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TERMINAL REPORT

A. BASIC INFORMATION

1. Project Title
   Climate-Resilient Agri-Fisheries (CRA) Assessment, Targeting & Prioritization for the Adaptation and Mitigation (AMIA) Phase 2 in Iloilo"

2. Proponent (s)
   Name: **Jescel B. Bito-onon**
   (Project Leader)
   Designation: Director, Research and Development
   Organization: Iloilo State College of Fisheries
   Address: Tiwi, Barotac Nuevo, Iloilo

3. Implementing Agency
   3.1. Lead Agency: **Iloilo State College of Fisheries**
   Head of Agency: **DR. GODELYN G. HISOLE**
   Name of Proponent: **Jescel B. Bito-onon**
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   3.2. Collaborating Agency: **DA-RFO VI**

4. Project Duration
   4.1 Approved Duration (Y/M): **2016/June-2017/April**
   4.2 Actual Duration (Y/M): **2016/July-2017/ July**
   4.3 Start Date of Implementation: **August 1, 2016**

5. Project Site(s)
   5.1 Province: **Iloilo**
   5.2 City/Municipality:

6. Project Funding
   6.1. Total Approved Budget: **Php 1,000,000.00**
   6.2. Total Amount Released : **Php 1,000,000.00**
   6.3. Agency Counterpart: NONE

Unliquidated Balance: NONE

7. RDE Agenda Addressed:
   - Climate Change

8. Expected Technology or Information:
   - Climate Risks in Agri- fisheries sector in Region VI through Geospatial & Climate Modeling Tools
   - Stakeholder's Perceptions, Knowledge and Strategies for Adaptation
   - Local Climate Resilient Agriculture Practices in the Province

9. Description of Technology/Information:

The project assesses the vulnerability to different risks of the agri-fisheries sector in Iloilo by means of participatory mapping of the target commodities through workshop with stakeholders, Focus Group Discussion and site visitation and validation. CRA practices such as *Sloping Agricultural Land Technology* (SALT) and *Small Water Impounding Project* (SWIP) of the top two (2) commodities of the province were validated through *Key Informant Interview* (KII) with stakeholders.

10. Target Beneficiaries/Users:
    - Policy makers, Agricultural technicians, LGU, Farmers and Fisher folks

11. Tags/Keywords:
    - Climate-Resilient Agriculture, Vulnerability Assessment, Adaptive Capacity, Geo-Spatial Modelling Tools

B. TECHNICAL DESCRIPTION

1. Rationale

The Adaptation and Mitigation Initiative in Agriculture (AMIA) seeks to enable the Department of Agriculture (DA) to plan and implement strategies to support local communities in managing climate risks – from extreme weather events to long-term climatic shifts. Spearheaded by the DA System-wide Climate Change Office (DA SCCO), AMIA Phase 1 in 2015-16 to implemented activities to strengthen DA's capacity to mainstream climate change adaptation and mitigation strategies in its core functions of R&D, extension, and

regulation. It is also designing complementary activities for building appropriate climate responsive DA support services.

With AMIA Phase 2 in 2015-16, the next big challenge is making climate-resilient agri-fisheries (CRA) an operational strategy through field-level action that directly involves, and impacts on the livelihoods of, farming communities. AMIA2 aims to invest in the launching of CRA communities -- as the initial target sites for action learning, supported by an integrated package of climate services and institutions, within a broader food system/value chain setting. The program is launching an integrated and multi-stakeholder effort to operationalize CRA at the community level in 9 target regions.

The AMIA2 program framework consists of 9 key clusters of inter-related activities, whose cumulative and combined results are envisioned to help AMIA achieve its goal for 2016 and beyond. For each cluster, a set of projects and activities would be designed towards operationalizing the AMIA framework.

Cluster 1: Enabling environment
Cluster 2: Vulnerability assessment and risk targeting
Cluster 3: Developing knowledge pool of CRA options
Cluster 4: CRA community participatory action research initial phase
Cluster 5: Enhancing services and institutions
Cluster 6: Integrating CRA in food systems and value chains
Cluster 7: Implementing CRA on scale
Cluster 8: Knowledge Management for results

The AMIA2 framework provides overall guidance in the planning and design of research and development interventions in 9 target regions.

1. Region I Ilocos
2. Region II Cagayan Valley
3. Region III Central Luzon
4. Region IVA Southern Luzon
5. Region V Bicol
6. Region VI Western Visayas
7. Region X Northern Mindanao
8. Region XI Southern Mindanao
9. Region XVIII Negros Island

Successful implementation of AMIA2 at the regional level requires the strong collaboration and support of key research and development institutions within the region. This proposed project enables AMIA2 to establish and mobilize regional teams, each led by a local State University/College (SUC), and in partnership with the corresponding Department of Agriculture - Regional Field Office (DA-RFOs).

2. Narrative Summary

2.1. Potential Impact or Goal

To assist selected communities in the Province to gain a better appreciation and understanding of the risks associated with climate change and assess suitable agri-fisheries climate-resilient technologies.

2.2. Outcome or General Objective/Purpose

The overall objective is to assess, target and prioritize climate-resilient agri-fisheries (CRA) research and development in Iloilo Province - in support of AMIA2.

2.3 Expected Output or Specific Objectives

a) To strengthen capacities for CRA methodologies of key research and development organizations in the region.
b) To assess climate risks in the region's agri-fisheries sector through geospatial & climate modeling tools.
c) To determine local stakeholders' perceptions, knowledge & strategies for adapting to climate risks
d) To document and analyze local CRA practices to support AMIA2 knowledge-sharing and investment planning.

2.4 Scope and Limitations/Constraints

The project covers the Iloilo Province that focuses on the five (5) stakeholders identified commodities such as; rice, corn, cacao, milkfish and eggplant. The climate risks in Iloilo Province were assessed using geo-spatial and climate modelling tools. Unavailability of stakeholders, security concerns and inaccessibility of sites were the problems commonly met in the implementation of the project.

3. Review of Related Literature

Climate change studies in the Philippines are emerging fast, focusing on different fields of sciences. Several climate change and

vulnerability (VA) studies (Jose and Cruz, 1999, Badjeck et al., 2010; Sajise et. al., 2012; Mamauag et al., 2013; Perez et al., 2013) have in fact been conducted in the Philippines. The current proposal will not in any duplicate these earlier studies and would in fact use the results of recent studies including those cited above to validate the climate change risks and suitability of selected agri-aqua commodities as climate resilient livelihood options for Iloilo.

Climate Smart Agriculture (CSA) is not single specific agricultural technology or practice that can be universally applied (FAO, 2013). It is an approach that requires site-specific assessments to identify suitable agricultural production technologies and practices. Scherr et al. (2012) suggested that agricultural systems can achieve climate-smart objectives, including improved rural livelihoods as well as climate change adaptation and mitigation through adopting a landscape approach. To be sustainable and climate resilient the needs of different stakeholders in a given landscape, land use planning as well as management of natural resources need to be coordinated across sectors and through a participative and consensus-based decision-making process. Achieving socio-ecologically sound landscape approaches will require building national and local capacity to develop responsible and inclusive governance arrangements which include improvements in tenure security and the recognition of the rights of individual and groups (FAO 2012).

Concerns on the impact of climate change on ecosystems and communities that depend on them have taken center stage in many if not all development interventions in recent years. However, the ability to effectively conserve ecosystems and the goods and services these provide depend to a large extent on the ability of the stakeholders to predict the impact of climate change and the communities' adaptive capacities to changes that may occur. Thus conservation efforts and interventions to mitigate the effects of climate change should consider not only the bio-physical factors but also the socio-economic conditions that to a large extent dictate the range of conservation and adaptations measures that could be effectively introduced and sustained over time.

Thus the project will ensure that the communities in Iloilo and local level actors are able to assess the suitability of various commodities as to given changes in rainfall patterns, temperature and risks due to climate change and to develop climate responsive adaptation mechanisms. This necessitate working closely with farmers/fishers' organizations and Local Government Units. (LGUs) The research will

focus on bringing all stakeholders into the process of identifying and understanding risks associated with climate change and assessing adaptation mechanisms/strategies that will build or improve resilience of the communities and the livelihood options that are available in the communities.

The sustainability assessment and mapping will be done to understand how the interactions among climate and other drivers of change (e.g. rising temperatures, sea level rise and pollution among others) impact key agriculture, aquaculture and fisheries production systems, value chains, and livelihoods in the study areas.

The presence of Climate Field School in Dumangas, Iloilo conducted trainings among farmers on practices in order to mitigate climate related risks. Trained farmers were able to understand the process of forecast interpretation, translation and communication for agricultural applications (Golez, 2012). Thus livelihood of the constituents are protected and continuously to be productive.

2.5 References

Badjeck, M., Allison, E., Halls, A., Dulvy, N., 2010. Impacts of climate variability and change on fishery-based livelihoods. Marine Policy, 34 (3): 375-383.

FAO. 2012. Mainstreaming climate-smart agriculture into a broader landscape approach. Background Paper for the Second Global Conference on Agriculture, Food Security and Climate Change, Hanoi, Vietnam, 3-7 September 2012. Food and Agriculture Organization of the United Nations (FAO), Rome, Italy. 26p.

FAO. 2013. Climate smart agriculture: Sourcebook. Food and Agriculture Organization of the United Nations (FAO), Rome, Italy. 557p

Golez, Ronaldo. 2012. Climate Field School. Dumangas, Iloilo.

Jose, A.M., Cruz, N.A., 1999. Climate change impacts and responses in the Philippines: water resources. Climate Research, 12: 77–84.

Mamauag, S.S., Aliño, P.M., Martinez, R.J.S., Muallil, R.N., Doctor, M.V.A., Dizon, E.C.,Geronimo, R.C., Panga, F.M., Cabral, R.B., 2013. A Framework for Vulnerability Assessment of Coastal Fisheries Ecosystems to Climate Change - Tool for Understanding Resilience of Fisheries (VA-TURF). Fisheries Research, 147: 381-393.

Perez, M.L., Sajise, A.J.U., Ramirez, P.J.B., Arias, J.K.B., Purnomo, A.H., Dipasupil, S.R., Regoniel, P.A., Nguyen, K.A.T., Zamora, G.J. (2013).

Economic Analysis of Climate Change Adaptation Strategies in Selected Coastal Areas in Indonesia, Philippines and Vietnam. WorldFish, Penang, Malaysia. Project Report: 2013-32.

Sajise, A.J., Sombilla, M., Ancog, R., 2012. Socio-economics of Climate Change in the Philippines: A Literature Synthesis (1990–2010). SEARCA and PCAARRD, Los Baños, Laguna, pp. 13–25, http://www.seachangecop.org/sites/

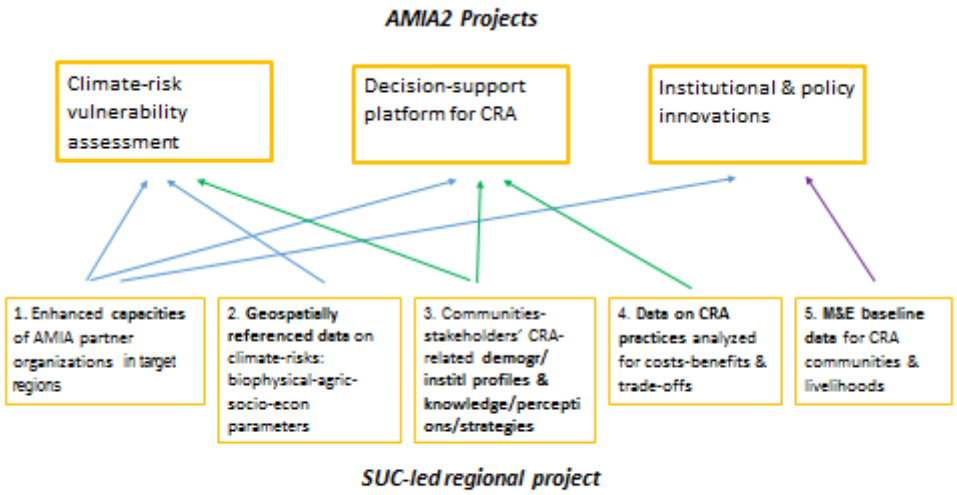
Scherr, S.J., S. Shames and R. Friedman. 2012. From climate-smart agriculture to climate-smart landscapes Agriculture & Food Security, 1:12 (1-15).

4. Methodology per Objective

The project seeks to contribute to the overall AMIA2 program framework, by contributing specific outputs to targeted national-level research projects. It has four key components:

1. Capacity strengthening for CRA research & development
2. Geospatial assessment of climate risks
3. Stakeholders' participation in climate adaptation planning
4. Documenting &analyzing CRA practices

AMIA baseline study for monitoring & evaluationThese project components are designed to be directly aligned with the research agenda of three AMIA2 projects: 1) climate-risk vulnerability assessment (CRVA), 2) decision-support platform for CRA, and 3) institutional and policy innovations.



Linking SUC-led regional project with AMIA 2 project porfolio

Component 1 - Capacity strengthening for CRA research & development

The regional project team participated in a series of trainings, workshops and learning events organized by AMIA2 projects that focus on three key methodologies: 1) CRVA, 2) CRA prioritization, and 3) CRA M&E.

The provided training support to key research and development stakeholders in the region, by organizing an intra-regional training that covers key learning contents from the national-level trainings.

Component 2 - Geospatial assessment of climate risks

The regional project team collected and organized geo-referenced data on vulnerability to climate risks of the region's agrifisheries sector. These datasets, from both primary and secondary sources, was based on the methodological guidelines provided by the AMIA2 CRVA project – covering climate-risk exposure, sensitivity and adaptive capacity.

Preliminary analysis – using GIS and climate modelling tools was undertaken at the regional level.

Component 3 - Stakeholders' participation in climate adaptation planning

The regional project team organized a series of stakeholders' meetings and focus group discussions to collect supplementary data and validate preliminary results of CRVA, as well to undertake CRA prioritization and planning.

These were guided by process facilitation and data collection tools developed by the AMIA2 projects on CRVA and CRA decision-support platform.

Component 4 - Documenting &analyzing CRA practices

The regional project team conducted a semi-structured survey with local stakeholders to identify and document CRA practices, as well as collect existing CRA-relevant statistical and other secondary data.

These data systematized and analysed, using cost-benefit and trade-off analyses tools as input to AMIA2 CRA prioritization and investment planning. These will likewise contribute to developing knowledge products, such as searchable online portal, under the AMIA2 project on CRVA decision-support platform. A national working team, consisting of representatives from regional teams, will undertake this joint task.

3. Results and Discussion

1. To strengthen capacities for CRA methodologies of research and development organizations in the region.

Seminars and trainings were conducted by AMIA2-CIAT and participated by regional teams. These focused on action planning, GIS Mapping (CRVA Methodology), CRA Decision Support and Cost-Benefit Analysis. With all the results of trainings, the Regional Team adopted these learning's process through project implementation. (Please see the Table 1)

Table 1.Seminars, meetings, workshops and trainings on CRA-AMIA2 Project

Event	Purpose	Venue	Date	Remarks/Person Involved
1. Planning Workshop on AMIA2-CIAT Projects	To present and discuss the over-all design and target outputs and work plan of the AMIA2-CIAT projects.	UP Los Baños	May 19-20,2016	UPLB-FI DA-RFO's AMIA-CIAT Team Project Leader
2. Training on Climate Risk Vulnerability Assessment	To capacitate the regional team in conducting CRVA based on the methodology formulated by AMIA-CIAT team	Torre Venezia Suite, Quezon City	June 6-8,2016	DA-BAR Representatives DA-RFO's CIAT Team ISCOF
3. Training on Cost-Benefit Analysis for Climate Resilient Agriculture	To strengthen the capacities of regional teams in conducting CBA based on the recommend methodological guidelines/tool To discuss and confirm on regional teams and their	Torre Venezia Suite, Quezon City	August4-6,2016	DA-BAR Representatives DA-RFO's CIAT Team ISCOF

	corresponding tasks in Decision- Support platform for CRA To update progress and general planning for CRVA and Decision-support platform for CRA.			
4. ISCOF Team Meeting	To plan and strategies the data collection process	ISCOF Board Room	August 22, 2016	ISCOF Team: Project Leader: Socio-economists: GIS Specialists Research Assistants
5. Project Enumerators Orientation Meeting	To orient the enumerators about the project and data collection process and questionnaires	ISCOF – Conference Room	August 23, 2016	ISCOF TEAM Enumerators Research Assistants DA RFO 6
6. Workshop on Climate Risk Vulnerability Assessment Stakeholders Validation	To orient the office of the municipal agriculture of Iloilo Province about AMIA Program To determine the crop occurrence in Iloilo Province To know the future sensitivity of the identified crops to Climate Change and the farmer's strategies	DA – RFO 6 Fort San Pedro, Iloilo City	September 2, 2016	CIAT-AMIA Team (Leo Kris Palao) ISCOF Team OPA Municipal Agriculturists Agricultural Technicians Report Officers DA – RFO VI BFAR - PFO

	To be able to identify the current adaptation strategies of the municipalities			
7. Data Collection and Geospatial Assessment	Data Collection Geospatial Assessment		September 2016 - February 2017	Forty four (44) municipalities and two (2) cities were involved; Representatives: Mayor MA's AT's Farmer MAO's Staff DA-Regional Field Office 6 Provincial Office: Office of the Provincial Agriculturists Provincial Planning and Development Office Provincial Environment and Natural Resources Office

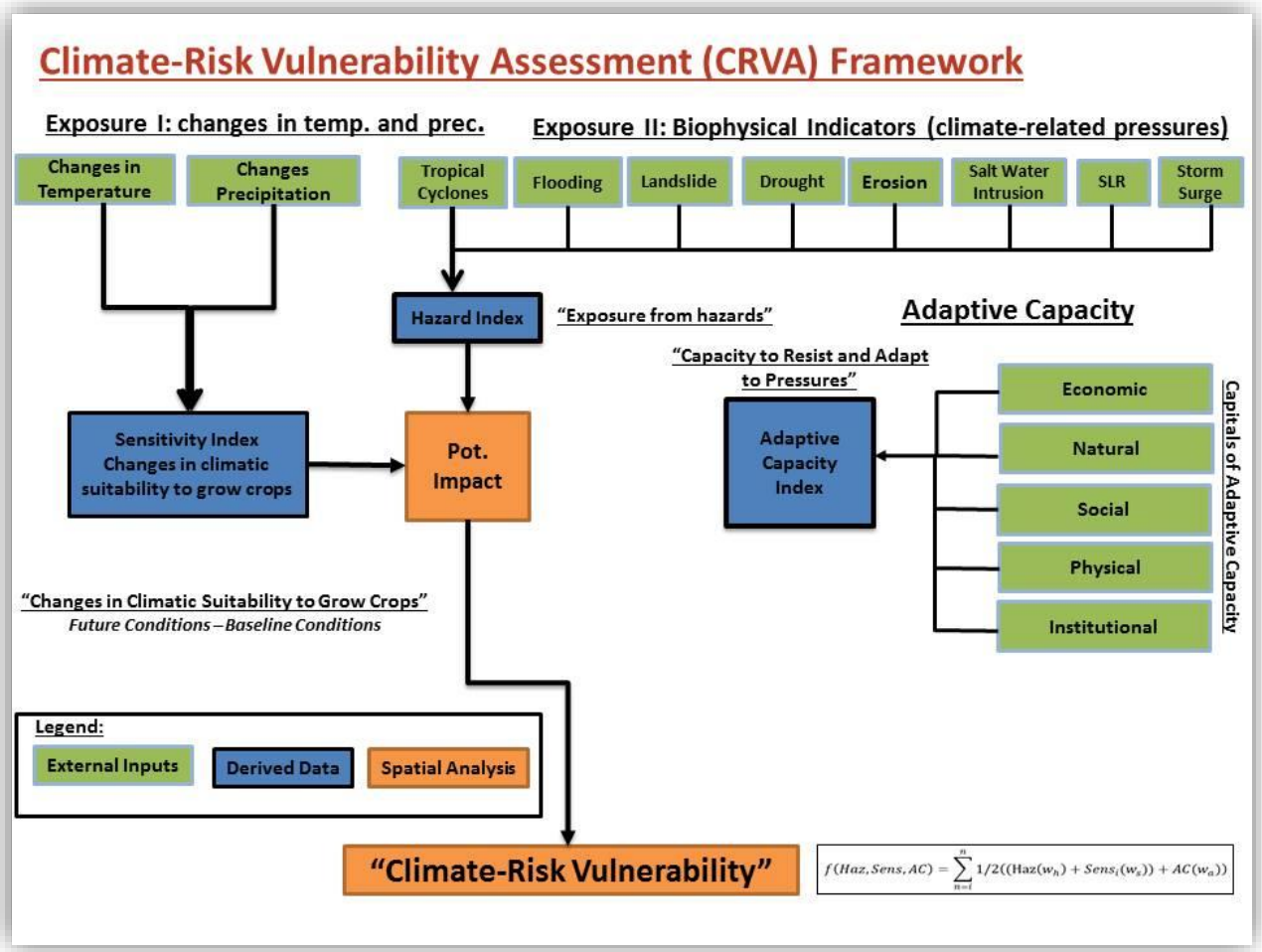
8. Workshop on Validating Smartness Assessment of Climate-Resilient Agriculture Workshop on Sharing Preliminary Results of Climate Resilient Agriculture (CRA) Prioritization and Extended CBA	To present the initial findings of the CBA as well as include social and environmental costs and benefits	Green Sun Hotel, Makati City	November 28 – 30, 2016	ISCOF Team National Experts on Fisheries, and Crops CIAT Team
8. Workshop on CRVA	Give an update on the status of data collection for crop occurrences and adaptive capacity Run Maxent model to generate climate and climate change crop suitability for each province Assess and revisit weighting for exposure 2 - climate related environmental hazards	SEARCA, UP Los Baños	January 10-12,2017	CIAT-ASIA Representatives SUC's ISCOF Team
9. AMIA-CIAT Project: Results Sharing and	To share and validate results of AMIA 2 (Phase 1)	Cebu City	February6-7,2017	Team AMIA 1 BSWM

Validation Workshop on CRVA & CRA Decision Support	To identify further variables and improvements for the upcoming CRVA AMIA 2++ (Phase 2) To discuss a resulting evidence-based strategic plan for climate-resilient agri-fisheries communities CRVA Stakeholder Validation Workshop			CIAT-AMIA Team DA-RFO's SUC's ISCOF Team
10. AMIA-CIAT Project: Workshop on Finalizing Results on CRA Prioritization, CRVA, and extended CBA	To give update on the status of CBA activities and present pre-final results To re-visit the CBA methodology and explore additional assessment of social and environmental dimensions To prepare investment briefs	B Hotel , Quezon City	March 1-3, 2017	CIAT-ASIA Team SUC's ISCOF Team
11. Results Sharing and Validation on CRVA and CRA Decision Support	To present Pre-final results on CRVA in Iloilo Province. To validate the results on CRVA and CRA Decision Support	College Board Room, ISCOF	March 7. 2017	DA-RFO's ISCOF Team

12. Workshop on Sharing and Validation of Preliminary Results on CRA Assessment, Targeting and Prioritization	To present Pre-final results on CRVA in Iloilo Province. To validate the results on CRVA and CRA Decision Support	Paon Resort, Estancia, Iloilo	March 9-10, 2017	DA – RFO 6 ISCOF Team Municipal Agriculture Officers, Report Officers Farmers
14. National Review and Planning Workshop	To present progress report	Brentwood suites, Quezon City	April 3-7, 2017	ISCOF Team CIAT BAR SWCCO

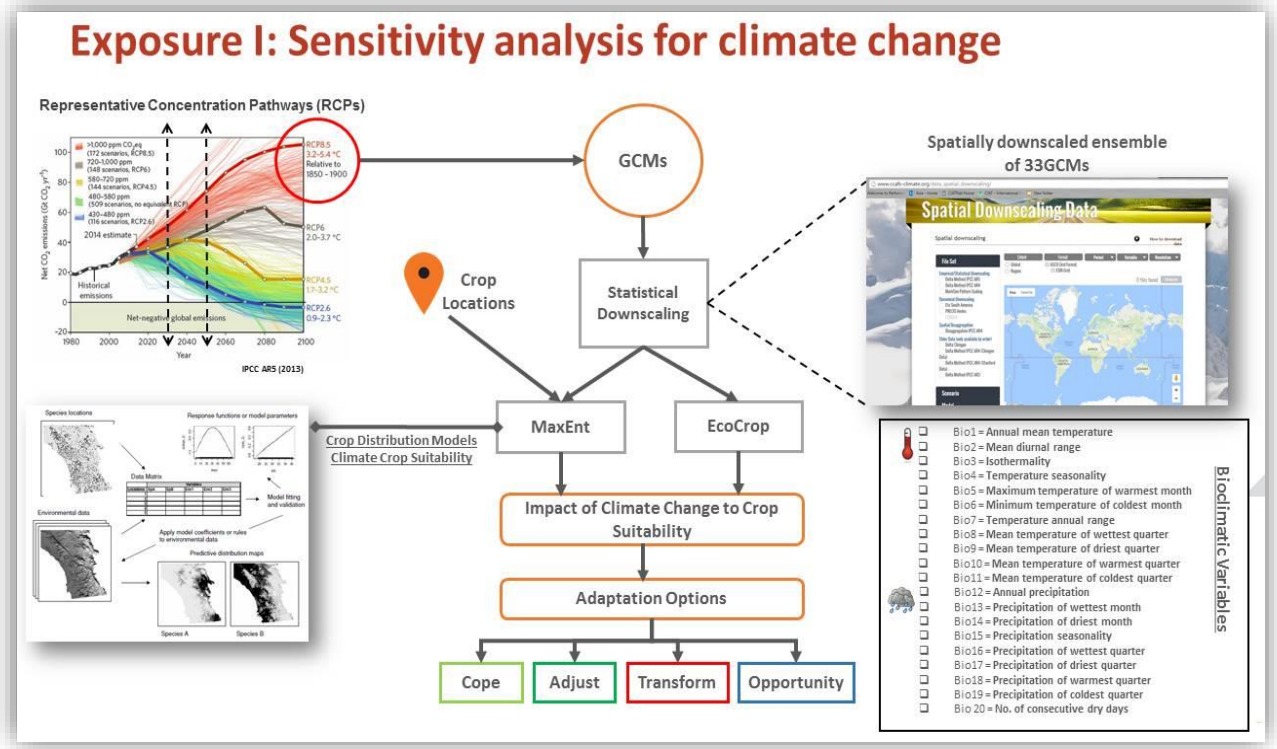
2. **To assess climate risks in the region's agri-fisheries sector through geospatial & climate modelling tools.**

The AMIA2-CIAT was organized and facilitated series of workshops and trainings to capacitate the regional team to carry out of CRVA. This is based on the methodological framework formulated by AMIA-CIAT team. (Please see Figure 1 below).



The Climate-risks Vulnerability Assessment (CRVA) framework has three (3) components; (1) Sensitivity that determines the changes in climatic suitability to grow crops, (2) Exposure of crop to hazards and (3) its Adaptive Capacity to cope and adapt to climate change impacts. The result of vulnerability can serve as assistance to the decision makers to plan and make strategies to manage and resist on the adverse effects of climate change.

Figure 2.Framework of Sensitivity Analysis.

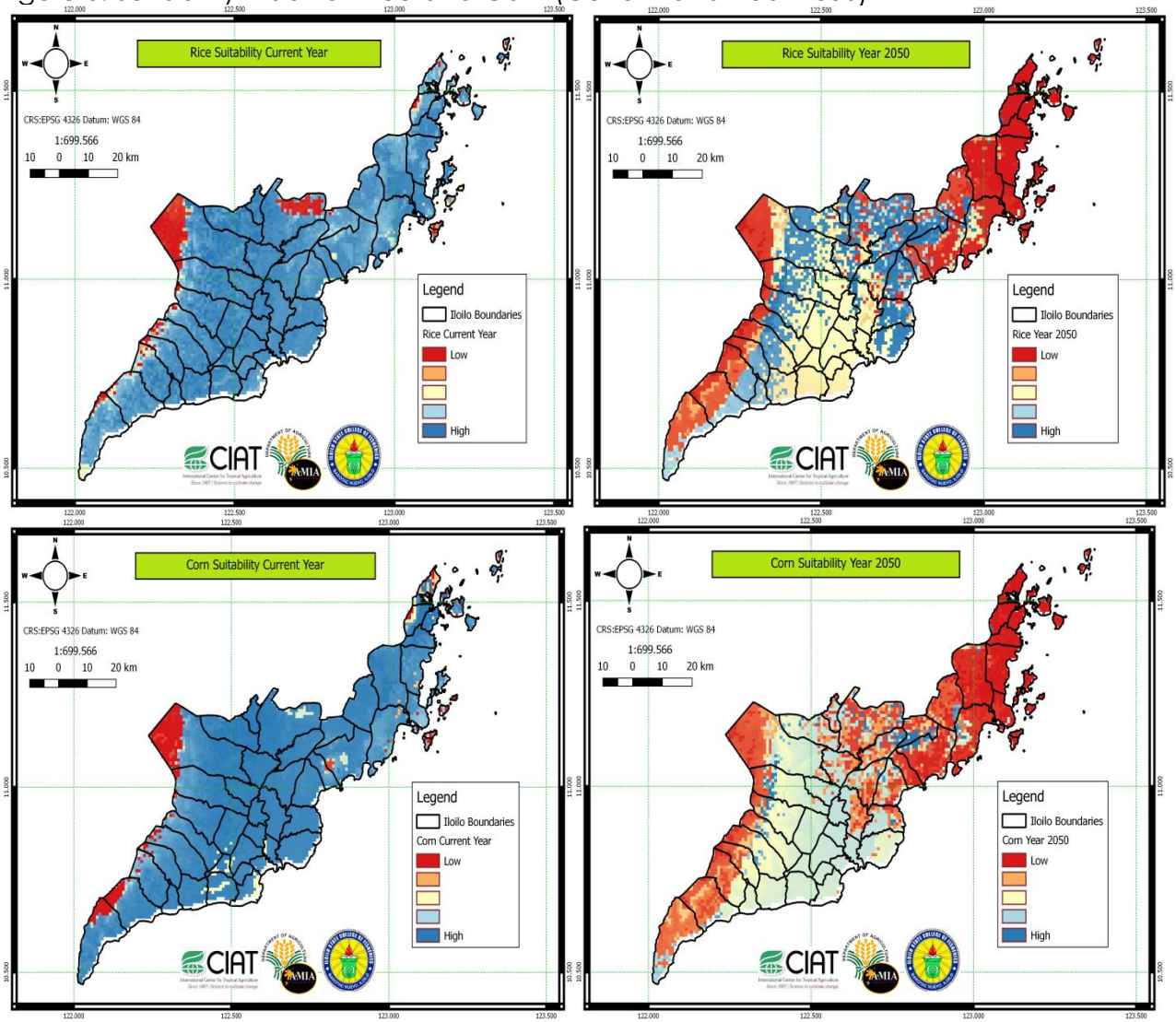


Sensitivity Analysis is one of the components of CRVA framework. This method used RepresentativeConcentration Pathways (RCPs) 8.5 with 33 GCMs ensemble into one to provide input on climate models because it is most recent and policy relevant. This can be done through statistically downscaled into 1km to predict scenarios with 20 bioclimatic variables using Maxent Model. The output would be used to determine the impact of climate change to crop suitability (Present Condition and Year 2050).

The Province of Iloilo has five (5) priority commodities namely; Rice, Corn, Eggplant, Cacao and Milkfish. Changing in climatic conditions (e.g. change in temperature and precipitation) will be used to measure the sensitivity of a particular crop. It can be determined the crop suitability based on climate-risk.

The low and high suitability index was shown on the figure below. The changing in climatic condition from present to year 2050, low suitability index might happen due to the increasing temperature and low precipitation will occur. The effect on crops will be more sensitive as the response on the increasing magnitude of climate hazard risk.

Figure 3. Suitability Index of Rice and Corn (Current and Year 2050)



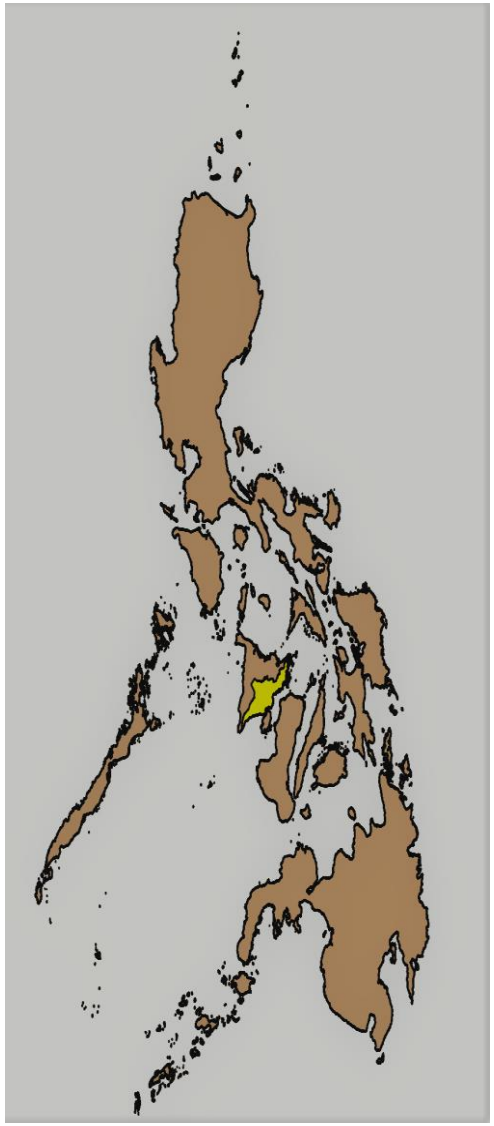
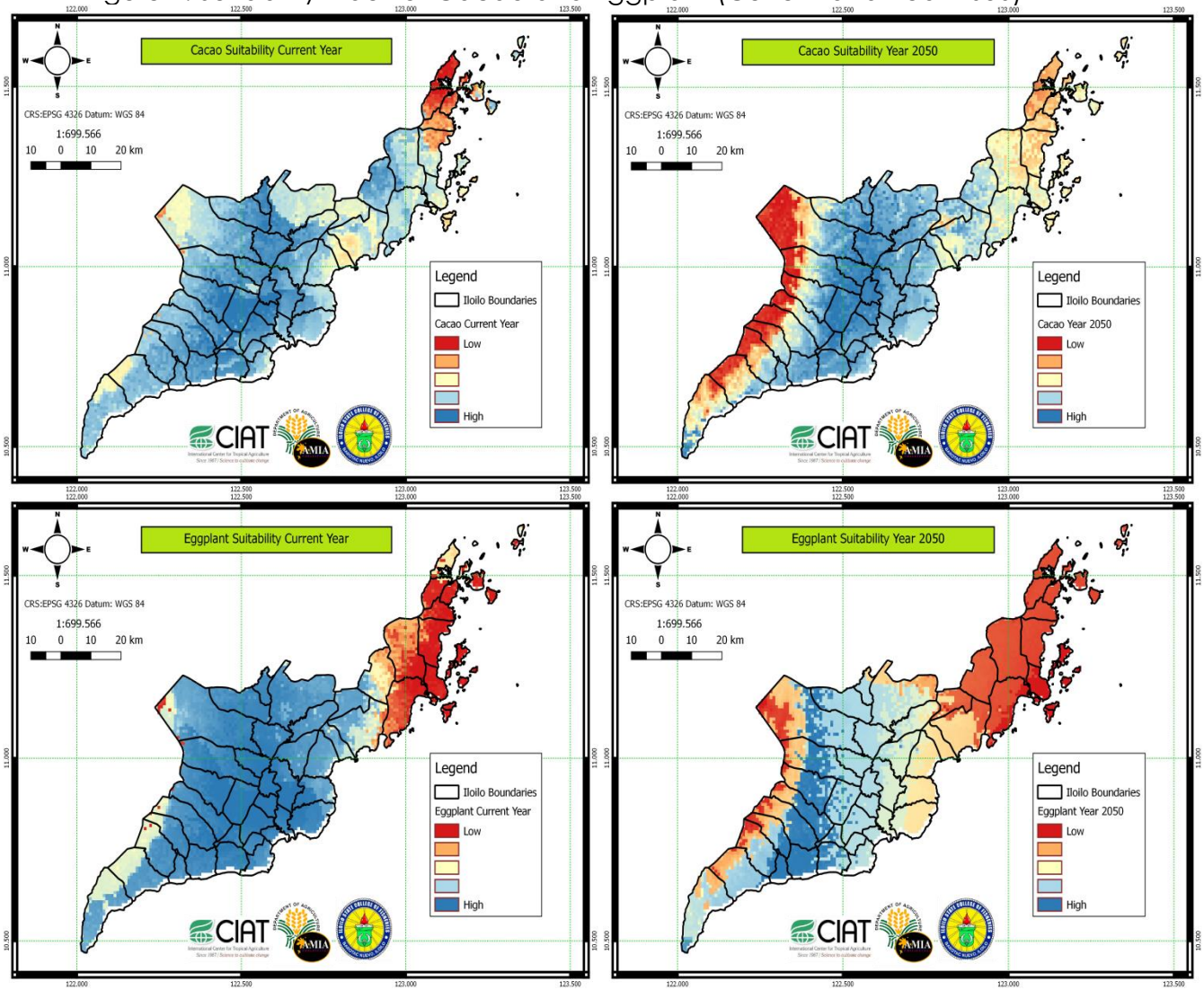


Figure 4. Suitability Index of Cacao and Eggplant (Current and Year 2050)



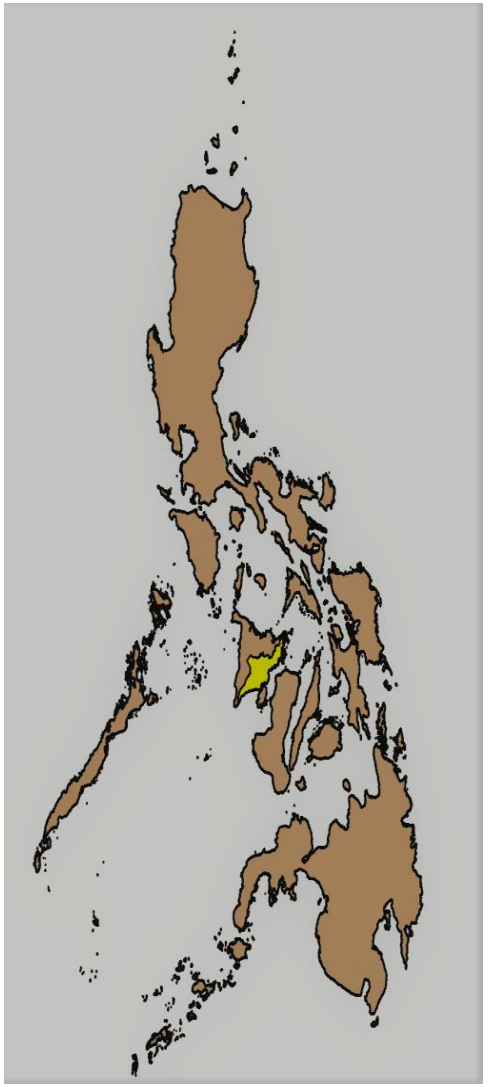
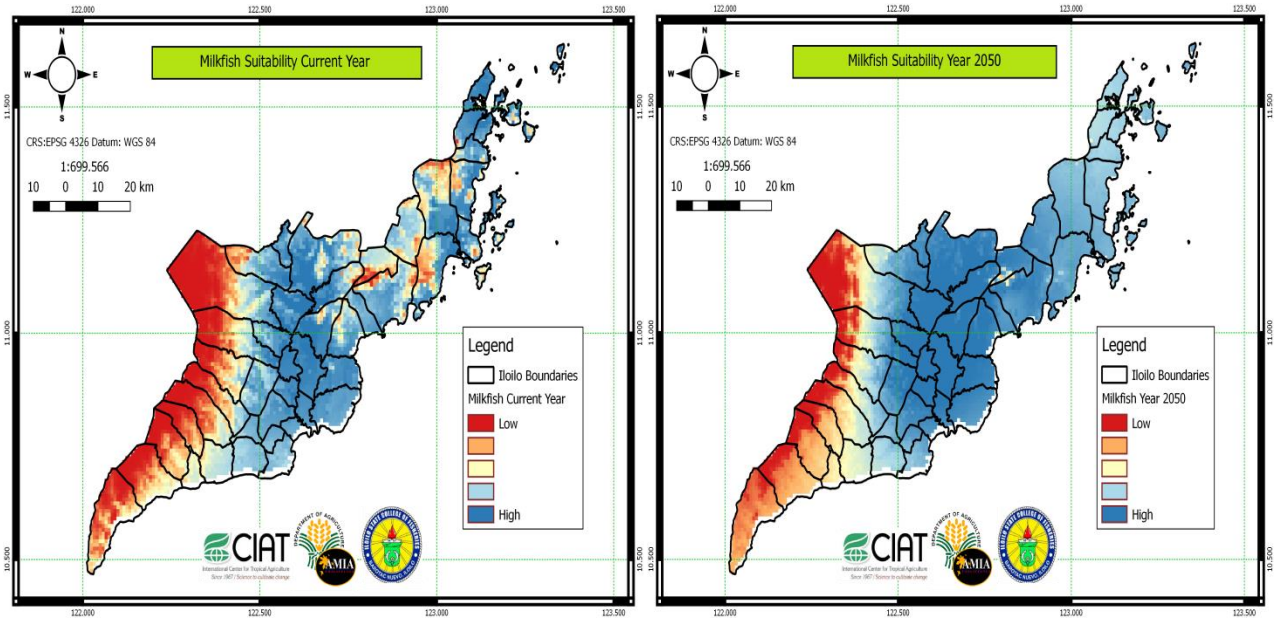


Figure 5. Suitability Index of Milkfish (Current and Year 2050)



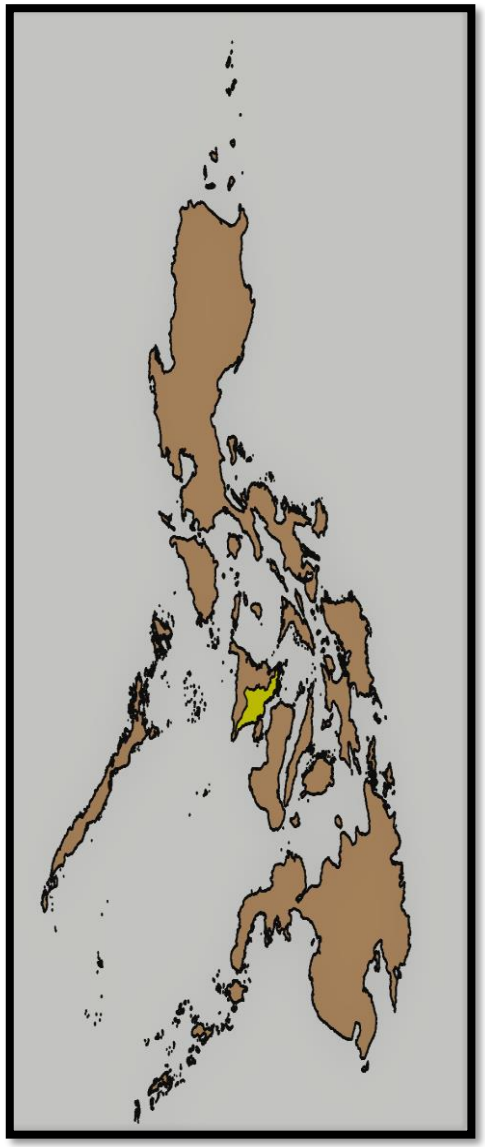
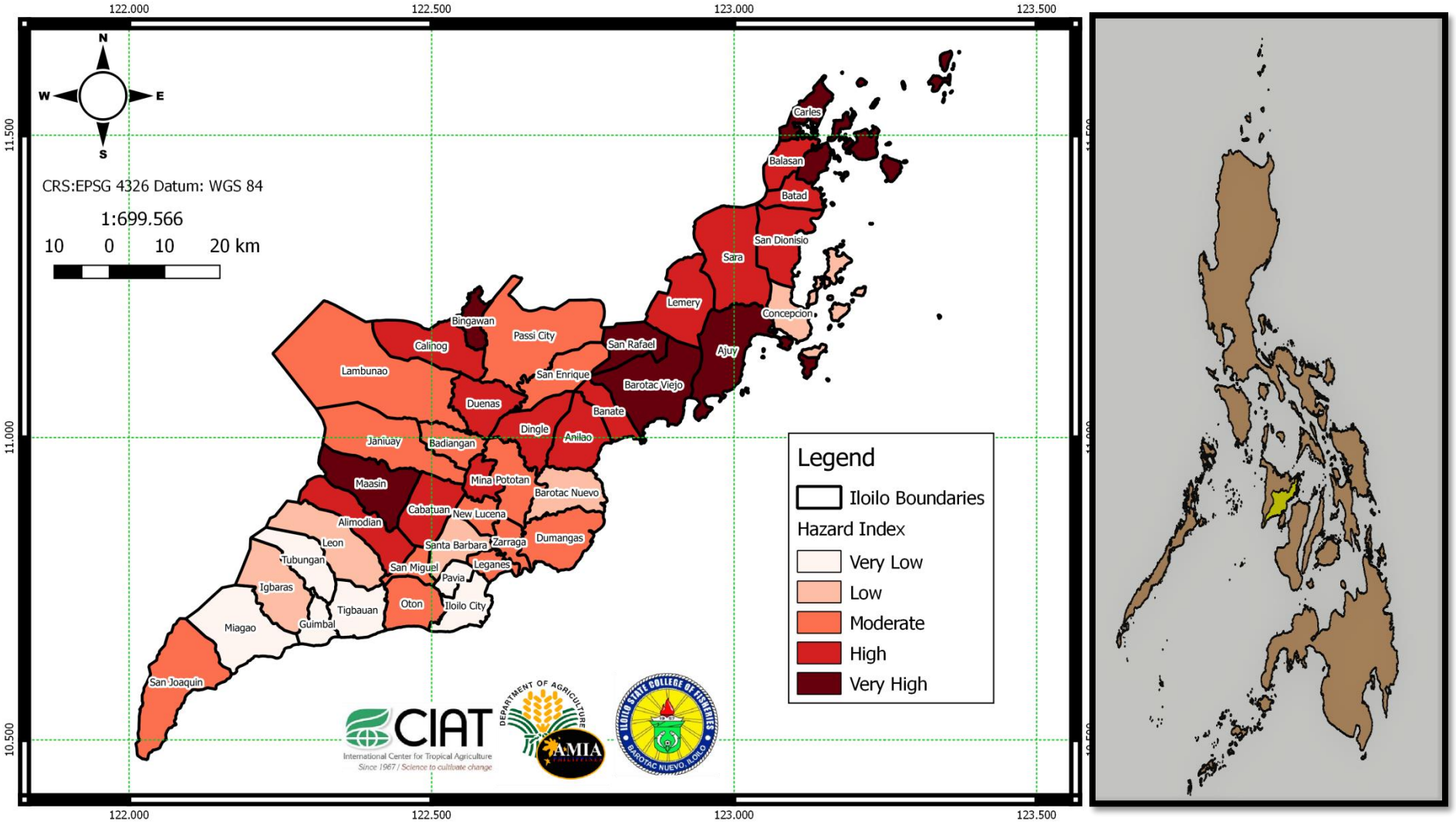


Figure 6. parameters and data sources of Climate Hazard.

Parameter	Source	Unit of measurement, spatial and temporal resolution
Typhoon	UNEP / UNISDR, 2013 (http://preview.grid.unep.ch/index.php?preview=data&events=cyclones&evcat=2&lang=eng)	1 kilometer pixel resolution. Estimate of tropical cyclone frequency based on Saffir-Simposon category 5 and higher from year 1970 to 2009.
Flooding	AMIA multi-hazard map / baseline data from Mines and Geosciences Bureau, Department of Environment and Natural Resources (MGB, DENR)	1:10,000 scale. Susceptibility of flood risk for Philippines from the past 10 years
Drought	AMIA multi-hazard map / baseline data from National Water Resources Board	Groundwater potential for the Philippines
Erosion	AMIA multi-hazard map / baseline data from Bureau of Soils and Water Management (BSWM)	1:10,000 scale. Soil erosion classified from low to high susceptibility
Landslide	AMIA multi-hazard maps / baseline data from MGB, DENR	1:10,000 scale. Landslide classified from low to high susceptibility
Storm Surge	AMIA multi-hazard maps / baseline data from Disaster Risk and Exposure Assessment for Mitigation, Department of Science and Technology (DREAM, DOST)	
Sea level rise	AMIA multi-hazard map /	
Saltwater Intrusion	AMIA multi-hazard map / baseline data from the NWRB	Groundwater potential for the Philippines

The ISCOF team considered exposures from secondary data as shown in Figure 6. This information from historical records of climate-related hazards as considered from past exposure to be a good representation for future climate.

Figure 7. Hazard Index in Iloilo Province



Rice has a high suitability for the entire province for the current year, however, it is projected in 2050 that the municipalities in the Northern part of Iloilo like Barotac Veijo, Ajuy, Lemery, Sara, Concepcion,Balasan, Batad, Estancia and portion of the western side of the province, like municipalities of Lambuano, Janiuay, Alimodian, Leon, Tubungan, Igbaras, Miag-ao and San Joaquin to have a low suitability. Also, it is projected that in some portion of the central towns like Dumangas, Barotac Nuevo, Anilao, Dingle, Passi City, Badiangan and San Enrique is still suitable to rice and will be moderately suitable to other areas namely; Iloilo City, Oton, Tigbauan, Pavia, Leganes, Zarraga, Cabatuan,Sta. Barbara , Mina, Pototan and New Lucena. As projected, rice will be sensitive to areas with low suitability like in the northern towns of Iloilo.

Currently corn is highly suitable for Iloilo, although, it is projected to have a low suitability in the Northern portion of the province. It includes the municipalities from Banate up to Estancia, portion of Passi City, San Enrique, Dingle, Anilao and Pototan. Corn at 2050 projections showed high sensitivity in portion of Fourth district and large portion of the Fifth district.

Cacao is highly suitable in the First District, Third District and portion of Fourth and Fifth districts of Iloilo. The Northern portion of the Fifth District have low suitability index and still have low suitability as projected in 2050. Furthermore, portion of municipalities of Lambuano, Janiuay, Alimodian, Leon, Tubungan, Igbaras, Miag-ao and San Joaquin to have a low suitability. Cacao at 2050 showed a highly sensitivite in mountainous areas of Lambunao and other parts of First district of Iloilo.

Eggplant has a high suitability in Calinog and highly suitable in other municipalities of 1st, 2nd 3rd and 4th Districts except for some parts in San Joaquin, Miagao, Guimbal, Tigbauan, San Rafael and Barotac Viejo with moderate suitability, and in Fifth District it has low suitability in the current year. Yet, it is still projected in 2050 to be low suitability in towns of Northern Iloilo such as Carles, Balasan, Batad and Estancia.

Milkfish is currently suitable in locations where milkfish culture located and still be suitable in the same municipalities.

Hazards identified for Iloilo Province were; typhoon, flood and erosion these three were considered as top three hazards for the Province of Iloilo. Typhoon showed a high effect in the Fifth District of Iloilo, and mostly these areas are considered as typhoon prone municipalities. Flood has a high effect in the Fourth district of Iloilo province. These flood prone municipalities are Dingle, Barotac Nuevo, and Dumangas. Erosion as a hazard shows that municipalities with higher slopes causes

moderate hazard. Hazard index showed (overlay of different hazards) that in the municipalities in the Fifth District are largely exposed to" very high" hazard such as municipalities of Carles ,Estancia, San Rafael, Barotac Viejo, Ajuy. While "high" in Balasan, Batad, San Dionisio, Sara, Concepcion and Lemery. Moderate to low exposure to hazards in some portion of Fourth, Third, Second and First districts, except for very high hazard exposure to municipalities of Bingawan and Maasin. This map was used in identification of areas that are highly exposed to climate hazard at risk and contributes in assessing the vulnerability index.

Figure 8.Adaptive Capacity weighting and selection process

Step 1: The dataset that were used to come up with the adaptive capacity index came from: National Competitive Council of the Philippines (NCCP), Philippine Statistics Authority (PSA), International Water Management Institute (IWMI), and National Mapping and Resource Information Authority (NAMRIA)

Step 2: Relevant variables were pre-selected from the database of NCCP, 2015

Step 3: Principal Component Analysis (PCA) and Random Forest was used to explore the geographic variances, correlation, and feature importance of data across provinces and indicators. The shortlisted indicators were cross checked and some more variables were included to complete the representation of the other AC capitals.

Steps 4 and 5: Experts from DA (from different agencies), NEDA, FAO, NGOs, and Academe were invited to the workshop. They were grouped into 2 clusters and ask to rank each of the indicators according to importance. Each group should discuss and decide for a common value/rate for each indicator. They were provided with 1-5 score/rates, where 5 is the highest/most important. Some of the variables were lumped into a single variable and was given a high score as suggested by experts. Overall weights for "Sensitivity (15%)", "Hazards (15%)", and "Adaptive Capacity (70%)" were also identified by the experts during the workshop.

Step 6: The values of the 32 indicators were integrated in the shapefile municipal boundaries. Each of the indicators was normalized and was treated with equal weights. The sum of the 32 indicators provided the adaptive capacity index.

Step 7: Five equal breaks was arbitrarily used with 0-0.20 (Very Low), 0.20-0.40 (Low), 0.40-0.60 (Moderate), 0.60-0.80 (High), and 0.80-1.00 (Very High).

These are the steps on how adaptive capacity index is being process. There are 16 out of 32 indicators came from different agencies (as shown in Figure 8) national & provincial and added the data from municipal level which included the rest of indicators.

There were 42 municipalities and 2 cities were surveyed to collect data for Adaptive Capacity. These include economic, natural, social, human, physical and institutional capitals. Data were collected at Municipal Planning and Development Office (MPDO) and Municipal Agriculture Office (MAO) some of the data needed are accessible at the office of Municipal Disaster Risk Management (MDRRMC). Interviews were conducted using modified checklist questionnaire, however, some of the data are not available thus it is needed to revisit day to day of the week to collect all the data needed.

Iloilo City has high economic capital followed by Pavia and Concepcion. Whereas, there are sixteen municipalities and Passi City belongs in moderate economic capital.

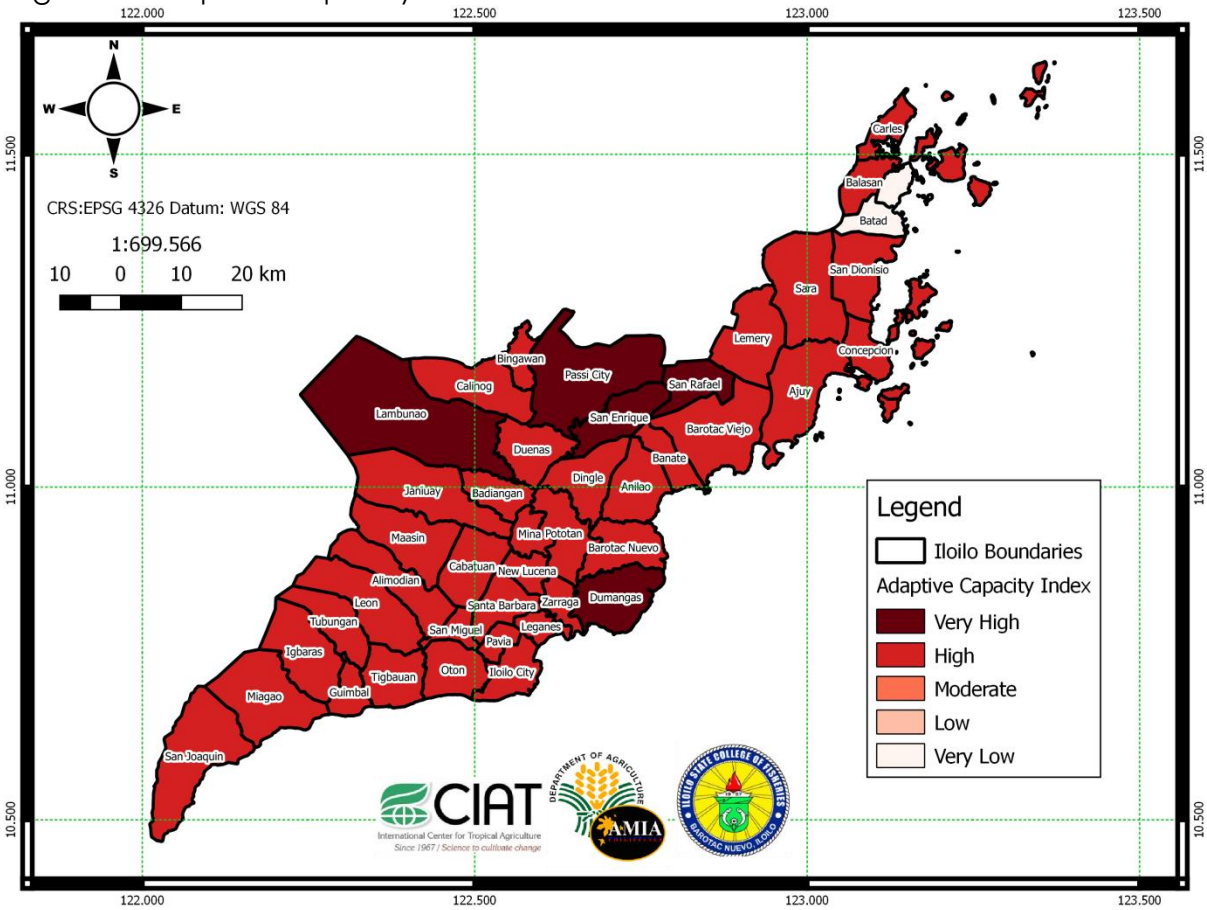
Iloilo City has "very high" in human capital in terms of health and education followed by Santa Barbara with high human capital. Moderate in Guimbal, Cabatuan, Janiuay, Calinog, Concepcion and Balasan, and the rest are low.

Natural capitals included: crop irrigated and mangrove/ forest are very high in the area of San Joaquin, Miag-ao, Igbaras, Tubungan, Tigbauan and Concepcion. Cabatuan, Guimbal, Leon, and Carles, Alimodian, Barotac Nuevo identified as high. Low in area of Oton, Duenas, San Enrique and Balasan others are very low.

Physical Capital includes; infrastructure investment, access to services, Infrastructure Network, Number of public transportation and telephone Companies and Mobile Services which are very high in municipality of Miagao, Guimbal, Santa Barbara, Zarraga, and Badiangan. There are twelve (12) municipalities identified as high and sixteen (16) municipalities identified as moderate and others are low.

Institutional capitals such as DRRMP, Buffer Stock and number of agricultural Officers/ specialists are high in twenty three (23) municipalities, eleven (11) are identified as high and others are moderate.

Figure 9. Adaptive Capacity Index.

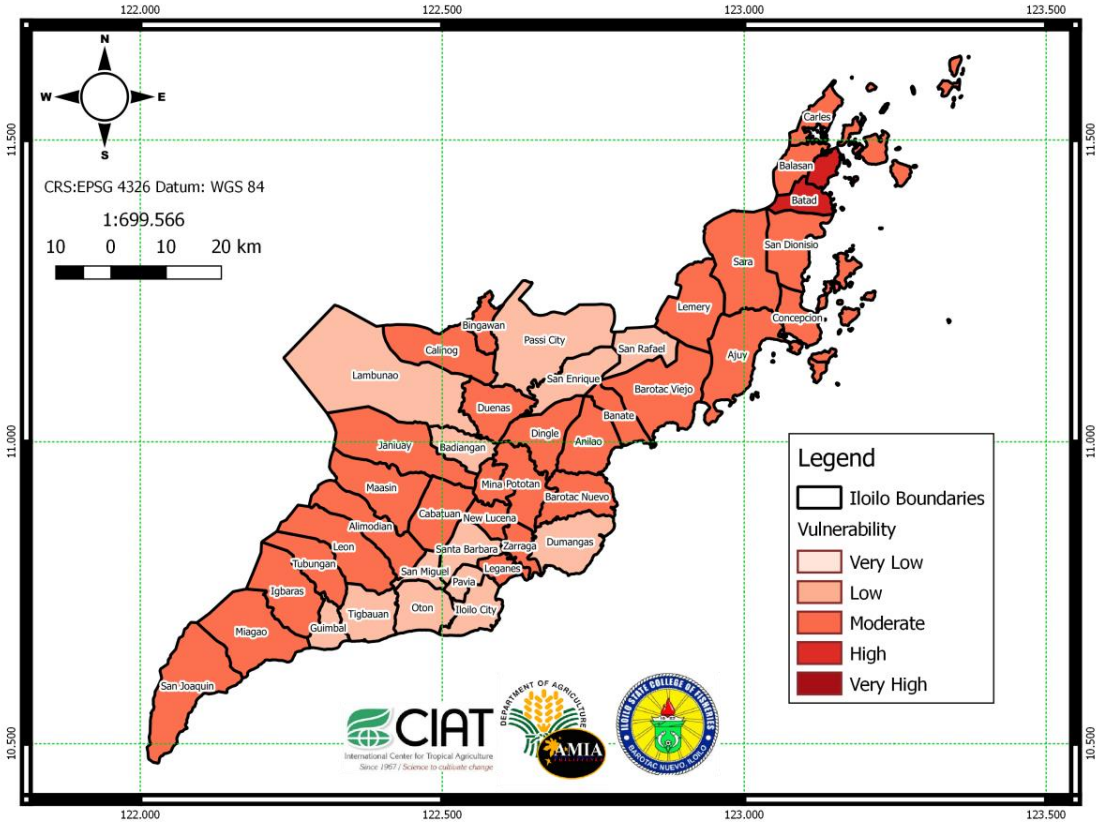


Among 44 municipalities, Dumangas, Lambuanao, Passi City, San Enrique and San Rafael have the "very high" adaptive capacity index followed by the Iloilo City and the rest of municipalities except for Batad. Their high adaptive capacity is credit to its strong capitals. Municipalities with "very high" adaptive capacity has an edge to be more equipped in Climate Change (CC) impacts because of its rich natural capital (goods and services), strong institutional capital (active DRRMP) that can support and satisfy the needs of its constituents. It can greatly help to become an asset, and can build more in economic. From natural capital, human produces goods that reflects low poverty incidence rate on the said municipalities. There are various trainings and programs conducted in response to Climate Change and an active have Disaster Risk Reduction Management council that facilitates communication to provide information through cell phones, radio, and television. In addition, presence of Early Warning System (EWS) can give an advantage to prevent and reduce the impact of disasters.

These findings can assist the policy makers in decision making, that are needed to move forward, to facilitate and inform community leaders on climate change impact. Prioritization on the development that are necessary in the community

and create strategies to cope with, and adapt (e.g. appropriate CRA practices) based on the projected climate change impact within the community.

Figure 10. Climate-Risk Vulnerability Result in Iloilo Province



The results of three (3) components of vulnerability assessment which includes sensitivity of crops, hazard exposure and its adaptive capacity was found in two (2) municipalities. Batad has the highest normalized result with 1.00 located in the Northern part of Iloilo. It implies that high sensitivity of crops which will lead to low suitability in the area that can greatly influence the level of vulnerability. Yet, its hazard exposure is also high it indicates that high exposure can be also determined the high vulnerability. On the other hand, the main factor that influences the vulnerability of the area is the adaptive capacity. As the result of it, Batad and considered as very low adaptive capacity due to the influence of low economic, human capital and relatively in social capital. Yet, high social capital can build high adaptive capacity to be more resilient and sustainable that influences other social actors to be collaborative in a common challenge.

3. To determine local stakeholders, perceptions, knowledge and strategies for adapting to climate risks.

Meetings with the stakeholders and Focus Group Discussions were conducted to collect supplementary data. These were conducted with collaboration with Provincial Agriculture Office and with the Municipal Agriculture Office. Secondary data were also collected. The participants were requested to identify common risks encountered during rainy and dry seasons on the target crops as reflected in Table1.

For Cost Benefit Analysis (CBA), another household survey was conducted among municipalities to gather data for the analysis. The Enumerators, the Socio-Economist and the Project Leader had carried out simultaneous Informal Interview with the farmers in the project sites. The Municipal Agriculture Officers assisted the team in meeting the farmers. Data were consolidated, tallied and analyzed. There are challenges and problems encountered in the implementation of the project along this area such as CBA tool familiarity and experience. However, trainings, local and regional meetings and consultations addressed different issues in the matter at hand. The data is now ready for the final input in the CBA tool provided for this purpose.

Key Informant Interviews/structured Interviews were conducted with corn farmer, rice farmers to obtain data for both conventional and CRA practices. These were justified for validation of Agriculture experts and consulted Scheduled method was employed. The project staffs set scheduled with stakeholders for interview, observation method with on site visit were also conducted.

Stakeholders' validation with DA RFO staffs was conducted last March 9-10, 2017. This was joined by rice/corn farmers and municipal Agriculture staffs. Input should be provided by the government training to update the stakeholders to the technology. Provision of hybrid seeds of corn instead of using organic fertilizer for higher productivity; as suggested added, the continuity and sustainability on the usage of Slopping Agricultural Land Technology (SALT) is also a concern.

Through this result showed that few corn Farmers adapt CRA practices on Slopping Agricultural land Technology (SALT). In general SALT is privately and socially profitable. There is still corn farmers needed to have training in the technology however there is difficulty in sustainability of the said technologies, also the result showed that the CRA practices might beneficial to some private individuals but not solely focused on maximizing profits in social aspects selected rice farmers who constantly practiced and acquire its personal

benefits.(Appendix 10)

4. To document and analyse local CRA practices to support AMIA2 knowledge-sharing and investment planning.

Interview with the local stakeholders were conducted to identify CRA practices for the two top commodities in the province. Small Water Impounding Project (SWIP) for rice was the CRA practice in Concepcion and San Dionisio. There were 4 rice farmers who uses SWIP since 2012 and 4 for the conventional farming were interviewed. The farmers recognized the high production of rice under SWIP.

Sloping Agricultural Land Technology (SALT) for corn are practiced in Batad and San Rafael. There were 4 corn farmers practiced SALT and 4 for conventional corn farming were interviewed.

Through the household survey conducted by the enumerators with the assistance of the project staff, we were able to identify CRA practices and other related inputs. One major problem we had encountered is time availability due to farmers' status. Nevertheless, these specific concerns were obliterated through linkages and stakeholders participation.

Subsequent to the series of interview and household survey of the CRA Practices Slopping Agricultural Land Technology (SALT) is identified. Sloping Agricultural Land Technology (SALT) as a CRA practice in Western Visayas particularly in the

province of Iloilo – Municipalities of Batad and San Rafael is recognized over all, SALT is privately and socially profitable also there are still corn farmers needed to have trainings in the technology for the reason that there is a difficulty in sustaining the technology.

The Net Present Value at 12% per annum focuses on the total welfare gain over the whole life of SALT as a CRA practice in Western Visayas particularly in the province of Iloilo – Municipalities of Batad and San Rafael. The Internal Rate of Return indicates the percentage in which benefits from the given CRA practice are realized. A rate of discount of 14% is applied as the SALT NPV of 8.98 is reduced to zero in the absence of externalities. But an SNPV of 437.92 is gained with the reduced soil erosion, water conservation, increased soil biodiversity and increased biodiversity. In general, SALT is privately and socially profitable.

Basically, contour farming can diversify farm income, increase crop production, improve landscape aesthetics, enhance wildlife habitat and provide protection and conservation benefits to crops. However, results showed that contour farming is slightly privately and socially profitable. Such that, it is less advantageous CRA practice for sustainable corn production in comparison with conventional agricultural practices. Somehow, as a very flexible, but low-input system, contour farming can provide ecological benefits. With this, it is recommended corn farmers must be provided with proper training on establishment and management of contour farming. By then, they could identify potential problems, relevant preventative or curative procedures in their application of this common CRA practice describe with them the appropriate techniques and understand the principles that apply to the contour farming.

The Net Present Value at 12% per annum focuses on the total welfare gain over the whole life of SWIP as a CRA practice in Western Visayas particularly in the province of Iloilo – Municipalities of Concepcion and San Dionisio. The Internal Rate of Return indicates the percentage in which benefits from the given CRA practice are realized. A rate of discount of 434% is applied as the

NPV of 3, 125.55 is reduced to zero in the absence of externalities. But an SNPV of 3,563.55 is gained with the increase of water availability, social capital, reduction of soil erosion and legal and political feasibility. In general, SWIP is privately and socially profitable.

To enhance the competitiveness of rice farmers in the region and to promote their participation in Climate-Resilient Agriculture Initiatives, it is recommended that they information dissemination concerning the CRA practice and other farming methods must be conducted on a regular basis in order to maintain the interest and level of farmers' perception specifically on SWIP as a common

cropping technology introduced to and adopted by rice farmers in Western Visayas - Region VI.

With this the result showed that CRA practices might beneficial to some private individuals but not solely focused on maximizing profits in social aspects. SWIP had increased income and yield of crops but to selected farmers who constantly practice and acquire its personal benefits. (Appendix 11)

2.3. Summary and Conclusion

The project "Climate-Resilient Agri-fisheries Assessment, Targeting and Prioritization for the Adaptation and Mitigation Initiative Phase 2" is in partnership with Department of Agriculture – Bureau of Agricultural Research and International Center for Tropical Agriculture (CIAT). CIAT conducted series workshops to serve as assistance for ten (10) regions on what methodology could be fit on. These kinds of training on CRVA Mapping, CRA practices and CBA, capacitated ten (10) regions in processing the data.

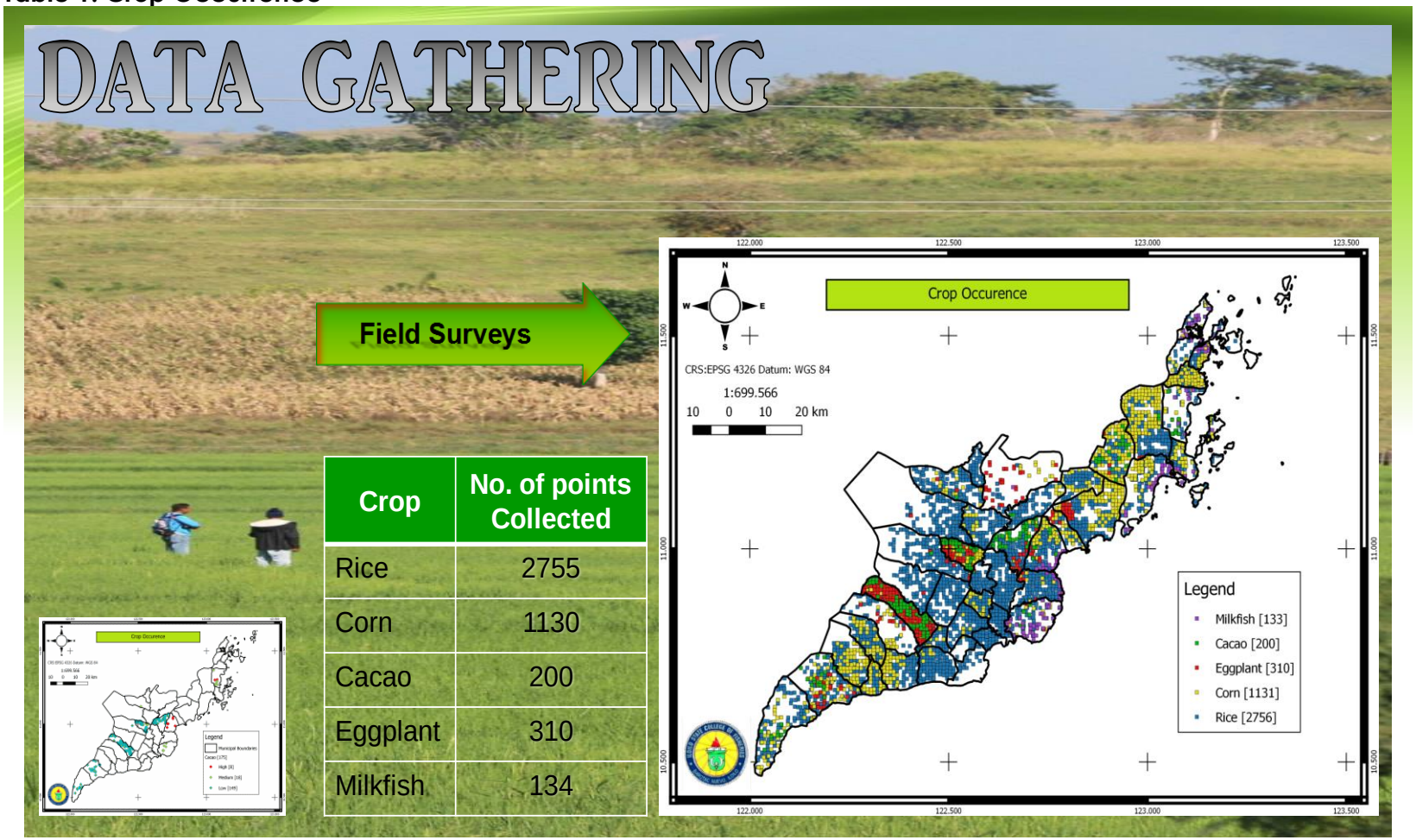
Based on the result on CRVA Mapping, the most vulnerable area was found in Northern Iloilo. This result confirmed that climate change has a huge impact on crops like rice and corn. It implies that, there is a need to reshape those existing adaptation strategies on how to adjust, to cope with, that could be fit on the necessity of each municipality. The decision makers has the power to influence the LGU's and to its constituents. The community has knowledge, to be equipped and take the challenge to be more resilient in adapting those strategies or practices.

The team came up to introduced two CRA practices namely Small Water Impounding Project for rice and Contour farming for corn. Northern Iloilo main crop is corn that is mainly affected. These practices are expected to be introduced and enhance in the selected vulnerable areas as mentioned above. These two practices are processed and analyse on the CBA tool to determine whether the practice is profitable or not profitable. As the result of the CBA tool the above mentioned practices are privately profitable and socially profitable.

APPENDICES

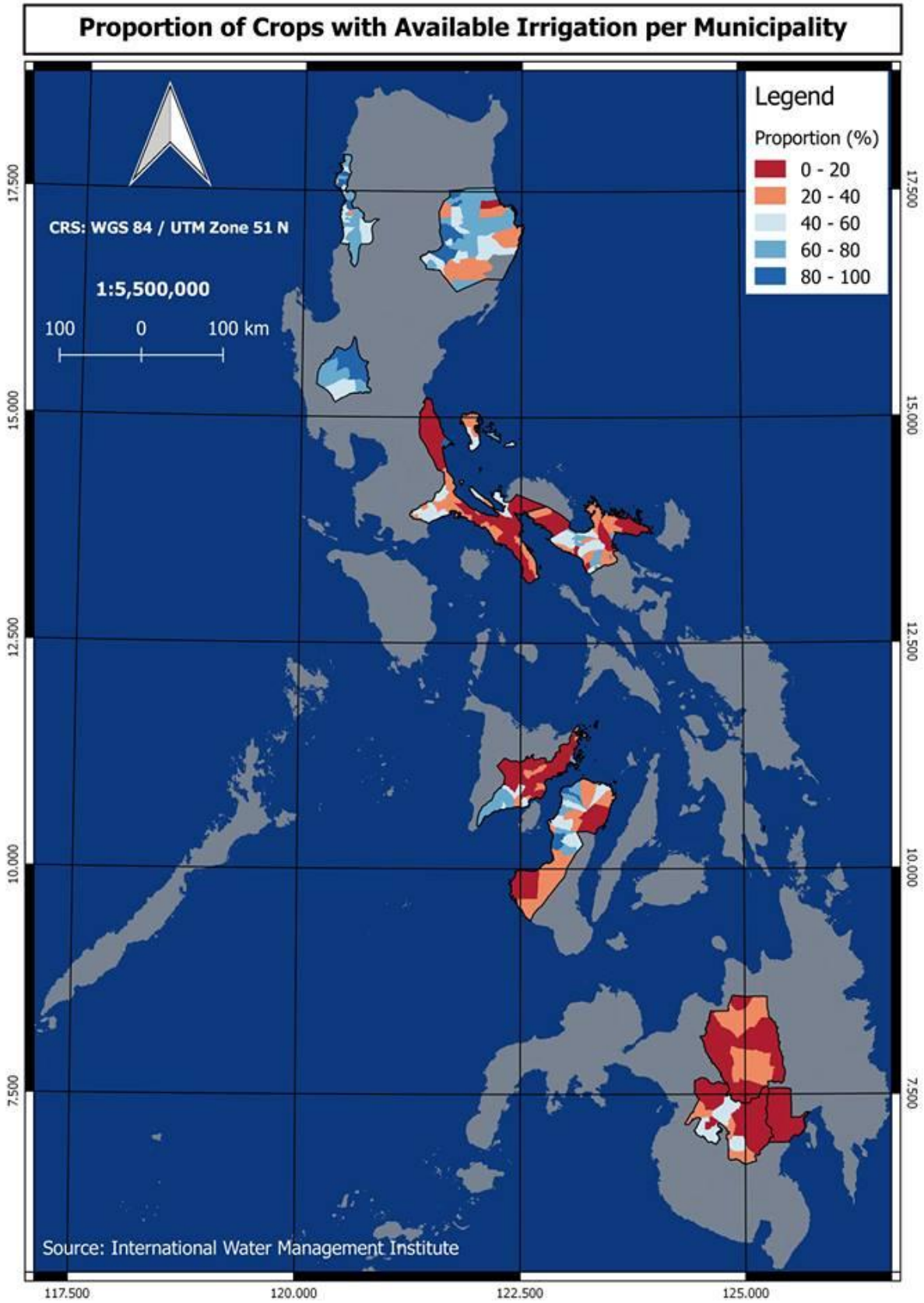
APPENDIX 1

Table 1. Crop Occurrence



Crop	No. of points Collected
Rice	2755
Corn	1130
Cacao	200
Eggplant	310
Milkfish	134

APPENDIX 2


Proportion of Crops with Available Irrigation per Municipality
Legend
Proportion (%)
0 - 20
20 - 40
40 - 60
60 - 80
80 - 100
CRS: WGS 84 / UTM Zone 51 N
1:5,500,000
100 0 100 km
Source: International Water Management Institute
17.500
15.000
12.500
10.000
7.500
117.500
120.000
122.500
125.000

APPENDIX 3
HAZARDS

Exposure 2: Climate-related Environmental Hazards

Biophysical Indicators (climate-related pressures)

Typhoon

Drought

Flood

APPENDIX 4

INVESTMENT BRIEF (SWIP)

Climate-Smart Agriculture Practices Investment Prioritization

Investment Prioritization for Region VI: Small-Water Impounding Project

Overview

Iloilo had the largest number of farms among the provinces in Western Visayas. At 133.5 thousand farms, it covers 186.3 thousand hectares of agricultural land and which accounted for 31.1 percent of the total farms in the region. Areas under agricultural land in Iloilo comprised 27.9 percent of the total land area for the region.

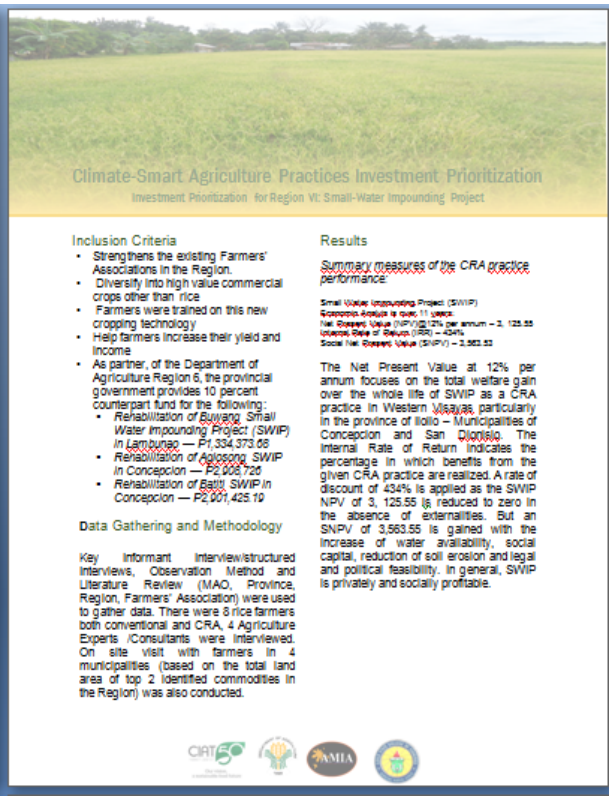
Palay was the major temporary crop in Region VI in terms of area planted. This crop was planted in an area of 471.4 thousand hectares in 292.5 thousand farms. Sugarcane followed next with 43.9 thousand farms reporting, covering 136.1 thousand hectares. Corn ranked third with 68.2 thousand farms, covering 55.7 thousand hectares. Irrigation was an indispensable means for producing agricultural crops. The most common system of irrigation was the individual system, which supplied water to 50.6 thousand farms with an irrigated area of 94.1 thousand hectares. Communal system of irrigation followed next, with 47.3 thousand farms which covered 47.3 thousand hectares, while the national irrigation system came in third, supplying water to 42 thousand farms, covering 55.9 thousand hectares of agricultural land. There were also a number of farms utilizing other systems of irrigation such as windmills, waterwheels, water fetching and many others *(https://psa.gov.ph)*.

ILOILO is at high risk to the effects of climate change because of its location and high population density, according to a study on "Business Risk Assessment and the Management of Climate Change Impacts" released by World Wide Fund for Nature (WWF) Philippine Group and Bank of the Philippine Islands (BPI) Foundation, Inc. Adaptive capacity assessed variables such as LGU, force, city revenue, expenditures, or reserves, and functional literacy – that reflects its ability to implement adaptation strategies. The study noted that Iloilo remains highly flood-prone but it has managed to keep its population growth down to 1.53%, much lower than the national average *(http://climatechange.searca.org)*.

Lastly, Iloilo is located within the typhoon belt with 20 percent of all typhoons hitting Western Visayas in the months of October, November and December. Aside from being a coastal city, it is also a flood-prone area and a drainage end of water from the upstream *(http://bayanihan.org)*.

Prioritized CRA Practice

Small Water Impounding Project (SWIP). It is a development of micro-catchment for soil and water conservation and for the provision of supplementary irrigation during the dry season.



Climate-Smart Agriculture Practices Investment Prioritization

Investment Prioritization for Region VI: Small-Water Impounding Project

Inclusion Criteria

- Strengthens the existing Farmers' Associations in the Region.
- Diversify into high value commercial crops other than rice
- Farmers were trained on this new cropping technology
- Help farmers increase their yield and income
- As partner, of the Department of Agriculture Region 6, the provincial government provides 10 percent counterpart fund for the following:
  - *Rehabilitation of Buwang Small Water Impounding Project (SWIP) in Lambunao — P1,334,373.68*
  - *Rehabilitation of Aglosong SWIP in Concepcion — P2,008,726*
  - *Rehabilitation of Batiti SWIP in Concepcion — P2,001,425.19*

Data Gathering and Methodology

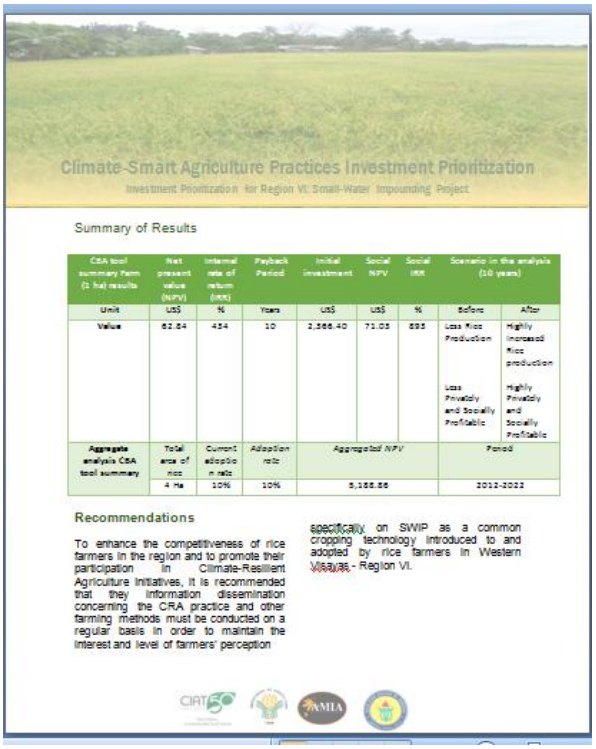
Key Informant Interview/structured Interviews, Observation Method and Literature Review (MAO, Province, Region, Farmers' Association) were used to gather data. There were 8 rice farmers both conventional and CRA, 4 Agriculture Experts /Consultants were interviewed. On site visit with farmers in 4 municipalities (based on the total land area of top 2 identified commodities in the Region) was also conducted.

Results

Summary measures of the CRA practice performance:

Small Water Impounding Project (SWIP)
Economic Analysis is over 11 years
Net Present Value (NPV) @ 12% per annum – 3, 125.55
Internal Rate of Return (IRR) – 434%
Social Net Present Value (SNPV) – 3,563.53

The Net Present Value at 12% per annum focuses on the total welfare gain over the whole life of SWIP as a CRA practice in Western Visayas particularly in the province of Iloilo – Municipalities of Concepcion and San Dionisio. The Internal Rate of Return indicates the percentage in which benefits from the given CRA practice are realized. A rate of discount of 434% is applied as the SWIP NPV of 3, 125.55 is reduced to zero in the absence of externalities. But an SNPV of 3,563.55 is gained with the increase of water availability, social capital, reduction of soil erosion and legal and political feasibility. In general, SWIP is privately and socially profitable.



Climate-Smart Agriculture Practices Investment Prioritization

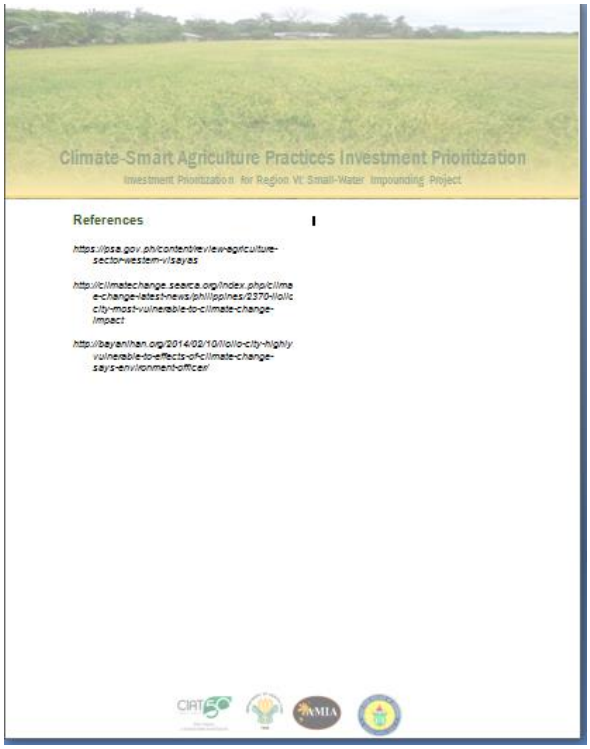
Investment Prioritization for Region VI: Small-Water Impounding Project

Summary of Results

CBA tool summary form (1 ha) results	Net present value (NPV)	Internal rate of return (IRR)	Payback Period	Initial investment	Social NPV	Social IRR	Scenario in the analysis (10 years)	
Unit	US$	%	Years	US$	US$	%	Before	After
Value	62.64	454	10	2,566.40	71.05	895	Less Rice Production Less Privately and Socially Profitable	Highly increased Rice production Highly Privately and Socially Profitable
Aggregate analysis CBA tool summary	Total area of rice	Current adoption rate	Adoption rate	Aggregated NPV			Period	
	4 Ha	10%	10%	5,166.66			2012-2022	

Recommendations

To enhance the competitiveness of rice farmers in the region and to promote their participation in Climate-Resilient Agriculture initiatives, it is recommended that they information dissemination concerning the CRA practice and other farming methods must be conducted on a regular basis in order to maintain the interest and level of farmers' perception specifically on SWIP as a common cropping technology introduced to and adopted by rice farmers in Western Visayas - Region VI.



Climate-Smart Agriculture Practices Investment Prioritization

Investment Prioritization for Region VI: Small-Water Impounding Project

References

https://psa.gov.ph/content/review-agriculture-sector-western-visayas

http://climatechange.searca.org/index.php/climate-change-latest-news/philippines/2370-iloilo-city-most-vulnerable-to-climate-change-impact

http://bayanihan.org/2014/02/10/iloilo-city-highly vulnerable-to-effects-of-climate-change-says-environment-officer/

APPENDIX 5
INVESTMENT BRIEF (SALT)

Climate-Smart Agriculture Practices Investment Prioritization

Investment Prioritization for Region VI: Sloping Agricultural Land Technology (SALT) or Alley Cropping

Overview

Iloilo had the largest number of farms among the provinces in Western Visayas. At 133.5 thousand farms, it covers 166.3 thousand hectares of agricultural land and which accounted for 31.1 percent of the total farms in the region. Areas under agricultural land in Iloilo comprised 27.9 percent of the total land area for the region.

Palay was the major temporary crop in Region VI in terms of area planted. This crop was planted in an area of 471.4 thousand hectares in 292.5 thousand farms. Sugarcane followed next with 43.9 thousand farms reporting, covering 136.1 thousand hectares. Corn ranked third with 68.2 thousand farms, covering 55.7 thousand hectares. Irrigation was an indispensable means for producing agricultural crops. The most common system of irrigation was the individual system, which supplied water to 50.6 thousand farms with an irrigated area of 94.1 thousand hectares. Communal system of irrigation followed next, with 47.3 thousand farms which covered 47.3 thousand hectares, while the national irrigation system came in third, supplying water to 42 thousand farms, covering 58.9 thousand hectares of agricultural land. There were also a number of farms utilizing other systems of irrigation such as windmills, waterwheels, water fetching and many others *(https://psa.gov.ph)*.

ILOILO is at high risk to the effects of climate change because of its location and high population density, according to a study on "Business Risk Assessment and the Management of Climate Change Impacts" released by World Wide Fund for Nature (WWF) Philippine Group and Bank of the Philippine Islands (BPI) Foundation, Inc. Adaptive capacity assessed variables such as labor force, city revenue, expenditures, or reserves, and functional literacy – that reflects its ability to implement adaptation strategies. The study noted that Iloilo remains highly flood-prone but it has managed to keep its population growth down to 1.53%, much lower than the national average *(http://climatechange.searca.org)*.

Lastly, Iloilo is located within the typhoon belt with 20 percent of all typhoons hitting Western Visayas in the months of October, November and December. Aside from being a coastal city, it is also a flood-prone area and a drainage end of water from the upstream *(http://bayanihan.org)*.

Prioritized CRA Practice

Sloping Agricultural Land Technology (SALT). A scheme developed for small farmers with few tools, little capital and little knowledge of modern agriculture. It is a form of alley farming in which field and perennial crops are grown in bands 4-5 m wide between contoured rows of leguminous trees and shrubs.

Inclusion Criteria:

Extension of SALT Nationwide
Many public and private organizations have voluntarily disseminated the technology to their clientele. SALT farms, established with the help of these organizations, now occupy over 5,000 ha throughout the country.

Crop Productivity
The region conducted tests on crop productivity with emphasis on corn, a traditional upland crop in the area.

Labor Management
This helped in control of farm weed growth and reduced labor requirement for weeding. Also, this reduced labour input as less labour was required for permanent perennial crops than for seasonal crops such as corn.

Data Gathering and Methodology

Key informant interview/structured interviews, Observation Method and Literature Review (MAO, Province, Region, Farmers' Association) were used to gather data. There were 8 Corn Farmers both conventional and CRA, 4 Agriculture Experts /Consultants were interviewed. On site visit with farmers in 4 municipalities (based on the total land area of top 2 identified commodities in the Region) was also conducted.

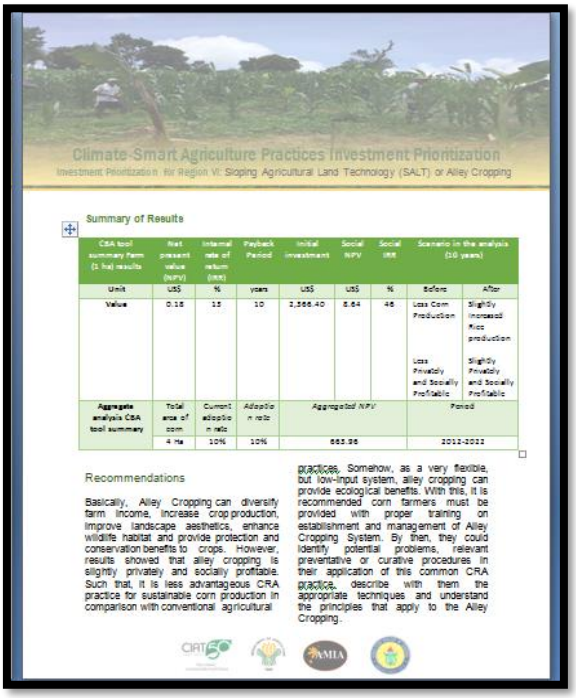
Results

Summary measures of the CRA practice performance:

Alley Cropping/Slopping Agricultural Land Technology (SALT)

Economic Analysis is over 11 years:
Net Present Value (NPV)@12% per annum – 8.98
Internal Rate of Return (IRR) – 13%
Social Net Present Value (SNPV) – 437.92
Social Internal Rate of Return (IRR) – 46%

The Net Present Value at 12% per annum focuses on the total welfare gain over the whole life of SALT as a CRA practice in Western Visayas particularly in the province of Iloilo – Municipalities of Batad and San Rafael. The Internal Rate of Return indicates the percentage in which benefits from the given CRA practice are realized. A rate of discount of 14% is applied as the SALT NPV of 8.98 is reduced to zero in the absence of externalities. But an SNPV of 437.92 is gained with the reduced soil erosion, water conservation, increased soil biodiversity and increased biodiversity. In general, SALT is privately and socially profitable.



Climate-Smart Agriculture Practices Investment Prioritization

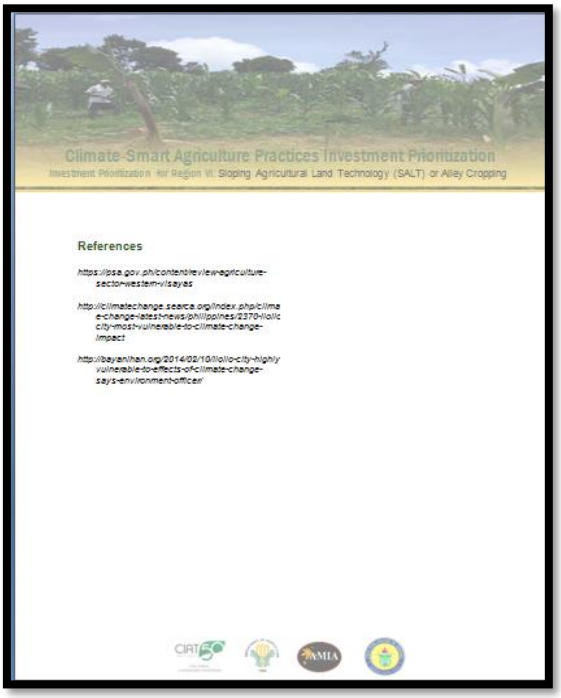
Investment Prioritization for Region VI: Sloping Agricultural Land Technology (SALT) or Alley Cropping

Summary of Results

CSA tool summary form (1 ha) results	Net present value (NPV)	Internal rate of return (IRR)	Payback Period	Initial investment	Social NPV	Social IRR	Scenario in the analysis (10 years)	
Unit	US$	%	years	US$	US$	%	Before	After
Value	0.18	15	10	2,566.40	8.64	46	Less Corn Production Less Privately and Socially Profitable	Slightly increased Rice production Slightly Privately and Socially Profitable
Aggregate analysis CSA tool summary	**Total area of corn**	**Current adoption rate**	**Adoption rate**	**Aggregated NPV**			**Period**	
	4 Ha	10%	10%	865.96			2012-2022	

Recommendations

Basically, Alley Cropping can diversify farm income, increase crop production, improve landscape aesthetics, enhance wildlife habitat and provide protection and conservation benefits to crops. However, results showed that alley cropping is slightly privately and socially profitable. Such that, it is less advantageous CRA practice for sustainable corn production in comparison with conventional agricultural practices. Somehow, as a very flexible, but low-input system, alley cropping can provide ecological benefits. With this, it is recommended corn farmers must be provided with proper training on establishment and management of Alley Cropping System. By then, they could identify potential problems, relevant preventative or curative procedures in their application of this common CRA practice, describe with them the appropriate techniques and understand the principles that apply to the Alley Cropping.



Climate-Smart Agriculture Practices Investment Prioritization

Investment Prioritization for Region VI: Sloping Agricultural Land Technology (SALT) or Alley Cropping

References

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http://bayanihan.org/2014/02/10/iloilo-city-highly vulnerable-to-effects-of-climate-change-says-environment-officer

APPENDIX 6
CBA Output

GROUP EXERCISE 2: Planning and Developing Strategies (Wednesday)

GROUP MEMBERS: *Dr. Aurelio Esmediana Jr., Prof. Jescel B. Bito-onon, Dr. Michael B. Dizon&Ms. Argeline Fabela*
REGION: VI
CRA's NAME: Small –Water Impounding Project (SWIP)

3. Develop a plan with timeline on data collection of externalities. Please try to be as specific as possible.

Externalities	Data collection Methodology (please specify # of respondents and who are the respondents if you collect primary data)	Expected Time (from…to)
1. Increased Water Availability	❖ Experts Workshop ✓ 18 agricultural extension officers World café- collaborative dialogue and knowledge-sharing, lecture and data collection. ❖ Literature Review ✓ Online, Reports of MAO, Province, Region, Farmers' Association) ❖ Key Informant Interview (KII) – Rice Farmers (Conventional and CRA) ❖ Observation Method ✓ On site visit with farmers – 2 municipalities	December 16-18, 2016 December 1-5, 2016 December 10 &17, 2016 December 16 & 17 2016
2. Social Capital/Costs	❖ Questionnaire Method (given during 1st CBA workshop) - *Participants were selected through snowball sampling* ❖ Schedule Method – MAO of 2 Municipalities ❖ Informal Interview with Agriculture Technicians ❖ Literature Review ✓ Reports of MAO, Province, Region, Farmers' Association) ❖ Key Informant Interview (KII)	December 16, 2016 December 19-23, 2016 December 16, 2016 December 1-5, 2016 December 10 & 17, 2016
3. Reduced Soil Erosion	❖ Questionnaire Method (given during 1st CBA workshop) - *Participants were selected through snowball sampling* ❖ Literature Review ✓ Online, Reports of Province, Region and Bureau of Soil) ❖ Key Informant Interview (KII)	December 16, 2016 December 1-5, 2016 December 10 & 17, 2016
4. **Legal and Political Feasibility**	❖ Interview Method – Survey regarding perception (Farmers & MAO of 2 Municipalities)	December 17, 2016

GROUP EXERCISE 2: Planning and Developing Strategies (Wednesday)

GROUP MEMBERS: *Dr. Aurelio Esmediana Jr.*, *Dr. Jescel B. Bito-onon*, *Dr. Michael B. Dizon* **&** *Ms. Argeline Fabela*

REGION: VI

CRA's NAME: Alley Cropping/Slopping Agricultural Land Technology (SALT)

3. Develop a plan with timeline on data collection of externalities. Please try to be as specific as possible.

Externalities	**Data collection Methodology** (please specify # of respondents and who are the respondents if you collect primary data)	**Expected Time** (from…to)
1. Reduced Soil Erosion	❖ Literature Review ✓ Online, Reports of MAO, Province, Region, Farmers' Association) ❖ Key Informant Interview (KII) – Corn Farmers (Conventional and CRA) ❖ Observation Method ✓ On site visit with farmers – 2 municipalities	December 1-5, 2016 December 10 &17, 2016 December 16 & 17 2016
2. Water Conservation	❖ Literature Review ✓ Reports of MAO, Province, Region, Farmers' Association) ❖ Key Informant Interview (KII) – Corn Farmers (Conventional and CRA) ❖ Observation Method ✓ On site visit with farmers – 2 municipalities	December 1-5, 2016 December 10 & 17, 2016 December 16 & 17 2016
3. Increased Soil Biodiversity	❖ Literature Review ✓ Online, Reports of Province, Region and Bureau of Soil) ❖ Key Informant Interview (KII) ❖ Expert Consultation/Interview ❖ Experimental: Soil Laboratory Analysis in Bureau of Soil (Department of Agriculture)	December 1-5, 2016 December 10 & 17, 2016 December 18 – 22, 2016
4. Increased Biodiversity	❖ Literature Review ✓ Online, Reports of Province, Region and Bureau of Soil) ❖ Key Informant Interview (KII) ❖ 2 Agriculture Experst Consultation/Interview - Identification of Local Species and Symbiotic Relationship of species present in the area	December 1-5, 2016 December 10 & 17, 2016 December 18 – 22, 2016

Questionnaire

CRA : _____
Date started : (month,year) _____

Increased Biodiversity

1. Have you observed improvement in biodiversity using CRA ? ____ YES ___NO

If Yes,

1.a. How long after introducing CRA do you begin to see improvements in biodiversity? Months _____

1. b. How long after introducing CRA does the improvement in biodiversity reach its maximum effect? Months _____

1.c. Please estimate species of plants have you observed before the CRA? Quantity____

1.d. Please estimate species of plants have you observed after the CRA? Quantity____

1.e. Are you willing to pay for the improvement of biodiversity brought about by this practice?

____ YES ___NO

If Yes, How much ? (peso) (min) _____ (max) _____

Increased Soil Biodiversity

1. Have you observed improvement in soil biodiversity using CRA ? ____ YES ___NO

If Yes,

1.a. How long after introducing CRA do you begin to see improvements in soil biodiversity?

Months _____

1. b. How long after introducing CRA does the improvement in soil biodiversity reach its maximum effect? Months _____

1.c. Please estimate in percentage the observable healthy plants before CRA practice? %_____

1.d. Please estimate in percentage the observable healthy plants after CRA practice? %_____

1.e. Are you willing to pay for the improvement in soil biodiversity brought about by this practice?

____ YES ___NO

If Yes, How much ? (peso) (min) _____ (max) _____

Reduced Soil Erosion

1. Have you observed reduction in soil erosion using CRA ? ____ YES ___NO

If Yes,

1.a. How long after introducing CRA do you begin to observed reduction in soil erosion?

Months _____

1. b. How long after introducing CRA does the reduction in soil erosion reach its maximum effect? Months _____

1.c. Have you observed any type of erosion before the CRA ? ____ YES ___NO

If Yes , what type ? (show photos) _____, _____, _____,

Please estimate in Percentage the occurrence of soil erosion. % _____

Type 1 : (%) _____

Type 2 : (%) _____

Type 3 : (%) _____

Type 4 : (%) _____

1.d. Have you observed any type of erosion after the CRA ? ____ YES ___NO

If Yes , what type ? (show photos) _____, _____, _____,

Please estimate in Percentage the occurrence of soil erosion. % _____

Type 1 : (%) _____

Type 2 : (%) _____

Type 3 : (%) _____

Type 4 : (%) _____

1.e. Are you willing to pay for the reduction of soil erosion brought about by this practice?

____ YES ___NO

If Yes, How much ? peso (min) _____ (max) _____

Social Capital

1. Have you observed improvement of social capital after adapting CRA ? ____ YES ___NO

If Yes,

1.a. How long after introducing CRA do you begin to observed improvement in social capital?

Months _____

1. b. How long after introducing CRA does improvement in social capital reach beyond the immediate community into larger social network? Months _____

1.c. Please estimate the impact of CRA practice on social capital ? %____

1.d. Have you benefited from improvement from social capital ? ?____ YES___NO

If Yes, how much? (min) _____ (max) _____

APPENDIX 7

CROP YIELD, PRACTICES and HAZARD

Crop	CRA Practices/ Technologies	Hazards/ Vulnerability
Cacao	Organic farming (vermin-compost) Mulching, Integrated Farming, Agroforestry	Drought Typhoon
Eggplant	Organic fertilizer, Crop Rotation, Trichogramma	Drought, Flood, Continuous rain, Pest Outbreak
Milkfish	Organic Fertilizer appl., Controlled water depth	Flood, Typhoon, Drought, Salinity, Sea water rise, Continuous rain ,
Rice	SWIP, Integrated Pest Management (IPM), Use of recommended varieties, Organic Farming Use recommended Varieties, Integrated Pest Management, Trichogramma	Floods, Drought, Typhoon, Pest outbreak
Corn		Floods, Drought, Typhoon, Pest outbreak

Rice Production

Municipality	Rice Production CY 2015 per Municipality					
	Area Harvested		Average Yield			Yield Classification[1]
	Irrigated	Rainfed	IRR	RF	Average	
Iloilo City	272.55	250.55	4.07	4.12	4.09	Medium
San Juaquin	2183.30	1711.37	3.17	2.63	2.93	Low
Miag-ao	3426.25	2937.85	3.8	3.05	3.46	Medium
Igbaras	950.72	2055.92	3.68	3.63	3.65	Medium
Tubungan	1032.09	2104.10	2.76	2.40	2.52	Low
Guimbal	789.00	789.00	4.33	3.52	3.84	Medium
Tigbauan	2051.95	2422.75	4.33	3.18	3.71	Medium
Oton	4855.97	4053.42	3.89	2.98	3.48	Medium
Leon	973.85	4381.55	3.78	3.22	3.32	Medium
Alimodian	610.25	1482.55	3.88	3.44	3.57	Medium
San Miguel	2245.30	1968.00	4.07	3.82	3.95	Medium
Sta Barbara	771.00	5262.13	4.62	3.43	3.43	Medium
Pavia	1293.96	529.65	5.06	4.13	4.79	High
Leganes	2803.90	37.40	4.81	4.21	4.80	High
Zarraga	3593.55	416.40	3.47	3.85	3.51	Medium
New Lucena	1408.95	2795.25	4.93	4.10	4.38	High
Cabatuan	305.00	6470.17	4.20	3.57	3.60	Medium
Maasin	396.00	1467.75	3.57	3.49	3.51	Medium
Pototan	9470.33	3910.00	4.55	3.19	4.15	High
Mina	5124.39	1189.16	4.76	4.56	4.72	High
Janiuay	2396.98	4131.61	4.10	3.51	3.72	Medium
Badiangan	1840.16	2468.00	4.08	3.79	3.91	Medium
Lambunao	469.75	11100.21	3.89	2.97	3.01	Medium
Calinog	281.63	6216.68	4.10	3.89	3.90	Medium
Bingawan	819.15	3193.69	4.18	3.84	3.91	Medium
Passi City	2466.02	10934.00	4.17	3.81	3.88	Medium
San Enrique	1775.50	2783.20	3.88	3.87	3.87	Medium
Dingle	5634.93	3499.75	4.69	3.97	4.42	High
Duenas	180.49	3156.00	4.73	3.38	3.45	Medium
Dumangas	12109.99	3498.49	3.73	3.09	3.59	Medium
Barotac Nuevo	4100.04	2872.63	4.78	4.50	4.66	High
Anilao	1687.58	2049.75	4.51	4.09	4.24	High
Banate	2525.00	2547.77	4.35	4.13	4.24	High
Btc Viejo	3681.90	3285.60	3.85	3.51	3.69	Medium
San Rafael	1584.00	1741.00	3.95	3.89	3.92	Medium
Sara	2581.67	5657.36	3.71	3.26	3.40	Medium
Ajuy	4042.55	3119.70	4.07	4.05	4.06	High
Lemery	4206.50	3398.30	3.77	3.79	3.78	Medium
San Dionisio	1245.46	4078.72	3.75	3.55	3.60	Medium
Concepcion	1029.36	1915.39	3.55	3.10	3.26	Medium
Balasan	1773.59	5450.63	3.32	2.96	3.05	Medium
Batad	1095.69	1719.32	4.19	3.88	4.00	Medium
Estancia	130.50	1202.25	4.14	3.88	3.91	Medium
Carles	0.00	3718.08		2.78	2.78	Low

Source: DA Provincial Office, Iloilo City, [1]Ave. yield of IRR +RF

Corn Production

Yield of Corn							
	GMO		Yellow		White		
Municipality	Area Harvesting (ha)	Ave. Yield Mt/ha.	Area Harvesting (ha)	Ave. Yield Mt/ha.	Area Harvesting (ha)	Ave. Yield Mt/ha.	Yield Classification[1]
AJUY	119.5	3.20	242.00	4.27			High
ALIMODIAN			637.05	2.46	237.60	2.57	Medium
ANILAO			138.60	4.19	34.80	3.27	High
BADIANGAN			85.00	5.39	10.00	3.50	High
BALASAN	1128.00	4.05	2053.00	4.09			High
BANATE			54.00	4.20	117.70	4.06	High
BAROTAC NUEVO			26.00	2.95			Medium
BAROTAC VIEJO	1915.00	4.66	2124.04	4.56			High
BATAD	1626.00	3.21	2130.00	3.51	13.00	3.38	High
BINGAWAN			121.00	2.52	27.00	2.13	Low
CABATUAN	35.00	3.86	40.00	3.78	80.00	2.42	High
CALINOG			50.50	3.40	2.75	3.30	High
CARLES	179.35	4.40	179.35	4.40			High
CONCEPCION	760.00	4.23	830.00	4.25	51.00	3.00	High
DINGLE			32.00	2.53	44.00	2.40	Medium
DUENAS			91.05	3.46	44.67	1.51	Medium
DUMANGAS			16.20	2.50			Medium
ESTANCIA			517.50	4.20			High
GUIMBAL			90.25	2.30	111.89	2.44	Low
IGBARAS			400.50	0.88	65.15	0.98	Low
JANIUAY			191.50	2.90	115.25	2.37	Medium
LAMBUNAO			1078.75	2.53	74.50	2.39	Low
LEGANES			9.75	3.08			High
LEMERY			3892.05	4.58	27.00	3.20	High
LEON			490.30	2.57	66.25	2.24	Low
MAASIN			259.75	2.65	57.75	2.19	Low
MIAGAO			229.50	2.21	141.00	2.15	Low
MINA			12.00	2.71	10.50	3.00	Medium
NEW LUCENA			23.00	3.03			Medium
OTON			15.50	2.57			Medium
PASSI CITY	795.00	4.92	1403.00	4.54	61.50	4,21	High
PAVIA			1.0	2.20	1.60	2.00	Low
POTOTAN	12.00	5.00	41.00	4.00	42.00	2.50	High
SAN DIONISIO	2225.00	4.44	3950.00	5.45			High
SAN ENRIQUE			188.00	4.15	5.50	2.78	High
SAN JUAQUIN			80.50	2.24			Low
SAN MIGUEL	9.50	2.50	50.10	3.39	46.70	2.86	Medium
SAN RAFAEL	477.90	3.50	600.95	3.62	6.75	3.50	High
SANTA BARBARA	26.00	5.11	69.05	4.78	42.20	3.80	High
SARA	1367.85	4.66	3453.35	4.54			High
TIGBAUAN			453.60	2.39	88.50	3.30	Low
TUBUNGAN	25.00	1.60	225.80	1.89	86.72	1.57	Low
ZARRAGA			13.30	4.74			High

APPENDIX 8

MONITORING AND EVALUATION FORM

Project Title: Climate-Resilient Agri-Fisheries (CRA) Assessment, Targeting & Prioritization for the Adaptation and Mitigation Initiative (AMIA) Phase 2 in Iloilo

Period covered: January 1- March 2017

Proponent: Jescel B. Bito-onon

Agency Iloilo State College of Fisheries

Potential Impact:						
Narrative Summary	**Objectively Verifiable Indicators**	**Actual Accomplishments**	**%**	**Influencing Factors and/or Problems Encountered**	**Action Taken**	**Significant Findings and/or Remarks**
Outcome: *To assess, target and prioritize climate resilient agriculture (CRA) in Region VI through climate Risk vulnerability assessment (CRVA) developing CRA decision-support platform, and baseline study.*	Number of municipalities	42 municipalities and 2 cities were visited for CRVA and CRA practices and CBA	95%	• Accessibility of respondents • Availability of data	• close coordination with target participants	• local agriculture and coordinating agency were supportive in providing data and trainings
Potential Output 1 *Enhanced capacities of AMIA partner organizations in the region*	Number of trained AMIA partners Number of Trainings and workshops participated	• 4 SUC project staffs and 3 RFO participated in Series of training and workshop • 9 workshops/ trainings attended by the project staffs	100%	• Availability of target participants for the workshop.	• Close coordination with local agriculture office	• Tools and questionnaire s were enhanced and externalities were considered support from local agriculture office were provided

		• 33 report officers, farmers and MAO participated in validation of results on CRA Assessment, targeting and prioritization • 32 MAO AND PAO attended the CRA project orientation.				
Potential Output 2 *Geospatially referenced data on climate-risks: biophysical-agricultural-socioeconomic parameters*	Number of municipalities map for crop occurrence Number of municipalities of secondary data needed for adaptive capacity Number of maps generated for	42 Municipalities and 2 cities were visited for crop mapping Secondary data were collected in 42 municipalities and 2 cities for 7 capitals needed for adaptive capacity. 39 maps were generated for CRVA such as crop	100%	• Availability of target person and Accessibility of the target area • Difficulty on availability of secondary data needed for AC	• Arranged Meetings' schedules with target person • Collection of data was done through email, and constant coordination with the target person .	Suitability and sensitivity of crops were identified; Sensitivity of rice due to typhoon is identified especially in northern part of Iloilo due to climate change and suitability of rice in 2030 are low suitable and others are high suitable. Low sensitivity of corn are identified Low sensitivity of Cacao in the Upper part of

	CRVA	occurrence, sensitivity, suitability, hazards and adaptive capacity				northern Iloilo are identified and also by the year of 2050. In terms of suitability cacao also low suitable. High sensitivity of eggplant in northern part of Iloilo and medium sensitive in Central part of Iloilo. High suitability of eggplant identified in Dumangas and Barotac Nuevo Iloilo Low sensitivity of Milkfish and low suitability are identified. Sensitivity of crop due to climate change. Climate- related Environmental Hazards are identified they are typhoon, flood and drought.

Potential Output 3 *Local stakeholders' CRA-related demographic/institutional profiles & knowledge/ perceptions/strategies*	Number of stakeholders participated in stakeholders CRA and CRVA validation Number of stakeholder participated in CRA results validation	34 stakeholders/ trainees participated and 11 CRA practices identified 37 farmers, report officers, MAO and DA RFO staffs participated in CRA results validation workshop	100%	• Provision of funds for farmers travel expenses	• Consulted and discussed with the administration	• Few Corn farmers adapt CRA practices on alley cropping • There are still corn farmers needed to have training in The technology • There is a difficulty in sustainability of the technology • Few rice farmers perceived that SWIP is for selected farmers
Potential Output 4 *Data on CRA practices analyzed for costs-benefits & trade-offs)*	Number of informal interviews conducted number of CRA practices	16 informal interviews were conducted for Two (2) CRA Practices and TOP 2 commodities were identified. Two CRA practices were identified and analyzed;	100%	• Accessibility of respondents • CBA Tool familiarity and experience	• Arranged Meetings' schedules with stakeholders • Attended trainings for CBA updates	• SWIP / water storage is privately and socially beneficial • Though Alley cropping is both privately , and social beneficial but minimal

	identified and analyzed number of externalities for each CRA practices	water storage (SWIP) and alley cropping (*SALT)* 8 externalities were identified in two CRA practices			• Familiarity of the CBA Tool	and long term
Potential Output 5 Design M&E tool for CRA communities	M&E tool	M& E tool were designed and validated with the stakeholder and target beneficiaries	**80%**			Farmers and agriculture officer were participative and identifying indicators for M&E framework template
MANAGEMENT		**FINANCIAL**			**OTHERS**	
• Established closed coordination with local agriculture offices • Linkages with coordinating agency, CIAT and DA RFO are recognized		• Procurement process is quite slow that some requests for supplies and materials are not yet provided.			Extension of project duration is requested for results validation and manuscript writing	

Submitted by:

JESCEL B. BITO-ONON
Project Leader

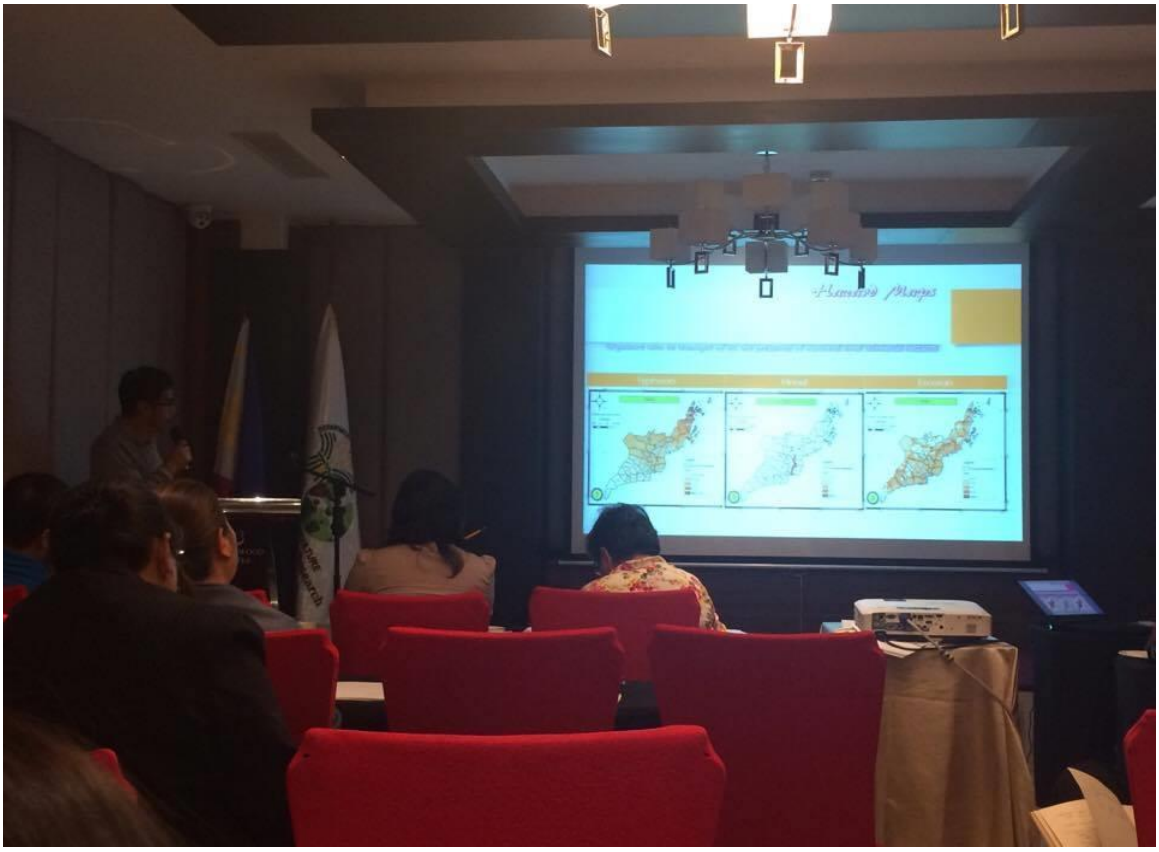
APPENDIX 9
DOCUMENTATION

CROP OCCURRENCE AT MUNICIPALITY OF MINA ILOILO
TOGETHER WITH THEIR MUNICIPAL AGRICULTURIST AND REPORT OFFICER (October 2016)

Result Sharing and validation with Stakeholders at Paon Resort, Estancia, Iloilo
March 9-10, 2017


CIAT

National Review of BAR Funded Projects
(April 3-7, 2017)

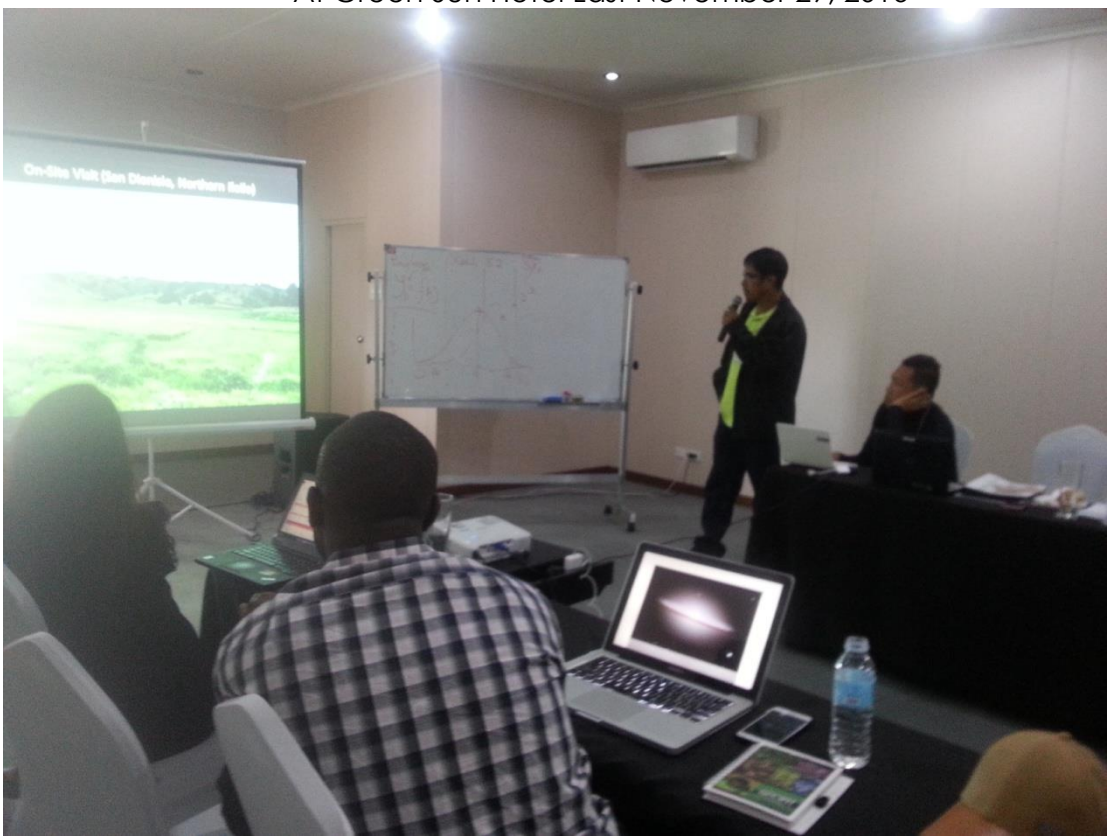


Monitoring and Evaluation of
BAR Team at ISCOF last March 27, 2017

Climate Risk Vulnerability Assessment
Stakeholders' Validation , at DA RFO 6, September 2, 2016


ILOILO STATE COLLEGE OF FISHERIES
Tiwi, Barotac Nuevo, Iloilo
in cooperation with
One ISCOF One PRIME
501

Workshop on Extended CBA
At Green Sun Hotel Last November 29, 2016

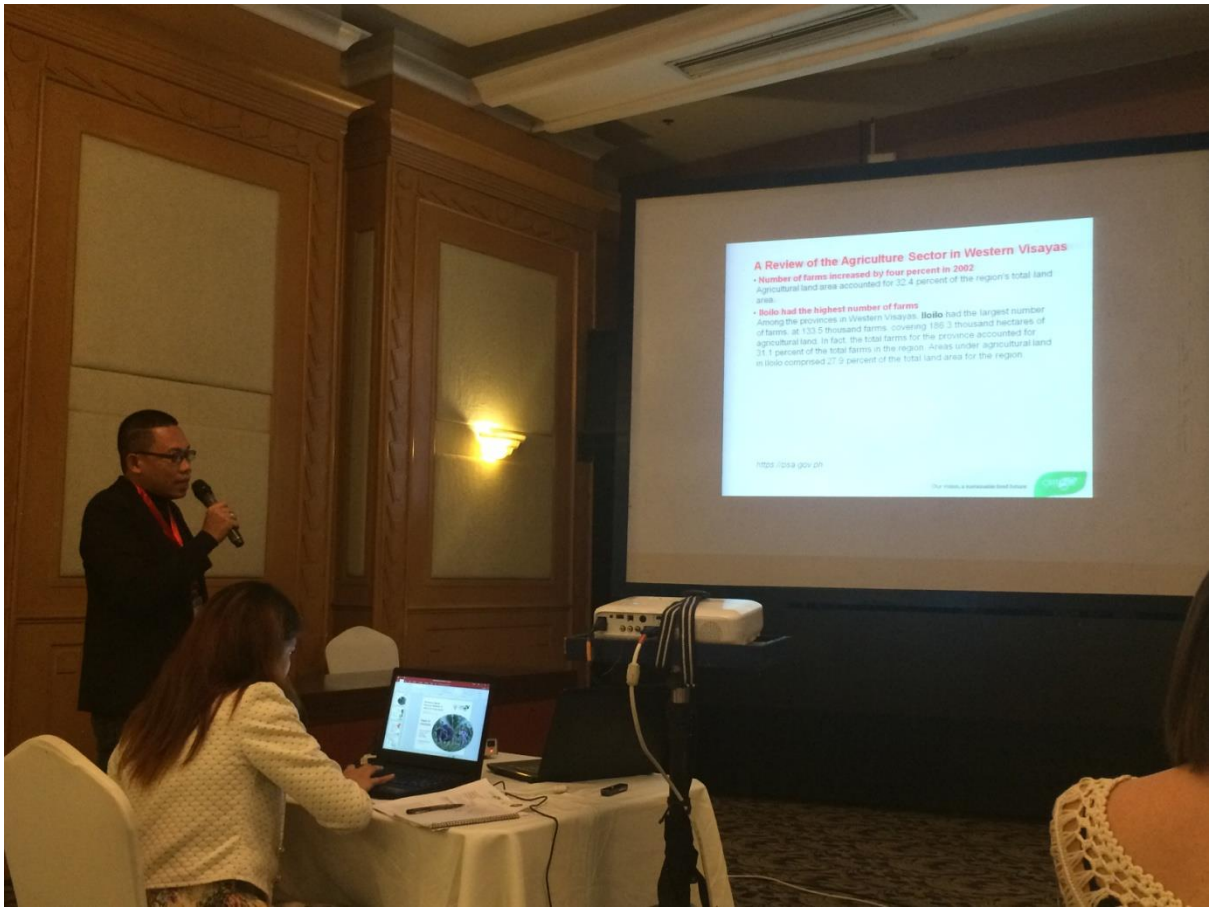


Enumerators Meeting at ISCOF Conference Room last August 23, 2016

Planning Workshop at CEC, UPLB, last May 19 -20 2016


Planning Workshop for
AMIA2-CIAT Projects
Climate Risk Vulnerability Assessment
(CVRA) and Decision-Support
Platform for Climate-Resilient
Agriculture (CRA) Prioritization
19-20 May 2016
Continuing Education Center (CEC)
University of the Philippines
Los Banos, Laguna

Result Sharing and Validation at Parklane Hotel, Cebu City February 6-7, 2017



Workshop on Finalizing Results on CRA, Prioritization, CRVA and Extended CBA at B Hotel , Quezon City, last March 1 – 3, 2017

Interview with the stakeholders in Different Municipalities in Iloilo Province from September 2016 – February 2017

Workshop on CRVA
SEARCA, UPLB, January 10-12, 2017