International Journal of Biosciences | IJB |
ISSN: 2220-6655 (Print) 2222-5234 (Online)
http://www.innspub.net
Vol. 16, No. 1, p. 435-442, 2020

RESEARCH PAPER OPEN ACCESS

Climate resilient assessment, targeting & prioritization for AMIA-Phase 2 Bicol Camarines Sur, Philippines

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Key words: Climate change, Resiliency, Adaptation, Mitigation

http://dx.doi.org/10.12692/ijb/16.1.435-342 Article published on January 30, 2020

Abstract

The Bicol region's Climate-Resilient Agri-Fisheries (CRA) assessment, targeting and prioritization for the Adaptation And Mitigation Initiative in Agriculture (AMIA) which primarily aims to strengthen the capacities for CRA in the region; assess climate risks through geospatial and climate modelling tools (DIVA, GIS, QGIS); determine local stakeholders' perceptions, knowledge and strategies for adapting to climate risks; and document local CRA practices in the region. Through formal household interview, key informant interview (KII), focused group discussion (FGD), CRA practices were identified (organic farming for corn and green super rice for rice) in the province; the number one crop occurrence in the region (rice); and produce an adaptive capacity aggregated map. Likewise, secondary data, literature review and expert consultation aided in the transfer of knowledge on Climate Risk Vulnerability Assessment (CRVA) and CRA established through series of trainings and workshops. Validation workshops were also conducted in which vulnerability assessment on climate-risk exposure, sensitivity and adaptability and risk targeting of agri-fishery sector using GIS climate change modelling tools were presented and discussed with the respondents and participants from various sectors.

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Introduction

Climate Smart Agriculture (CSA) is one way to achieve agricultural development priorities in the face of volatile weather patterns and climactic changes; and to ensure that the three pillars of food security through agricultural productivity, adaptation and managing climate variability are addressed, understanding environment friendly and sustainable agriculture is a necessity. Likewise, to strengthen capacities for CRA in the region and introduce farming practices to help local farmers cope with both current variability and future climate scenarios, research is best undertaken.

As indicated in the National R & D Agenda (HNRDA) 2017-2022 and using it as guide, this research is geared for "maximum economic and social benefit for the people". Thus, while ensuring a cohesive convergence and integration of R & D efforts towards the shared goal of inclusive socio-economic growth and considering one of five sectors of national R&D agenda on Disaster Risk Reduction and Climate Change Adaptation, this research is based on the assessment and risk targeting of agri-fishery sector using LiDAR data processing technologies.

Community-level food production especially while adapting to climate-smart and nutrition-smart ways of producing food is one way to helping developing countries address poverty and malnutrition. Farmers need to respond and learn how to adjust their agricultural practices to meet changing and more difficult environmental conditions since agriculture and climate change are narrowly concomitant. Aside from that, it is also necessary to use multiple benefit approaches such as diversified farming to increase agricultural productivity and build capacity for households to adapt to climate change while protecting our ecosystem.

Hence, this study focused on the regional climate resilient Assessment, Targeting & Prioritization for AMIA- Phase 2 Region V (Bicol)-Camarines Sur. Specifically, to strengthen capacities for CRA methodologies of key research and development organizations in the region; to assess climate risks in the region's agri-fisheries sector through geospatial and climate modelling tools; to determine local stakeholders' perceptions, knowledge and strategies for adapting to climate risks and to document and analyze local CRA practices to support AMIA2 knowledge-sharing and investment planning.

Material and methods

Capacity building on Climate Resilient Agriculture (CRA)

Capacity development were done through series of training, seminars and workshops, conducted in partnership with the International Centre for Tropical Agricultural (CIAT), an international research organization that is dedicated to developing technologies, innovative methods, and new knowledge that better enable farmers, mainly smallholders, to improve their crop production, incomes and management of natural resources. Capacity strengthening on Climate Risk Vulnerability Assessment (CRVA), capacity strengthening on CRA prioritization, capacity strengthening on CRA knowledge hub development and Capacity strengthening on CRA monitoring and evaluation were conducted.

Geospatial and climate modelling

Geospatial and climate modeling were used in assessing climate risks in the region's agri-fisheries sector. CRVA guidelines were adopted for the collection of secondary data for exposure-sensitivity, CRVA guidelines and Focus Group Discussions (FGDs) for the collection of secondary-primary data for adaptive capacity were employed, GIS-climate modelling run species distribution model (Eco Crop/Max Ent) for the preliminary data analysis and workshop- open source GIS tools (DIVA GIS, QGIS) or ArcGIS for the cross - regional/national data analysis workshop were employed.

Documenting CRA practices

Documenting and analyzing local CRA practices to support Adaptation and Mitigation Initiative in Agriculture 2 (AMIA 2) knowledge-sharing and investment planning were done through key informants interview using the survey checklist for the survey on CRA practices was utilized backed-up by on-site observation. Online analytical tools on Cost-Benefit Analysis and trade-off analyses introduced by CIAT was used in creating investment briefs for the chosen CRA practices: organic farming for corn and climate smart varieties for rice.

Result and discussion

In strengthening capacities for CRA methodologies of key research and development organizations in the region, the regional team members participated in different workshops and trainings conducted for capacity strengthening on CRVA, CBA and CRA.

During the conduct of the trainings and workshops, the team sought for the approval of the mayors or their representatives and asked the assistance of the Municipal Agriculture Officers and the focal persons to identify the participants. The output enhanced capacities of the regional team and AMIA partner organizations in the region.

In assessing climate risks in the region's agri-fisheries sector through geospatial and climate modelling, the research team also conducted workshop to gather data for crop occurrences and adaptive capacity. Twenty-nine (29) municipalities participated in the said activities. Outputs from the participants were then processed into actual data maps. The validation workshop was conducted to ensure the reliability and validity of data and information initially provided by the target municipalities. The output included the geospatially referenced data on climate-risks: biophysical-agricultural-socioeconomic parameter.

As shown in Fig. 1, the city of Naga in the 3rd District of Camarines Sur has the highest adaptive capacity (0.80-1.00; Very High) in terms of their natural, social, human, economic, physical, anticipatory and institutional capacity indices. Considering that the location of Naga is a buzzling metropolitan area, people have access to various financial institutions and cooperatives, have more capacity for social and economic investments, have more access to health and education and various telecommunication services aside from easy access to harvested resilient crops as it is evident in grocery merchandizes in various shopping malls and grocery stores. Because of the number of residential areas, access to jobs and ease of transportation, there is also an influx of new and prospective permanent residents.

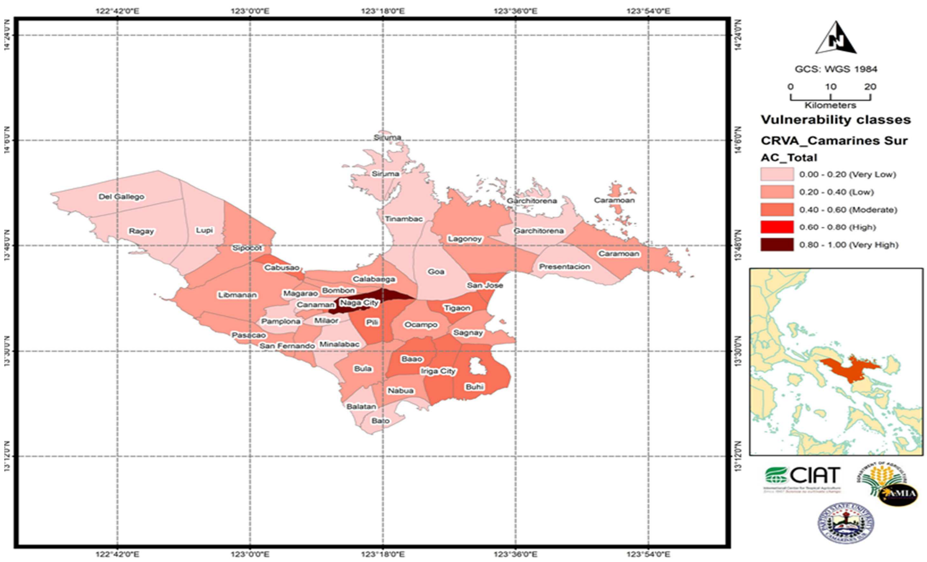

Fig. 1. Aggregate Adaptive Capacity Map of Camarines Sur.

Meanwhile, the aggregate map shows that the municipalities of Del Gallego, Ragay, Lupi in the first district have a very low adaptive capacity (0.00-0.20; Very Low) including Canaman, Magarao, Bombon which means that these areas have low result in terms of the seven adaptive capacity indicators. This also means that residents of these areas are highly vulnerable when it comes to the impact of climate change.

This likewise suggests that adaptation strategies in these areas on enhancing human and social capital, needs to be undertaken to increase resilience. This derived adaptive capacity index result also determines each geographical location's potential capacity to resist and adapt to climate-related pressures.

As shown from the map in Fig. 2, the municipality of Cabusao has the highest hazard indicator (0.80-1.00; Very High) which means that this area is directly affected by the impacts of climate change.

This is also followed by Siruma (0.60-0.80; High), being comprised of treacherous terrains, unique topographical features and long stretch of coastal lines near the pacific region.

This means that both of these locations are at risk of hydro-meteorological and geophysical hazards. Likewise, using the geospatial climate modelling tool, this also means that Cabusao and Siruma's agri-fisheries sector is significantly affected by exposure to the climate-related pressures and sensitivity index.

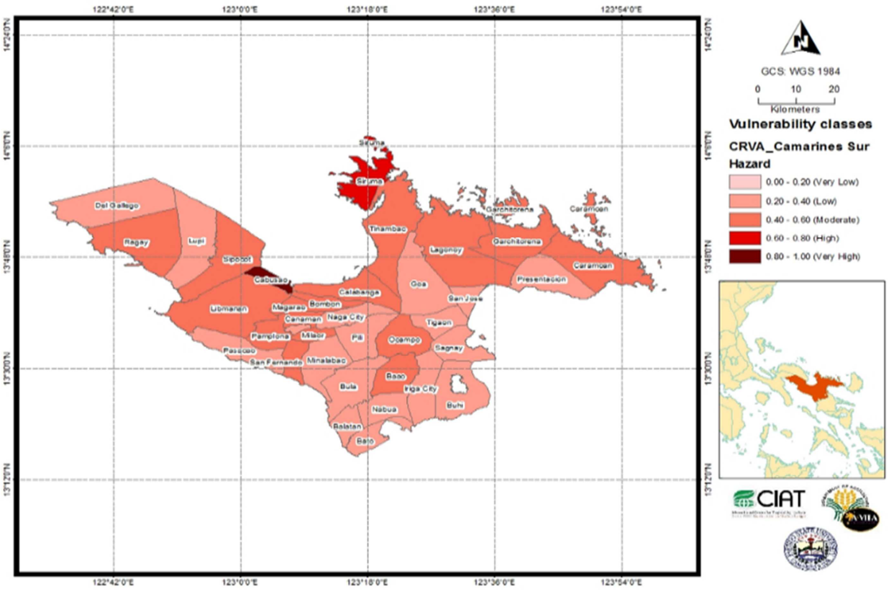

Fig. 2. Hazard Map of Camarines Sur.

The result further shows that majority of locations in the Province of Camarines Sur have moderate (0.40-0.60; Moderate) hazard index especially in the upper municipalities near Lagonoy gulf like Tinambac, Lagonoy, Garchitorena, and Caramoan. These data mean that majority of the municipalities in the province of Camarines Sur face moderate risk of climate hazard that may affect their adaptive capacity and resilience. This finding somehow bring contrast to the following Fig. hence it shows very high risk of vulnerability and crop sensitivity index. It also implies that the geographical location of the municipalities along rivers and seas are exposed to various risks and hazards that posted high index of vulnerability. Based from the actual site observations and interviews from the farmer respondents, the areas along seashores and riverbanks are more affected by various natural calamities with tripled impact of typhoons, flooding and salt intrusion. This is evident with the municipalities situated along Bicol River, coastal municipalities found in Lagonoy Gulf, Maqueda Channel, Ragay Gulf and San Miguel Bay. The parameters looked into in determining the exposure to hazards were typhoon, flooding, drought, erosion, landslide, storm surge, sea level rise and salt water intrusion.

Fig. 3 revealed that Siruma, Tinambac, Garchitorena, Del Gallego, Ragay, Lupi, Pamplona, Milaor and Minalabac are very highly vulnerable areas (0.80-1.00; Very High) when it comes to the biophysical indicators: tropical cyclone, flooding, landslide, drought, erosion, salt water intrusion, sea level rise and storm surge.

Likewise, municipalities of Sipocot, Cabusao, Libmanan, Bato, Bula, Lagonoy, Ocampo, Sagñay, Presentacion and Caramoan are also highly vulnerable areas (0.60-0.80; High). This means that all these areas are significantly vulnerable to climate-related pressures, which, in turn, may affect their resilient capacity and may result to significant damages and potential loss to the agri-fisheries sector. The map also reveals the pre-emptive vulnerability and hazard situation of the province of Camarines Sur especially in terms of crops as revealed in the following maps.

The aforementioned municipalities characterized by high vulnerability indices were considered to be one of the recipients of the next stage of the project as basis of implementation of the AMIA 2+. As revealed in Fig. 4, mango and eggplants are abundantly present in the lower municipalities in the province from Ragay to Pili to Bato which means that currently, residents of these municipalities, have enough supply to these crops and are harvesting them on a daily basis for home consumption and merchandise despite its vulnerability assessment.

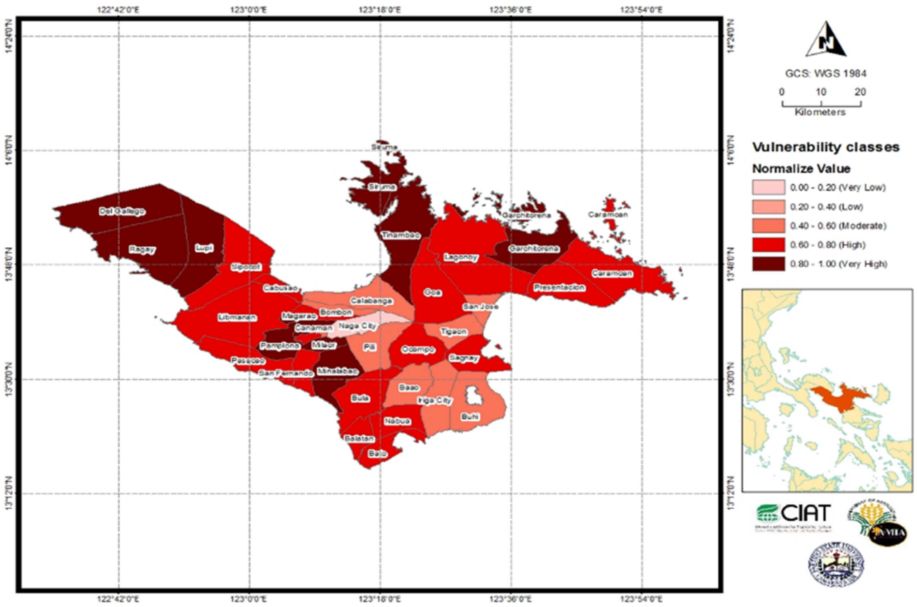

Fig. 3. Vulnerability Map of Camarines Sur.

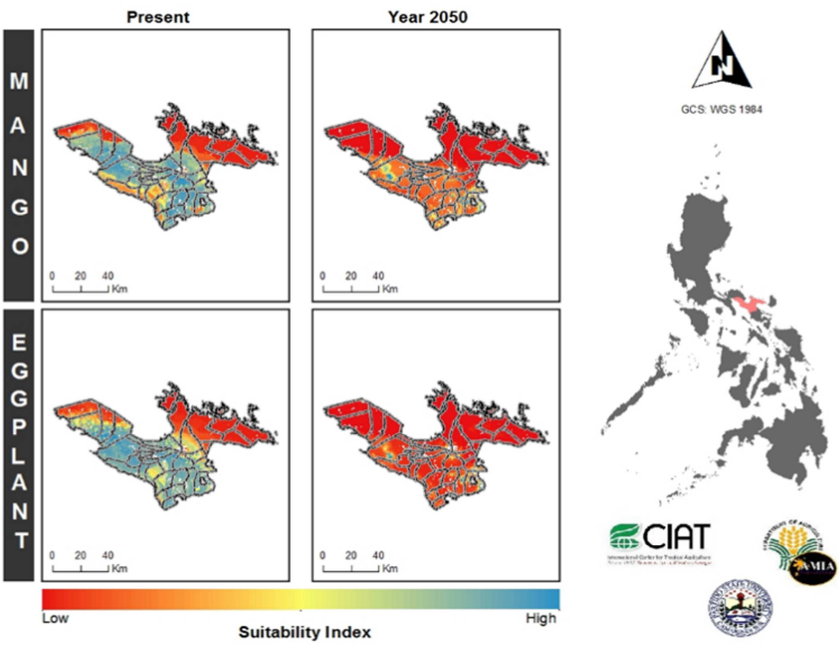

Fig. 4. Present and Year 2050 Suitability Map of Mango and Eggplant.

However, by measuring the changes in climatic suitability to grow these crops, the map showed low suitability index. This result reveals that determining the future conditions of both mango and eggplants based on its baseline conditions by 2050 and percent change, its sensitivity index shows that in the next thirty years, climate-change impact could potentially depreciate its entire supply.

In Fig. 5, it can be gleaned that rice plantations are predominantly located in Magarao, Bombon, Canaman, Pili, Ocampo and partly found in San Jose and Minalabac. Its resilience projection showed moderate amount of sensitivity which means that in the next years to come, supply of rice may be depleted moderately. This entirely mean that growing rice or 'palay' is still suitable in these areas even by 2050.

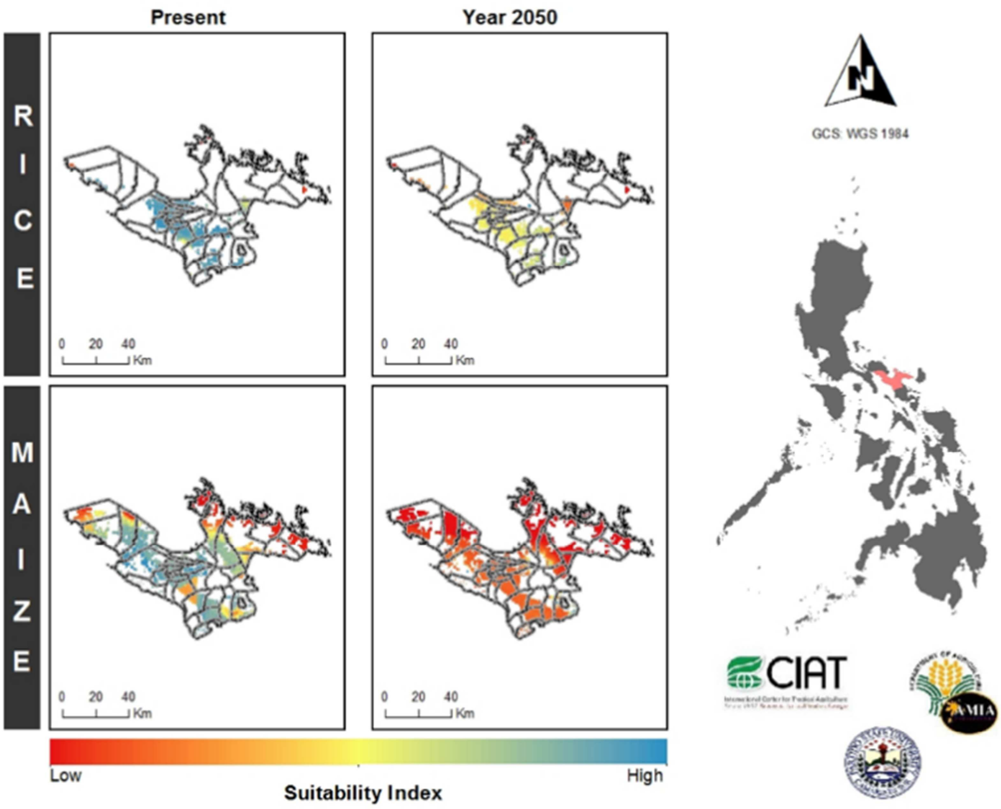

Fig. 5. Present and Year 2050 Suitability Map of Rice and Maize.

When it comes to maize, the map shows that this crop is sprinkled in various municipalities of Camarines Sur which means that this crop can be found even near the coastal areas but are substantially found in Sipocot, Libmanan, Magarao, Canaman, Milaor, Pili, Baao, Iriga, Goa and Tigaon. This means that growing maize in these locations is still suitable to present volatile weather conditions. Nevertheless, baseline data shows that its future condition may be futile.

Tomato, as revealed in Fig. 6, shows that it can be found in almost all locations in the province of Camarines Sur even if it has its low suitability in some areas. As shown, it is basically found in Libmanan, Sipocot, San Fernando, Ocampo, Baao, and Nabua; moderately found in parts of Lupi and Ragay. By 2050, its projection is moderate with still abundant supply in Libmanan. This means that this crop is resilient to climatic changes and can grow for more than thirty years later. This also means that growing tomato especially in these areas is at least resilient to climatic hazards and can suitably be grown. Meanwhile, in the fisheries sector, Fig. 13 shows high tilapia hatcheries in Libmanan, Sipocot, San Fernando, Ocampo, Nabua, Baao, Ocampo. However, in 2050, this will diminish due to vulnerability indices while Sipocot, Lupi and Ragay still have a moderate supply.

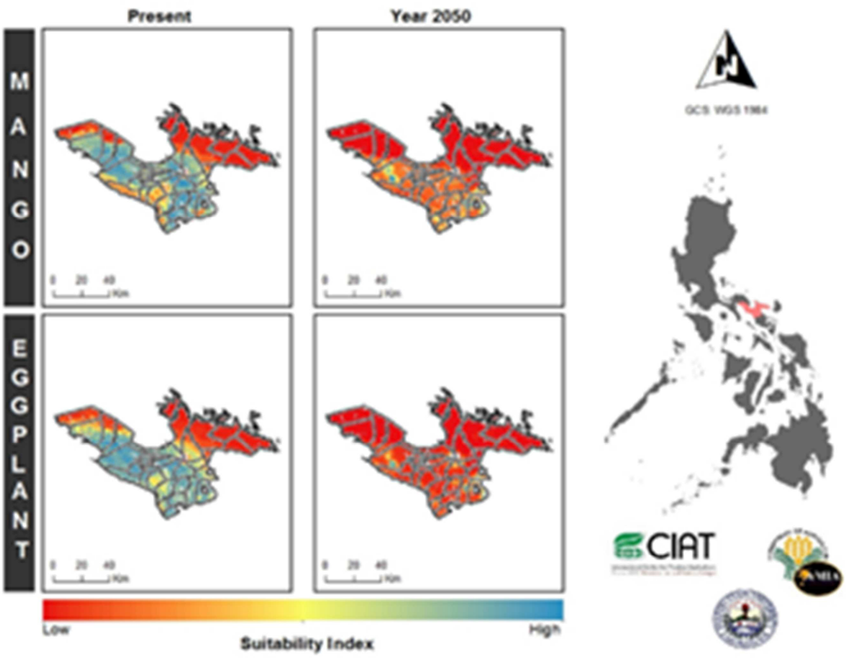

Fig. 6. Present and Year 2050 Suitability Map of Tomato and Tilapia.

In determining local stakeholders' perceptions, knowledge and strategies for adapting to climate risks. The gathered data from the interviews and secondary data and household survey using the customized survey questionnaire were conducted in selected sites in the province In documenting and analyzing local CRA practices to support AMIA2 knowledge-sharing and investment planning (insert investment brief) CRA Practices: Climate Smart Varieties-Green Super Rice (GSR) and Organic Farming. The regional team conducted surveys to farmers, key informant (KI) interviews and focus group discussion (FGD) to experts, MAOs and agriculture technicians regarding the CRA practices. The research team utilized the CBA Tool introduced by CIAT. Output: Investment brief, Data on CRA practices analyzed for costs-benefits and trade-offs using CIAT CBA tool. Two CRA practices or good practices were identified, these are the use of Green Super Rice and the Organic Farming.

Conclusion

Transfer of knowledge on CRVA and CRA is established through series of trainings and workshops conducted by CIAT. Based from the results, rice has the highest number of points as shown in the crop occurrences map followed by corn, eggplant, tilapia (fishery), mango, tomato and napier. Crop suitability changes overtime for 50 years that varies to its specific location. It is observed that corn has a very high suitability particularly on the second, third and fifth districts. Rice, eggplant, tomatoes and mango have very high suitability and are spotted in the fourth district and fifth districts of Camarines Sur. As shown in the adaptive capacity aggregated map that is comprised with its indicators namely human, natural, physical, institutional and economic capital, Naga City has a very high adaptive capacity while Del Gallego, Ragay, Lupi, and other coastal municipalities in the 3rd, 4th and 5th districts mark a very low adaptive capacity.

The identified CRA practices in the province as identified by the stakeholders are organic farming and green super rice for corn and rice, respectively.

Acknowledgements

This project received financial support from the Department of Agriculture-Bureau of Agricultural Research (DA-BAR). The authors wish to acknowledge the support of ParSU President Dr. Raul G. Bradecina, Department of Agriculture Regional Field Office 5 and the International Center for Tropical Agriculture (CIAT). The Municipal Agriculture Offices and Municipal Mayors of Camarines Sur, and the farmer respondents are likewise acknowledged.

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