Department of Agriculture
Bureau of Agricultural Research
RDMIC Bldg., Elliptical Rd. Cor. Visayas Ave., Diliman, Q.C. 1104
Phone Nos.: (632) 928-8624 & 928-8505 • Fax: (632) 927-5691
Email: barrdegrants@bar.gov.ph • Website: http//www.bar.gov.ph

PROGRESS REPORT

A. BASIC INFORMATION

1. Project Title : Climate-Resilient Agri-fisheries (CRA) Assessment, Targeting & Prioritization for the Adaptation and Mitigation Initiative (AMIA) in Samar Province, Region VIII
2. Proponent (s) : Pastor P. Garcia
3. Implementing Agency
   3.1. Lead Agency: Visayas State University
   Head of Agency: Edgardo E. Tulin, PhD
   Name of Proponent: Pastor P. Garcia
   Contact Details:
   Email: pastor.garcia@vsu.edu.ph
   Landline: 053-5637370
   Fax: (053) 563 8264
   Mobile: 09152997766
   3.2. Collaborating Agency: Department of Agriculture RFO VIII
4. Project Duration:
   4.1 Approved Duration (Y/M): 12 months
   4.2 Actual Duration (Y/M): 15 months
   4.3 Start Date of Implementation: June 1, 2017
5. Project Site(s)
   5.1 Province: (Western) Samar
   5.2 City/Municipality: All 26 municipalities of (Western) Samar
   5.3 Barangay: N/A
   5.4 Geocode
6. Project Funding
   6.1. Total Approved Budget: PhP993,230.08
   6.2. Total Amount Released: PhP993,230.08
   6.3. Agency Counterpart:
   6.4. Actual Expenses: PhP 974,876.11
   6.5. Unliquidated Balance: PhP18,353.97
7. RDE Agenda Addressed: Development of unified vulnerability suitability assessment for all areas; Development of crop modelling tools for predictive use especially for high value crops.
8. Expected Technology or Information:
   - Vulnerability to climate risks maps at municipal level in Western Samar
   - New methodology for assessing climate impacts to crops
   - Decision-support platform in prioritizing technology options and investment planning for climate-resilient agri-fisheries (CRA) in Western Samar province
9. Description of Technology/Information:
   - Key climate risks identified for Western Samar agri-fisheries sector and vulnerability of target farming system assessed.
   - Contribute to the national online-searchable portal of CRA practices – pool of CRA technologies and practices, drawn from general compendium, available through Web-based hub.

10. Target Beneficiaries/Users: Farmers, Provincial DA, Regional DA, Researchers
11. Tags/Keywords: Climate-resilient; agri-fisheries; adaptation; mitigation; local knowledge and practices

B. TECHNICAL DESCRIPTION

1. Rationale

1.1. Problem Statement

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 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. After AMIA 1, the AMIA 2 was implemented in 2015 to 2016. This AMIA 2++ project for region 8 is an expansion of the AMIA 2 and follows the same methodology.

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-RFO8).

The Eastern Visayas Regional Development Plan (NEDA, 2011) emphasized the importance of Climate Change Adaptation in Agriculture and Fishery. Hazards such as floods caused significant damage to agriculture. It is, therefore, important that the region prepares for climate change by adopting plants and animal species, technologies and infrastructure support that are durable or resilient to it. These can be done through the following specific interventions (NEDA, 2011):

- Promote the utilization of improved genes/species of local livestock and poultry that are less vulnerable;
- Pursue aggressive research and development (R&D) on climate change-sensitive technologies, climate-proof support facilities and climate-responsive food production system;
- Promote climate-resilient aquaculture technologies ;
- Encourage Public-Private Partnership (PPP) in the generation, restoration and rehabilitation of irrigation systems that are climate-proof; and
- Intensify public investment in construction/rehabilitation of climate-proof Production and Post-Harvest Support Services.

Having identified the need to develop climate resilient agriculture and fishery for region VIII, there is need to come up with a good risk and vulnerability assessment in

order to incorporate Climate Change Adaptation (CCA-DRR) in updating the plans for agriculture and fishery in the area.

This proposed project is going to be piloted in the province of Western Samar. The province of Samar occupies the southwestern part of Samar Island. It has the largest land area (559,100 has.) among the three Samar provinces which constitute 42% of the island's total land area and 26% of Region VIII. The San Juanico Bridge connects Samar to the province of Leyte on the southeast across the San Juanico Strait. It is bounded on the north by Northern Samar, on the east by Eastern Samar, on the south by Leyte Gulf and on the west by the Samar Sea. Catbalogan City, the provincial capital is 107 kilometers from Tacloban City, the regional capital of Eastern Visayas.

1.2. SWOT

Strengths: DA-RFO8's strong commitment to streamlining CC concern in the whole DA region 8 operations. The outputs of AMIA 1 served as initial approximation of climate-risk vulnerability and hazards exposure information that can be used in this project. Participation of Visayas State University in the projects brings more academic and research skills on climate change research.

Weaknesses: AMIA1 outputs primarily focus on risk exposure (hazard), data sources and analytical methods need further validation at higher-level resolution. Despite the efforts on data collection last AMIA1, the project still face limited availability of data, especially on crop occurrences and adaptive capacity. CRA practices need to be fully assessed ex-ante for relative costs/benefits, nor prioritized for relevance to location-specific climate risks and value chain for Western Samar. Existing CRA assessments are focused on productivity and the production system.

Opportunities: Climate-change adaptation a priority agenda of the broader agri-fisheries sector in the country. There is increased awareness of and demand for relevant CRA practices by stakeholders – from local communities to national policy makers.

Threats: Impacts of climate change are urgent, critical challenges requiring immediate response and action.

2. Narrative Summary

2.1. Potential Impact or Goal

CRVA results are critical to AMIA's next-stage planning and design for an action research and development to build CRA communities. The resulting information would support AMIA strategic decisions in targeting key climate risks for priority commodities/ systems in specific communities in region 8. It also guides DA-RFO8 in establishing the framework for results-based monitoring and evaluation of AMIA achievements, i.e. community-level outcomes and responsive policies and institutions.

The CRA result, on the other hand, is important in building climate-resilient productive livelihoods in agri-fisheries communities through cost-effective investment planning for CRA interventions in Region 8.

2.2. Outcome or General Objective/Purpose:

The overall objective of the project is to assess, target and prioritize climate-resilient agri-fisheries (CRA) technologies and practices in Region XIII in support of AMIA2+.

2.3. 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 analyse local CRA practices to support AMIA2 knowledge-sharing and investment planning; and
e) To provide support to DA-RFO by providing data in establishing AMIA baseline for outcome monitoring and evaluation (M&E) of CRA communities and livelihoods.

2.4. Scope and Limitations/Constraints:

This project is piloted in the province of Western Samar covering all municipalities.

3. Review of Related Literature

3.1. Body Text

Vulnerability to climate change is determined by the complex interaction of: 1) exposure to identified effects of climate change (e.g. changes in temperature and precipitation), 2) sensitivity characteristics that define differential responses to climate change effects (e.g. topographic/biophysical profile, crop suitability, economic dependence on agriculture), and 3) adaptive capacity for managing climate change (e.g. organizational capacity, education, poverty rate).

While extreme weather events are a critical factor especially in the Philippines, climate change vulnerability also encompasses the medium- to long-term, cumulative and direct effects of climate risks. Likewise, it is essential that vulnerability assessment has to cover climatic variables and the associated biophysical, natural resource and socio-economic drivers.

Beyond the focus on exposure to risks/hazards, AMIA recognizes that vulnerability targeting requires understanding the differential impact of these risks on communities depending on degree of sensitivity and their adaptive capacity. Similarly while agricultural productivity is a central goal, AMIA seeks to demonstrate that agro-economic gains are specifically through effective climate adaptation with mitigation.

The Eastern Visayas region is one of the three regions situated in central Philippines and serves as a link to Luzon and Mindanao through the National Maharlika Highway that runs through it. It is bound by the Surigao Channel and the island of Mindanao on the south; by the San Bernardino Strait and the tip of the Bicol Peninsula

on the north; the Maqueda Bay, Camotes and Visayan Seas, and the islands of Cebu and Bohol on the west; and the Leyte Gulf, the Philippine Sea and the Pacific Ocean on the east (DA R08, 2016).

The region is vulnerable to geo-hazards as manifested by the number of disasters that happened in the region that resulted to loss of life and damage to properties. In the past 20 years, aside from typhoons, the region experienced the following major disasters: 1) flashflood in Ormoc City and Burauen, Leyte on November 5, 1991, killing around 8,000 people; 2) landslide in Guinsaugon, St. Bernard, Southern Leyte on February 2006, burying an entire village and killing almost 1,200 people; 3) landslide/flashflood in Panaon Island, Southern Leyte on December 19, 2003 claiming the lives of more than 100 people; and 4) Super Typhoon Haiyan on Nov 9, 2013, killing more than 10,000 lives plus millions of damage in homes and infrastructure.

Based on the Rapid Geo-hazards Assessment the most common geo-hazards of the region are: landslide, flood, earthquake and earthquake-related hazards, coastal erosion, volcanic eruption, and subsidence (lowering of the ground)/carbonate sinkholes (a geological condition wherein sinkholes are developed in limestone or carbonate rocks).

The Eastern Visayas region is generally an agricultural area with forty-five percent (45%) or 976,415 ha of its total land area are devoted to agriculture. Twenty-eight percent (28%) are forests, 25% is grasslands and the rest is used for other purposes (NEDA RDP 2011). Its population as of August 1, 2015 was 4,440,150 based on the 2015 Census of Population (POPCEN 2015). It has six provinces, namely, Leyte, Southern Leyte, Biliran, Samar, Northern Samar and Eastern Samar.

3.2. References:

a) Adger, W., Kelly, M., Ninh, N. (2001). Environment, Society, and Precipitous Change. Living with Environmental Change. Vol.1, pp.3-19
b) Béné, C., T. Frankenberger and S. Nelson (2015). Design, Monitoring and Evaluation of Resilience Interventions: Conceptual and Empirical Considerations. IDS Working Paper, Volume 2015, No 459. IDS.
c) Braun, J., Wheeler, T. (2013). Climate Change Impacts on Global Food Security. Science Vol. 341, pp.508-513
d) Challinor A., et al. (2014). Climate Variability and Vulnerability to Climate Change: A Review. Global Change Biology. Vol. 20, pp.3313-3328
e) CIAT-CCAFS (2015). Guidelines for Climate-Risk Vulnerability Assessment. Cali, Colombia
f) DA-RFO8,(undated), Regional Agricultural Profile. http://da08.da.gov.ph/index.php/da-nfrs/profile
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h) Nelson, G. C., Rosegrant, M. W., Koo, J., Robertson, R., Sulser, T., Zhu, T., Ringler, C., et al. (2010). The Costs of Agricultural Adaptation to Climate Change. Washington D.C.
i) NEDA, (2011). Regional Development Plan. In http://www.neda.gov.ph
j) Philippine Statistics Authority, (undated). Country Statistics.
k) Philippine Statistics Authority, (2015). PSA Census of Population. In http://www.psa.gov.ph
l) Reddy, P. (2015). Climate Resilient Agriculture for Ensuring Food Security. Springer

India.
m) Reynolds, M., Ortiz, R. (2010). Adapting Crops to Climate Change: A Summary. Climate Change & Crop Production. Vol. 1, pp.1-9

4. Methodology and highlights of result per objective

Objective 1: To strengthen capacities for CRA methodologies of key research and development organizations in the region

Methodology and highlight of result:

Series of trainings/workshops were conducted to capacitate the Regional Department of Agriculture personnel on CRA research & development. These trainings/workshops and the date they are held, are as follows:

- A project orientation and crop occurrence workshop was held in San Jorge Experimental Station, San Jorge, Samar last October 10, 2017. This was participated by the DA-RFO8 AMIA team with 3 provincial and 21 municipal LGU personnel. As a result, seventeen (17) crop occurrence data were collected and mapped in 21 out of 26 municipalities in the province of Samar.
- The DA-RFO8's AMIA team were involved during secondary data collection on crop damage due to hazard (i.e. 2015 Drought), and other secondary data used for adaptive capacity analysis. As a result, eight (8) hazards data and seven (7) adaptive capacity data were collected and tabulated ready for CRVA analysis.
- The DA-RFO8 AMIA team were involved during the collection of primary data through formal survey, Focus Group Discussion and workshop conducted during the duration of the project. As a result, they were exposed on the techniques on doing field interview, focus group discussion and other data gathering techniques.
- The DA-RFO8's Economist participated during the training on Cost-Benefit analysis conducted in SEARCA, UPLB, Laguna last January 17-19, 2018. As a result, the DA staff (Economist) was able to use the different tools and methods in Cost-Benefit Analysis including the use of on-line tool/software.
- The DA-RFO8's GIS Specialist participated during the training on GIS Raster-based Analysis for CRVA conducted in SEARCA, UPLB, Laguna last January 23-25, 2018. As a result, the DARFO8's GIS specialist was able to run the Maxent climate model as well as conduct GIS raster-based analysis needed for CRVA.

There were also several participatory consultations and meetings with DA-RFO8 AMIA team conducted for various purposes, such as follows:

- A consultative meeting to identify and decide the priority crops to be included in the CRVA analysis was conducted last September 12, 2017. As a result, there were eight priority crops that were identified and selected, as follows: Abaca, Banana, Cacao, Maize/corn, Pakbet vegetables, Irrigated rice, Rainfed rice and Upland rice.
- A consultative meeting-cum-field visit was conducted last August 2-4, 2017 to validate the initial result of CRVA analysis, select the two crops and two CRA practices for in-depth cost–benefit analysis. As a result, there were two crops (vegetable/Pakbet and Upland rice) and two CRA practices (Protected cultivation of high valued vegetable production and Alley cropping on upland rice production) being selected for in-depth investigation.

- A consultative meeting was conducted last December 6, 2017 to finalize the selection of the CBA project site. As a result, the LGU of Sta. Rita, Samar was selected by the VSU and DARFO8 AMIA team because of its vulnerability (moderate), more number of farmers adopting/testing climate-resilient technologies and accessibility.

The different instruments used during the workshop and primary data collection is presented in **Appendix A & B**.

As an offshoot to the discussion and consultation, the VSU team assisted the DARFO8 AMIA team in formulating and submitting a PhP7.5M project proposal (i.e. second phase) with the purpose of conducting the CRVA and CBA project components covering the remaining four provinces of Region 8 and also conduct capacity building activities intended for selected DA personnel in the region and other regions as well and at present the MOA is already signed by VSU and DA-RFO8 and for signing by DA Secretary. A copy of the project MOA is presented in **Appendix C**.

Objective 2: To assess climate risks in the region's agri-fisheries sector through geospatial & climate modeling tools

Methodology and highlight of result:

Based on the CRVA framework, the climate risk vulnerability analysis was determined by adding climate sensitivity plus hazards to generate the potential impact and deducted by adaptive capacity.

For climate sensitivity analysis, the present (baseline) and future (i.e. Year 2050) projection of the climatic condition in the province of Samar (with 20 different climatic parameters) were taken from various sources, as follows:

a) Baseline: Worldclim (Hijmans, R.J., S.E. Cameron, J.L. Parra, P.G. Jones and A. Jarvis, 2005. Very high resolution interpolated climate surfaces for global land areas. International Journal of Climatology 25:1965-1978)
b) Future(Year 2050): CIAT (International Center for Tropical Agricuture) and Future Earth. Spatial Downscaling Methods: CCAFS-Climate Data Portal. Available online: https://ccafs.cgiar.org/spatial-downscaling-methods

These climatic data and the crop occurrence data were used as input in the Maxent model to determine the present and future climate exposure sensitivity of each crop selected, defined as the increase or decrease of climatic suitability of selected crops to changes in temperature and precipitation.

There were eight (8) crops that were included in the analysis such as follows: Abaca, Banana, Cacao, Maize/corn, Pakbet vegetables, Irrigated rice, Rainfed rice and Upland rice.

For hazard exposure analysis, there were eight (8) natural hazards included, as follows: a) erosion, b) flooding, c) drought (with actual damage report, 2015), d) landslide, e) saltwater intrusion, f) sea level rise, g) storm surge and h) tropical cyclone. The data were collected from several sources and analysed in GIS to generate the combined hazards index for each municipality.

For adaptive capacity analysis, there were seven (7) capitals that were included and used as indicators for adaptive capacity by municipality level, such as follows: a) economics capital, b) natural capital, c) human capital, d) physical capital, e) social capital, f) anticipatory capital and g) institutional capital. These data were analysed in GIS to generate the combined adaptive capacity index by municipality.

Finally, the climate risk vulnerability assessment for each crop was determined by adding the climate sensitivity and hazards, minus the adaptive capacity. The result of the CRVA analysis of the eight priority crops is presented in the **Appendix D**.

Objective 3. To determine local stakeholders' perceptions, knowledge & strategies for adapting to climate risks

Methodology and highlight of result:

Through a workshop, the potential CRA practices found in the province of Samar were identified by the municipal and provincial LGU participants. This list was validated through follow-up field visits and discussion with DA personnel, agricultural systems expert, and the farmers. As a result, twenty one (21) CRA practices were validated and described and presented in the **Appendix E**.

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

Methodology and highlight of result:

Out of the 21 climate resilient agriculture (CRA) practices that were identified and validated, two CRA practices were selected by the VSU team through consultation with DA-RFO8 AMIA team, for in-depth documentation and Cost-Benefit analysis, as follows: a) Protected cultivation of high valued vegetable production and b) alley cropping on upland rice production.

Both primary and secondary data were collected through formal and informal methods in order to make the cost-benefit and trade-off analysis. The data were tabulated and inputted to the on-line analytical tools available at the CIAT website.

As a result, two investment brief were produced on a) protected cultivation of high valued vegetable production and b) alley cropping in upland rice production.

The instrument used during the formal survey is shown in **Appendix F & G** and the two investment briefs are shown in **Appendix H & I.**

Objective 5. To support the establishment of AMIA baseline for outcome monitoring and evaluation (M&E) of CRA communities and livelihoods.

Methodology and highlight of result:

The VSU team coordinated with DA-RFO8 AMIA team in establishing baseline data for outcome monitoring and evaluation of CRA communities & livelihoods. Most of these data were based on the parameters used in the CRVA analysis (i.e. hazards and adaptive capacities). These are mostly monitoring for implemented or planned projects and activities that minimizes the damage impact of natural hazards as well as

increase the adaptive capacity of the stakeholders in the agri-fishery sector.

As a result, a training on monitoring and assessment tool on resiliency was included in the capacity building plan for the proposed phase 2 of the project (**Appendix J**).

5. Appendices

Appendix A. Climate Resilient Agricultural (CRA) identification questionnaire
Appendix B. Adaptive capacity indicators questionnaire
Appendix C. MOA between VSU and DA_AMIA Region8-Phase 2
Appendix D. CRVA result for each priority crops in Samar province
Appendix E. CRA practices in Samar province
Appendix F. Survey questionnaire for protected vegetable production
Appendix G. Survey questionnaire for alley cropping in upland rice
Appendix H. Investment brief for protected cultivation of high valued vegetable production
Appendix I. Investment brief for alley cropping in upland rice production
Appendix J. List of trainings listed under the proposed AMIA Region8-phase 2

C. PROJECT MANAGEMENT

1. Updated Work Plan Schedule (June 1 to August 31, 2018)

Activities	**Methods/Tools**	**Timetable June 1 to August 31, 2018**
1. Capacity strengthening for CRA research & development *(Output: enhanced **capacities** of AMIA partner organizations in the region)*		
Capacity strengthening on CRVA	Training	Done
Capacity strengthening on CRA prioritization	Training	Done
Capacity strengthening on CRA knowledge hub devt	Training	CIAT
Capacity strengthening on CRA M&E	Training	CIAT
2. Geospatial assessment of climate risks *(Output: geospatially referenced data on climate-risks: biophysical-agricultural-socioeconomic parameters)*		
Collection of secondary data for exposure-sensitivity	CRVA guidelines	Done
Collection of secondary-primary data for adaptive capacity (if necessary)	CRVA guidelines, FGDs	Done
Preliminary data analysis	GIS-climate modeling	Done
Cross-regional/national data analysis workshop	Workshop	CIAT
3. Stakeholders' participation in climate adaptation planning *(Output: Local stakeholders' CRA-related demographic/institutional profiles & knowledge/perceptions/strategies)*		
Regional-level CRVA stakeholders' validation	Workshop	Done
Community-level CRVA stakeholders' validation	FGDs/meetings (3)	Done
Regional-level CRA stakeholders' validation	Workshop	Done
Community-level CRA stakeholders validation	FGDs/meetings (3)	Done
4. Documenting & analysed CRA practices *(Output: data on CRA practices analysed for costs-benefits & trade-offs)*		
Key informant survey on CRA practices	Survey checklist	Done
Cost-benefit and trade-off analyses	Analytical tools	Done
National knowledge-sharing event on CRA	Workshop	CIAT
Planning workshop for AMIA2	Workshop	CIAT
5. AMIA baseline study for monitoring & evaluation *(Output: M&E baseline data for CRA communities &*		

Activities	Methods/Tools	Timetable June 1 to August 31, 2018
livelihoods)		
Survey on target communities & livelihoods	Survey questionnaire	DARFO8
Cross-regional/national data analysis workshop	Workshop	CIAT
Add: Proposed additional activity		
Refinement of CRVA result using additional model	Workshop	CIAT
Presentation of refined CRVA result and CBA investment brief to DA-RFO8	Seminar/workshop	VSU

Name of Respondent: _____ Municipality: _____ _

IDENTIFICATION OF CLIMATE-RESILIENT AGRICULTURE (CRA) PRACTICES

CRA Practices/Technologies		**Check if Yes**	**Barangay(s) where it is located**
Forestry	Agroforestry		
	Use of Living Fences		
	Bench Terracing		
	Stone Walling		
Crop Production System	Intercropping		
	Conservation Agriculture		
	Crop switching		
	Ratooning		
	Adaptive Crop Calendar		
	Organic Agriculture Practices		
Soil Management	Mulching		
	Improved Fallow		
	Covercropping		
	Green manuring		
	Compost/vermicast application		
	Microbial Technology		
Water Management	Terracing		
	Drip Irrigation		

	Water Harvesting		

Pest and Disease Management	Use of Bio-pesticides		
	Push and pull system (crop combination)		
	Use of Beneficial Organisms		
	Integrated Pest Management (IPM) except Chemical control		
Genetic Resource Management	Use of Traditional cultivars/varieties		
	Indigenous crop species		
	Use of tolerant varieties		
Livestock	Zero Grazing		
	Silvopastoral system		
	Crop-Poultry Integration		
	Crop-Livestock Farming		
Value Chains	On-farm Value added products		
	Value added products - BioOrganic fertilizers; IMO6		
	Biotechnology application		
Fish and Aquaculture	Aquasilviculture		
	Fish culture with vegs.		
	Rice + Fish Production		
	Sorjan Farming		
	Aquaculture		

Energy	Use of biogas digesters		
	Timber production for charcoal and fuel		
Climate Risk Management	Meteorological advisories, Early Warning Systems		
	Rice Crop Manager		
	Corn and Cassava Farmer Advisories		
	Agroecosystem analysis (AESA)		
Policies and Institutions	Index-based Insurance schemes		
	Nonburning of rice straw and other biomass ex. sugarcane		
	Provision of incentives to farmers adopting organic farming		
	Provision of higher price of organically grown products		

Project Title: **Climate-Resilient Agri-fisheries (CRA) Assessment, Targeting and Prioritization for the Adaptation and Mitigation Initiative in Agriculture (AMIA) in Samar Province.**

Name of Municipality/City_____

Name of Respondent: _____

INDICATORS	VALUES
Total or estimated number of farmers in the municipality/ city	
Average farm size (in ha)	
Number of farmers visited by or consulted with agricultural extension workers	
Number of farmers owning their agricultural production land	
Distance of the farthest barangay to the market (in km)	
Number of active or existing farmers group or unions	
Name of active and or existing farmers group or unions and its respective number of members (Note: Kindly use separate sheet if the space provided for is not enough.)	
Number of farmers with access to Shallow Tube Well (STW)	
Number of farmers with access to reliable water for irrigation	
Number of farmers with access to quality seeds	
Number of farmers with access to fertilizers and pesticides	
Number of farmers with access to irrigation infrastructure	
Number of farmers with access to post-harvest infrastructure	
Number of registered trainings and/or seminars held related to climate change	
Area of Marine Protected Areas (MPAs) (in ha)	
Percentage (%) of women elected in government (i.e., elected officials)	
Percentage (%) of ethnic minorities in government (i.e., elected officials)	
Percentage (%) prevalence rate of malnourished children under 7 years old	
Estimated Soil organic matter (in %)	

% of Farmers visited by or consulted with agricultural extension officer	
Presence of functioning MDRRMC (YES/NO)	
Access to early warning information via Radio, TV or meetings (YES/NO)	
With access to communication technology, cellphone, internet (YES/NO)	
Number of household	
Average number of adults in a household	
Number or percentage of Household with access to safe water	
Number or percentage of Household with access to potable water	
Number or percentage of Household with sanitary toilets	
Number or percentage of household with access to electricity	
Number of health centers or hospitals	
Number of Doctors	
Number of nurses	

Crops	Yield: (kg/hectare)	Annual Production (average):
1. Upland Rice		
2. Rice		
3. Maize/Corn		
4. Coconut		
5. Banana		
6. Ginger		
7. Taro/Gabi		
8. Sweet potato		
9. Cassava		
10. Napier		
11. Trichantera		

MEMORANDUM OF AGREEMENT

KNOW ALL MEN BY THESE PRESENTS:

This Memorandum of Agreement made and entered into by and among:

The **DEPARTMENT OF AGRICULTURE CENTRAL OFFICE,** a government instrumentality with office address at Elliptical Road, Diliman, Quezon City, represented herein by its Secretary, **EMMANUEL F. PIÑOL**, herein referred to as **"DA-Central Office"**;

The DEPARTMENT OF AGRICULTURE – REGIONAL OFFICE 8 –EASTERN VISAYAS, a government instrumentality with office address at Paterno Ext, Downtown, Tacloban City, represented herein by its Regional Executive Director**, ATTY. CIPRIANO G. SANTIAGO** herein referred to as **"DA-RFO 8"**; and

The **VISAYAS STATE UNIVERSITY (VSU),** an institution of higher learning established under Pres. Decree No. 470 as amended by Pres. Decree No. 700, and converted into state university by virtue of R. A. 9158 and 9437, with principal office at Visca, Baybay City, Leyte, Philippines, duly represented by the University President, **DR. EDGARDO E. TULIN**, hereinafter referred to as "**VSU",** the implementing agency.

WITNESSETH

WHEREAS, the Philippines is now facing the very real impacts of climate change, which threaten to undermine development prospects and exacerbate the vulnerability of poor **communities especially the country's agri-fisheries sector;**

WHEREAS, the Department of Agriculture, being the principal government agency responsible for the promotion of agricultural development, has launched the Adaptation and Mitigation Initiative in Agriculture (AMIA), with the overall vision of enabling the local communities in the agri-fisheries sector to pursue sustainable livelihoods while effectively managing climate risks;

WHEREAS, as a strategy, AMIA develops and promotes climate resilient agriculture (CRA) through the implementation of technologies and practices, introducing institutional and social innovations, and accessing –climate- relevant support services;

WHEREAS, the DA RFO 8, being the regional office of DA is directed to promote the adoption and utilization of recommended agricultural technologies and practices to develop a climate-resilient agriculture and fisheries sector in the region;

WHEREAS, the VSU having resources for agriculture research and development, was selected as institutional partner of DA RFO 8 to implement Climate Risk Vulnerability Assessment (CRVA) projects, a basic reference to identifying Climate Resilient Agriculture (CRA) options in building climate-resilient agri-fisheries sector.

NOW THEREFORE, in view of the foregoing premises, the parties hereby agree on the following:

Article I

GENERAL PROVISIONS

1. This Tripartite Memorandum of Agreement shall cover the implementation of Climate-Risk Vulnerability Assessment (CRVA) projects in DA RFO 8 - Eastern Visayan provinces with a total project cost of Seven Million Five Hundred Pesos only (Php7,500,000.00) from the DA-Central Office funds;

2. Implementation of the projects shall be based on the approved Work and Financial Plan (WFP) that forms part of this Agreement, herein referred to as Annex A.

Article II

RESPONSIBILITIES AND DUTIES

DA- Central Office

1. Provide project policy guidelines and directions, and perform oversight functions;

2. Download funds directly to VSU for the implementation of Climate-Risk Vulnerability Assessment (CRVA) projects for Region 8;

3. Conduct monitoring and evaluation on the progress of the project implementation with designated DA- RFO 8 staff/AMIA Focal Person;

4. Obligate the allotment for the project to be implemented based on the advice of allotment and/or memorandum of agreement or similar document;

5. Issue a check in the name of Implementing Agency (IA) in this case, VSU;

6. Maintain a subsidiary ledger of the cash transferred pertaining to the project;

7. Require VSU to submit the reports and furnish VSU with a copy of the journal voucher (JV) taking up the expenditures. Upon receipt of the copy of the Certificate of Settlement and Balances (CSB) and the Credit Notice (CN) issued by VSU Auditor, the Accountant shall draw a journal voucher restoring back the amount previously credited for any disallowance. He shall furnish the implementing agency with a copy of the journal voucher; and

8. Issue the official receipt for the unexpected balance and the refunded disallowance remitted by VSU.

DA – RFO 8

1. Assist VSU in the conduct of Climate Risk Vulnerability Assessment (CRVA) project.

2. Assist the DA-Central Office in monitoring and evaluation on the progress of CRVA projects implemented by VSU; and,

3. Engage DA Bureaus and attached agencies, as well as the Provincial Local Government Unit, through the Provincial Agriculture and Veterinary offices, to provide technical assistance whenever needed.

VSU

1. Receive fund from DA Central Office, issue official receipt, and maintain a separate account for the project in any government servicing bank;
2. Disburse funds solely in accordance with the approved WFP (Annex A), consistent with existing accounting and auditing rules and regulations and Republic Act 9184, otherwise known as the Government Procurement Reform Act.
3. Deposit the amount with its authorized depository bank;
4. Keep separate subsidiary records for the trust liability whether or not a separate bank account is maintained;
5. Within five (5) days after the end of each month, the Accountable Officer (AO) shall prepare the RCI and the RD and shall submit them with all supporting vouchers/payrolls and documents to the Accountant. These reports shall be approved by the Head of the Agency;
6. Within ten (10) days after receipt from the Accountable Officer, the Accountant shall verify the reports, provide accounting entries, record and submit the duplicate copies of the Reports with all the originals of vouchers/payroll and all supporting documents to the Implementing Agency Auditor. The Accountant shall ensure that only expenses for the project are included in the Reports. He shall submit the original copy of the Reports to the SA;
7. Record the disallowance in audit after receipt of the Certificate of Settlements and Balances and the Credit Notice issued by the Implementing Agency Auditor and require the settlement of any suspension and disallowance;
8. Designate a Project Team to coordinate the implementation of CRVA projects in accordance to the approved WFP (Annex A);
9. Submit to DA-Central Office through DA-RFO 8, monthly project report on the various activities undertaken, issues encountered, and recommendations to ensure coordinated project implementation.
10. Provide counterpart as required and as maybe needed by the project either in cash or in kind, such as but not limited to labor and other materials for project implementation;
7. Maintain a record of the project's operations, and whenever requested, allow DA-Central Office and DA-RFO 8 to access the same at any reasonable time;
9. Return/refund to DA- Central Office, excess or unutilized funds after project completion.

Article III

OTHER TERMS AND AGREEMENTS

1. The parties shall issue the necessary documents, papers, and fulfill the provisions of this Agreement to implement Climate Risk Vulnerability Assessment (CRVA) projects, a basic reference to identifying Climate Resilient Agriculture (CRA) options in building climate-resilient agri-fisheries sector
2. In the event that certain circumstances, not covered by the provisions contained herein, will arise or develop, or any doubtful point/s be raised concerning any of the provisions of this Agreement, the parties shall within ten (10) days, from receipt of request for

interpretation and/or application of such doubtful point/s or circumstances, make their best effort to settle the same;

3. The provisions of this Agreement shall be subject to all applicable and appropriate government laws, rules and regulations.

Article IV

TERMINATION AND PENALTY

Any violation of the terms and conditions set forth herein or misappropriation of funds of the involved parties shall subject the same to administrative/penal sanction under the Laws of the Philippines.

This contract may be terminated by any of the contracting parties, upon justifiable causes to be determined by proper authorities, and provided that a written Notice of Termination is issued at least thirty (30) days prior to termination date.

Article V

AMENDMENTS AND EFFECTIVITY

The parties may, upon mutual agreement, amend or modify this Memorandum of Agreement anytime through an addendum signed by all parties.

This Agreement shall take effect on the date of signing hereof by all parties and will continue to be in force until full completion of approved project/s.

IN WITNESS WHEREOF, the parties, through their authorized representatives, have hereunto affixed their signatures this ___day of _____2018, at _____.

DEPARTMENT OF AGRICULTURE **CENTRAL OFFICE**	**DEPARTMENT OF AGRICULTURE** **REGIONAL OFFICE 8**
EMMANUEL F. PIÑOL Secretary	**ATTY. CIPRIANO G. SANTIAGO** Regional Executive Director

VISAYAS STATE UNIVERSITY

DR. EDGARDO E. TULIN
President

SIGNED IN THE PRESENCE OF

U-NICHOLS A. MANALO Director, DASWCCO	**ANDREW RODOLFO T. ORAIS** DA RFO 8	**PASTOR GARCIA** ECOFARMI-VSU

ACKNOWLEDGEMENT

Republic of the Philippines)
Quezon City) :SS

BEFORE ME, a Notary Public, personally appeared the following

NAME	ID NO.	ISSUED ON	ISSUED AT
EMMANUEL F. PIÑOL			
CIPRIANO G. SANTIAGO			
EDGARDO E. TULIN			

Known to me to be the same persons who executed the foregoing instrument consisting of six (6) pages including the page wherein the acknowledgement is written and they acknowledge to me that the same is their own and free voluntary act and deed of the government agencies/entities they respectively represent.

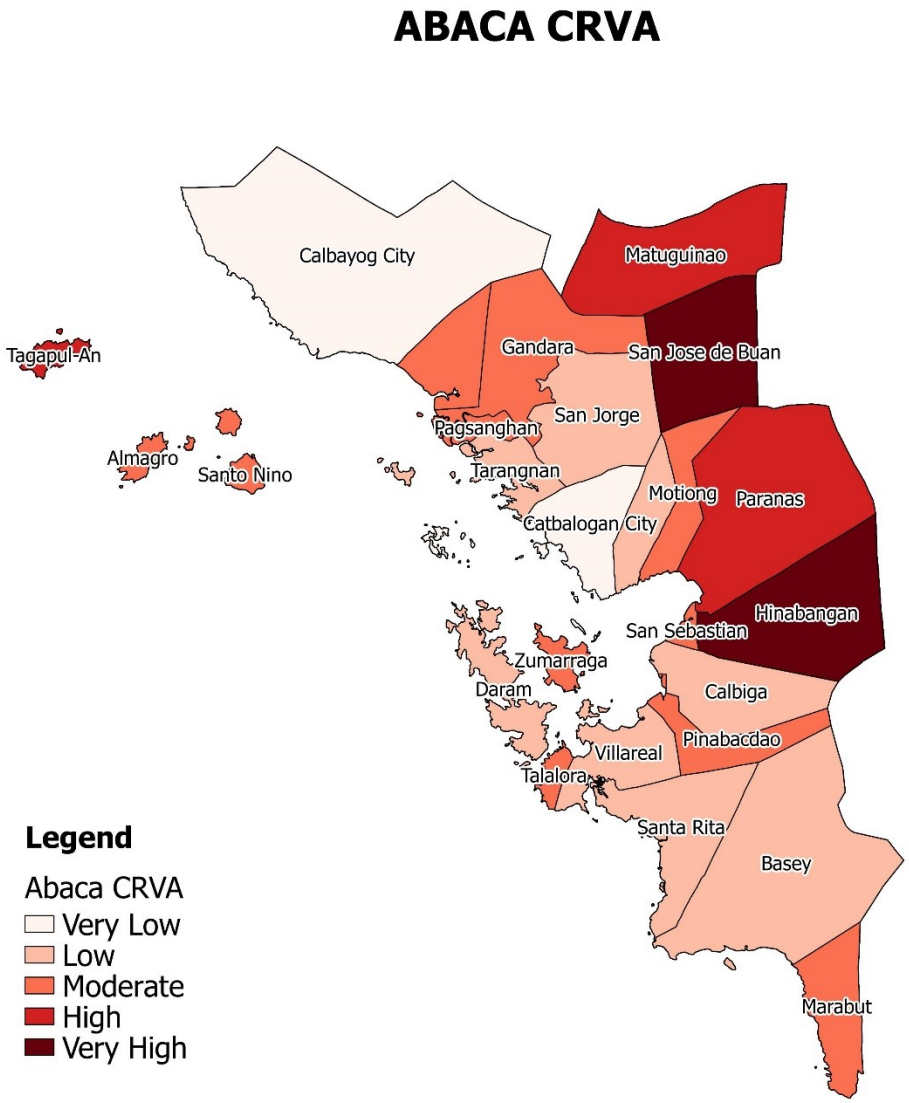
IN WITNESS WHEREOF, I hereunto set my hand and seal, this ____ day of _____2018 at Quezon City, Philippines.

NOTARY PUBLIC

Until_____
PTR No. _____
Issued at _____
Issued on _____

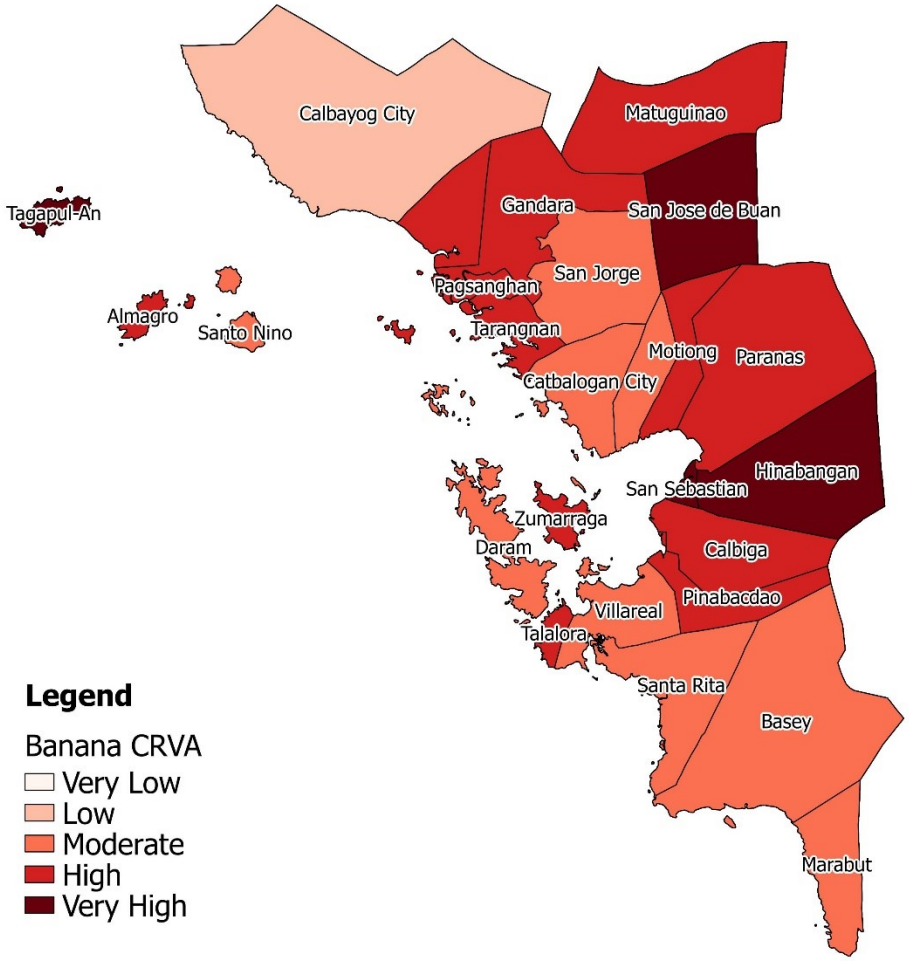
Doc. No. _____
Page No. _____
Book No. _____
Series of 2018

Appendix D. CRVA Results for each priority crops in Samar



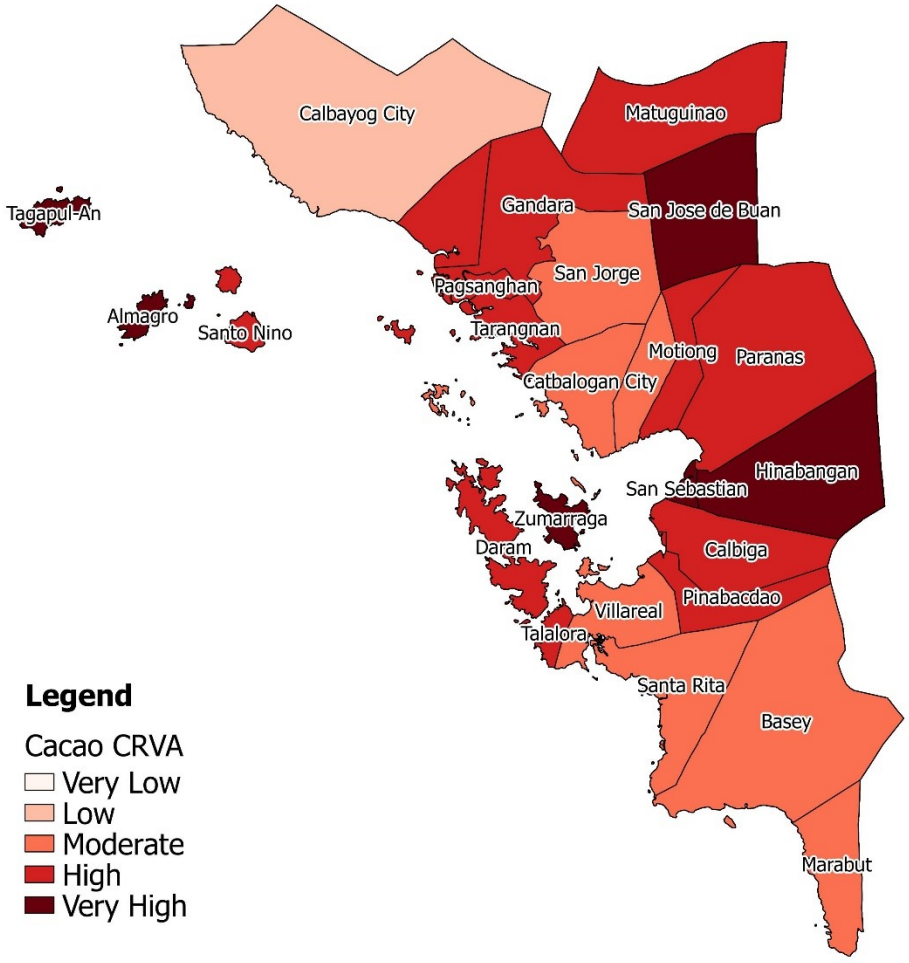
CRVA RESULT FOR ABACA

BANANA CRVA



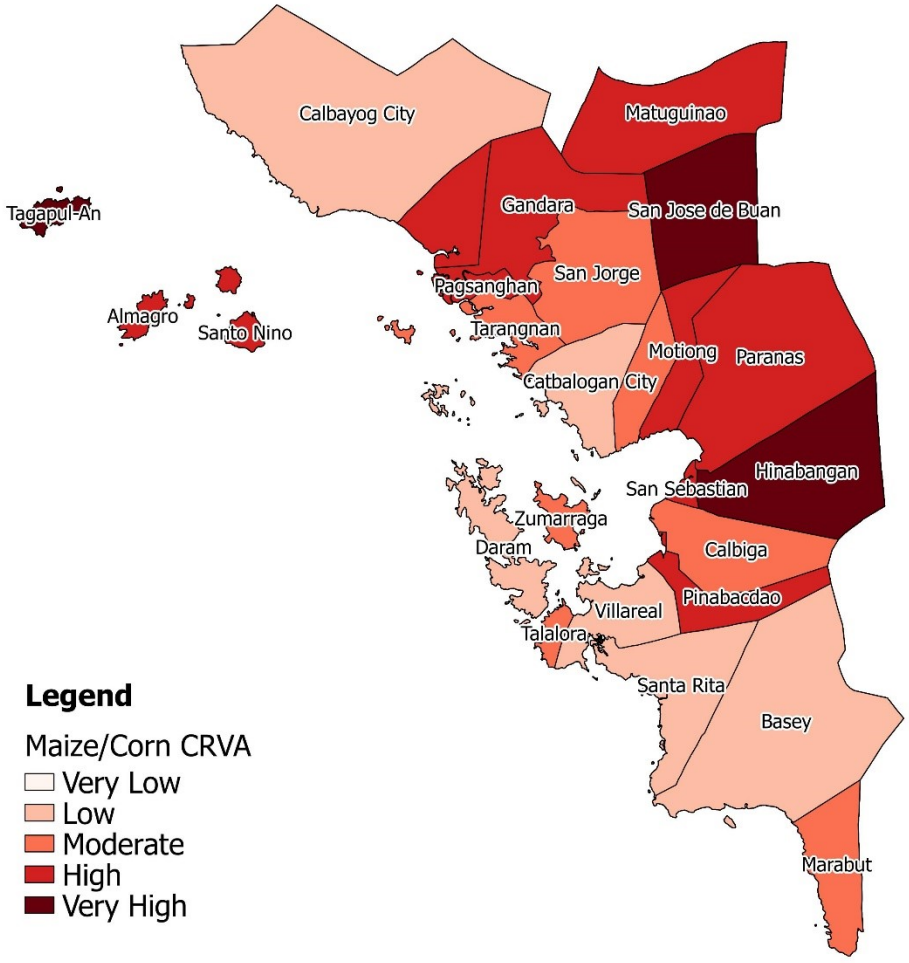
CRVA RESULT FOR BANANA

CACAO CRVA



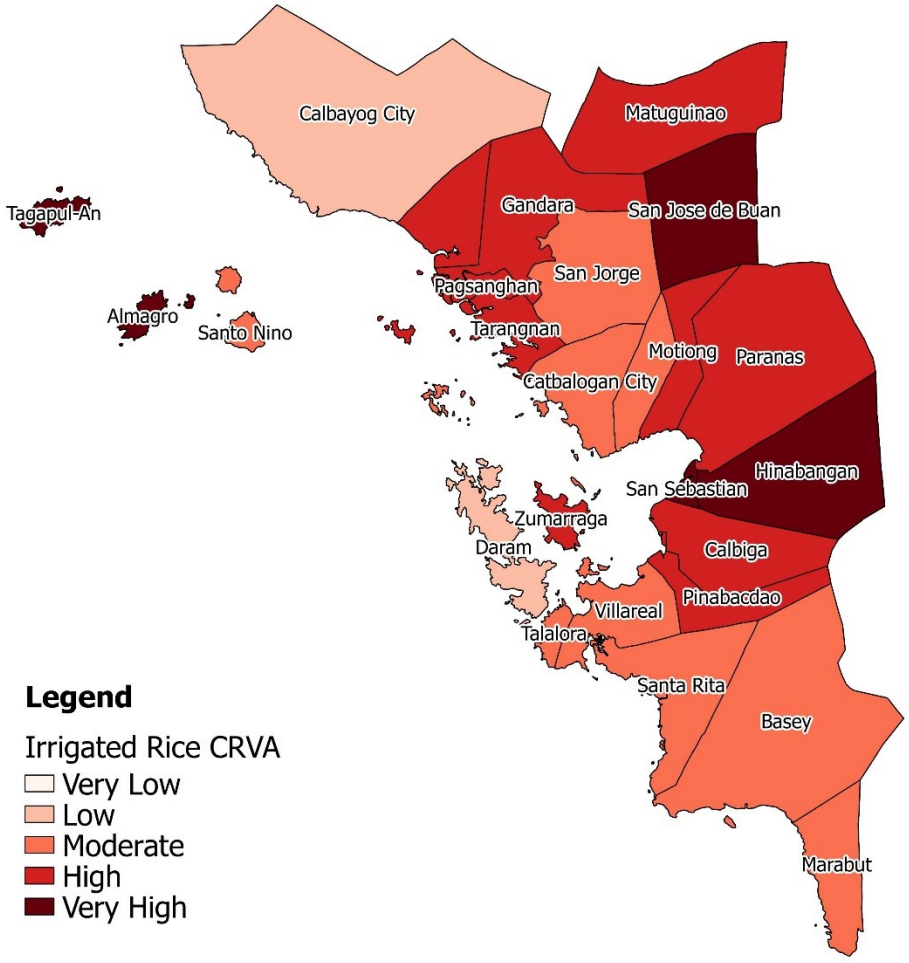
CRVA RESULT FOR CACAO

MAIZE/CORN CRVA



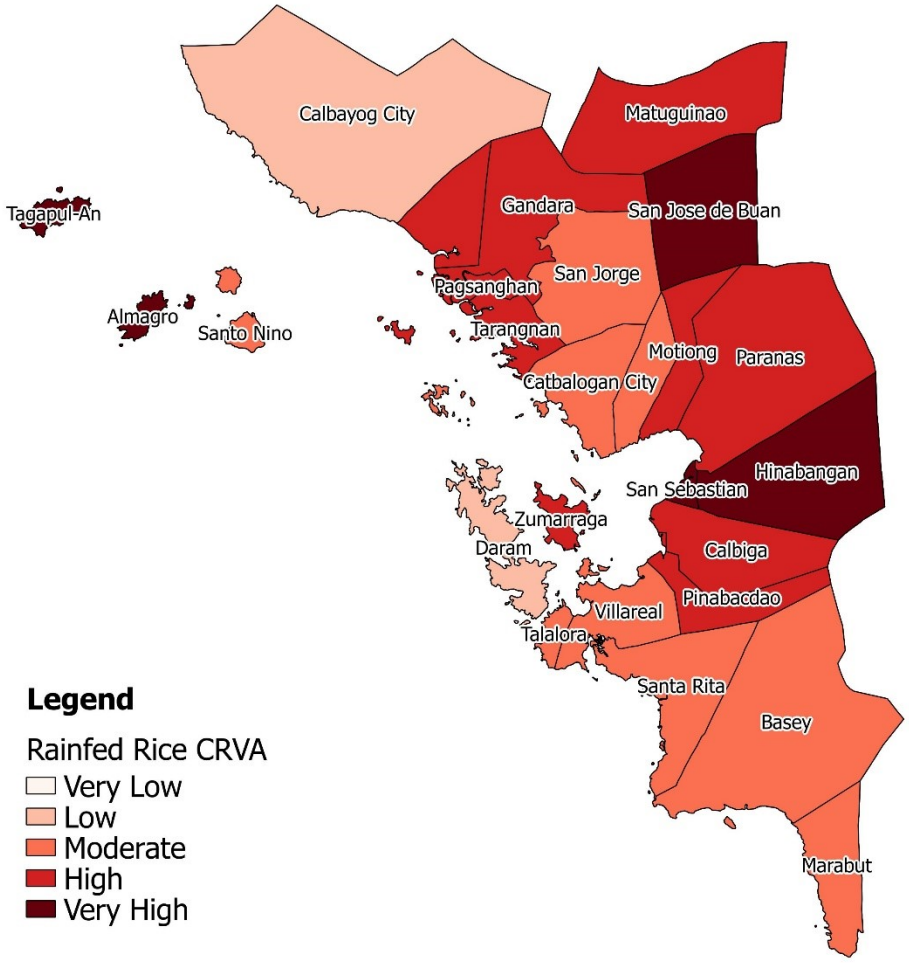
CRVA RESULT FOR CORN

IRRIGATED RICE CRVA



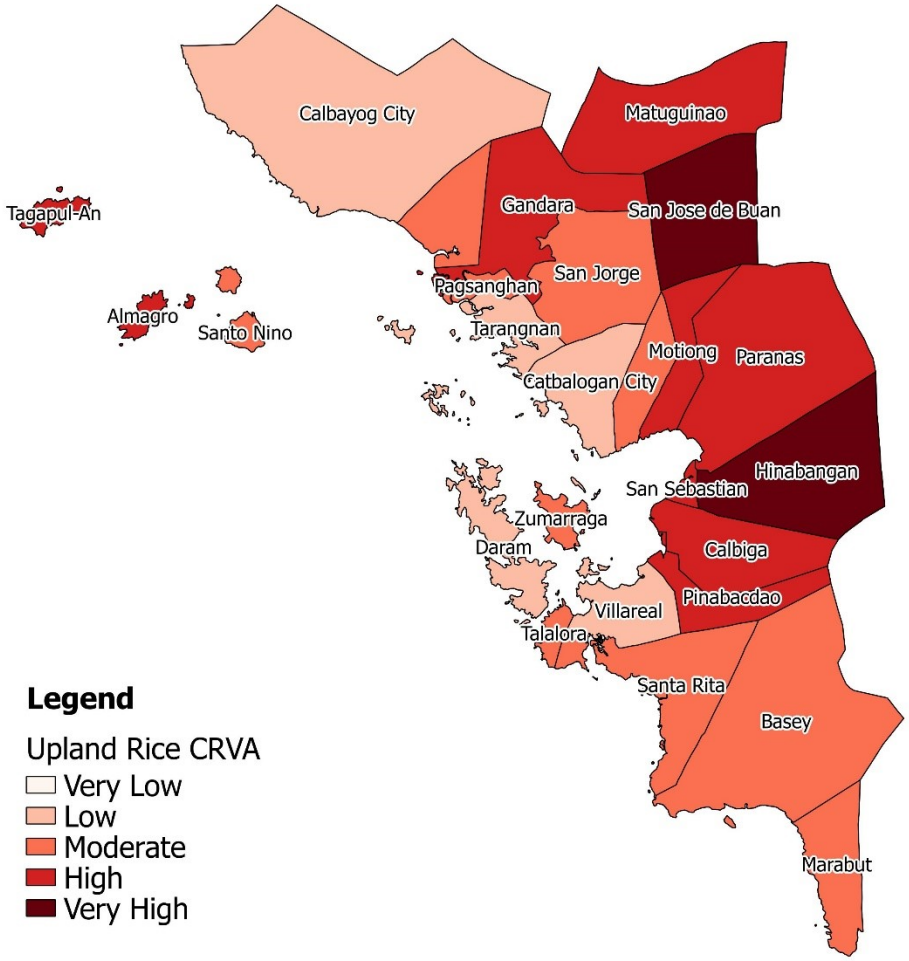
CRVA RESULT FOR IRRIGATED RICE

RAINFED RICE CRVA



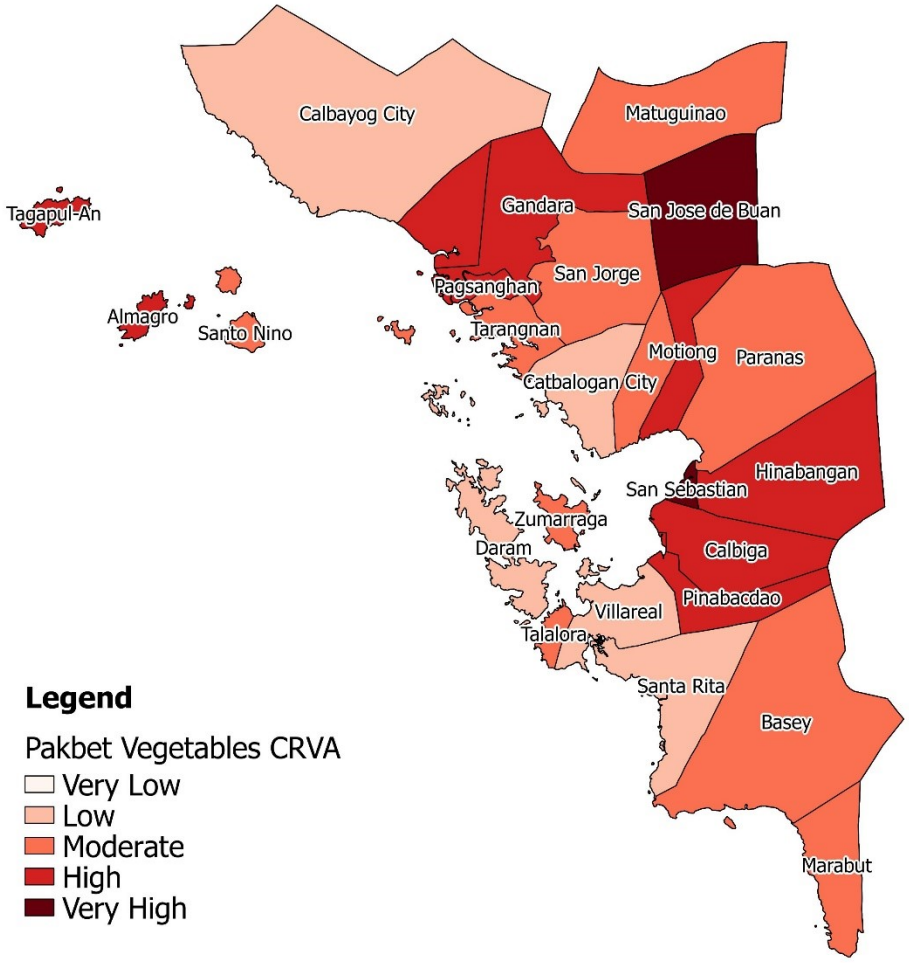
CRVA RESULT FOR RAINFED RICE

UPLAND RICE CRVA



CRVA RESULT FOR UPLAND RICE

PAKBET VEGETABLES CRVA



CRVA RESULT FOR PAKBET VEGETABLES

Appendix E. Climate Resilient Agriculture (CRA) Practices in Samar Province (Eastern Visayas Region)

CRA Practice	Description	No. of Municipalities Practicing (Total = 26 Municipalities)	CRA Contributing Factors		
			Sustainability	Adaptability	Mitigation
1. Agroforestry	Land use management system that combines the production of trees with agricultural crops, animals and other resources in the same area. It aims to increase or sustain productivity while maintaining ecological stability. It also hopes to increase income for improved quality of life.	7 (26.92 %)	✓	✓	✓
2. Alley cropping	Planting rows of trees at wide spacing with companion crop grown in the alleyways between the rows. It is a larger version of intercropping or companion planting conducted over a longer time scale. This can diversify farm income, improve crop production and provide protection and conservation benefits to crops.	6 (23.08 %)	✓	✓	✓
3. Sloping Agriculture Land Technology (SALT) Example: Bench terracing, Contour farming, Terracing	Package of technology on soil conservation and food production, integrating different soil conservation options in just one setting. SALT is a method of growing permanent crops in beds/strips between contoured rows of nitrogen fixing trees. The nitrogen fixing trees are planted in double rows to make hedgerows. This soil conservation technology can also be considered agroforestry since rows of permanent crops like coffee, cacao, citrus, and other fruit trees are dispersed throughout the farm plot.	2 (7.69 %)	✓	✓	✓
4. Organic farming Example: Application of	Alternative agricultural system that relies on fertilizers of organic origin such as compost, manure, green manure, etc. and emphasize more	8 (30.77 %)	✓	✓	✓

Vermicompost, animal manures, organic food wastes, bio-fertilizers etc.	on techniques such as crop rotation and companion planting.				
5. Crop rotation	Practice of growing a series of dissimilar or different types of crops in the same area in sequenced seasons. It is done so that the soil of farms is not used for only one set of nutrients. Its helps in reducing soil erosion and increases soil fertility and crop yield.		✓	✓	
6. Ratooning	Process of regrowing of crops for commercial purposes after the first harvest without uprooting the first crop.	10 (38.46 %)	✓	✓	✓
7. Cover cropping	Cropping system that entice on growing covercrops for the purpose of enhancing organic matter into the soil, add nitrogen in a slow-release way that plants can handle leading to less nitrogen volatilization.	2 (7.69 %)	✓	✓	✓
8. Green manuring	Plowing under or incorporation of any green manure crops after they produce flowers. Green manures are forage or leguminous crops that are grown for their leafy materials needed for soil conversation.	3 (11.54 %)	✓	✓	✓
9. Mulching	A layer of material applied to the surface of soil. Reasons for applying mulch include conservation of soil moisture, improving fertility and health of the soil, reducing weed growth and enhances the visual appeal of the area.	4 (15.38 %)	✓	✓	✓
10. Drip irrigation	Type of micro-irrigation system that has the potential to save water and nutrients by allowing water to drip slowly to the roots of plants, either from above the soil surface or buried below the surface. The goal is to place water directly into the				

	root zone and minimize evaporation. Sometimes called trickle irrigation and involves dripping water onto the soil at very low rates (2-20 liters/hr) from a system of small plastic pipes fitted with outlets called emitters or drippers.	4 (15.38 %)	✓	✓	
11. Rainwater harvesting • Small Water Impounding Project (SWIP)	Means of capturing rain water, where it falls and capture the runoff from, catchment and streams etc. It is generally a direct rainwater collection and the collected water could be stored for later use and recharged into the ground water again. • A water harvesting and storage structure consisting of an earth embankment spillway, outlet works and canal facilities. It is a designed for soil and water conservation and flood control by holding as much water as possible during the rainy season and utilize it during the dry season.	1 (3.85 %)	✓ ✓	✓ ✓	
12. Integrated Pests Management (IPM) • Integration of beneficial organisms • Natural pesticides	A pest management system that conforms on the socioeconomic context of farming systems, the associated environment of the population dynamics of the pests. • System of farming wherein beneficial organisms in the farm will be protected and/or preserved for the purpose of reducing the population and damaged by pests. • Natural pesticides are a substance that disrupts or kills organisms that we consider to be pests such as weeds, damaging insects, or microbes that cause diseases. These pesticides are highly toxic but are actually much safer and more eco-friendly than conventional pesticides.	8 (30.77 %) 4 (15.38 %) 6 (23.08 %)	✓ ✓ ✓	✓ ✓ ✓	

• Push and pull system	• Controlling agricultural pests by using repellant “push” plant and trap “pull” plants. This is a push-pull technology developed in Kenya in controlling agricultural pests, wherein grasses planted around the perimeter of the crop attract and trap the pest, whereas other plants, like desmodium planted between the rows of maize, repel the pest and control parasitic pests.	3 (11.54 %)	✓	✓	
13. Use of traditional cultivars	Are equally indispensable for global food security. Subsistence farmers around the world continue to grow primarily locally adopted versions of professional breed seeds.	12 (46.15 %)	✓	✓	
14. Indigenous crop species	A crop species that are endemic and/or naturally existing in a place rather than arriving from another place.	7 (26.92 %)	✓	✓	
15. Climate-resilient varieties	A crop variety is tolerant if the pest can live on the plant, but the plant is not seriously affected by the pest. For example most rice varieties are tolerant against leaf feeders. If leaf damage is not to severe, the plants compensate by producing extra leaves or tillers.	12 (46.15 %)	✓	✓	
16. Crop - animal integration • Crop-poultry integration	• A system of farming wherein crop components are integrated with poultry such as chicken, ducks etc. to enhancing poultry products while improving crop productivity through efficient use of available resources in the farm.	5 (19.23 %)	✓	✓	✓

• Crop - livestock farming	• It is when you have crops and animals on the same farm. In most cases, the animals are fed with the crops produced in the farm. Once they eat, their manure is used for fertilizers.	6 (23.08 %)	✓	✓	✓
17. Aquasilviculture	A multi-purpose production system that allows production of fish in a mangrove reforestation undertaking. It is a mangrove-friendly aquaculture technique of producing fish in a watered area enclosed with net but does not allow cutting of mangrove trees. Farming of aquatic organisms in both coastal and inland areas involving interventions in the rearing process to enhancing productivity and/or production.	3 (11.54 %) 10 (38.46 %)	✓ ✓	✓ ✓	
18. Crop - Fish Integration • Fish culture + vegetables • Rice + Fish culture	• Fish polyculture system integrated with vegetable farming on improving yield and economic benefits of small-scale farmers. This technology aims to meet the increasing demand of fish and vegetables, stabilize their income and diversify food production, consequently improving food security. • An integrated rice field/pond complex, where fish are grown concurrently or alternatively with rice. Fish may be deliberately stocked (fish culture), or may enter fields naturally from surrounding waterways where flooding occurs (rice field fisheries) or a bit of both.	1 (3.85 %) 2 (7.69 %)	✓	✓	

19. Rice crop manager	A comprehensive decision support tool to help farmers increase farm yield and income. This is a computer and mobile phone based tools providing rice, maize and wheat farmers with a personalized crop and nutrient management guideline.	9 (34.61 %)	✓	✓	
20. Meteorological advisories, EWS /Adaptive crop calendar	One of the agrometeorological information program that provides meteorological (weather forecast), agricultural (identify how weather forecast affects farming), extension (two-way communication with users), and information dissemination (media, IT and others) services. Tool that provides timely information about seeds to promote local crop production. It contains information on planting, sowing and harvesting periods of locally adapted crops in specific agro-ecological zones. It also provides information on the sowing rates of seed and planting materials and the main agricultural practices.	4 (15.38 %)	✓	✓	
21. Protected cultivation	Involves series of techniques for the modification of the natural environment of plants, which totally or partially alter the microclimate conditions, with the aim of improving their productive performance. The main objectives include protection of crops from harmful temperatures, wind, rain, and from pests, diseases and predators, creating a microclimate that allows for the improvement of their productivity and quality, contributing to a better use of resources.	4 (15.38 %)	✓	✓	✓

QUESTIONNAIRE FOR COST AND BENEFIT ANALYSIS: PROTECTED VEGETABLE PRODUCTION IN SAMAR

Please Check ( ) Conventional
( ) Protected Vegetable Production

I. General Information

1.1 Name of respondent	
1.2 Home address	
1.3 Age	
1.4 Sex	1. Male 2. Female
1.5 Household head	1. Yes 2. No
1.6 Marital status	1. Single 2. Married 3. Other; specify _____
1.7 Household size	
1.8 Formal years at school	
1.9 Years in general farming	
1.10 Years in rice farming	
1.11 Primary occupation	
1.12 Secondary occupation	
1.13 Annual household income	
1.14 Contact number	

II. Land Uses and Cropping System

2.1 Total area of agriculture and forestry land (ha) _____

2.2 Total cultivated area in 2017 (ha) _____

II.1 Use for change in physical productivity

Parcel No.	Crops Planted	Total area (ha)	Tenure status [a]	Topography [b]	Water source [c]	Distance from farm to water source (km)	Distance from home to farm (km)	Soil quality/ fertility [d]

Answer Codes:

[a] Tenure status: *1 – Owner, 2 – Rented, 3 – Tenant, 4 – Other (specify)*

[b] Topography: *1 – flat, 2 – sloping, 3 – hilly, 4 – mountainous*

[c] Water source: *1 – Irrigation, 2 – Rainfed, 3 – Well, 4 – Other (specify)*

[d] Soil quality/fertility: *1 – Good/Very Fertile, 2 – Average/Moderate, 3 – Bad/Poor, 4 – Very Poor, 5 – Not Productive*

II.2 Use for current productivity level of output

Parcel No.	Crops Planted	Area (ha)	No. of season per year	Yield by cropping season (latest or 2017) *indicate unit*		Total Yield/ year (*indicate unit*) To be computed	Total volume sold (indicate unit)	Price per unit (PhP)	Revenue per year (PhP)
				Dry season	Wet season				

2.3 Annual Crop Yield

II.3 Use for change rate of current yield under conventional practice and sensitivity analysis

Crop	Season	Yield/Unit				
		Current (2017)	2016	2015	2014	2013
Cauliflower						
Lettuce						
Broccoli						
Sweet pepper						
Tomato						
Other (specify)						

2.4 Annual Price Change

II.4 Use for change rate of farm price output and sensitivity analysis

Crop	Season	Price/unit				
		Current (2017)	2016	2015	2014	2013
Cauliflower						
Lettuce						
Broccoli						
Sweet pepper						
Tomato						
Other (specify)						

III. Agricultural practices

3.1 Do you apply any new techniques/machines/practices which increase yield?

1. Yes 2. No

If yes, please list

Name of Technique/ machine/practices used	Objective/ Reason for adoption	Starting year of adoption	Area planted with new technology practice
1.			
2.			
3.			
4.			

3.2 CSA Practices

ID	Name of CSA practice	Have you heard about this before? [a]	If yes, from whom did you know the information?	Are you currently adopting? [a]	If yes, how long have you adopted?	Reason for adoption	If no, why did you not adopt?
1	Organic agriculture						
2	Protected vegetable production						
3	Crop rotation						
4	Use of climate smart varieties (submergence, salinity, drought tolerant rice variety)						
5	Crop diversification						
6	Alley cropping						
7	Other (specify)						

Answer Codes: [a] 1 - Yes; 2 – No

Opinion on Climate-Smart Agriculture practices

What is your opinion on Climate-Smart Agriculture (CSA) practices?

(*From a scale of 1 to 4, 4 for being the highest please indicate whether you agree or disagree with the following CSA practices*)

CSA Practices	Opinion				
	Don't Know	Strongly Disagree	Disagree	Agree	Strongly Agree
Organic agriculture					
Protected vegetable production					
Crop rotation					

Use of climate smart varieties (submergence, salinity, drought tolerant rice variety)					
Crop diversification					
Alley cropping					
Other (specify)					

(*Only ask 3.3 if respondent adopted 1 of those above practices*)

3.3 In your opinion, what is the benefit of the practices that you have adopted?

1 – Increase income
2 – Less labor required
3 – Reduce pest and disease
4 – Increase quality of products
5 – Other (please specify) _____

IV. Cost and Benefit of Crop Production: Protected Vegetable Production

Use for cost structure in CBA tool. Inputs for variable: (1) physical change in machinery, inputs, services, labors of implementation cost & maintenance cost and (2) operation cost

What is the area covered by the protected structure? _____ (indicate unit)
Total cost of protected structure: PhP _____
Expected life span (years): _____
What are the types of vegetables planted in the structure? _____
_____
Source of seeds: _____
Plot below the usual planting calendar

Type of Vegetable	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Cauliflower												
Lettuce												
Broccoli												
Sweet pepper												
Tomato												
Other (specify)												

Input use

Season 1 Material Inputs: <u>Cauliflower</u> (Variety: _____)

Input use	Unit	Without Protected Structure			With Protected Structure		
		Qty	Price/ unit	Total Cost	Qty	Price/ unit	Total Cost
Total Area Planted							
Seeds							
Pole/ sticks							

Complete (14-14-14) NPK							
Urea (46-0-0) N							
Ammonium Sulfate (21-0-0) N							
Ammonium Phosphate (16-20-0) NP							
Muriate of potash (0-0-60) K							
Magnesium sulfate ($MgSO_4$)							
Zinc sulfate ($ZnSO_4$)							
BORAX							
Chicken dung							
Carbonized rice hull							
Vermicast							
Fermented plant and animal extract							
Botanical pesticides							
Other material input (specify)							
Food/meals of laborers (if any)							
Land rent							
Interest on capital							
Other expense (specify)							
Total							

Season 1 Labor Use: <u>Cauliflower</u> (Variety: _____)

Activities	Unit	**Without Protected Structure**				**With Protected Structure**			
		No. of Persons	No. of Days	Rate Per Day	Total Cost	No. of Persons	No. of Days	Rate Per Day	Total Cost
Total Area Planted									
Land preparation									
Seedbed preparation									
Planting									
Irrigation/ watering									
Fertilization									

Spraying									
Harvesting									
Pruning									
Sorting									
Packing									
Transporting and marketing									
Other (specify)									
Total									

Season 1 Yield (specify unit): _____
Price per unit: _____

Season 1 Material Inputs: <u>Lettuce</u> (Variety: _____)

Input use	Unit	**Without Protected Structure**			**With Protected Structure**		
		Qty	Price/ unit	Total Cost	Qty	Price/ unit	Total Cost
Total Area Planted							
Seeds							
Pole/ sticks							
Complete (14-14-14) NPK							
Urea (46-0-0) N							
Ammonium Sulfate (21-0-0) N							
Ammonium Phosphate (16-20-0) NP							
Muriate of potash (0-0-60) K							
Magnesium sulfate ($MgSO_4$)							
Zinc sulfate ($ZnSO_4$)							
BORAX							
Chicken dung							
Carbonized rice hull							
Vermicast							
Fermented plant and animal extract							
Botanical pesticides							
Other material input (specify)							

Food/meals of laborers (if any)							
Land rent							
Interest on capital							
Other expense (specify)							
Total							

Season 1 Labor Use: Lettuce (Variety: _____)

Activities	Unit	**Without Protected Structure**				**With Protected Structure**			
		No. of Persons	No. of Days	Rate Per Day	Total Cost	No. of Persons	No. of Days	Rate Per Day	Total Cost
Total Area Planted									
Land preparation									
Seedbed preparation									
Planting									
Irrigation/ watering									
Fertilization									
Spraying									
Harvesting									
Pruning									
Sorting									
Packing									
Transporting and marketing									
Other (specify)									
Total									

Season 1 Yield (indicate unit): _____
Price per unit: _____

Season 1 Material Inputs: <u>Broccoli</u> (Variety: _____)

Input use	Unit	Without Protected Structure			With Protected Structure		
		Qty	Price/ unit	Total Cost	Qty	Price/ unit	Total Cost
Total Area Planted							
Seeds							
Pole/ sticks							
Complete (14-14-14) NPK							
Urea (46-0-0) N							
Ammonium Sulfate (21-0-0) N							
Ammonium Phosphate (16-20-0) NP							
Muriate of potash (0-0-60) K							
Magnesium sulfate ($MgSO_4$)							
Zinc sulfate ($ZnSO_4$)							
BORAX							
Chicken dung							
Carbonized rice hull							
Vermicast							
Fermented plant and animal extract							
Botanical pesticides							
Other material input (specify)							
Food/meals of laborers (if any)							
Land rent							
Interest on capital							
Other expense (specify)							
Total							

Season 1 Labor Use: <u>Broccoli</u> (Variety: _____)

Activities	Unit	Without Protected Structure				With Protected Structure			
		No. of Persons	No. of Days	Rate Per Day	Total Cost	No. of Persons	No. of Days	Rate Per Day	Total Cost
Total Area Planted									
Land preparation									
Seedbed preparation									
Planting									
Irrigation/ watering									
Fertilization									
Spraying									
Harvesting									
Pruning									
Sorting									
Packing									
Transporting and marketing									
Other (specify)									
Total									

Season 1 Yield (indicate unit): _____
Price per unit: _____

Season 1 Material Inputs: <u>Sweet Pepper</u> (Variety: _____)

Input use	Unit	Without Protected Structure			With Protected Structure		
		Qty	Price/ unit	Total Cost	Qty	Price/ unit	Total Cost
Total Area Planted							
Seeds							
Pole/ sticks							
Complete (14-14-14) NPK							
Urea (46-0-0) N							
Ammonium Sulfate (21-0-0) N							

Ammonium Phosphate (16-20-0) NP							
Muriate of potash (0-0-60) K							
Magnesium sulfate ($MgSO_4$)							
Zinc sulfate ($ZnSO_4$)							
BORAX							
Chicken dung							
Carbonized rice hull							
Vermicast							
Fermented plant and animal extract							
Botanical pesticides							
Other material input (specify)							
Food/meals of laborers (if any)							
Land rent							
Interest on capital							
Other expense (specify)							
Total							

Season 1 Labor Use: <u>Sweet Pepper</u> (Variety: _____)

Activities	Unit	**Without Protected Structure**				**With Protected Structure**			
		No. of Persons	No. of Days	Rate Per Day	Total Cost	No. of Persons	No. of Days	Rate Per Day	Total Cost
Total Area Planted									
Land preparation									
Seedbed preparation									
Planting									
Irrigation/ watering									
Fertilization									
Spraying									
Harvesting									
Pruning									

Sorting									
Packing									
Transporting and marketing									
Other (specify)									
Total									

Season 1 Yield (indicate unit): _____
Price per unit: _____

Season 1 Material Inputs: <u>Tomato</u> (Variety: _____)

Input use	Unit	**Without Protected Structure**			**With Protected Structure**		
		Qty	Price/ unit	Total Cost	Qty	Price/ unit	Total Cost
Total Area Planted							
Seeds							
Pole/ sticks							
Complete (14-14-14) NPK							
Urea (46-0-0) N							
Ammonium Sulfate (21-0-0) N							
Ammonium Phosphate (16-20-0) NP							
Muriate of potash (0-0-60) K							
Magnesium sulfate ($MgSO_4$)							
Zinc sulfate ($ZnSO_4$)							
BORAX							
Chicken dung							
Carbonized rice hull							
Vermicast							
Fermented plant and animal extract							
Botanical pesticides							
Other material input (specify)							
Food/meals of laborers (if any)							

Land rent							
Interest on capital							
Other expense (specify)							
Total							

Season 1 Labor Use: <u>Tomato</u> (Variety: _____)

Activities	Unit	**Without Protected Structure**				**With Protected Structure**			
		No. of Persons	No. of Days	Rate Per Day	Total Cost	No. of Persons	No. of Days	Rate Per Day	Total Cost
Total Area Planted									
Land preparation									
Seedbed preparation									
Planting									
Irrigation/ watering									
Fertilization									
Spraying									
Harvesting									
Pruning									
Sorting									
Packing									
Transporting and marketing									
Other (specify)									
Total									

Season 1 Yield (indicate unit): _____
Price per unit: _____

Season 2 Material Inputs: <u>Cauliflower</u> (Variety: _____)

Input use	Unit	Without Protected Structure			With Protected Structure		
		Qty	Price/ unit	Total Cost	Qty	Price/ unit	Total Cost
Total Area Planted							
Seeds							
Pole/ sticks							
Complete (14-14-14) NPK							
Urea (46-0-0) N							
Ammonium Sulfate (21-0-0) N							
Ammonium Phosphate (16-20-0) NP							
Muriate of potash (0-0-60) K							
Magnesium sulfate ($MgSO_4$)							
Zinc sulfate ($ZnSO_4$)							
BORAX							
Chicken dung							
Carbonized rice hull							
Vermicast							
Fermented plant and animal extract							
Botanical pesticides							
Other material input (specify)							
Food/meals of laborers (if any)							
Land rent							
Interest on capital							
Other expense (specify)							
Total							

Season 2 Labor Use: <u>Cauliflower</u> (Variety: _____)

Activities	Unit	Without Protected Structure				With Protected Structure			
		No. of Persons	No. of Days	Rate Per Day	Total Cost	No. of Persons	No. of Days	Rate Per Day	Total Cost
Total Area Planted									
Land preparation									
Seedbed preparation									
Planting									
Irrigation/ watering									
Fertilization									
Spraying									
Harvesting									
Pruning									
Sorting									
Packing									
Transporting and marketing									
Other (specify)									
Total									

Season 2 Yield (specify unit): _____
Price per unit: _____

Season 2 Material Inputs: <u>Lettuce</u> (Variety: _____)

Input use	Unit	Without Protected Structure			With Protected Structure		
		Qty	Price/ unit	Total Cost	Qty	Price/ unit	Total Cost
Total Area Planted							
Seeds							
Pole/ sticks							
Complete (14-14-14) NPK							
Urea (46-0-0) N							
Ammonium Sulfate (21-0-0) N							

Ammonium Phosphate (16-20-0) NP							
Muriate of potash (0-0-60) K							
Magnesium sulfate ($MgSO_4$)							
Zinc sulfate ($ZnSO_4$)							
BORAX							
Chicken dung							
Carbonized rice hull							
Vermicast							
Fermented plant and animal extract							
Botanical pesticides							
Other material input (specify)							
Food/meals of laborers (if any)							
Land rent							
Interest on capital							
Other expense (specify)							
Total							

Season 2 Labor Use: Lettuce (Variety: _____)

Activities	Unit	**Without Protected Structure**				**With Protected Structure**			
		No. of Persons	No. of Days	Rate Per Day	Total Cost	No. of Persons	No. of Days	Rate Per Day	Total Cost
Total Area Planted									
Land preparation									
Seedbed preparation									
Planting									
Irrigation/ watering									
Fertilization									
Spraying									
Harvesting									
Pruning									

Sorting									
Packing									
Transporting and marketing									
Other (specify)									
Total									

Season 2 Yield (indicate unit): _____
Price per unit: _____

Season 1 Material Inputs: <u>Broccoli</u> (Variety: _____)

Input use	Unit	**Without Protected Structure**			**With Protected Structure**		
		Qty	Price/ unit	Total Cost	Qty	Price/ unit	Total Cost
Total Area Planted							
Seeds							
Pole/ sticks							
Complete (14-14-14) NPK							
Urea (46-0-0) N							
Ammonium Sulfate (21-0-0) N							
Ammonium Phosphate (16-20-0) NP							
Muriate of potash (0-0-60) K							
Magnesium sulfate ($MgSO_4$)							
Zinc sulfate ($ZnSO_4$)							
BORAX							
Chicken dung							
Carbonized rice hull							
Vermicast							
Fermented plant and animal extract							
Botanical pesticides							
Other material input (specify)							
Food/meals of laborers (if any)							

Land rent							
Interest on capital							
Other expense (specify)							
Total							

Season 2 Labor Use: <u>Broccoli</u> (Variety: _____)

Activities	Unit	**Without Protected Structure**				**With Protected Structure**			
		No. of Persons	No. of Days	Rate Per Day	Total Cost	No. of Persons	No. of Days	Rate Per Day	Total Cost
Total Area Planted									
Land preparation									
Seedbed preparation									
Planting									
Irrigation/ watering									
Fertilization									
Spraying									
Harvesting									
Pruning									
Sorting									
Packing									
Transporting and marketing									
Other (specify)									
Total									

Season 2 Yield (indicate unit): _____
Price per unit: _____

Season 2 Material Inputs: <u>Sweet Pepper</u> (Variety: _____)

Input use	Unit	Without Protected Structure			With Protected Structure		
		Qty	Price/ unit	Total Cost	Qty	Price/ unit	Total Cost
Total Area Planted							
Seeds							
Pole/ sticks							
Complete (14-14-14) NPK							
Urea (46-0-0) N							
Ammonium Sulfate (21-0-0) N							
Ammonium Phosphate (16-20-0) NP							
Muriate of potash (0-0-60) K							
Magnesium sulfate ($MgSO_4$)							
Zinc sulfate ($ZnSO_4$)							
BORAX							
Chicken dung							
Carbonized rice hull							
Vermicast							
Fermented plant and animal extract							
Botanical pesticides							
Other material input (specify)							
Food/meals of laborers (if any)							
Land rent							
Interest on capital							
Other expense (specify)							
Total							

Season 2 Labor Use: <u>Sweet Pepper</u> (Variety: _____)

Activities	Unit	Without Protected Structure				With Protected Structure			
		No. of Persons	No. of Days	Rate Per Day	Total Cost	No. of Persons	No. of Days	Rate Per Day	Total Cost
Total Area Planted									
Land preparation									
Seedbed preparation									
Planting									
Irrigation/ watering									
Fertilization									
Spraying									
Harvesting									
Pruning									
Sorting									
Packing									
Transporting and marketing									
Other (specify)									
Total									

Season 2 Yield (indicate unit): _____
Price per unit: _____

Season 2 Material Inputs: <u>Tomato</u> (Variety: _____)

Input use	Unit	Without Protected Structure			With Protected Structure		
		Qty	Price/ unit	Total Cost	Qty	Price/ unit	Total Cost
Total Area Planted							
Seeds							
Pole/ sticks							
Complete (14-14-14) NPK							
Urea (46-0-0) N							
Ammonium Sulfate (21-0-0) N							

Ammonium Phosphate (16-20-0) NP							
Muriate of potash (0-0-60) K							
Magnesium sulfate ($MgSO_4$)							
Zinc sulfate ($ZnSO_4$)							
BORAX							
Chicken dung							
Carbonized rice hull							
Vermicast							
Fermented plant and animal extract							
Botanical pesticides							
Other material input (specify)							
Food/meals of laborers (if any)							
Land rent							
Interest on capital							
Other expense (specify)							
Total							

Season 2 Labor Use: <u>Tomato</u> (Variety: _____)

Activities	Unit	**Without Protected Structure**				**With Protected Structure**			
		No. of Persons	No. of Days	Rate Per Day	Total Cost	No. of Persons	No. of Days	Rate Per Day	Total Cost
Total Area Planted									
Land preparation									
Seedbed preparation									
Planting									
Irrigation/ watering									
Fertilization									
Spraying									
Harvesting									
Pruning									

Sorting									
Packing									
Transporting and marketing									
Other (specify)									
Total									

Season 2 Yield (indicate unit): _____
Price per unit: _____

V. General information

5.1 How is tasks distribution/labor division in your household and farm? (whichever is applicable)

Task/Activity	Male labor (%)	Female labor (%)
Household finance decision making		
Farm management decision making		
In your household, who usually attends seminar/trainings/meetings?		
Household		
House chores		
Take care of children		
Food expense management		
Children expense management		
Agricultural activities		
Livestock		
Sale of livestock		
Land preparation		
Plowing		
Harrowing		
Farrowing		
Clearing and repair of dikes		
Planting and nursing		
Preparing the seedbed		
Preparing the seeds (soaking)		
Dispersing/Sowing of seeds		
Pulling and bundling of seedlings		
Lining the field		
Distribution of seedlings		
Planting / Transplanting		
Care and maintenance		
Manual weeding		

Use of rotary weeder		
Application of fertilizers		
Spraying organic concoction		
Spraying pesticide		
Irrigating/water management		
Harvesting and postharvest activity		
Harvesting/Reaping		
Threshing		
Winnowing		
Hauling		
Hauling		
Drying		
Sale of crop		

5.2 Do you witness any change in labor division in your community over the last 10 years? Please specify.

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5.3 What is your greatest concern regarding climate change in the future?

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Thank you for your collaboration!

QUESTIONNAIRE FOR COST AND BENEFIT ANALYSIS: ALLEY CROPPING OF UPLAND RICE IN SAMAR

Please Check ( ) Conventional/ Check Variety (specify _____)
( ) Alley Cropping CSA/ Check Variety (specify _____)

I. General Information

1.1 Name of respondent	
1.2 Home address	
1.3 Age	
1.4 Sex	1. Male 2. Female
1.5 Household head	1. Yes 2. No
1.6 Marital status	1. Single 2. Married 3. Other; specify _____
1.7 Household size	
1.8 Formal years at school	
1.9 Years in general farming	
1.10 Years in rice farming	
1.11 Primary occupation	
1.12 Secondary occupation	
1.13 Annual household income	
1.14 Contact number	

II. Land Uses and Cropping System

2.1 Total area of agriculture and forestry land (ha) _____

2.2 Total cultivated area in 2017 (ha) _____

II.1 Use for change in physical productivity

Parcel No.	Crops Planted	Total area (ha)	Tenure status [a]	Topography [b]	Water source [c]	Distance from farm to water source (km)	Distance from home to farm (km)	Soil quality/ fertility [d]

Answer Codes:

[a] Tenure status: *1 – Owner, 2 – Rented, 3 – Tenant, 4 – Other (specify)*

[b] Topography: *1 – flat, 2 – sloping, 3 – hilly, 4 – mountainous*

[c] Water source: *1 – Irrigation, 2 – Rainfed, 3 – Well, 4 – Other (specify)*

[d] Soil quality/fertility: *1 – Good/Very Fertile, 2 – Average/Moderate, 3 – Bad/Poor, 4 – Very Poor, 5 – Not Productive*

II.2 Use for outputs/activities affected by practice

Parcel No.	Crops Planted	Area (ha)	Identify name of seed variety	Source of seeds/ seedlings [a]	Qty. of seeds planted (kg)	Method employed in planting [b]	Cropping System used [c]	Which crop did you rotate/ intercrop?	Area of intercrop/ rotation? (ha)

Answer Codes

[a] Source of seeds/ seedlings: *1 - Saved from own harvest, 2 - Free from government, 3 - Purchased from private seller, 4 - Purchased from government, 5 - Other(s), specify _____*

[b] Method of planting rice: *1 - Broadcasting, 2 - Transplanting (with line/guide), 3 - Transplanting (without line/without guide)*

[c] Cropping system used: *1 - Monocropping, 2 - Crop rotation, 3 - Intercropping*

II.3 Use for current productivity level of output

Parcel No.	Crops Planted	Area (ha)	No. of season per year	Yield by cropping season (latest or 2017) *indicate unit*		Total Yield/ year (*indicate unit*) To be computed	Total volume sold (indicate unit)	Price per unit (PhP)	Revenue per year (PhP)
				Dry season	Wet season				

2.4 Annual Crop Yield

II.4 Use for change rate of current yield under conventional practice and sensitivity analysis

Crop	**Season**	**Yield/Unit**				
		Current (2017)	**2016**	**2015**	**2014**	**2013**
1	Dry					
	Wet					
2	Dry					
	Wet					
3	Dry					
	Wet					
4	Dry					
	Wet					

2.5 Annual Price Change

II.5 Use for change rate of farm price output and sensitivity analysis

Crop	Season	Price/unit				
		Current (2017)	**2016**	**2015**	**2014**	**2013**
1	Dry					
	Wet					
2	Dry					
	Wet					
3	Dry					
	Wet					
4	Dry					
	Wet					

III. Agricultural practices

3.1 Do you apply any new techniques/machines/practices which increase yield?

1. Yes 2. No

If yes, please list

Name of Technique/ machine/practices used	Objective/ Reason for adoption	Starting year of adoption	Area planted with new technology practice
1.			
2.			
3.			
4.			
5.			

3.2 CSA Practices

ID	Name of CSA practice	Have you heard about this before? [a]	If yes, from whom did you know the information?	Are you currently adopting? [a]	If yes, how long have you adopted?	Reason for adoption	If no, why did you not adopt?
1	Organic agriculture						
2	Use of Green Super Rice (submergence, salinity, drought tolerant rice variety)						
3	Crop diversification						
4	Alley cropping						
5	Other (specify)						

Answer Codes: [a] 1 - Yes; 2 - No

Opinion on Climate-Smart Agriculture practices

What is your opinion on Climate-Smart Agriculture (CSA) practices?

(*From a scale of 1 to 4, 4 for being the highest please indicate whether you agree or disagree with the following CSA practices*)

CSA Practices	Opinion				
	Don't Know	Strongly Disagree	Disagree	Agree	Strongly Agree
Organic agriculture					
Use of Green Super Rice (submergence, salinity, drought tolerant rice variety)					
Crop diversification					
Alley cropping					
Protected cultivation					
Other (specify)					

(*Only ask 3.3 if respondent adopted 1 of those above practices*)

3.3 In your opinion, what is the benefit of the practices that you have adopted?

1 – Increase income
2 – Less labor required
3 – Reduce pest and disease
4 – Increase quality of products
5 – Other (please specify) _____

Input use

Input use	Unit	Dry Season			Wet Season		
		Qty	Price/ unit	Total Cost	Qty	Price/ unit	Total Cost
1. Seeds							
2. Complete (14-14-14) NPK							
3. Urea (46-0-0) N							
4. Ammonium Sulfate (21-0-0) N							
5. Ammonium Phosphate (16-20-0) NP							
6. Muriate of potash (0-0-60) K							
7. Organic fertilizer "*commercially produced*"							
8. Organic fertilizer, (*Pls. specify:* _____)							
9. Carbonized rice hull							
10. Organic spray							
11. Herbicide							
12. Molluscicide							
13. Insecticides							
14. Fungicide							
15. Rodenticide							
16. Food/meals							
17. Fuel							
18. Irrigation fee							
19. Empty sacks							
20. Land rent							
21. Interest on capital							
22. Other (s), specify _____							
23.							
24.							
25.							
26.							
27.							

Labor use

Activities	Dry Season			Wet Season		
	No. of persons	No. of days	Rate per day	No. of persons	No. of days	Rate per day
Land Preparation						
Grass cutting and land preparation						
Clearing/Pagpanaw						
Cutting of trees/Pagkahoy						
Kaingin/Pagsunog						
Plowing with carabao						
Harrowing/Final leveling with carabao						
Final land preparation						
Total						
Crop and Contour Hedgerow Establishment						
Marking of contour lines						
Planting of hedgerow materials						
Dibbling/Sowing of palay seeds						
Total						
Care and maintenance						
First hand weeding						
Final hand weeding						
Hand weeding (contour hedgerow)						
Fertilization						
Spraying						
Warding-off of birds						
Total						
Harvesting and post-harvest operations						
Manual harvesting/Reaping of palay/Gathering of harvest						
Manual threshing of harvested palay						
Winnowing and bagging of threshed palay						
Drying						
Harvesting of hedgerow materials						
Hauling						
Transporting						
Total						
GRAND TOTAL						

V. General information

5.1 How is tasks distribution/labor division in your household and farm?

Task/Activity	Male labor (%)	Female labor (%)
Household finance decision making		
Farm management decision making		
In your household, who usually attends seminar/trainings/meetings?		
Household		
House chores		
Take care of children		
Food expense management		
Children expense management		
Agricultural activities		
Livestock		
Sale of livestock		
Land preparation		
Plowing		
Harrowing		
Farrowing		
Clearing and repair of dikes		
Planting and nursing		
Preparing the seedbed		
Preparing the seeds (soaking)		
Dispersing/Sowing of seeds		
Pulling and bundling of seedlings		
Lining the field		
Distribution of seedlings		
Planting / Transplanting		
Care and maintenance		
Manual weeding		
Use of rotary weeder		
Application of fertilizers		
Spraying organic concoction		
Spraying pesticide		
Irrigating/water management		
Harvesting and postharvest activity		
Harvesting/Reaping		
Threshing		
Winnowing		
Hauling		
Hauling		
Drying		
Sale of crop		

5.2 Do you witness any change in labor division in your community over the last 10 years? Please specify.

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5.3 What is your greatest concern regarding climate change in the future?

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Thank you for your collaboration!

Protected Cultivation of High Value Vegetables in Samar Province

Investment Brief

FRONT PAGE

Protected Cultivation of High Value Vegetables

Protected cultivation of high value vegetables such as cauliflower, lettuce and sweet pepper is a CRA practice that makes use of permanent structure covered in plastic. This production system enables the production of vegetables year-round. Compared to open field cultivation, farmers adopting the CRA practice can increase yield and income as well as support the production of clean and safe vegetables. Moreover, protected cropping can result to reduced leaching of nutrients and use of fertilizers and pesticides. Hence, it contributes to decreased emission of CO^2 and to improvement in water quality.

Impacts of Protected Cultivation on:

Productivity

- Protected cropping increases the frequency of planting of vegetables per year from three to five times.

- Provides farmers higher yield and increased income.
- Supports the production of safe and clean vegetables.
- The CRA practice requires an additional initial investment of approximately PhP 109,246.00 (USD 2,128.73) per structure. The production of cauliflower, lettuce and sweet pepper provides a positive net present value of PhP 204,678.00 (USD 3,988.27).

Adaptation

- Protected cultivation enables the production of high value vegetables year-round.
- Reduces use of fertilizers and pesticides.

Mitigation

- Decreases emission of CO^2 from reduced pesticide application.
- Improves water quality.

Cost-Benefit Analysis: Highlights

Without CRA (Open Filed Cultivation)	With CRA (Protected Cultivation)
Yield/ 100m^2/ year • Cauliflower ------- 83kg • Lettuce ---------- 16kg • Sweet pepper --- 0kg • • Cauliflower -------PhP 135/ kg • Lettuce ---------- PhP 300/ kg • Sweet pepper --- PhP 150/ kg	Yield/ 100m^2/ year • Cauliflower -------112kg • Lettuce ---------- 176kg • Sweet pepper --- 102kg • • Cauliflower --------PhP 135/ kg • Lettuce ----------PhP 300/ kg • Sweet pepper ------PhP 150/
Investment: PhP 109,246.00 USD 2,128.73	
Payback Period	5 years

Recommendation: Why invest?

- Based on current yield, price and 12% discount rate, the CRA can be a worthwhile investment.
- It requires an additional initial investment of PhP 109,246.00 (USD 2,128.73) to establish the permanent protected structure.
- The investment can be recovered in 5 years.
- The positive incremental benefit starts in year 1.
- It has a potential higher private NPV and IRR of PhP 204,678.00 (USD 3,988.27) and 49.94%, respectively.

INSIDE PAGES

Overview

Region VIII has a total land area of 2,143,169 hectares, 45% of which (964.4 hectares) is devoted to agriculture (NEDA, 2011). The province of Samar has a total land area of 604,803 hectares. As of 2016, it devoted about 280,474 hectares (46%) to agriculture (PLGU-Samar, 2016). The top five crops in the province include coconut, rice, banana, corn and rootcrops. With increasing demand, high value vegetables such as cauliflower, lettuce and sweet pepper become more important. They have shorter growing period hence provide farmers faster additional income.

However, production of high value vegetables in the region is highly affected by its Type IV rainfall pattern. Aside from high annual rainfall, this is characterized by a distinct wet season (from July to January) and a significant amount of rainfall for the remainder of the year. The frequent typhoons that occur in the region makes vegetable farming more difficult and results to shortage of supply (Gonzaga *et al*. 2013). The use of protected structures can save vegetables from damage due to heavy rainfall and winds hence, protecting farmers from incurring losses.

Similar to other provinces in the region, Samar receives heavy rainfall throughout the year and is frequently visited by typhoons. It is subjected to a number of climate-related hazards. Aside from typhoon, the area is also prone to rain-induced landslide, drought, sea level rise and flooding during heavy rainfall. Moreover, it is considered under Category 2 (with 50–75% of the residents considered poor) based on the 2012 Family Income and Expenditure Survey. With this combination of socio-spatial traits, the vulnerability of the population to natural hazards becomes higher.

Protected Cultivation of High Value Vegetables

Protected cropping system is one of the strategies for climate change protection in vegetable farming. This CRA makes use of permanent structure covered in plastic that has an effective cultivation area of 100m^2. It involves the year-round production of high value vegetables such as cauliflower, lettuce and sweet pepper.

Aside from damage due to heavy rainfall and strong winds, farmers encounter problems of pest infestation with open field cultivation of vegetables. This requires higher use of pesticides to control pest and diseases. With protected structures, pest and disease infestation is lessened resulting to reduction in the use of pesticides.

The CRA enables farmers to produce good quality and safe, high value vegetables year-round. Moreover, it provides them higher yield and increased income. Decreased application of pesticides could contribute to lesser emission of CO^2 and improvement in water quality.

Why is the CRA practice better than the conventional upland rice cultivation?

- Off-season/ year-round production of high value vegetables.
- Reduces the use of fertilizers and pesticides, hence lessens costs for these inputs.

- Protects the crop from damage due to heavy rainfall and strong winds.
- Reduces nutrient leaching and provides better soil condition for plant growth.
- Decreases emission of CO^2 from reduced pesticide application.
- Improves water quality.

CRA Project Site Map

Data Gathering

Consultation Meeting

The CRA practice was identified through a Consultation Meetings with 20 out of 26 MAOs/ CAOs in Samar province on October 10, 2017. This was validated with DA8 key officials and DA field staff in the municipality of Sta. Rita on February 7–8, 2018.

Key Informant Interview/ Survey

Primary input-output data were gathered for both alley cropping and conventional practices through key informant interviews (KIIs) with one farmer cooperator of the *Yamang Lupa* Program (YLP) and another farmer who grows the same types of high value vegetables from March 20–23, 2018 in the municipality of Sta. Rita, Samar. Results of the KIIs were validated with results of field trials conducted in the region by the YLP.

Use of Secondary Data

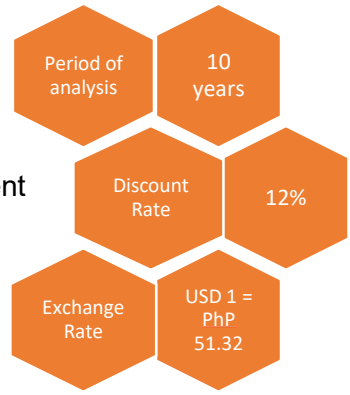
Secondary data on the level and value of externalities, local interest rate, and foreign exchange rate were also gathered. These were used in the cost-benefit analysis.

The CIAT CBA Methodology

Cost-Benefit Analysis (CBA) was used to determine the relative profitability between the CRA and conventional upland rice farming practices using the CIAT CBA Online Tool. It involves the comparison of annual flows of incremental benefits with that of incremental costs. It analyzes the full benefits and costs of the CRA practice and adoption responses for both individual farmers and the aggregate level of the affected population.

Cost-Benefit Analysis Results

The CRA practice requires an additional initial investment of about PhP 109,246.00 (USD 2,128.73 at PhP51.32 exchange rate) per structure. Incremental costs are incurred mainly for the establishment of the permanent protected structure. The investment can be recovered after five years. A positive incremental net benefit can be realized starting the first year of operation. The estimated annual incremental net benefit is about PhP 58,449.00 (USD 1,138.92).



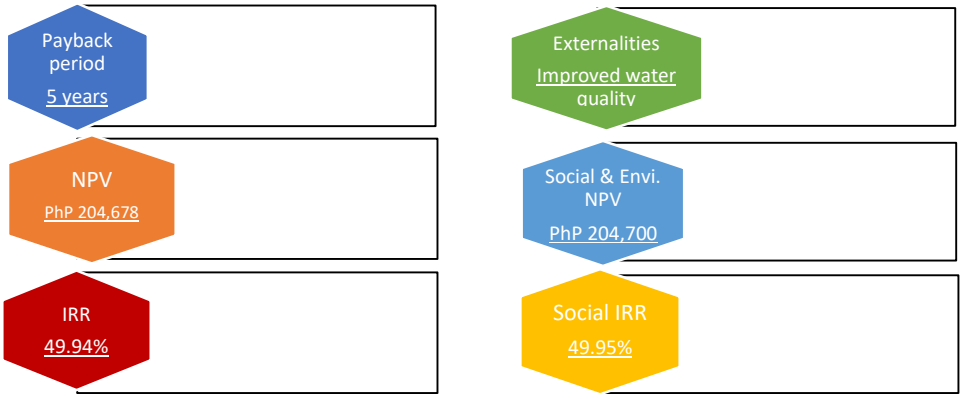
Without CRA (Open Filed Cultivation)	With CRA (Protected Cultivation)
Yield/ 100m^2/ year • Cauliflower ------- 83kg • Lettuce ---------- 16kg • Sweet pepper --- 0kg • • Cauliflower -------PhP 135/ kg • Lettuce ---------- PhP 300/ kg • Sweet pepper --- PhP 150/ kg	Yield/ 100m^2/ year • Cauliflower -------112kg • Lettuce ---------- 176kg • Sweet pepper --- 102kg • • Cauliflower --------PhP 135/ kg • Lettuce ----------PhP 300/ kg • Sweet pepper ------PhP 150/
Investment: PhP 109,246.00 USD 2,128.73	
Payback Period	5 years

Based on current yield, price of vegetables, and 12% discount rate, the CRA can be a worthwhile investment. It has a potential higher private NPV and IRR of PhP 204,678.00 (USD 3,988.27) and 49.94%, respectively. Taking into account the value of improved water quality, the CRA seems

not so attractive from the point of view of society. It has a more or less similar social NPV of PhP 204,700.00. (USD 3,988.7) and quasi-IRR of 49.95%.

Given the pilot area, the current adoption of the CRA can rise to 30%. This can generate total benefits of about PhP 324M (USD 6,313,007.09).

Farm Level Analysis



Aggregate Analysis

Total Area of upland Rice	Current Adoption Rate	Projected Adoption Rate	Aggregate NPV (PhP)
2,200 structures	**5%**	**30%**	**PhP 324M US$ 6,313,007**

Sensitivity Analysis

Even with a 10% reduction in the yield of cauliflower, the CRA practice still proves profitable and a worthwhile investment.

Recommendations

Given the above findings, it is recommended that the Government promote the adoption of the CRA practice and ensure programs to provide financial support for the establishment of permanent protected structures. Moreover, in order to reduce the degree of uncertainty in the evaluation of the impacts of the CRA practice, it is recommended to allocate funds to finance research programs to gain more information on yield and environmental externalities.

Where?

Protected cultivation of high value vegetables is profitable in the province of Samar.

What?

It is recommended that farmers adopting the CRA practice must grow cauliflower, lettuce and sweet pepper. Other vegetables like chili pepper and tomato can be grown.

Who?

The CRA practice is recommended to farmers engaged in vegetable production.

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About the Authors

This Investment Brief was authored by the team from the Visayas State University (VSU), CIAT SUC partner for the Climate Resilient Agriculture Decision Support Project in Region VIII.

Dr. Pastor P. Garcia, Project Leader, Visayas State University
pastor.garcia@vsu.edu.ph

Dr. Fe M. Gabunada, Agricultural Economist, Visayas State University
fe.gabunada@vsu.edu.ph

Prof. Alan B. Loreto, GIS Expert, Visayas State University
alan.loreto@vsu.edu.ph

Dr. Dionesio M. Bañoc, Farming System Expert, Visayas State University
dionesio.banoc@vsu.edu.ph

Engr. Kim Ralph D. Rosal, Research Assistant, Visayas State University

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Alley Cropping Using Pineapple (*Ananas comosus* L.) as Hedgerow in Upland Rice Production in Samar Island

Investment Brief

FRONT PAGE

Alley Cropping Using Pineapple as Hedgerow in Upland Rice Production

Alley cropping is one of the strategies for climate change protection in rice farming. It involves planting of pineapple (*Ananas comosus*) along the contour as vegetative barrier and upland rice between hedgerows using the aromatic *Kalinayan* variety. Aside from climate change adaptation potential, it also provides ecological benefits. It can buffer alley crops to weather extremes and diversify income (from upland rice and pineapple) to hedge financial risk. Moreover, it can increase biodiversity, reduce soil erosion, and improve nutrient as well as water use efficiency (Wolz *et al*., 2018).

Impacts of Alley Cropping on:

Productivity

- Alley cropping provides additional income from pineapple as hedgerow material.

- The CRA practice requires an additional initial investment of approximately PhP10,280.00 (USD200.31) per hectare. The production of both upland rice and pineapple provides a positive net present value of PhP76,940.00 (USD1,499.23).

Adaptation

- The CRA enables farmers to diversify income source that protects them against financial losses.
- It also increases biodiversity.

Mitigation

- The CRA practice helps improve nutrient and water use efficiency.
- It reduces soil erosion by 16.33 Mg/ ha/ yr.

Cost-Benefit Analysis: Highlights

Without CRA (Traditional Upland Rice Cultivation)	With CRA (Alley Cultivation)
Yield/ha/year • Upland rice --- 22 sacks Price • Upland rice --- PhP2,100/ sack	Yield/ha/year • Upland rice --- 7 sacks • Pineapple --- 1,300 fruits Price • Upland rice --- PhP2,100/ sack • Pineapple --- PhP30/ fruit
Investment:	PhP10,280 USD200.31
Payback Period	3 years

Recommendation: Why invest?

- Based on current yield, price and 12% discount rate, the CRA can be a worthwhile investment.
- It requires an additional initial investment of only PhP10,280.00 ($200.31) per hectare to establish the alley crop and produce upland rice.
- The investment can be recovered in 3 years.
- The positive incremental benefit starts in year 2.
- It has a potential higher private NPV and IRR of PhP76,940.00 (USD1,499.23) and 87%, respectively.

INSIDE PAGES

Overview

Region VIII has a total land area of 2,143,169 hectares, 45% of which (964.4 hectares) is devoted to agriculture (NEDA, 2011). The province of Samar has a total land area of 604,803 hectares. As of 2016, it devoted about 280,474 hectares (46%) to agriculture (PLGU-Samar, 2016). The top five crops in the province include coconut, rice, banana, corn and rootcrops.

Rice remains the staple food of the people not only in the province of Samar but also in Eastern Visayas Region. The average per capita consumption of rice in Region VIII is 127kg/ year. Among the six provinces, Samar ranks fourth in terms of average per capita rice consumption in the amount of 128kg/ year (DA8, 2012). Aside from being the source of staple food, rice cultivation provides employment opportunities.

Rice accounts for 21.86% of the total agricultural output in Eastern Visayas. Rice production environments in the region include irrigated and rainfed areas (classified as lowland and upland). As of 2013, Region VIII has a total of 6,286 hectares devoted to upland rice production (DA8,

2013). The province of Samar has the largest upland rice environment (3,798 hectares), followed by Northern Samar (1,127 hectares). One of the programs aimed at increasing rice productivity and competitiveness in the region is Agri-Pinoy Rice Program. One of the strategies employed is harnessing the potential of upland areas for sustainable farming practices like alley cropping.

Similar to other provinces in the region, Samar receives heavy rainfall throughout the year and is frequently visited by typhoons. It is subjected to a number of climate-related hazards. Aside from typhoon, the area is also prone to rain-induced landslide, drought, sea level rise and flooding during heavy rainfall. Moreover, it is considered under Category 2 (with 50–75% of the residents considered poor) based on the 2012 Family Income and Expenditure Survey. With this combination of socio-spatial traits, the vulnerability of the population to natural hazards becomes higher.

Alley Cropping Using Pineapple as Hedgerows in Upland Rice Production

Upland rice production is highly important especially in the province of Samar. Among the provinces in Eastern Visayas, it has the largest area devoted to upland rice production. However, the farming practices employed by farmers are very traditional that usually results to low productivity (DA8, 2013).

One of the improved practices for upland rice production introduced in the region is alley cropping using pineapple as hedgerows. It promotes the use of *Kalinayan* cultivar, a peculiar and popular aromatic upland rice variety in the region. *Kalinayan* is a much sought-after rice variety despite its higher price because of its excellent aroma, pinkish kernel and good eating quality (DA8, 2012) hence tastier and healthier to eat. Just like other aromatic cultivars, it can have higher milling recovery and good cooking qualities (Mante, 2016).

The CRA practice makes use of a high-valued cop such as pineapple as vegetative barrier. Its effectiveness in mitigating soil erosion is comparable to shrubs and trees. Moreover, it prevents the run-off and loss of nutrients particularly N and K and contributes to higher soil pH, organic matter and available N and K (Sharma *et al*., 1997).

Why is the CRA practice better than the conventional upland rice cultivation?

- Diversification of income source that protects farmers against financial loss.
- Preservation of the *Kalinayan* upland rice variety.
- Increases farm biodiversity.
- Reduces soil erosion.
- Improves nutrient and water use efficiency.

CRA Project Site Map

Data Gathering

Consultation Meeting

The CRA practice was identified through a Consultation Meetings with 20 out of 26 MAOs/ CAOs in Samar province on October 10, 2017. This was validated with DA8 key officials and DA field staff in the municipalities of Sta. Margarita and Sta. Rita on February 7–8, 2018.

Key Informant Interview/ Survey

Primary input-output data were gathered for both alley cropping and conventional practices through key informant interviews (KIIs) with two farmer cooperators and survey of six upland rice farmers from May 22–24, 2018 in the municipalities of Calbiga and Motiong, Samar and Lope de Vega, Northern Samar. Results of the KIIs and survey were validated with results of field trials conducted in the region by the Philippine Rural Development Program (PRDP) project.

Use of Secondary Data

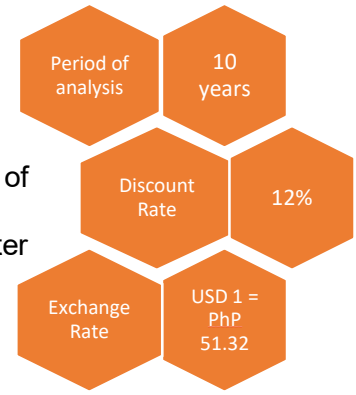
Secondary data on the level and value of externalities, local interest rate, and foreign exchange rate were also gathered. These were used in the cost-benefit analysis.

The CIAT CBA Methodology

Cost-Benefit Analysis (CBA) was used to determine the relative profitability between the CRA and conventional upland rice farming practices using the CIAT CBA Online Tool. It involves the comparison of annual flows of incremental benefits with that of incremental costs. It analyzes the full benefits and costs of the CRA practice and adoption responses for both individual farmers and the aggregate level of the affected population.

Cost-Benefit Analysis Results

The CRA practice requires an additional initial investment of about PhP10,280.00. (USD200.31 at PhP51.32 exchange rate) per hectare. Incremental costs are incurred mainly for the establishment of pineapple vegetative hedgerows. The investment can be recovered after three years. Due to transition of production, positive incremental net benefit can be realized starting the second year. The estimated annual incremental net benefit is about PhP20,685.00 (USD403.06).

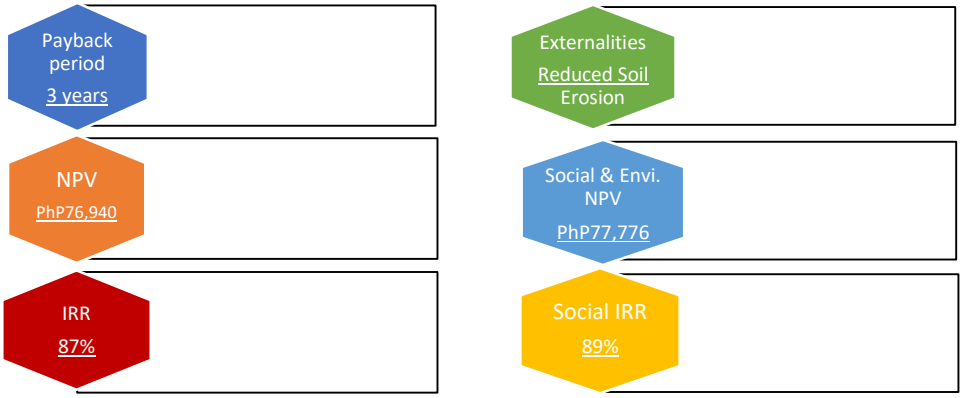


Without CRA (Traditional Upland Rice Cultivation)	With CRA (Alley Cultivation)
Yield/ha/year • Upland rice --- 22 sacks Price • Upland rice --- PhP2,100/ sack	Yield/ha/year • Upland rice --- 7 sacks • Pineapple --- 1,300 fruits Price • Upland rice --- PhP2,100/ sack • Pineapple --- PhP30/ fruit
Investment:	PhP10,280 USD200.31
Payback Period	3 years

Based on current yield, price premium for *Kalinayan* rice, price of pineapple, and 12% discount rate, the CRA can be a worthwhile investment. It has a potential higher private NPV and IRR of PhP76,940.00 (USD1,499.23) and 87%, respectively. Taking into account the value of reduced soil erosion, the CRA seems to be more attractive from the point of view of society. It has a potential increased NPV of PhP77,776.00. (USD1,515.52) and quasi-IRR of 89%.

Given the pilot area, the current adoption of the CRA can rise to 27%. This can generate total benefits of about PhP230.15M (USD4,484,635).

Farm Level Analysis



Aggregate Analysis

Total Area of upland Rice	Current Adoption Rate	Projected Adoption Rate	Aggregate NPV (PhP)
6,286 hectares	**10%**	**27%**	**PhP 230.15M US$ 4,484,635**

Sensitivity Analysis

Even with a 15% reduction in the price of pineapple, the CRA practice still proves profitable and a worthwhile investment.

Recommendations

Given the above findings, it is recommended that the Government promote the adoption of the CRA practice and ensure programs to support the availability of supply of pineapple suckers and quality seeds of *Kalinayan* rice variety. Moreover, in order to reduce the degree of uncertainty in the evaluation of the impacts of the CRA practice, it is recommended to allocate funds to finance research programs to gain more information on yield and environmental externalities.

Where?

Alley cropping using pineapple as hedgerow in upland rice production is profitable in Samar Island. Aside from farmers engaged in upland rice production in the province of Samar, those from Northern Samar can also benefit from this CRA practice.

What?

It is recommended that farmers adopting the CRA practice must plant pineapple as hedgerow material. They should also use the *Kalinayan* upland rice variety.

Who?

The CRA practice is recommended to farmers engaged in upland rice production.

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About the Authors

This Investment Brief was authored by the team from the Visayas State University (VSU), CIAT

SUC partner for the Climate Resilient Agriculture Decision Support Project in Region VIII.

Dr. Pastor P. Garcia, Project Leader, Visayas State University
pastor.garcia@vsu.edu.ph

Dr. Fe M. Gabunada, Agricultural Economist, Visayas State University
fe.gabunada@vsu.edu.ph

Prof. Alan B. Loreto, GIS Expert, Visayas State University
alan.loreto@vsu.edu.ph

Dr. Dionesio M. Bañoc, Farming System Expert, Visayas State University
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Appendix J. List of training activities included in AMIA-Region8 Phase 2

Capacity strengthening on CRVA	Training-workshop
Capacity strengthening on CBA	Training-workshop
Orientation of AMIA to RFO programs, identification/incorporation of AMIA activities to programs' plans	Training-workshop
Training on climate information services (CIS),Climate resilient Field School (CrFS)	Training-workshop
Strengthening of Farmers' association on CCA adaptation	Training-workshop
Training on Monitoring and assessment tool on resiliency	Training-workshop