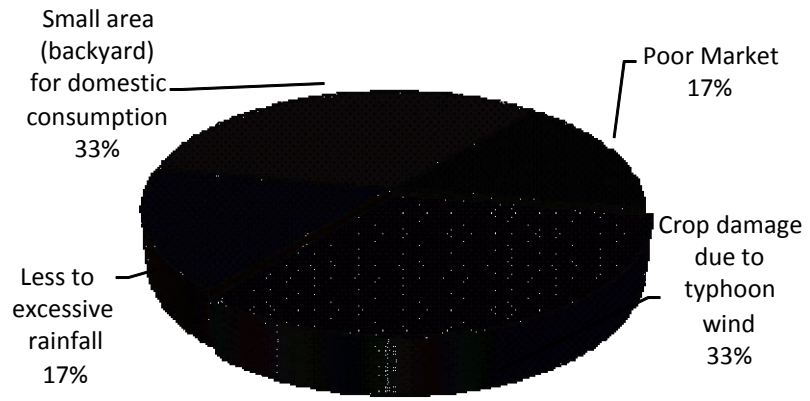



Figure 86 **Vulnerability factors of vegetable farmers**

Farmers who are into root crops production are highly vulnerable to excessive amount of rainfall, which damages their crop. Another factor is the low demand for root crops which contribute to their vulnerability (**Figure 87**).

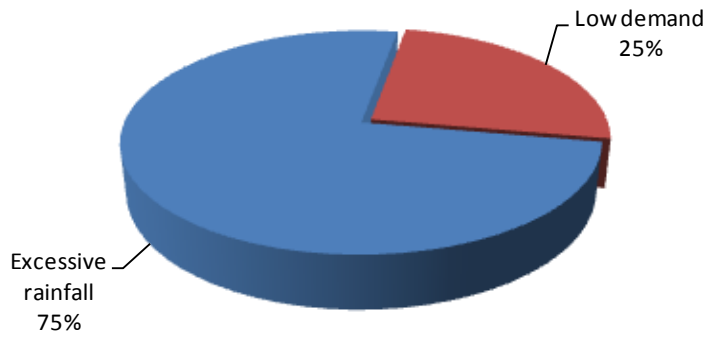



Figure 87 **Vulnerability factors of root crop farmers**

Coastal flooding, flooding due to sea water level rise and flooding due to inability of the lake in Buhi to drain excess water in the lake is the number one factor that makes the fisher folks in the pilot sites vulnerable. Excessive rainfall was also identified as another factor which results in flooding. (**Figure 88**) Another vulnerability factor among fisher folks is poor access to fishing grounds.

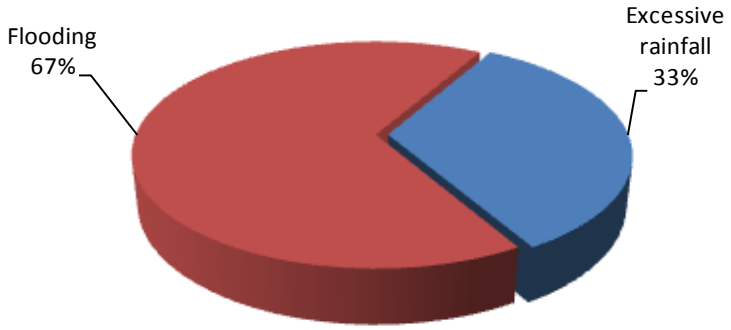



Figure 88 **Vulnerability factors of Fisher Folks**

Animal raisers are usually affected and are very vulnerable due to animal diseases and the high input requirements of production (**Figure 89**).

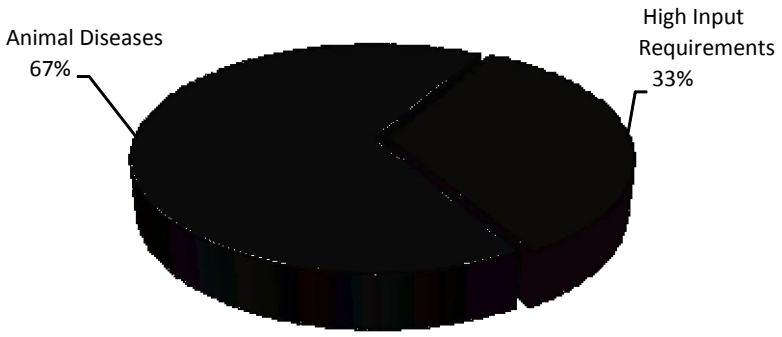



Figure 89 **Vulnerability factors of Animal Raisers**

#### 6.2.1.2 Risk Condition of Farmers

The risk condition of farmers is greatly influenced by climate related hazards that are very common in the pilot sites. These hazards are strong winds brought by monsoon, destructive wind due to typhoon, flooding due to typhoon and excessive rainfall, coastal flooding due to typhoon or sea level rise or storm surge, saltwater intrusion/inundation during high tides, and low amount of rainfall that leads to drought. These hazards cause great damage to planted crops and reduce the productivity of small farm holdings of the farmers.

Analysis of the typhoon pattern in the region reveals that it usually occurs during the wet season. This pattern increases and worsens the risk condition of the farmers. With the small area of land available for crop production, they tend to ignore the risk hoping to maximize the use of the land. This system leaves farmers with nothing and has to start all over again when these hazards occur.

The practices of farmers that make them more at risk to hazards are as follows: a) planting crops during typhoon months, b) inappropriate application or use of commercial fertilizers without first conducting a soil analysis, c) constant use of single variety crop without replacement for more than 3 years, d) lack of interest to engage into other alternative sources of livelihood, e) low attention given for the maintenance of Communal Irrigation System (CIS), f) use of inappropriate varieties in saline prone areas and the lack of access to saline prone varieties, and g) poor water management (**Figure 90**).

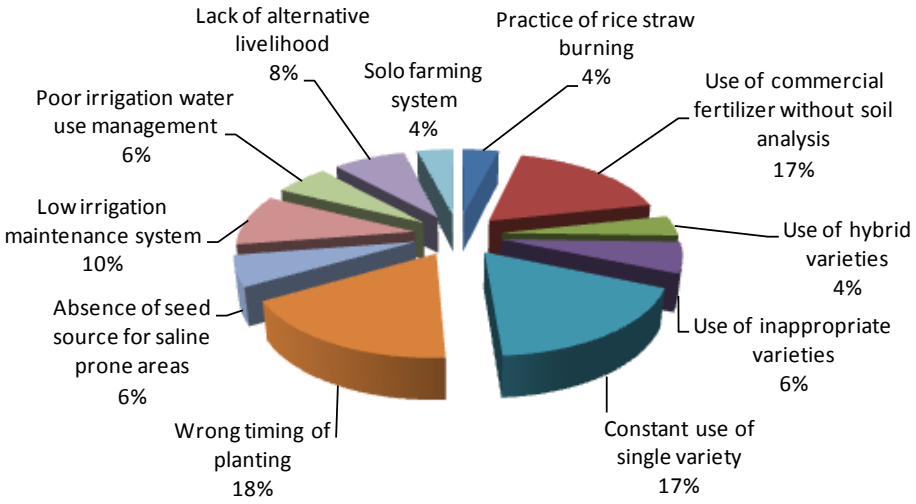



**Figure 90** Factors contributing to the risky condition of the farmers

These problems are further exacerbated by the fact that farmers are economically or are financially incapable to rehabilitate or re-establish their farms immediately after a hazardous or disastrous event.

#### 6.2.1.3 Existing Food Balance

Table 38 shows the existing food balance of the farmers in the project sites who are most vulnerable to disasters.

Table 38 **Existing food balance of agricultural groups.**

| Groups Most Vulnerable to disasters | Existing Food Balance | | |
|---|---|---|---|
| | Buhi | Guinobatan | Gubat |
| Rice farmers | For every 100 sacks of harvest, only 20 sacks are left for home consumption | For every 90-100sacks/ha. of harvest, only 10- 20 % are left for home consumption | 30-50% of the harvest of most rice farmers are retained for their consumption |
| Corn farmers | Only 5% of their harvest is used for home consumption. | For commercial purposes, only 5 % of their harvest is used for home consumption. | None |
| Vegetable growers | Most of the vegetable growers are backyard growers. Primarily, their harvest is for home consumption. Sometimes they sell some vegetable to buy things they need | Most of the vegetable growers are backyard growers. Their harvest is for home consumption. They only sell vegetables if they need cash to buy other things that they need at home | All vegetable growers are backyard growers and their harvest are only for their own consumption |
| Coconut growers | 98% for the market, 2% for home consumption | 95% for the market, 2% for home consumption | 100% for market |
| Root crops growers | For home consumption | For home consumption | For home consumption |
| Animal raisers | Mostly for the market | Mostly for the market | 50% for the market |
| Fisher folks | 100% of the harvest of most fisher folks are for the market | 100% of the harvest of most fisher folks are for the market | 100% of the harvest of most fisher folks are for the market |

Findings show that farmers' rice harvest is generally for the market, however, farmers leave 10-20% of their harvest for home consumption. The Gubat group keeps a bigger portion of their harvest (30-50%) for home consumption. The trend seems to be the same with other

crops except for vegetables and root crops which are generally grown for home consumption. Fish catch is wholly for the market.

#### 6.2.1.4 Farmers Coping Strategies

The existing strategies adopted by the farmers to cope with the risk due to these hazards are as follows (**Figure 91**)

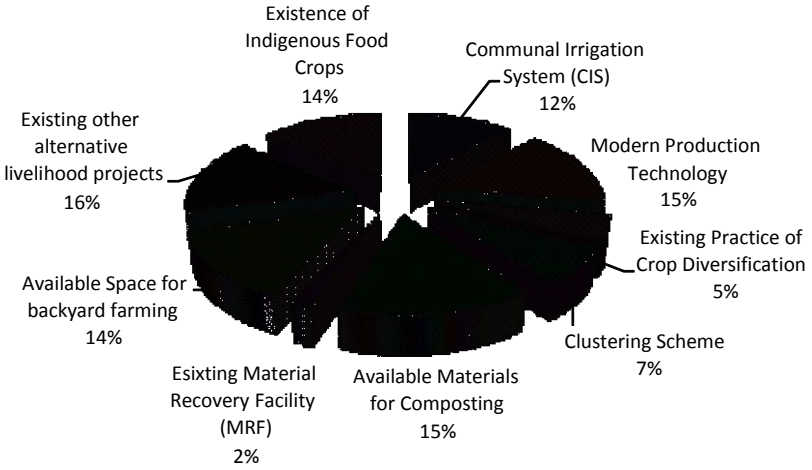



Figure 91 **Coping strategies of farmers**

Since farmers cannot do much with standing field crops when natural hazards occur but to harvest premature crops, the coping strategies adopted are for livestock and poultry. These are done by raisers to minimize risks affecting their vulnerability conditions, which include:

1. Animal confinement during typhoon event;
2. Retrofitting of animal housing; and
3. Application of good animal management practices.

#### 6.2.1.5 Risk Condition of Fisher folks

The risks of fisher folks are greatly influenced by climate related hazard like strong winds brought by seasonal monsoon and typhoon. The months from October to February are considered lean periods for small fisher folks, because of the strong seasonal wind known as South-Easterly wind (Amihan). During this period, open sea fish harvesting is only limited to 5 to 15 days. This is a risky situation especially for small fisher folks who rely on fish harvesting as a source of daily subsistence. A day without fishing is also a day without food on the table. Fisher folks put themselves at high risk when they tend to ignore the hazards in order to survive. This problem is compounded when typhoon occurs outside of the lean months.

#### 6.2.1.6 Coping Strategies of Fisher folks

The existing strategies adopted by fisher folks to cope with the risk due to these hazards are as follows:

1. Engagement in non-fishery based or alternative means of livelihood such as handicraft and shell craft, and
2. Engagement in agriculture during lean months;

### *6.2.2* Service Sector

The service sector comprises those who are working and receiving regular salary from the government. They comprise 21% of the livelihood groups in San Buenaventura and Mauraro (Tables 14 & 22), 19.67% in Masarawag (Table 18), 16.5% in Minto (Table 20) and 14% in Bagacay and Ariman (Tables 24 & 26). This livelihood group is also highly affected by typhoon and other natural hazards**.**

### *6.2.3* Wage laborers

Comprising 33% of the total percentage of livelihood groups in the Pilot Barangays, the wage laborers are also very highly vulnerable to the effects of typhoon and flooding. This group relies much on daily livelihood opportunities, which become limited every time there are hazardous climatic events.

### *6.2.4* Businessmen and Traders

Ten percent of the livelihood groups in the Pilot Barangays comprise of businessmen and traders and just like the wage laborers they are also vulnerable to the effects of typhoon and flooding. This group also relies much on good weather conditions.

If affected by hazards and calamities, the coping strategies of the above livelihood groups include: a) finding alternative livelihood activities appropriate for the season, b) securing / storing food supply, c) observing the environment to become aware of the hazard situation and understanding the nature of hazards and its impact on their livelihood, and d) seeking assistance from local officials / government agencies.

Table 39 **Number of farmers per crop planted and average farm holding**

| Municipality and Barangay | Rice | | | Corn | | | Vegetable and Root crops | | | Coconut | | | Abaca | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *No. of Farmers* | *Total Land Area planted (Ha)* | *Average Area per Farmer(Ha)* | *No. of Farmers* | *Total Land Area planted (Ha)* | *Average Area per Farmer(Ha)* | *No. of Farmers* | *Total Land Area planted (Ha)* | *Average Area per Farmer(Ha)* | *No. of Farmers* | *Total Land Area planted (Ha)* | *Average Area per Farmer(Ha)* | *No. of Farmers* | *Total Land Area planted (Ha)* | *Average Area per Farmer(Ha)* |
| Municipality of Buhi | | | | | | | | | | | | | | | |
| 1. San Buenaventura | 9 | 10 | 1.11 | - | - | | 14 | 2.28 | 0.16 | 16 | 15.5 | 0.97 | | | |
| 2. San Ramon | 22 | 22.66 | 1.03 | 32 | 32 | 1.00 | 20 | 6.15 | 0.31 | 257 | 189 | 0.74 | | | |
| 3. Igbac | 64 | 64 | 1.00 | 22 | 22 | 1.00 | 38 | 9.31 | 0.25 | 853 | 670 | 0.79 | 5 | 50 | 10.00 |
| | | | | | | | | | | | | | | | |
| Municipality of Gubat | | | | | | | | | | | | | | | |
| 1. Ariman | 196 | 97.67 | 0.50 | | 2.5 | | 20 | 1.75 | 0.09 | 35 | 113.06 | 3.23 | | | |
| 2. Bagacay | 153 | 84.93 | 0.56 | | 3 | | 19 | 2 | 0.11 | 96 | 581.54 | 6.06 | | | |
| 3. Rizal | 243 | 89.86 | 0.37 | | 3 | | 19 | 2 | 0.11 | 93 | 300.03 | 3.23 | | | |
| | | | | | | | | | | | | | | | |
| Municipality of Guinobatan | | | | | | | | | | | | | | | |
| 1. Masarawag | 163 | 97.74 | 0.60 | 6 | 3.25 | 0.54 | 143 | 41.749 | 0.29 | 274 | 579.02 | 2.11 | 9 | 6.065 | 0.67 |
| 2. Mauraro | 52 | 27.2 | 0.52 | 92 | 69.55 | 0.76 | 176 | 64.34 | 0.37 | 112 | 177.05 | 1.58 | | | |
| 3. Minto | 75 | 45.175 | 0.60 | | | | | | | 16 | 23.5 | 1.47 | | | |
| 3,344 | 977 | | | 152 | | | 449 | | | 1,752 | | | 14 | | |
| | 29.22% | | 0.70 | 4.55% | | 0.82 | 13.43% | | 0.21 | 52.39% | | 2.24 | 0.42% | | 5.34 |

# 7. INSTITUTIONAL DRM SYSTEM ANALYSIS

The institutional DRM system was analyzed using the FAO guide for DRM systems analysis methodology. The purpose of an institutional assessment is to:

- Identify the strengths and weaknesses in order to determine how effective is the design and the implementation of locally relevant DRM practices;
- Identify specific gaps in the organizational structure, roles and capacities in order to design measures to strengthen the existing DRM system, improve linkages with vulnerable sectors (e.g. agriculture, water resources and health), and reinforce vertical and horizontal coordination among different actors;
- Analyze the different (and sometimes conflicting) interests and perceptions regarding DRM of all players, including government officials, politicians, elected council representatives, traditional leaders, private sector entrepreneurs, NGOs and civil society organizations; and
- Identify the tangible institutional attributes (policies, organizational mandates and structures), supporting instruments (such as finance, logistical support and technologies) and intangible attributes (attitudes, perceptions and underlying motivating factors) that determine the success of DRM programs.

In order to fully understand the result of this assessment, there is a need to present first the Disaster Management Capacity of the Philippines. Most of the succeeding discussions were lifted from the WB and NDCC report on NDRM in the Philippines published in 2005.

## 7.1 Indicators of Existing Institutional and Technical Capacity (ITC) on DRM

The monitoring sheets for DRM Analysis developed by the FAO were used in determining the existing key processes and instruments of the pilot site related to the DRM framework. The indicators of the monitoring sheets served as guide in identifying specialized institutional and technical capacity in relation to the different elements of the DRM framework and in identifying future opportunities for intervention. The proposed assessment categories of DRM indicators are: Non-existent (NE), existent but non-operational (ENO), and Operational (O). The proposed assessment indicators for degree of implementation of identified categories are: Good (G), Satisfactory (S), and Inadequate (I).

## 7.2 National DRM System

Following are the findings on the Agriculture and Fisheries DRM systems as analyzed and reported by Dr. Satendra Singh, Disaster Management Expert and TCDC Consultant for DRM of the project.

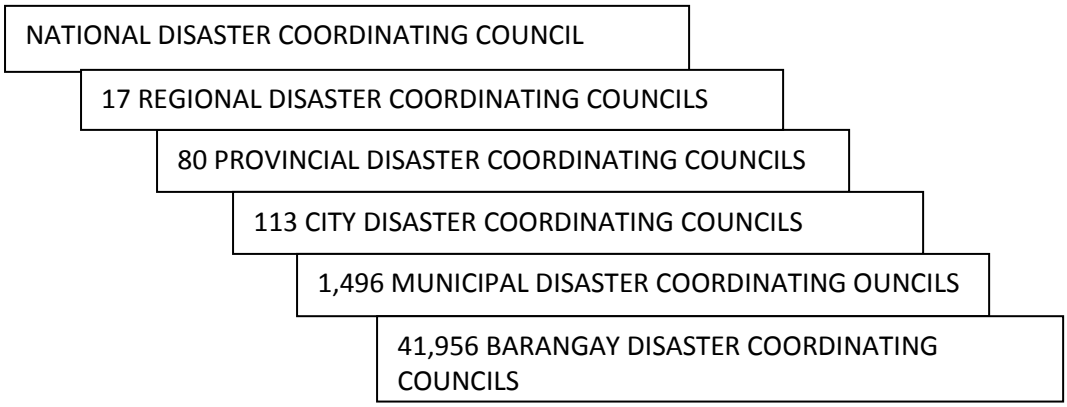
### *7.2.1* Institutional Framework

The Philippine Disaster Management System (PDMS) is carried out at various political subdivisions and administrative regions of the country through the National Disaster Coordinating Council (NDCC), 17 Regional Disaster Coordinating Councils, 80 Provincial

Disaster Coordinating Councils, 113 City Disaster Coordinating Councils, 1,496 Municipal Disaster Coordinating Councils, and 41,956 Barangay Disaster Coordinating Councils.

The NDCC is the highest policy-making body for emergency management programs in the Philippines, with the Office of Civil Defense as its operating arm.

- National Disaster Management System




The Government of the Philippines pursues a comprehensive disaster management framework that encompasses disaster risk reduction / mitigation and preparedness in the pre- event and disaster response and rehabilitation / recovery in the post-event. It is within this framework that all stakeholders in DM at all levels are expected to carry out their roles and responsibilities in unified and coordinated way to achieve maximum results in ensuring a safe population and a safe nation.

### *7.2.2* NDCC Functions

At the national level, the NDCC serves as the President's adviser on disaster preparedness programs, disaster operations, and rehabilitation efforts undertaken by the government and the private sector. It acts as the top coordinator of all disaster management programs and projects and the highest allocator of resources in the country to support the efforts at the lower DCC level. In the discharge of its functions, the NDCC utilizes the facilities and services of the Office of Civil Defense as its operating arm.

### *7.2.3* Tasks of NDCC Chairman and Member-Agencies

The Chairman and members of the Council have the following tasks:

- Chairman - Convenes the Council as often as necessary and calls on all other departments/bureaus/agencies, other instrumentalities of the government and the private sector for assistance when the need arises.
- Administrator, Office of Civil Defense - Coordinates the activities, functions of the various agencies and instrumentalities of the government, private institutions and

civic organizations to implement the policies and programs of the NDCC; disseminates materials relative to disaster prevention, control and mitigation; and advises the Chairman on matters concerning disaster management.

- Secretary of Interior and Local Government - Oversees the organization of DCCs, the establishment of Disaster Operation Centers of all local governments, and the training of DCC members in coordination with OCD, DSWD, PNRC, and other appropriate agencies.
- Secretary of Social Welfare and Development - Extends relief assistance and social services to the victims as necessary.
- Secretary of Health - Provides health services during emergencies as necessary, and organizes reaction teams in hospitals, clinics and sanitary and other health institutions.
- Director-General, NEDA - Responsible for the determination and analysis of the effects of disasters and calamities on the socio-economic plans and programs of the country, and development of damage assessment scheme.
- Secretary of Labor and Employment - Provides emergency employment opportunities to disaster victims, implements the industrial civil defense programs and measures, and organizes and trains Disaster Control Groups in all factories and industrial complexes.
- Secretary of Education, Culture and Sports - Provides assistance in the public education and campaign regarding disaster preparedness, prevention and mitigation, makes available school buildings as evacuation centers, and organizes and trains disaster control groups and reaction teams in all schools and institutions of learning.
- Secretary of Trade and Industry - Maintains normal level of prices of commodities during emergencies, and organizes Disaster Control Groups and Reaction Teams in large buildings used for commercial and recreational purposes, maintains normal level of prices of commodities during emergencies.
- Secretary of Agriculture - Undertakes surveys in disaster areas to determine the extent of damage of agricultural crops, livestock and fisheries and renders technical assistance to disaster victims whose crops or livestock have been destroyed.
- Secretary of Budget and Management - Releases funds required by the departments for disaster operations.
- Secretary of Environment and Natural Resources - Responsible for reforestation and control of areas which tend to cause flooding, landslides, mudflow and ground subsidence, provide seeds, seedlings and saplings and technical assistance regarding mines, forests and lands, formulates rules and regulations for the control of water and land pollution.
- Secretary of Finance - Issues rules and regulations with the relevant agencies concerned for the funding by local government of the requirements for organizing, equipping, and training of their disaster coordinating councils and reaction teams.

- Secretary of Public Works and Highways - Restores destroyed public structures such as flood control, waterworks, roads, bridges, and other vertical and horizontal facilities/structures and provides heavy and light equipment for relief, rescue and recovery operations.
- Secretary of Tourism - Organizes and trains disaster control groups and reaction teams in hotels, pension houses, restaurants and other tourist-oriented facilities.
- Secretary of Transportation and Communications - Restores destroyed communication and transportation facilities such as railroads and vertical structures, and organizes emergency transport services from the national down to the barangay level; and restores destroyed communication and transportation facilities such as railroads and vertical structures.
- Director, Philippine Information Agency - Provides public information service through dissemination of disaster mitigation measures.
- Secretary-General, Philippine National Red Cross - Conducts disaster leadership training courses, assists in the training of DCCs at all levels; and assists in providing emergency relief assistance to disaster victims.
- Chief of Staff, Armed Forces of the Philippines - Responsible for the provision of security in disaster area and provision of assistance in the reconstruction of roads, bridges and other structures and transportation facilities for rapid movement of relief supplies and personnel and for the evacuation of disaster victims.

**PARTNER ORGANISATIONS**: In addition to the Disaster Coordinating Councils, there are a number of other agencies involved in disaster risk reduction, as follows:

1. **Office of Civil Defense (OCD)** – the core organization for disaster reduction and mitigation, composed of 19 line agencies.
2. **Local Government Units** – prepares and implements disaster risk management plans, executes preparedness, response, recovery and development programs.
3. **Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)** – provides weather forecasting and early warning advisories.
4. **Department of Environment and Natural Resources (DENR)** - responsible for hazard mapping, watershed improvement and protection
5. **National Water Resources Board (NWRB) -** responsible for the overall management of water resources, formulates IWRM plan framework for regional and local plans, integrating disaster reduction and management.
6. **Philippine Institute of Volcanology and Seismology** – predicts volcanic eruption and earthquakes and their geo-tectonic phenomena, determines areas likely to be affected.

7. **Department of Agriculture** - collects data concerning damages to agriculture by natural disasters. Promote crop insurance against natural hazards matching compensation by the insurance company and provides agriculture inputs – fertilizers, seeds etc. to disaster affected farmers through LGU.

8. **Other organizations** - in addition to these main role players, there are number of other organizations (GOs and NGOs) directly or indirectly involved in the field of disaster risk management.

### *7.2.4* Disaster Risk Reduction Initiatives

The Govt. of Philippines has taken a number of initiatives to make the disaster risk management system more effective, giving more emphasis on preparedness and mitigation. The NDCC has developed Four Point Action Plan on Disaster Preparedness i.e.-

a. Upgrading the forecasting and warning capability of PAGASA and PHIVOLCS, which are the warning agencies for Met-Hydro and Geological hazards, respectively;

b. Public information campaign on disaster preparedness;

c. Capacity building for local government units in identified vulnerable areas; and

d. Mechanisms for government and private sector partnership in relief and rehabilitation. The other issues being taken care by the Government include-

- Hazard and Risk Assessment.
- Integrating Disaster Risk Management in National and Local Development Plans.
- Disaster Management Training and Contingency Planning.
- Community – Based Disaster Management.
- Customization of WBI Web-Based Disaster Risk Management Courses.
- Enhancement of Emergency Response Capability through training of First Responders' Groups and development of a National Incident Command System

### *7.2.5* The DRR System: Strengths and Gaps

The DRR system in the country despite having a number of strengths has many weaknesses and needs to explore the opportunities for further strengthening disaster risk reduction at national, regional and local levels.

#### 7.2.5.1 Strengths

- **Well defined institutional framework** - The NDCC has a DRM institutional set-up at national, regional, municipality and barangay levels, along with relevant laws/acts and national policy framework.

- **Criteria for disaster declaration** - Has clearly defined criteria for declaring disasters.
- **Good network of line organizations** - The country has a number of organizations to support DRM activities in various ways i.e. data collection, providing scientific input and technical support, creating and capacitating human resource/providing training etc. In addition to main organizations looking after the DRR, there are a number of supporting agencies, who may play a significant role in strengthening DRR in the country. The main ones are listed below:

**Major Supporting Agencies for Disaster Risk Management**:

- Center for Disaster Preparedness - Manila
- Center for Initiatives and Research on Climate Adaptation (CIRCA) - Bicol
- Corporate Network for Disaster Response (CNDR) - Manila
- Department of Science and Technology (DOST) – Nationwide
- Department of Interior and Local Government (DILG) – Nationwide
- Disaster Risk Reduction Network (DRR Net) - Nationwide
- Disaster Risk Reduction Training and Learning Circle - Nationwide
- Earthquake and Megacities Initiatives – Manila / International
- International Institute for Disaster Risk Management (IDRM) - International
- International Institute of Rural Reconstruction (IIRR) - International
- National Economic and Development Authority (NEDA) - Nationwide
- Philippine Red Cross (PNRC) – Nationwide

- **HRD and awareness strategy** - Has well defined HRD and awareness programmes.
- **Regular simulations -** OCD carries out regular simulation exercises to review the situation. Simulation exercises are undertaken at regular interval at regional level.
- **Good training facilities** - Has well established training centers, with adequate facilities and training materials. There are a number of institutes who may provide training for DRM and technical issues associated with it. The OCD also provides such training at regular basis to different role players.
- **Good NGOs network** - The country has a number of NGOs working in close collaboration with the government and they have a good approach at grass root level.
- **Educated society** - Most of the people in the country, even in rural areas are educated and are able to grasp the DRM knowledge easily.

#### 7.2.5.2 Key Gaps

- **Less emphasis on mitigation and preparedness -** Disasters in the country are being dealt within manners that are ad-hoc and response oriented. The activities of DCCs are mainly restricted to response and there is not much emphasis on mitigation and preparedness. In general, the tasks of these organizations are restricted to response and providing necessary relief.
- **Poor funding** - In general, the budget allocation for DRM is 5% of development budget, allocated only for response purposes and is mainly used for compensation to victims. In a very exceptional situation, fund is made available from Reserve funds of the government. The other line agencies have a similar problem of funding and have very minimal budget to sustain DRM initiatives. There is a need to set up a revolving/ reserve fund at national and regional levels that may be used not only for response and relief, but also for mitigation and preparedness purposes.
- **Limited risk reduction capacity**- The DCC members and LGUs have limited risk reduction capacity and also lack resources. There is need to capacitate these organizations with training and equipping with essential resources, including equipment.
- **Weak information system**- The proper information dissemination system is lacking. The information does not get down to the people that need it. The knowledge available with research and other institutions do not get properly disseminated at the grass root level.
- **Weak early warning system**- Early warning and forecast system is not up to mark and needs modernization and proper means to communicate it at grass root level. The information provided by PAGASA offices at different levels is only for short and medium range and is rarely used by the community and other stakeholders.
- **Poor insurance sector**- Insurance system is not working properly. There is a need for an enhanced insurance system to compensate affected farmers. The poor people, especially in rural areas are not getting much benefit from the insurance sector due to various technical and other problems.
- **Lack of coordination/ collaboration**- Coordination with other stakeholders is not appropriately managed. There is a gap in the information sharing among various line agencies/ departments; horizontal linkages among many institutions appear to be inadequate in many instances. Efforts by donors, multilateral and civil society are poorly coordinated and thus generate little effects.
- **Confusion about roles and responsibilities**- There is less clarity about roles and responsibilities for strategic oversight, planning, coordination and implementation of mitigation and response measures for all forms of natural hazards.
- **Poor DRR and development linkage**- Most of the developmental agencies do not have any DRR/ Contingency plan and the strategic linkage between DRR and development is not given much priority in development planning.

## 7.3 Disaster Risk Reduction in Bicol Region

Known as Region V, Bicol region has a total land area of roughly 17,632.5 square kilometers, which is 5.9 percent of the country's total land area. The region is very prone to a number of disasters including typhoons, floods, volcanic explosion, earthquakes, storm surge, etc. For DRM, the region has a Regional Disaster Coordination Council, 107 Municipality Coordinating Councils and a total of 3471 Barangay coordinating councils. In addition the region also has NGOs and Government agencies looking after disaster risk management at different levels. The PAGASA, NEDA, OCDs, PHILVOLCS, PNRC, NWRD and TPC (regional level units) are other agencies involved in DRM activities and providing necessary support to the Disaster Coordinating Councils. The research institutes and universities/ colleges are also involved in DRM activities by offering formal courses, carrying out research relating to DRM and helping in human resource development through training.

During the year 2008 and 2009, a number of programmes and initiatives were taken in the context of disaster preparedness and mitigation. The main ones are enlisted in the succeeding text:

- The region was selected as one of the recipients of the Hazard Mapping and Assessment for Effective Community-based Disaster Risk Management or READY project, which involved the development of locally driven hazard maps for the local government units (LGUs).
- The OCD developed a database of barangays along the coastal areas including the names of the chairpersons and their contact numbers to ensure that weather warning bulletins would immediately reach them.
- The province of Sorsogon conducted baseline research to define vulnerabilities covering the provincial, municipal and barangay levels.
- The APSEMO implemented several important activities i.e. (a) formulation of emergency warning system, communication protocol, and evacuation procedures for floods and landslides in the barangays; (b) set guidelines in pre-emptive evacuation for typhoons; (c) installed 18 rainfall monitoring stations at the community level; (d) conducted pre-emptive evacuation during typhoon Frank and tail of cold front/landslides occurrences; (e) collected and validated data and needs of evacuees; and (f) prepared evacuation plans identifying and inspecting evacuation centers in the province and designated pick-up points per barangay. APSEMO also maintained a close working relationship with the Provincial Disaster Coordinating Council (PDCC) and the warning agencies for timely release of PDCC advisories to communities through local broadcast media.
- International NGOs like the Fundacion Accion Contra EI Hambre (ACF) and Save the Children Foundation, in collaboration with the Office of Civil Defense conducted contingency planning with pilot provinces, municipalities and barangays in the provinces of Camarines Sur, Albay and Catanduanes
- The OCD conducted workshops with partner agencies and stakeholders on community-based disaster risk management (CBDRM) and institutional capacity development. Participatory capacity and vulnerability assessment activities were carried out in the different barangays.

- The office of Civil Defense supported the implementation of special projects of DRM namely: (a) The READY Project: European Commission- UNDP-ADPC Assistance Support Project; (b) Partnership in Disaster Reduction in Southeast Asia- Asian Disaster Preparedness Center (PDRSEA- ADPC); and (c) European Commission-OXFAM Great Britain Assistance Support Project for good practices in DRM.
- The Department of Agriculture provided agribusiness and marketing assistance (AMADA) to 555 farmers/entrepreneurs. The DA, in partnership with the Local Government Units (LGUs) and Agricultural Training Institute (ATI) conducted fifteen packages of technology trainings and seventeen Farmers Field Schools.
- The Central Bicol State University of Agriculture (formerly Camarines Sur State Agricultural College) offered starting June 2008 a ladderized MS program in Disaster Risk Management, the first of its kind in the Philippines.

**Other Important Projects related to DRR being run in Bicol region are:**

- **Improvement in Technological Monitoring and Information Dissemination System**: The RDC endorsed the project for improvement of forecasting and early warning system
- **Institutionalization of a Public Safety and Emergency Management Office**: The Department of Interior and Local Government (DILG) conceptualized Good Practices in Local Governance- "Facility for Adaptation and Replication (GO-FAR)". The project assisted the Albay Public Safety and Emergency Management Office (APSEMO) in documenting their good practices.
- **Learning from Good Practices in Disaster Risk Management**: The province of Sorsogon was chosen as one of the pilot provinces in the OXFAM-GB assisted project supported by the Humanitarian Aid Department of the European Commission.
- **The RDC recognized the importance of LGUs to invest in pre-disaster activities** to reduce disaster risks. The Development Administration Committee (DAC) discussed the following policy recommendations that would facilitate the prioritization of programs and projects related to DRM: (a) a policy to allocate up to 20 percent of the local calamity fund for pre-disaster activities; (b) to encourage LGUs to institutionalize their respective Disaster Management Offices (DMOs) and to allocate regular funds for their operations; and (c) for DepEd to insure all school buildings for risk transfer and to facilitate repair of school buildings damaged by hazards. These concerns were endorsed to the RDC for approval and adoption.

### *7.3.1* Disaster Risk Management in Agricultural Sector

The region's economy is highly dependent on agriculture. It is the worst affected sector due to natural hazards in the Bicol region. Along with food grains i.e. rice and corn, the cash crops like coconut, pili and abaca are also badly affected by disasters. The damage costs substantially vary in various years as some of them result from unpredictable and variable events. These costs are likely to increase over time due to global climate change, which

seems to particularly affect the area that is vulnerable due to its geographic location, climate and fragile land use pattern. In recent past, the food grain production in the region showed a decreasing trend. Reduction in yield was noted in the three major rice producing provinces of Camarines Sur, Albay and Sorsogon. They collectively shared 70 percent of the area harvested with rice and 80 percent of total rice production. In 2008, 1.2 million metric tons of grains were produced from 390,992 hectares. This was only 1.09 percent growth compared to the 4.02 percent increase in area harvested. As a consequence, productivity in terms of yield was reduced by 2.81 percent--from 3.16 to 3.07 metric tons per hectare. If this trend continues, food sufficiency would be at risk assuming that population growth rate will be the same as that in 2007, which is 1.23 percent. One of the main reasons for this decreasing trend is the increase in frequency and intensity of natural disasters.

The Department of Agriculture is the main agency responsible for the promotion of agriculture development and growth through increased productivity. With the passage of the Local Government Code of 1991, the extension function, responsibilities and concerned personnel of the DA were devolved to the respective Local Government Units.

### *7.3.2* Department of Agriculture: Mandate, Mission and Vision:

**Mandate:** The Department of Agriculture is the government agency responsible for the promotion of agriculture development by providing the policy framework, public investments, and support services needed for domestic and export-oriented business enterprises.

**Mission:** To help and empower the farming and fishing communities and the private sector to produce enough, accessible and affordable food for every Filipino and a decent income for all.

**Vision:** A modernized smallholder agriculture and fisheries; a diversified rural economy that is dynamic, technologically advanced and internationally competitive. Its transformation is guided by the sound practices of resource sustainability, the principles of social justice, and strong private sector participation.

### 7.3.3. Initiatives in the Agriculture and Fishery Sectors as reported by DA RFU V

It is widely recognized that the Department of Agriculture plays an integral part in reducing disaster risks in Bicol Region, given the high dependence of majority of the population to this sector for livelihood. In the past three years, there have been several initiatives, both coming from the national government in partnership with other institutions, as well as, local disaster preparedness programs and projects that focused on CCA and DRR in the agriculture sector. Among these are:

- **Stress Tolerant Rice Research, Development & Commercialization** (IRRI, DA-Phil Rice, BIARC) – the project includes adaptability trials and selection of drought, saline and submergence tolerant rice varieties, which are being conducted in the provinces of Camarines Sur, Albay and Sorsogon. These provinces are the major rice producing provinces that have rice areas vulnerable to saline intrusion, drought and flooding.

- **Upland Rice Development Program** (DA RFU-5) - it was conceptualized as an adaptation strategy for the rice industry after the "rice crisis" in 2007, and the 2008 dry season flooding (February-March) which affected mostly the low lying areas in Camarines Sur and Albay. Its major components include the provision of farm inputs (seeds, plough and harrow) as well as capacity building activities for upland rice farmers.
- **Post-Harvest Facilities** (DA-BPRE) - drying rice and corn specifically during wet season cropping has been a problem which results in high post-harvest losses. Flat-bed dryers were provided to farmer cooperatives/organization through counter-parting scheme to address this problem
- **Crop Insurance for Rice Farmers -** in partnership with PCIC, DA RFU-5 initiated this intervention to encourage farmers to participate in the Quick-Turn-Around project and also to use certified seeds. This risk transfer mechanism is the only project identified in the documents of DA which has relevance to DRR in agriculture.
- **Palayamanan (Palay or Rice and Yaman or Wealth) Project –** is a rice-based farming system with crop and livestock integration that aims to increase farmer's income. Farm diversification reduces the risks of losing everything from disaster and increases resiliency of farmer beneficiaries.
- **Green House Project -** under the High Value Commercial Crops (HVCC) program, LGU's and Farmer Cooperatives/Organizations are provided with green houses, through a counter-parting scheme, to encourage farmers to produce off-season crops.
- **Modified Rapid Composting -** beneficiaries are provided with inoculants, equipments, facilities and technical assistance on organic fertilizer production to minimize the use of inorganic fertilizers which is one of the major sources of green house gas emissions.
- **Technical Assistance/Advocacy** (w/Non-Government Organizations, People's Organizations, and Farmers' Organizations) - DA RFU-5 has been working in partnership with NGO's namely Rice Watch and Action Network (R1) and SeaRice in projects that are focused on CCA and DRR. DA assisted the R1 in their project on "climate proofing" the programs and projects in the Municipality of Irosin, Sorsogon, while a training on participatory rice breeding for problem areas was conducted with SeaRice.

### 7.3.4. The Key Gaps

The review of the main documents related to Disaster Management of the DA, and other role players reveal that there are only very few activities being undertaken for disaster risk reduction in the agricultural sector. Although some initiatives were implemented to address the different risks affecting the agriculture industry brought about by climate change, there is still a need to mainstream, institutionalize and integrate the concepts of DRR and CCA into the DA programs and projects. It can also be noted that these interventions were identified by considering DRR measures although they were not promoted and packaged as such. The agency also has the capacity to plan ahead when there is an impending natural hazard like La Nina, El Nino, and typhoon, but the current process needs to improve which can be described as reactive in nature.

The report published by NEDA in the year 2009 also accepted CCA as a priority area for sustainable agriculture development. The document recognized the seriousness of the

problem and suggested that the agriculture sector should be strategically assisted to make it more resilient against the adverse impact of climate change. Considering the unusual agro-climatic conditions, NEDA proposed that research and development activities should be pursued to develop farming systems technologies for climate change adaptation.

The discussion with various stakeholders - the policy makers, the implementers, the NGOs, Farmer leaders and even the farmers at different barangays also revealed that they are not proactive yet about this strategic aspect for DRM in the agricultural sector.

It was also noted that in practice, during the implementation of its duties and functions, DA is involved in some activities related to disaster management. But most of these activities concentrated only on relief and response and gave negligible importance to the preparedness and mitigation concerns.

The outcomes of the primary and secondary data analysis in the context of the DRM issues in agriculture are presented below:

- **Low priority to DRM** - The DRM in agriculture is still of low priority in DA's policy and planning. No document in DA is available that speaks about this strategic issue directly.
- **Emphasis on response and relief only** - The relief and response are the main concerns for almost all agriculture stakeholders during any type of disasters. The DA's approach to DRM is mainly restricted to compilation of damage data and providing some relief to the victims. The DRM issues in agriculture are mainly limited to rehabilitation of crop production by providing planting materials immediately after typhoons, and creation or revival of physical assets for disaster prevention.
- **Poor capacity of DA and LGU staff in DRR** - The DA and LGU staff responsible for agriculture development and its extension are not well equipped with DRR techniques and need capacity building through proper training.
- **Less importance given to DRM Technical issues** - The technical issues for DRM in agriculture i.e. saline water intrusion, soil conservation, etc. are less priority issues.
- **Poor early warning and weather forecasting** - Early warning / weather forecast system is poor and use old / outdated techniques, which are able to provide only short and medium range forecast. The information are communicated to the line departments through formal communication means i.e. phone, fax etc. and are rarely used for crop contingency planning.
- **Poor loan facilities** - To avail of loan from the banks for farmers is a very tedious and time consuming exercise. The interest rates are also very high and banks seek guarantee to give loans. The poor farmers very rarely go to the banks for loan and mostly depend on their relatives or friends. In some cases the farmers take agriculture input on loan from the distributing firms.
- **Poor response to HRD in DRM** - The HRD for DRM in agriculture is the most negligible component. Though farmers are provided some information about crop planning through seminars, training etc, yet nothing much is told about other important issues i.e. DRM planning, crop diversification, alternative livelihood resources, small irrigation system, etc.

- **Weak knowledge dissemination system** - The knowledge dissemination system from the research institute to the users does not function well. The information flow is not very smooth and the farmers do not get much information about the new researches/ developments in the agriculture field.
- **No proper preparedness** - There is rarely any preparedness to meet the emergency situation i.e. buffer stocking for seeds, fertilizers, etc. The facilities for keeping such stocks i.e. warehouses etc. are also not available.
- **Negligible alternative livelihood resource** - The alternative livelihood resources are not sufficient to compensate the livelihood loss due to disasters. There is not much enthusiasm in the government or NGO sectors to develop such resources. The farmers do not get good guidance or resources to start/ develop such income generating small enterprises at local level.
- **Information gap for marketing** - There is not much information available to the farmers about marketing trend and demand, so that they may diversify their product. Sometimes, this makes farmers unable to get right value of their products.
- **Poor coordination** - Proper coordination among various stakeholders, especially in the agriculture sector is lacking. The sharing of information is very minimal, causing gaps in knowledge sharing and using available knowledge for appropriate DRM planning in agriculture sector. There is no proper coordination among research institutions and the service provider. Similar situation exists for the data generating institutes and the user groups.
- **Lack of clear cut policy about insurance** - Lack of clear cut policy about insurance in the agriculture sector and less enthusiasm among the farmers to use the facility. The guidelines for the insurance in agriculture are not very clear and different groups have different information. It is not clear to the farmers on, how to make maximum benefit out of this facility.
- **Poor knowledge dissemination for DRM issues** - The extension service for agriculture is mainly provided through LGUs, which are less equipped to disseminate the DRM knowledge to the agriculture community. (Satendra Singh, 2010)

### 7.4 DRM Systems: Municipal Level

The status of the municipal level DRM systems of the pilot sites was generated through FGDs, KII, formal survey and workshops held in the pilot areas and during the trainings on DRR, CBDRM and Gender Integration in DRM at CBSUA from November 2009- March 2010. Assessment instruments used were adopted from FAO and CBDRM publication of ADPC.

The 10 Institutional Technical Capacities (ITC) that served as bases for assessing the status of DRM capacity of the three pilot municipalities are as follows:

1. Disaster risk assessment
2. Disaster risk management planning and monitoring
3. Disaster mitigation and Prevention
4. Awareness raising and dissemination of risk information
5. Community level early warning systems

6. Preparedness
7. Providing immediate response and/or relief assistance
8. Assessing damage and loss
9. Reconstruction of settlements, infrastructure and services
10. Rehabilitation, economic and social recovery

### *7.4.1* Municipality of Buhi

Findings show that a great majority (80.56%) of the expected Institutional Technical Capacity (ITC) for DRM do not exist in the pilot barangays of the municipality of Buhi. Few ITC areas (14.58%) are found to be existing but non-operational and a very small percentage (4.86%) of the required ITC is operational. (Table 40)

The indicators that are totally non-existing in all the 3 pilot barangays of Buhi are those under:

- Disaster risk assessment
- Disaster mitigation and prevention, and
- Reconstruction of settlements, infrastructures and services.

Those existing but non-operational under the preparedness indicator are:

- Roles and responsibilities allocated and with directory of names and inventories of equipment (San Buenaventura)
- Shelters and high grounds available to save lives and livelihood (all)

On indicators concerning the provision of immediate response and/or relief assistance, some are existing but non-operational and some are operational.

- Availability of social capital networks to support neighbors and relatives is operational in San Buenaventura.
- Mechanisms/procedures for community level emergency food distribution and emergency relief is provided for and targeted to the most vulnerable groups are operational in San Buenaventura but existing yet non-operational in Igbac and San Ramon.

For assessing damage and loss due to disasters, Buhi is familiar with the procedure that assessment teams should consult the community but it is only operational in San Buenaventura.

Under reconstruction, economic and social recovery, micro financing does exist in Buhi but in terms of their contribution for the rehabilitation of disaster affected areas, it is only San Buenaventura which was able to receive such services.

The operational (O) ITC of Buhi and their corresponding assessments is shown in **Table 40.**

### *7.4.2* Municipality of Guinobatan

In Guinobatan, a very impressive (70.14%) number of ITC components are operational. A small fraction (13.89% and 15.97%) is considered existing but non-operational and not-existing, respectively.

The existing but non-operational (ENO) and operational (O) components of the ITC of Guinobatan and their corresponding assessments are shown in **Table 41**.

### *7.4.3* Municipality of Gubat

In Gubat, only a small percentage (18.06%) of the ITC components exists, but is non-operational, 38.19% is operational and a larger portion (43.75%) is non-existent.

The existing but non-operational (ENO) and operational (O) components of ITC of Gubat and their corresponding assessments are shown in **Table 42**.

Table 40 **Assessment of Operational ITC of Buhi**

| Key processes and instruments (related to the DRM framework) | Indicators | Name of institution involved in | | Measures and capacities for implementation | | |
|---|---|---|---|---|---|---|
| | | Lead responsibility | Supporting role | Staff | Tech skills | Financial resources |
| Providing immediate response and/or relief assistance | Mechanism/procedures for community-level emergency food distribution exist | MDCC | Barangay Tanod, Barangay Council | S | S | I |
| | Emergency relief has been targeted to the most vulnerable households | MDCC & LGU | | S | S | I |
| Assessing damage and loss | Damage and loss assessment teams consulted with community representatives | | Barangay Tanod, Barangay Council | | | |
| Rehabilitation, economic and social recovery | Micro-financing institutions contribute to rehabilitation | Barangay Council Micro finance | | S | S | I |

Table 41 **Assessment of Operational ITC of Guinobatan**

| Key processes and instruments (related to the DRM framework) | Indicators | Name of institution involved in | | Measures and capacities for implementation | | |
|---|---|---|---|---|---|---|
| | | Lead responsibility | Supporting role | Staff | Tech skills | Financial resources |
| 1. Disaster risk assessment | Local communities have been involved in risk assessment exercises | BDCC | Community Volunteers | G | I | I |
| | Community hazard and vulnerability maps prepared and regularly updated | -do- | -do- | S | I | G |
| | Livelihood profiles of vulnerable groups identified | -do- | -do- | G | G | G |
| | Livelihood asset at risk identified | -do- | -do- | G | G | G |
| 2. Disaster risk management planning and monitoring | Community DRM committee and volunteers exist | -do- | -do- | S | I | I |
| | Community DRM plan addressing major hazards exist | -do- | -do- | S | G | I |
| | At-risk groups involved in the planning process | -do- | -do- | I | I | I |
| | Hazards monitoring technology available and procedures defined | -do- | -do- | I | I | I |

| Key processes and instruments (related to the DRM framework) | Indicators | Name of institution involved in | | Measures and capacities for implementation | | |
|---|---|---|---|---|---|---|
| | | Lead responsibility | Supporting role | Staff | Tech skills | Financial resources |
| 3. Disaster mitigation and Prevention | Disaster risk reduction practices are carried out at village level (e.g. water harvesting) | BDCC &DPC | -do- | G | G | I |
| | Community/village is included in district hazard-sector-specific mitigation plans | -do- | -do- | G | G | I |
| | Advisory services on disaster mitigation are available at community/village level | -do- | -do- | I | I | I |
| | Community-based DRM methods are prescribed and understood properly by CBOs/CSOs and the community members | -do- | -do- | I | I | I |
| 4. Awareness raising and dissemination of risk information | Awareness-raising campaigns undertaken at village level | MDCC, BDCC, DPC | -do- | S | G | I |
| | Local Media programmes targeted to DRM awareness-raising prepared/disseminated | -do- | -do- | S | G | I |
| | Community is aware of alert signals for different types of disasters | -do- | -do- | S | G | I |

| Key processes and instruments (related to the DRM framework) | Indicators | Name of institution involved in | | Measures and capacities for implementation | | |
|---|---|---|---|---|---|---|
| | | Lead responsibility | Supporting role | Staff | Tech skills | Financial resources |
| | Mechanisms exist to communicate hazard risk to community level | -do- | -do- | I | I | I |
| | Community -based awareness approaches implemented (field days, orientation meetings, folk songs, dramas, demonstration rallies, exchange visits etc) | -do- | -do- | I | I | I |
| 5. Community level early warning systems | Early warning messages are received at the community level | BDCC | PDCC, MDCC | G | G | G |
| | Mechanisms exist to communicate hazard risk to the community | BDCC | Media | I | S | I |
| | Systems to ensure outreach of EWS to the most vulnerable people in place ( including, if relevant, translation of messages into local languages) | BDCC | Purok Leaders | S | S | S |

| Key processes and instruments (related to the DRM framework) | Indicators | Name of institution involved in | | Measures and capacities for implementation | | |
|---|---|---|---|---|---|---|
| | | Lead responsibility | Supporting role | Staff | Tech skills | Financial resources |
| | Indigenous knowledge incorporated in EW systems (e.g. local calendars, local measures, almanac, etc) | O | | I | I | I |
| 6. Preparedness | Community preparedness plan exist | BDCC | SC | S | S | S |
| | Rules and responsibilities allocated and directory of the names and inventories of equipment | BDCC | SC | S | S | S |
| | Shelters and high grounds available to save lives and livelihoods | BDCC | DepEd SC, DA | S | S | S |
| | Warehouse for emergency food and other supplies available in the area | BDCC | Purok Leaders | S | S | I |
| | Volunteers trained to provide support in case of emergency | SC, BDCC | BNS, PNP | S | G | S |
| | Evacuation routes identified and local people informed | BDCC | MDCC | S | S | I |
| | Regular mock evacuation exercises conducted at community level | BDCC | MDCC, SC | S | S | I |

| Key processes and instruments (related to the DRM framework) | Indicators | Name of institution involved in | | Measures and capacities for implementation | | |
|---|---|---|---|---|---|---|
| | | Lead responsibility | Supporting role | Staff | Tech skills | Financial resources |
| 7. Providing immediate response and/or relief assistance | Social capital networks to support neighbors and relatives exist | BDCC | MDCC, PDCC | I | S | I |
| | Search and rescue teams available at the community level | SC, BDCC | MDCC | S | S | I |
| | Mechanism/procedures for community-level emergency food distribution exist | BDCC | DSWD, MDCC | S | S | I |
| | Mechanisms/procedures for organizing emergency shelter in place | BDCC | MDCC | S | S | I |
| | Emergency relief has been targeted to the most vulnerable households | BDCC, MDCC | DSWD, MDCC | S | S | I |
| | Community mechanisms to coordinate the response in place | BDCC | Media, MDCC | S | S | S |
| 8. Assessing damage and loss | Damage and loss assessment teams consulted with community representatives | BDCC | Purok Leaders, GO | S | S | I |
| | Damage and loss assessment include vulnerability and livelihood profiles | GO, BDCC | NGO | S | S | S |

| Key processes and instruments (related to the DRM framework) | Indicators | Name of institution involved in | | Measures and capacities for implementation | | |
|---|---|---|---|---|---|---|
| | | Lead responsibility | Supporting role | Staff | Tech skills | Financial resources |
| 9. Reconstruction of settlements, infrastructure and services | Community rehabilitation plans exist (formulated with community consultation) | MDCC,BDCC | GO, NGO | I | I | I |
| | Reconstruction, resettlement and sector rehabilitation take into consideration "building back better" principles | BDCC | PDCC, MDCC, NGO, GO | I | S | I |
| | Rehabilitation plans take into consideration local livelihood strategies | BDCC DPO | DA, MDCC, NGO | I | S | I |
| | Community has benefitted from national compensation schemes | BDCC | NDCC | I | I | I |
| | Community has benefitted from international assistance for rehabilitation | O | | I | I | I |
| 10. Rehabilitation, economic and social recovery | Mechanisms to prepare plans for rehabilitation and economic recovery exist | BDCC | PEO, MEO, BOC | I | S | I |
| | Funding mechanisms supporting rehabilitation exist | BDC | LGU | I | I | I |

| Key processes and instruments (related to the DRM framework) | Indicators | Name of institution involved in | | Measures and capacities for implementation | | |
|---|---|---|---|---|---|---|
| | | Lead responsibility | Supporting role | Staff | Tech skills | Financial resources |
| | Evidence of provision of key production inputs needed for livelihood recovery (e.g. fishing boats and equipment, farming implements, seeds and fertilizers) | BDCC | DA, TABI | I | I | I |
| | Micro-financing institutions contribute to rehabilitation | BDCC | NGO | S | S | S |
| | Plans to re-build area-specific livelihood exists | BDC, BDCC | LGU, NGO | I | S | I |
| | Guidelines for local institutions and informal groups to help affected communities exist | BDCC | MDCC, PDCC, MSWD | S | S | I |
| | DRM elements incorporated into livelihood restoration/development programs to build resilience to future hazards | BDCC | SC, LGU | S | S | I |

Table 42 **Assessment of Operational ITC of Gubat**

| Key processes and instruments (related to the DRM framework) | Indicators | Name of institution involved in | | Measures and capacities for implementation | | |
|---|---|---|---|---|---|---|
| | | Lead responsibility | Supporting role | Staff | Tech skills | Financial resources |
| 1. Disaster risk assessment | Local communities have been involved in risk assessment exercises | MDCC | BDCC | I | I | S |
| | Livelihood profiles of vulnerable groups identified | BDCC | BFARMC | S | S | S |
| | Livelihood asset at risk identified | BDCC | LGU | I | I | I |
| 2. Disaster risk management planning and monitoring | Community DRM committee and volunteers exist | BDCC | | I | I | I |
| | Community DRM plan addressing major hazards exist | | | I | I | I |
| | At-risk groups involved in the planning process | BDCC | MDCC | S | S | S |
| 3. Disaster mitigation and Prevention | Disaster risk reduction practices are carried out at village level (e.g. water harvesting) | | | I | I | I |
| | Community-based DRM methods are prescribed and understood properly by CBOs/CSOs and the community members | | | S | S | S |

| Key processes and instruments (related to the DRM framework) | Indicators | Name of institution involved in | | Measures and capacities for implementation | | |
|---|---|---|---|---|---|---|
| | | Lead responsibility | Supporting role | Staff | Tech skills | Financial resources |
| 4. Awareness raising and dissemination of risk information | Local Media programmes targeted to DRM awareness-raising prepared/disseminated | | | S | S | S |
| | Community is aware of alert signals for different types of disasters | BDCC | NGO | S | S | S |
| | Mechanisms exist to communicate hazard risk to community level | BDCC | NGO | S | S | S |
| 5. Community level early warning systems | Early warning messages are received at the community level | NATIONAL | LGU | S | S | S |
| | Systems to ensure outreach of EWS to the most vulnerable people in place ( including, if relevant, translation of messages into local languages) | | | I | I | I |
| 6. Preparedness | Community preparedness plan exist | | | S | S | S |
| | Volunteers trained to provide support in case of emergency | | | | | |

| Key processes and instruments (related to the DRM framework) | Indicators | Name of institution involved in | | Measures and capacities for implementation | | |
|---|---|---|---|---|---|---|
| | | Lead responsibility | Supporting role | Staff | Tech skills | Financial resources |
| | Evacuation routes identified and local people informed | | BARANGAY | S | S | S |
| | Regular mock evacuation exercises conducted at community level | | BARANGAY | S | S | S |
| 7. Providing immediate response and/or relief assistance | Mechanism/procedures for community-level emergency food distribution exist | BARANGAY | LGU | S | S | S |
| | Mechanisms/procedures for organizing emergency shelter in place | LGU/BARANGAY | | S | S | S |
| | Emergency relief has been targeted to the most vulnerable households | NATIONAL/LGU | | S | S | S |
| | Community mechanisms to coordinate the response in place | | | I | I | I |
| 8. Assessing damage and loss | Damage and loss assessment teams consulted with community representatives | DA/MAO | | I | I | I |
| | Damage and loss assessment include vulnerability and livelihood profiles | | | I | I | I |

| Key processes and instruments (related to the DRM framework) | Indicators | Name of institution involved in | | Measures and capacities for implementation | | |
|---|---|---|---|---|---|---|
| | | Lead responsibility | Supporting role | Staff | Tech skills | Financial resources |
| 9. Reconstruction of settlements, infrastructure and services | Community rehabilitation plans exist (formulated with community consultation) | BARANGAY OFFICIAL | | S | S | S |
| | Rehabilitation plans take into consideration local livelihood strategies | LGU | BARANGAY OFFICIAL | S | S | S |
| | Community has benefitted from national compensation schemes | NATIONAL | | I | I | I |
| 10. Rehabilitation, economic and social recovery | Mechanisms to prepare plans for rehabilitation and economic recovery exist | BARANGAY OFFICIAL | NATIONAL/LGU | S | S | S |
| | Funding mechanisms supporting rehabilitation exist | BARANGAY OFFICIAL | NATIONAL/LGU | S | S | S |
| | Micro-financing institutions contribute to rehabilitation | COOP | | S | S | S |
| | Guidelines for local institutions and informal groups to help affected communities exist | BARANGAY OFFICIAL | | S | S | S |

## LOCAL TERMINOLOGIES

| Local Term | Meaning |
|---|---|
| Albulario | - are local folks practicing alternative healing methods using indigenous herbs, roots and prayers. They are preferred by local folks especially when they believe that the illness of a family member is due to the intervention of supernatural beings. |
| Manghihilot | - usually refers to locally trained midwife who provides services for local women in giving birth at home. |
| Parcel of Land | – locally termed as “sarong sukol”, this usually refers to 1/3 of a hectare. |

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| Arnido O. Llamarez, AT | LGU Guinobatan |
| Vicente P. Picardo, AT | LGU Gubat |
| NCIP | Buhi, Camarines Sur |