INTRODUCTION

Bicol Region, due to its location, is highly vulnerable to typhoons, floods, drought and volcanic eruptions. These natural occurrences frequently lead to severe damage of properties, infrastructure, and loss of livelihoods in agriculture. Forty percent of Bicol Region's rice area is affected by flooding, drought and saline intrusion.

The Assessments of Climate Change Impacts and Mapping of Vulnerability to Food Insecurity under Climate Change to Strengthen Household Food Security with Livelihoods' Adaptation Approaches (AMICAF) is a project of the Food and Agriculture Organization of the United Nations (FAO) in partnership with the Department of Agriculture. It is a project funded by the Ministry of Agriculture, Fishery and Forestry of Japan (MAFF). AMICAF Project has four components namely: Step 1: Impacts of climate change on agriculture; Step 2: Food Insecurity Vulnerability Analysis; Step 3: Livelihood Adaptation to Climate Change; and Step 4: Institutional analysis and awareness.

FAO along with the Department of Agriculture Regional Field Office 5 (DA-RFO5) conducted the Step 3 component of the project which focuses on the livelihood adaptation to climate change that involves a community-based approach to identify, test and evaluate adaptation options that increase the ability of vulnerable groups to deal with the impact of climate change on food security. Step 3 aims to establish an institutional framework for the identification, validation, field testing and evaluation of good practices. This is for the adaptation of various stakeholders and enhancement of the capacities of vulnerable communities.

FAO and DA-RFO5 have been working together in several projects that implement the adaptation of good practice options, one of which is TCP/PHI/3203. The results of the TCP/PHI/3203 on the most adaptive good practice options and utilization of Automatic Weather Station (AWS) for early warning and support cropping system in were used in the AMICAF project.

Good practice options which include testing of stress-tolerant rice varieties Green Super Rice (GSR) lines, drought, saline-tolerant and submergence-resistant varieties) and rice-duck integration were tested on rice fields located in eight (8) Camarines Sur municipalities, one (1) municipality each in Camarines Norte and Masbate. These municipalities are known to be susceptible to climate change hazards. Saline environments are represented by coastal rice fields in Calabanga, Canaman, Camarines Sur and Basud, Camarines Norte; flooded environments by three Nabua barangays near flood catchment basins, one barangay in Gainza; and drought-prone environments by rainfed and upland areas in Buhi, Cabusao, Baao, Bula, Camarines Sur and San Fernando, Masbate.

The conduct of the Step 3 component of the AMICAF project in the Region was a success. This is proven because similar projects have adapted the methodologies and results from the project. DIPECHO project of FAO and Bicol Agri-Water Project of USAID have also put into use the flip charts produced by the project for their Climate Farmer Field Schools (CFFS).

In addition, the rice and corn banner programs, and Agricultural Training Institute (ATI) of the DA-RFO5 adapted the AMICAF produced flip charts to be used in their conduct of CFFS to farmers in the different barangays in the region.

I. Activities and Outputs

A. Project sites

There are 10 project sites for AMICAF in the Bicol Region. Eight (8) municipalities in Camarines Sur, and one (1) municipality each for Camarines Norte and Masbate are chosen to be the project sites for AMICAF. These project sites are chosen because these municipalities are known to be susceptible to climate change hazards. Figure 1 below shows the map of the different municipalities in the Region.

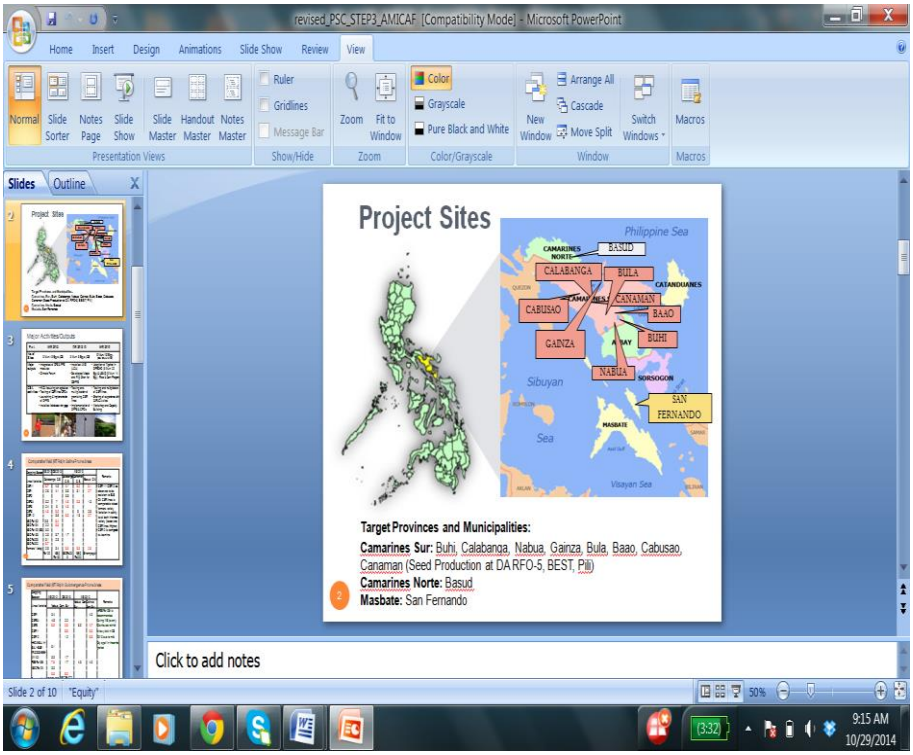


Figure 1. AMICAF projects sites in the Bicol Region

The municipalities of Calabanga and Canaman in Camarines Sur, as well as Basud, Camarines Norte are all municipalities that experience saline intrusion. This is because they are near coastal areas. The municipalities of Buhi, Baao, Bula and Cabusao in Camarines Sur; and San Fernando in Masbate all represent a drought prone environment. All these municipalities are in an upland area and grow rainfed rice. The municipalities of Nabua and

Gainza, Camarines Sur are both representatives of flood prone environment. The municipalities are both located near flood catchment basins.

Table 1 show the major hazards experienced by the chosen AMICAF project sites. These hazards are felt by the farmers and fisherfolk through reduction of yield on crops, loss of livelihood, food insecurity, loss of planting materials (seeds), water scarcity, inability to send their children to school, mental distress and damage to properties/other resources.

Table1. Major Hazards present in the different project sites

Municipality	Major Hazards	Vulnerable Sector & Impacts	Coping Mechanisms
Calabanga, and Canaman, Camarines Sur; and Basud, Camarines Norte	• Saline Intrusion • Flooding • Typhoons • Storm Surge • Pest and Diseases	• Farmers/ Fisherfolk • Reduction in yield on crops • Loss of livelihoods • Food insecurity • Loss of planting materials (seeds) • Water scarcity • Unable to send children to school • Mental distress • Damage to properties/other resources	• Early planting and use of early maturing varieties • Planting of vegetables and other fruit crops • Bamboo craft making • Fishing (when rice field are flooded) • Buy and Sell (other commodities) • Out-migration • Growing/raising of crops, livestock/poultry in less vulnerable areas; • Borrow money from relatives/friends, etc… • Seek assistance from DA • Utilize alternate staple: taro, banana, cassava, sweet potato, corn, golden apple snail (other insects)
Buhi, Baao, Bula, and Cabusao Camarines Sur; and San Fernando, Masbate	• Drought (rainfed/ upland areas) • Flooding • Typhoons • Pest and Diseases		
Nabua and Gainza, Camarines Sur	• Flooding • Typhoons • Pest and Disease		

The farmers and fisherfolk have different coping mechanisms for the hazards that they encounter. Some farmers plant early and use early maturing varieties, while others plant vegetables and other fruit crops. Farmers opt to do fishing when their rice fields are flooded. Bamboo craft making, buy and sell of other commodities and growing/raising of crops, livestock/poultry in less vulnerable areas are also some of the alternatives done by farmers and fishers. Some farmers and fishers also resort to migration.

B. Activities

There were different activities done in the Region to help in the realization of the results in the Step 3 component of the project. The activities conducted are as follows:

1. Conduct situation assessment in target communities

The FAO team along with DA-RFO5 and Local Government Units (LGUs) of the prospective project sites conducted site inspection through site visits. Hazards, Vulnerability and Capacity Assessment were done by farmers and Agricultural Technicians (AT's) prior to project implementation.

2. Identification, validation, field-test location specific practices for community-based adaptation and evaluation of these practices and approaches at local context through participatory processes

Evaluation and Planning Workshop was conducted to identify possible sites for expansion of GSR lines/rice varieties technology demonstration under the framework of Climate Farmer Field School (CFFS). Selection of possible sites and good practice options, specifically the varieties to be used for varietal trials in specific municipalities were discussed.

The agricultural technicians of the project sites presented their plans based on the agro-ecosystem in their respective area. These were approved by representatives from FAO and DA-RFO5 for implementation.

3. Capacity development within the framework of Farmers Field School (FFS) in target communities

The Climate Farmer Field School (CFFS) was formally launched on May 2012. It was initiated by the LGU's, DA RFO5, ATI, and FAO-AMICAF. The technology demonstration was finalized using the existing PalayCheck system. It was integrated with organic farming technology, corn and vegetables production.

During the first two cropping seasons, the Climate Farmer Field Schools used a framework developed by DA-RFO5. The learning and experiences from these contributed to the content of the CFFS flipchart developed by AMICAF. The use of the CFFS flipchart was launched on May 31, 2013. A facilitator's manual entitled "Climate resiliency Field School (CrFFS)" was also used by the agricultural technicians was additional reference in teaching the farmers. The materials were used in the once a week meeting with Farmers.

4. Coordination and integration of AMICAF related activities in Bicol Region

Municipalities in the region adapted CFFS-Flipchart based on AMICAF experiences. It was also used in the project sites of DIPECHO 1 (Libon, Camalig, and Ligao in Albay; Irosin, Casiguran and Gubat in

Sorsogon). The flipchart was also used in the Bicol Agri-Water project of the USAid in the following municipalities: Nabua, Camarines Sur – San Esteban, San Antonio, San Roque, San Vicente, Buhi, Camarines Sur – Sta. Cruz, Iraya, Sagrada, Dela Fe and Monte Calvario Polangui, Albay-Pintor, Gamot, La Medalla, Kinuartehan, Balangibang. CFFS Trainings of LGU's, Agricultural Training Institute, Rice and Corn Program of DA RFO V also used the flipchart.

The DA unit in the municipality of Calabanga, Camarines Sur also adapted the good practice options like rice duck farming and varietal trials of GSR lines in their bottoms-up budgeting project. This is to generate additional income for their farmers. This is also done for food security.

The farmer cooperators have already adapted the best suited GSR lines in their respective farm lands. They have also influenced the nearby barangays to do the same. The DA-RFO5 now also supports the testing of GSR lines. This is done as mitigation measures for extreme climate conditions like El Nino.

II. Results

A. Capacity Development

Trainings were conducted in the Bicol Region with regard to the different concepts of climate change adaptation and disaster risk reduction. Table 2 shows the different trainings AMICAF project conducted in the region.

Table2. Different trainings conducted in the Region

Date	Title	Participants	No. of Male	No. of Female	Total
August 11-14, 2014	Local Level Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) in Agriculture: Trainings of Field Implementers	ATs, PPDO, MDRRO, MA's, OCD, DA, FAO and CBSUA	25	29	54

Jun 10, 2014	Regional forum on Community Based Climate Change Adaptation in Agriculture (Bicol)	LGU's (Bula, Buhi, Calabanga, Ocampo, Pamplona, Gainza, Baao, Nabua, Canaman, Cam. Sur, OPAG (Cam. Sur, Cam. Norte, Albay, Sorsogon, Masbate), Farmers (Baao, Buhi, Iriga), BSWM, NIA, NEDA, ATI, PhilRice, Fatima Center (NGO), CBSUA,DA-RFO5 and FAO	19	23	42
May 20, 2014	Documentation Workshop on Process, Experiences & Learning's on Community based CCA in Bicol	LGU's (Bula, Buhi, Calabanga, Cam. Sur, DA-RFO5 and FAO	3	10	13
Jan.29, 2014	Regional Analysis Workshop on Mainstreaming Climate Change Adaptation (CCA) and Disaster Risk Reduction (DRR) into Agriculture and Related sectors	LGU's (Bula, Bato, Buhi, Nabua, Baao, Canaman, Cam. Sur, Basud, Cam. Norte, San Miguel, Bato,Cat., Irosin, Sor., Libon, Camalig, Albay), OPAG's (Albay, Cam. Sur, Cam. Norte, Masbate, Sorsogon), NEDA5, PAGASA, CBSUA, BU, DILG, DA-RFO5 & FAO	27	17	44
May 31, 2013	CFFS Training and Launching (AMICAF, DIPECHO, USAID)	Participation of 42 male and 39 female personnels from FAO-Amicaf, DA RFU-V, ATI-Bicol, DIPECHO , USAID , APCO of Bicol Region, Provincial Agriculturist, PAGASA-Legaspi and Quezon City, MAO, AT's and Farmers	42	39	81
April 15-16, 2013	Entrepreneurship training	participated by 10 Agricultural Technologists from Buhi, Calabanga, Nabua, Camarines Sur and Irosin, Sorsogon,12 from DA-RFU-V, 1 from DTI and 2 staff from AMICAF	11	17	26

April 11, 2013	2nd Field Day, Igbac, Buhi	99 farmers from Igbac, Sta. Justina, San Francisco and San Ramon, Buhi, 4 from DA-RFU-V, 3 from FAO-AMICAF and 3 from PhilRice-Ligao and 4 from LGU-Buhi	37	75	112
Feb. 12-13, 2014	FlipChart Review in QC	DA,PAGASA, IRRI, PhilRice and ATI	20	15	35
Feb. 5, 2013	Interpretation of Weather/Climate Outlook and generation of Farm Weather Bulletin	AWS staff, PAGASA, AT's, DA and FAO staff	15	25	40

These trainings have helped the famers, agricultural technicians, LGU workers, municipal agriculturists, and provincial agriculturists to deepen their understanding on the concepts of climate change adaptation and mitigation and disaster risk reduction.

Farmers who are now planting successful GSR lines have observed an increase in yield and income. Good farming management are also being practiced by the farmers. Agricultural technicians have also gained knowledge about the existing Palay Check System. They also now better understand weather forecasts from PAGASA. This knowledge has helped the ATs and LGU workers prepare the localized farm weather bulletins. The trainings have also helped the municipal and provincial agriculturists in their preparation of disaster risk reduction plans.

B. Field Testing for Good Practice Options for Climate Change Adaptation

There are different good practice options introduced by the AMICAF project to help farmers and other agricultural workers to adapt to the changing climate. These are testing GSR varieties that are drought tolerant, saline tolerant and flood tolerant; and the introduction of rice duck farming.

B.1 Testing of Green Super Rice Lines (GSR) under climate change related stress.

Drought-tolerant rice varieties were tested in both rainfed lowland and upland environments in several communities in Buhi, Camarines Sur (Brgy. Igbac, Brgy. Sta. Justina and Brgy.San Francisco), Baao, Bula and Cabusao, Camarines Sur and San Fernando, Masbate. Saline environments were represented by coastal rice fields in Basud, Camarines Norte, Canaman, Camarines Sur and three (3) barangays in Calabanga, Camarines Sur (Brgy. Sogod, Salvacion-Baybay, and Belen). On the other hand, submergence-tolerant varieties were tested in fields near catchment basins in three Nabua barangays (Brgy. Bustrac, San Isidro Inapatan, and San Antonio, Poblacion) and one barangay in Gainza, Camarines Sur.

The result of the adaptability trial in hazard specific areas revealed that GSR11, GSR8, and GSR1 are the top performing GSR lines in Wet Season Cropping in 2013.. Other traditional varieties such as Black Rice and Golden Blondie also performed well with average yield of 3.1 mt/ha and 4.0 mt/ha respectively. This is despite of Rice Black Bug infestation in Brgy. Igbac, Buhi, Camarines Sur.

A reduction in yield was observed during the dry cropping season. This can be attributed to the actual rainfall generated from Automatic Weather Station (AWS).*(see Annex 4 Amount of rainfall generated in project sites)*

It was observed to be way below normal forecast in Buhi. The adaptability trial during dry cropping season shows GSR12 and GSR2, GSR5a and GSR11 can tolerate drought condition.

The project tested GSR lines under saltwater intrusion in two (2) municipalities in Camarines Sur and one (1) municipality in Camarines Norte the adaptable variety are GSR2, GSR11, GSR8 and GSR5. GSR11 and GSR2 are the top two performers in the tested rice lines. CamarinesNorte adaptable varieties under water salinity level of 1770 to 2720ppm are GSR11, GSR8, GSR1 and GSR12 which yield 3.1 to 2.7 mt/ha comparable to farmer variety which yield only 2.5 mt/ha.

Generally, Result of the adaptability trial in hazard specific areas revealed that GSR12a, GSR11, GSR8, and GSR5 are top performing GSR lines in upland areas with 2.6 to 62.5% advantage over check varieties across nine (9) sites. These GSR lines can tolerate minimum amount of rainfall. GSR2 was the farmer preferred variety because of its good tillering ability comparable to lemon grass and good eating quality.

It is concluded that the top saline tolerant varieties were GSR12a, GSR2, GSR8, GSR5a and GSR11 with 2.6 to 62.5% advantage over check varieties across six (6) sites. However, GSR lines were observed to be susceptible Bacterial Leaf Blight.

PSB Rc18(s1) and GSR8 is recommended for flooded areas as this rice variety/lines are tolerable in flooding. Adaptability trial shows 17.6 % advantage over check across three (3) sites in flood prone areas in Camarines Sur. *(see Annex 1 Yield (mt/ha) of the different GSR lines and varieties evaluated for climate change-related stress in Bicol region)*

Wider adaption also of GSR lines was initiated by the project using 20kg/ha seed requirement. Farmers were given 5 kg GSR seed for adoption. The yield produced after harvest was then measured. Data such as rainfall, humidity, minimum and maximum temperature were also gathered in the duration of the planting season. These data were gathered because this indicates the vulnerability of the area to climate change.

B.2 Rice Duck System

Rice duck farming were also tested in CFFS sites to reduce inherent vulnerability of farming system to weather and climate hazards. The benefits from rice duck farming includes reduce in cost of inputs for inorganic fertilizer and chemical application. Rice duck farming also increased the income of farmers from the sale of ducks eggs. It also serves as a source of food for the farmers. Ducks were integrated into rice fields in three sites in the province of Camarines Sur. The harvest from the rice fields and the return of investment from the rice and duck eggs was computed. It showed an increase in income for the farmers.*(see Annex 2. Result of the different Good Practice Options in Bicol Region)*

B.3 Other Good Practice Options

Also, intercropping with corn plants as border plants was employed in the upland farms. IRRI superbags for storing rice seeds and the use of earthen jars for food storage were also introduced as good practice options. Mushroom Production and organic farming was also introduced under the season long farmer field school.

B.4 Seed Multiplication of Green Super Rice Lines (GSR)

GSR lines are also reproduced at the Bicol Experiment Station in Pili, Camarines Sur in WS 2012. A total of seven (7) lines/varieties weighing one kilograms were given to DA RFO 5 for seed multiplication. Seeds sown last June 12, 2013 were transplanted on July 2, 2013 in 2,000 m^2 line/variety. A total of 1.4 hectares was devoted for seed multiplication in preparation for the demand of GSR lines. However, tungro was observed in rice cultivars due to in nearby field inoculant of tungro was being tested. In WS 2013 another set of GSR seeds were given by the project sites in DA BEST seed multiplication and harvest from this cropping supply the seed for technology demonstration and other rice program. A total of 2,142 kgs seed were bought by the AMICAF Project for expansion site.

GSR seed production and on farm field trial harvest allocated seeds for distribution in Region 8. A total of 568 kilograms of GSR seeds where allocated for those areas affected by typhoon Yolanda (International Name: Haiyan).

GSR lines are also reproduced in the six provinces of Bicol Region. The DA-LGU pursues seed multiplication and storage of multi-traits rice seeds in collaboration with farmers associations or cooperatives to ensure rice production during adverse climatic condition.

C. Local Climate Information and Early Warning Systems

Farmers Field Schools farmers were given weather advisory based on the AWS data and PAGASA forecast to monitor precipitation in the test sites and decide on best management practice.

Farmers were also taught to use a fabricated raingauge made of recycle materials was installed to monitor precipitation of the techno demo sites. Data from AWS (Automatic Weather Station) AWS in three pilot sites in Nabua, Buhi and Calabanga, Camarines Sur was conducted to provide accurate and reliable agronomic data such as temperature, humidity, rainfall, wind speed, and solar radiation.

Agricultural Technician and AWS staff learned how to interpret climatic data. They used this to prepare farm weather bulletins, to be able to provide localized climate outlook and advisory.

D. Information Education and Communication materials

A total of four brochures were made by the project for dissemination. It includes the major outputs, activities and accomplishments made by the project. One of which is the press release published last December 6, 2013 in the DA website (http://bicol.da.gov.ph). The said press release talked about the GSR line adaptable in upland, saline, and submergence areas in Bicol. The farmer co-operator in project site sold his GSR harvest to the nearby barangay as it has proven its adaptability in the locality.

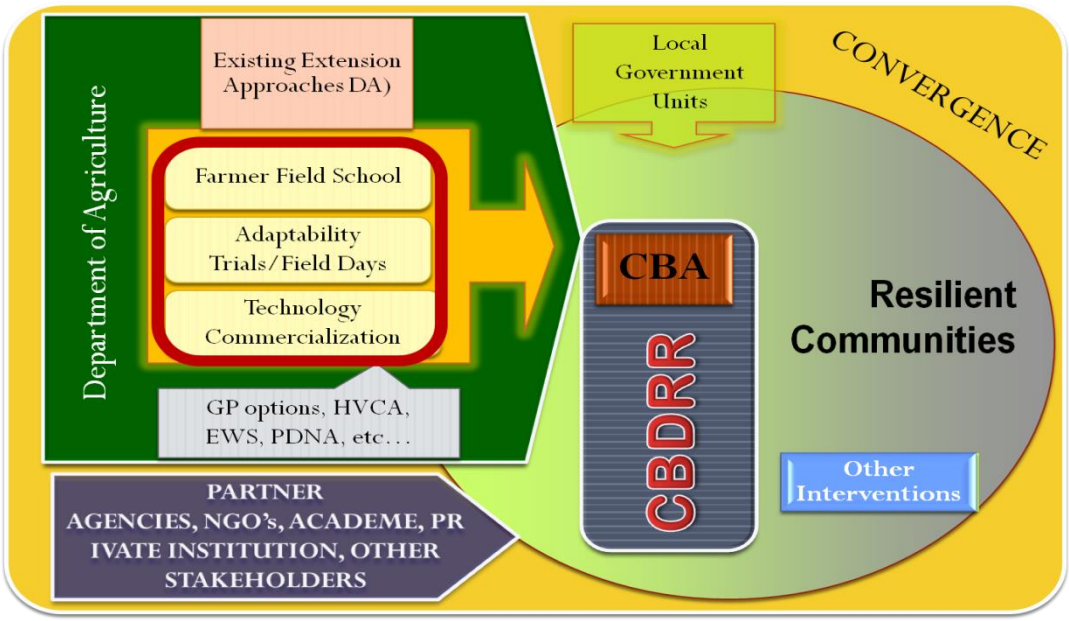
GSR lines promoted by the project was also highlighted by media last January 9, 2014 by Bicolmail at www.bicolmail.com.

III. Summary and Conclusion

The original implementation design of step 3 in Bicol Region should have used the information in the different model outputs from step 1 and 2. However, due to time constraint, the project team decided to identify, validate, field test and evaluate good practice options for adaptation based on the current and future vulnerabilities of farming communities, in areas that are currently experiencing the adverse impacts of climate change on food production systems, specifically saline intrusion, drought and flooding which will become more severe and frequent in the future.

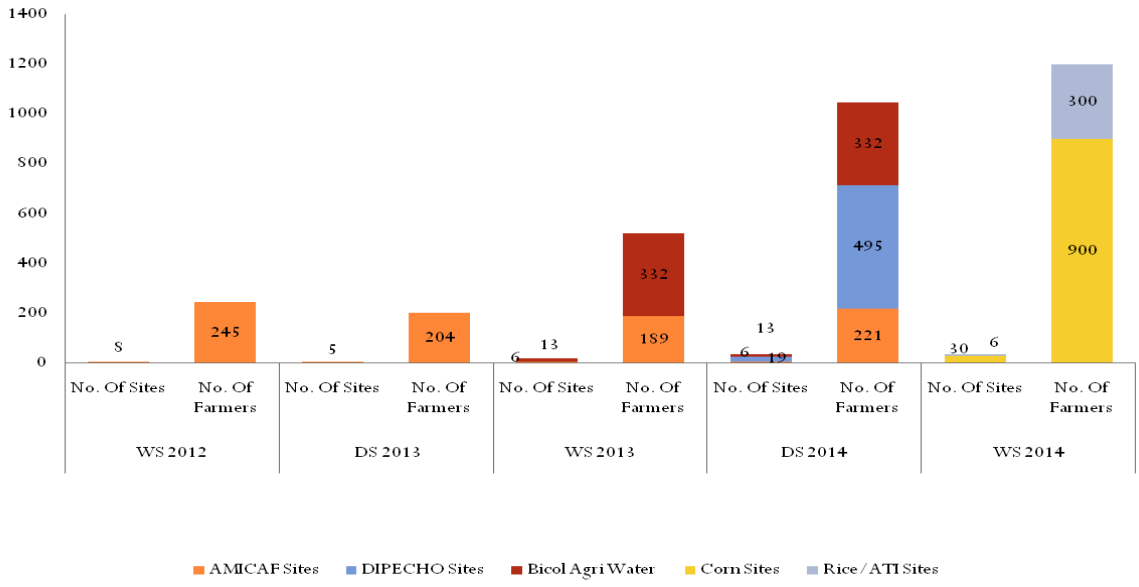
This project was able to achieve part of the proposed DRR/CCA mainstreaming framework under the TCP project which was to mainstream good practice options and link different community-based approaches in the regular programs and projects of the agency, specifically in the existing research and extension delivery system through Farmer Field Schools (FFS), Technology Demonstration (TD) and Technology Commercialization. Right now the Climate Smart module and flipchart were adopted by several projects as well as the DA Corn Program that assisted in the mainstreaming process as envisioned in the TCP mainstreaming framework (kindly see the framework below).

Figure 2 TCP: Proposed Framework for Mainstreaming DRR/CCA



One of the major highlight of the project it to come up with the AMICAF flipchart that was initiated by DA RFO5 and field assistant assisted in lay outing the content of the said materials that was used already by other banner programs in DA.The project helps capacitated the vulnerable communities to adapt to climate change through adoption of community based approaches such as good practices options conducted. Development of flipchart on climate information as an example of Climate change adaptation options were also adopted in Bicol Region as well as in the Caraga Region through support of DA Rice program. A total of 100 set of flipchart funded by DA Rice were distributed in six provinces of Bicol Region for adoption.

Increasing Number of Climate-Farmers Field School (CS-FFS) in different programs and special projects across site in Bicol Region.



The utilization of PAGASA climate outlook and forecast guided DA, LGUs and farmers in planning within the CS-FFS approach, specifically in the identification of adaptable cropping pattern and farming practices. Better understanding of good practice options, climate/weather forecast and timely delivery of advisories to farmers enhances local disaster preparedness and reduces livelihood losses.

AMICAF project initiated seed production of GSR lines as mitigation for adverse climatic condition. Other regions were also conducting seed multiplication and technology demonstration under the DA Rice Program. The result of adaptability trial in hazard specific areas revealed that GSR12a, GSR11, GSR8, and GSR5 are top performing GSR lines in upland areas with 2.6 to 62.5% advantage over check varieties across nine (9) sites. These GSR lines can tolerate minimum amount of rainfall. GSR2 was the farmer preferred variety because of its good tillering ability comparable to lemon grass and good eating quality.

It is concluded that the top saline tolerant varieties were GSR12a, GSR2, GSR8, GSR5a and GSR11 with 2.6 to 62.5% advantage over check varieties across six (6) sites. However, GSR lines were observed to be susceptible Bacterial Leaf Blight.

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Step 3 focused more on linking and integrating community-based/participatory approaches for adaptation (Community Based Disaster Risk Reduction/Management: CBDRR/M) which are being advocated and popular among non-government organizations (NGO) with the agency-funded approaches that are more focused on increasing crop productivity through the promotion of production technologies and crop protection. The outputs in step 3 assisted in mainstreaming of Climate Field School within the government extension systems with Dumangas, Ilo-ilo and Irosin, Sorsogon as models.

With climate change impacts likely to increase the frequency and occurrence of extreme events that will have a direct impact on food security among vulnerable communities/households as identified and presented in both step 1 and 2, the need for a sector-specific plan at the local level is key being the first line of adaptive action. The impact assessment based on the models produced from the different steps, specifically the developed approaches in step 3 should become an important reference for local planners to craft DRR/CCA plans that are focused in improving the resiliency of poor and vulnerable farming households/communities.

To sustain the benefits from the project as well as mainstream the different tools and methodologies compiled and developed under the AMICAF project, further upscaling and dissemination of available information and technologies should be promoted by all partners, specifically within DA being

the mandated agency to reduce food production losses, increase productivity and efficiency in the sector that are critical in maintaining the affordability of food and purchasing power, especially among the poor.