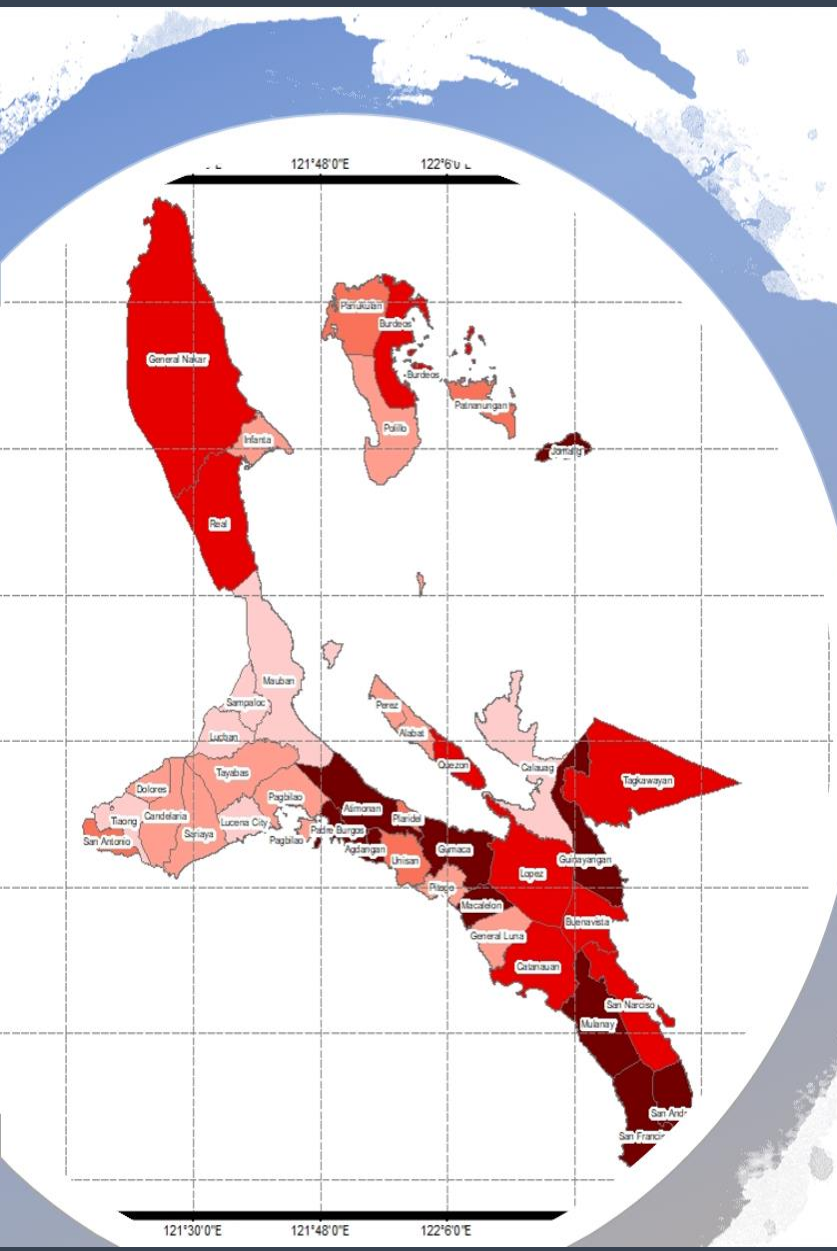

Climate Risk Vulnerability Assessment as a Decision Support Tool for Science-Based Planning in Agriculture Sector in Quezon Province

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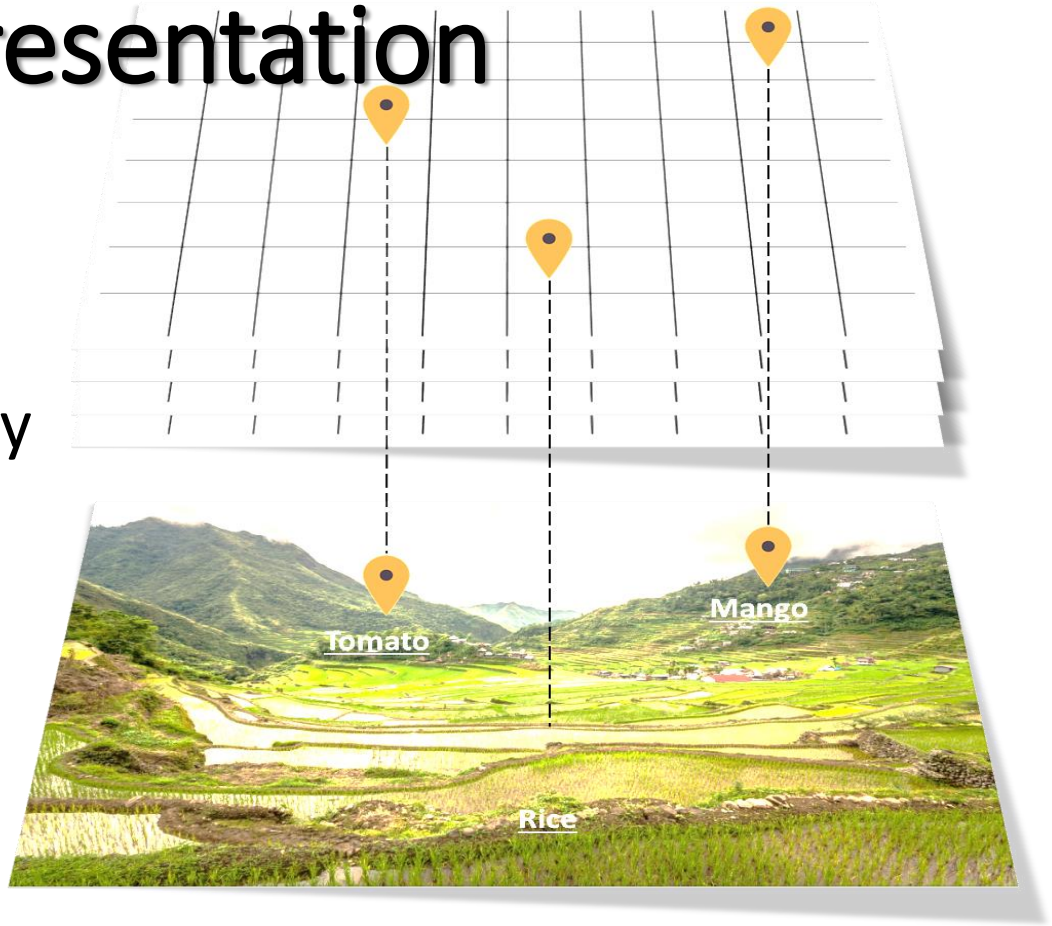
Lucban, Quezon

Outline of the Presentation

I. Rationale
II. Objectives of the study
III. Methodology
IV. Results
V. Conclusion
VI. Recommendation



RATIONALE

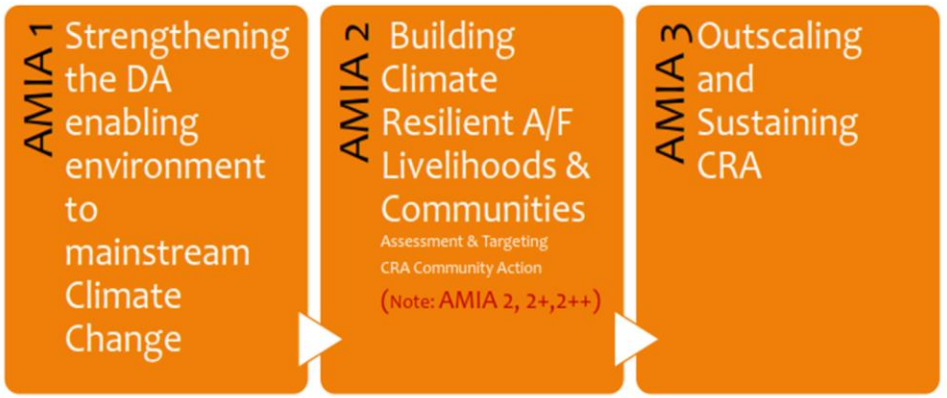
- Agriculture sector is the source of food and livelihood
- Backbone of Philippine Economy
- Source of employment for 30% of labor force in the Philippines

Brown, Ebora and Decena (2018)

Climate Change is REALLY here!

- Agriculture considered to be the most vulnerable sector
- High dependence on climate and weather
- Low ability to adapt of farmers and fisherfolks due to socio-economic condition
- Poorest among the poor sector in the Philippine Society (NEDA, 2009)

- ADAPTATION & MITIGATION INITIATIVES IN AGRICULTURE
- To respond to the challenges posed by Climate Change in agriculture sector
- Department of Agriculture issued a memorandum dated January 25, 2013
- Mainstreaming of Climate Change in the DA Programs, Plans and Budget.



(Source: DA-SWACCO)

Region	Province	Partner SUC
Ilocos Region (Reg. 1)	Ilocos Sur	Mariano Marcos State University
Cagayan Valley (Reg. 2)	Isabela	Isabela State University
Central Luzon (Reg. 3)	Tarlac	Tarlac Agricultural University
CALABARZON (Reg. 4A)	Quezon	Southern Luzon State University
Bicol (Reg. 5)	Camarines Sur	Partido State University
Western Visayas (Reg. 6)	Iloilo	Iloilo State College of Fisheries
Northern Mindanao (Reg. 10)	Bukidnon	Central Mindanao University
Davao (Reg. 11)	Davao City	University of Southeastern Philippines
Soccsksargen (Reg. 12)	North Cotabato	University of Southern Mindanao
Negros Island (Reg. 18)	Negros Occidental	Visayas State University

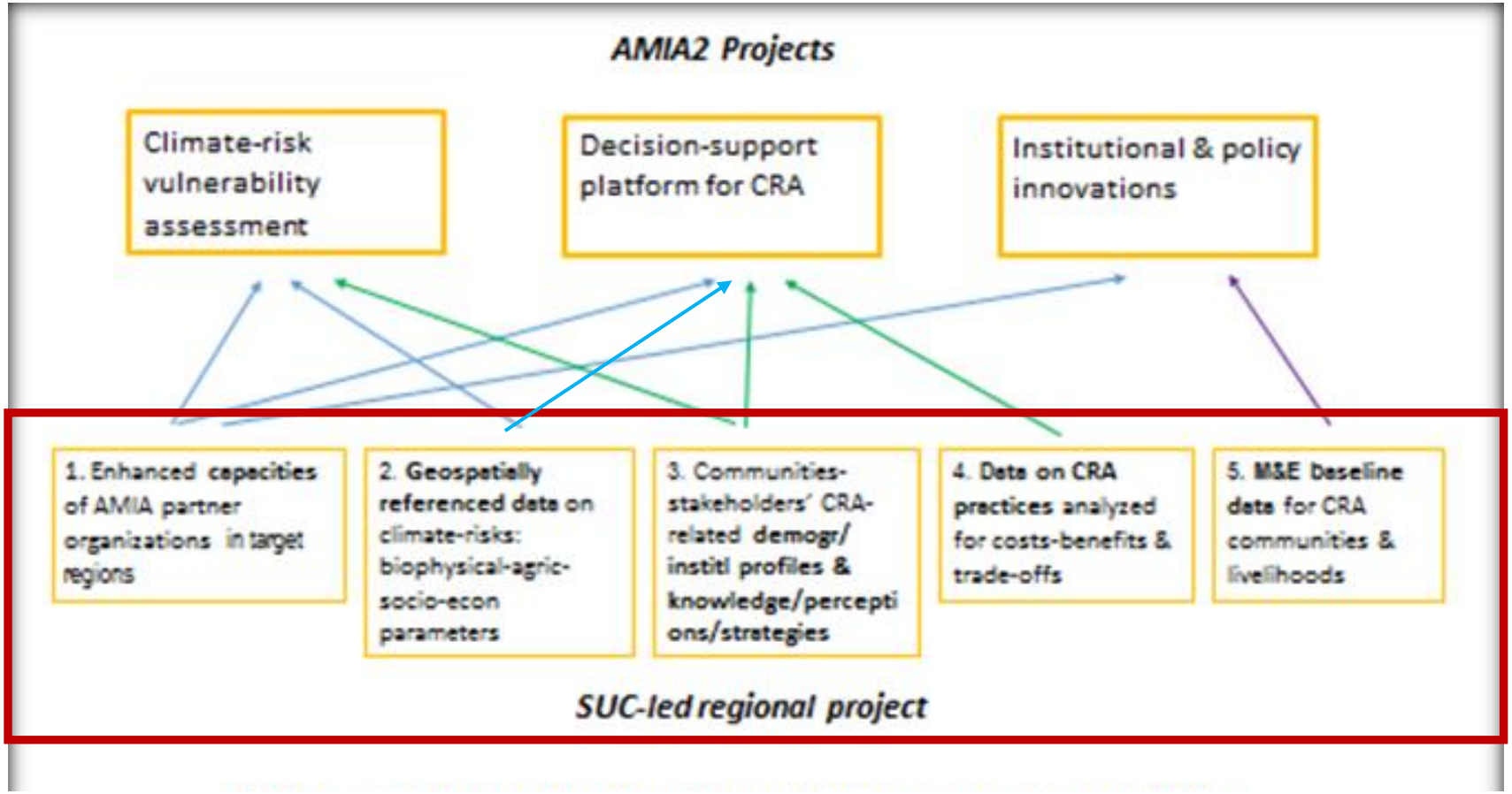


Figure 1. *The conceptual framework of DA's Adaptation and Mitigation Initiatives in Agriculture (AMIA) Program Phase 2 (source: CIAT)*

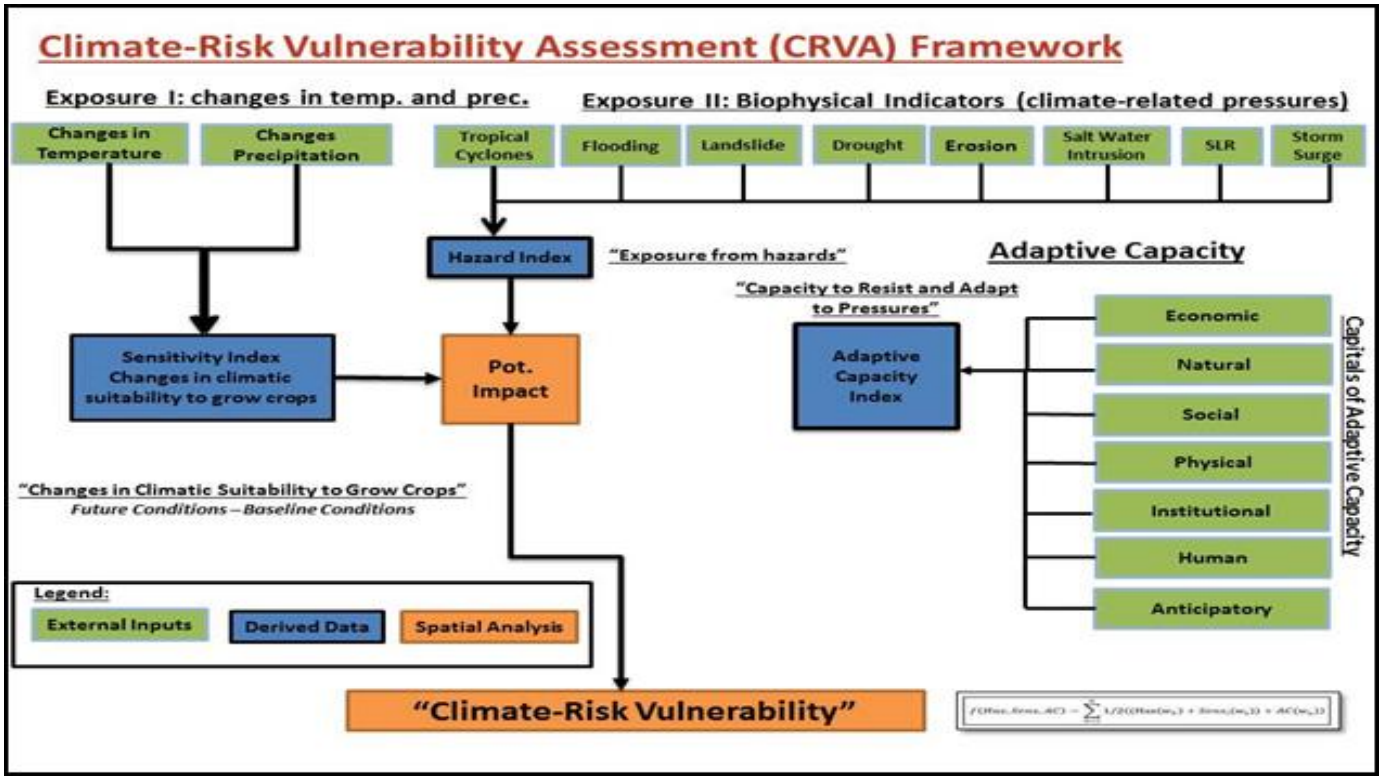
OBJECTIVES:

MAIN PURPOSE: To assess the climate-risk vulnerability of climate resilient agricultural practices and provide inputs for science-based planning in agriculture sector in Quezon Province.

Specific Objectives:

1. To assess climate risks of the province agriculture sector using geospatial and climate modelling tools
2. To document and analyze local CRA practices to support science-based planning
3. To identify the effectiveness of the training program for science-based planning in the community

METHODOLOGY: GEOSPATIAL ASSESSMENT



$$f(Haz, Sens, AC) = \sum_{n=i}^{n} \frac{1}{2}\left(\left(Haz_{(w_h)} + Sens_{(w_s)}\right) + 1 - AC_{(w_a)}\right)$$

METHODOLOGY

- Focus Group Discussion and Workshop as main technique in data collection
- Supported with secondary data sources
  - Local Stakeholders Knowledge and Strategies
  - Crop Occurrence and Hazards exposure identification

METHODOLOGY

HAZARDS EXPOSURE

HAZARDS CONSIDERED
1. Typhoon
2. Flooding
3. Erosion
4. Sea Level Rise
5. Drought
6. Landslide
7. Storm Surge
8. Salt Water Intrusion

Weights (%) à

Criteria	Typhoon		Flooding		Erosion		Sea Level Rise		
	Rate	Weight	Rate	Weight	Rate	Weight	Rate	Weight	
Probability of Occurrence	5	0.24	5	0.25	3	0.20	1	0.08	
Impact to Local Household Income	5	0.24	4	0.20	3	0.20	2	0.17	
Impact to Key Natural Resources to Sustain Productivity (i.e., water quality & quantity, biodiversity, soil fertility)	4	0.19	4	0.20	3	0.20	1	0.08	
Impact to Food Security of Luzon	4	0.19	4	0.20	2	0.13	1	0.08	
Impact to Food Security of the Country		0.00		0.00		0.00		0.00	
Impact to Nat'l Economy	3	0.14	3	0.15	1	0.07	1	0.08	
TOTAL	21	1.00	20	1.00	12	0.80	6	0.50	59
	0.36		0.34		0.20		0.10		1.00

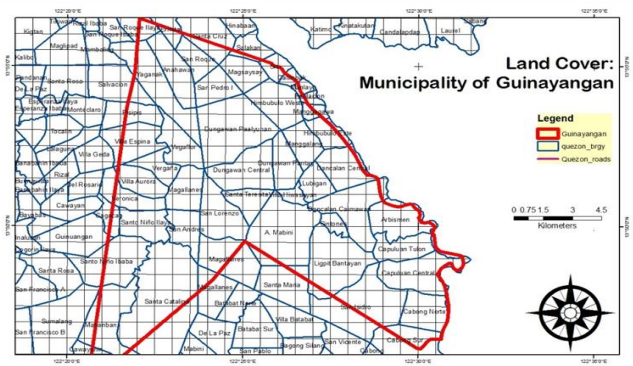
METHODOLOGY

SENSITIVITY/SUITABILITY ANALYSIS

How was the data collected for crop occurrence?

CROPS CONSIDERED
1. Rice
2. Corn
3. Squash
4. Cacao
5. Coffee

Location of crops

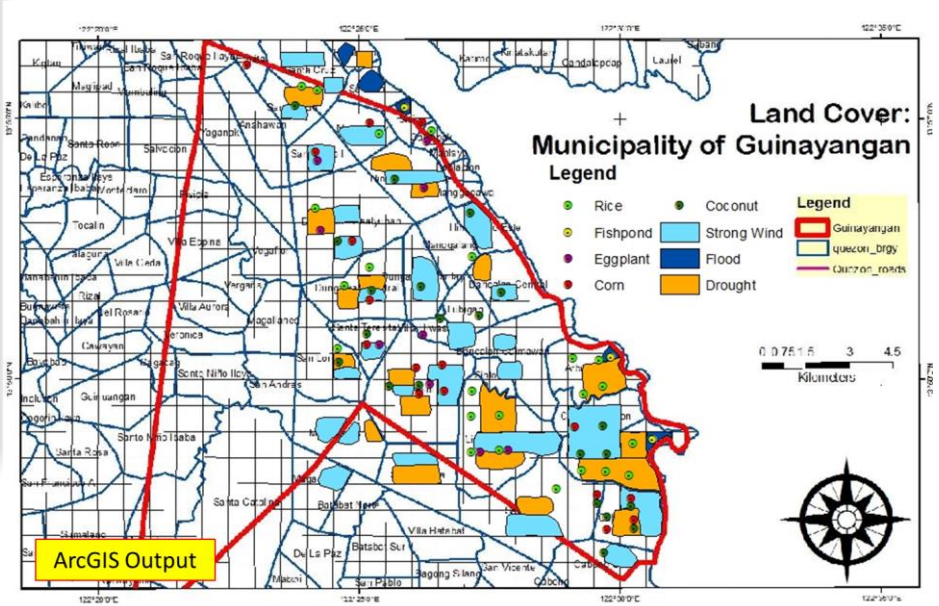


Fishnet of 1km x 1km aligned to climate grid
Other features included as reference

Staff from
Local Government Units
Agricultural Department

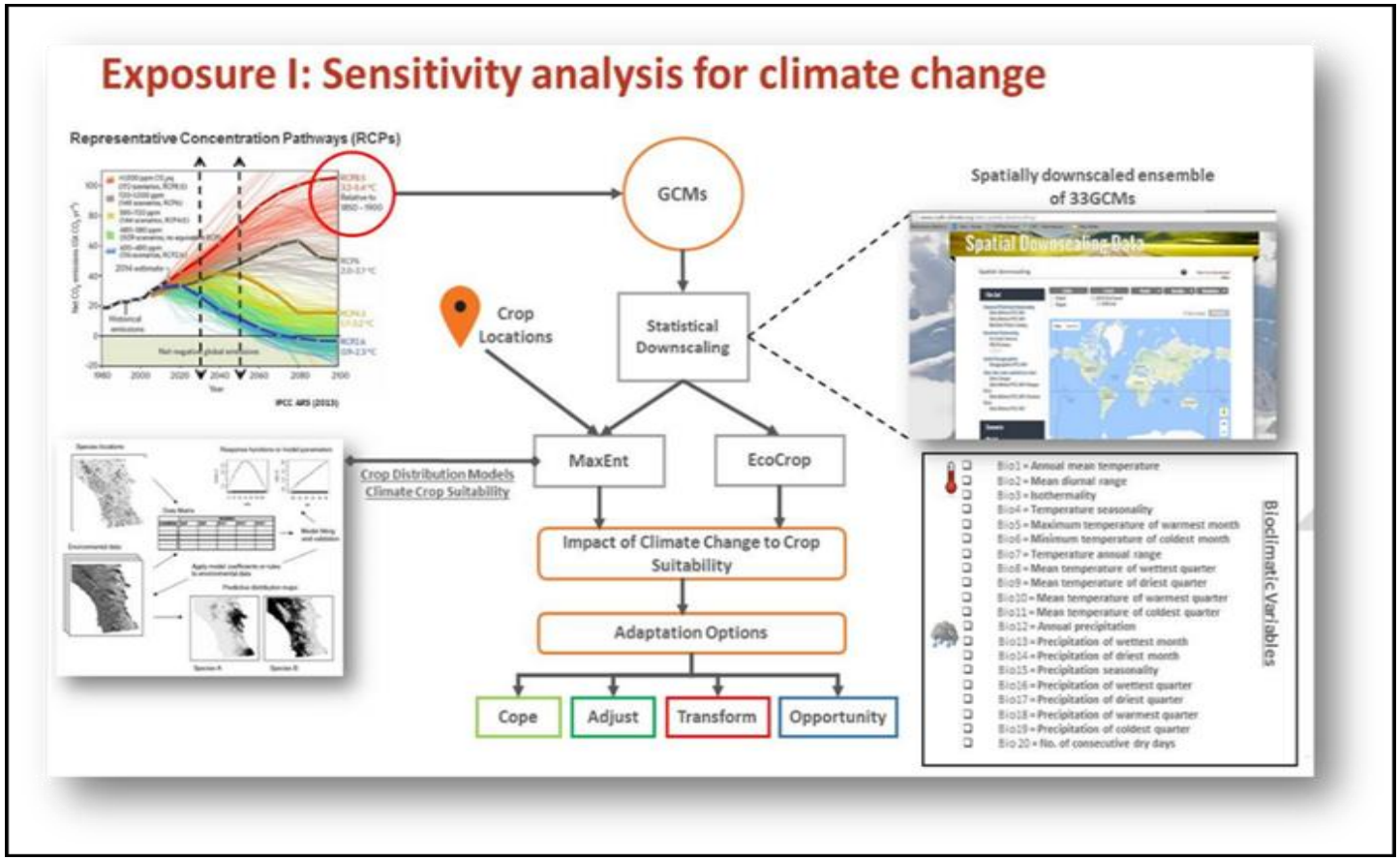
METHODOLOGY

Output derived from the workshop



ArcGIS Output

METHODOLOGY



METHODOLOGY

Adaptive Capacity

ECONOMIC CAPITAL	INDICATOR
Yield(MT/ha)	
	Rice
	Irrigated
	Rainfed
Corn	
	Yellow
	white
	green
Eggplant	
Squash	
Cacao	
Coffee	
Napier	
Tilapia	
Income Level	% of poverty incidence
Households have running water and sanitation	
	% of HH with potable water
	% of HH with sanitary toilet
Households have electricity	No. of energized Barangay
Access to credit	No. of microfinance institution
	No. of finance cooperatives
Commodity Price Fluctuation	Inflation Rate
Diversified Income and off-farm income	% of off-farm to total income
Agricultural insurance	% of farmers with access
Employment in agriculture	% of total pop'n.

NATURAL CAPITAL	INDICATOR
Soil Organic Matter	Soil Type
Supporting Ecosystems and their Health	Area of MPAs
Groundwater availability	% of farmers with access
Reliable water for irrigation	% of farmers with access

SOCIAL CAPITAL	INDICATOR
Existence of farmer's groups or unions	No. of registered farmer groups or unions
Participation/ Activity of farmer's groups or unions	% of farmers who are members of coops/unions/groups
Equity of women and men in decision making	% of women in gov't. (i.e. elected officials)
Inclusion of Ethnic Minorities	

HUMAN CAPITAL	INDICATOR
Educational Level	
i. literacy rate	
ii. Average school years	
iii. TOTAL of school enrollment	
Pre-School	
Elementary	
Secondary	
Quality of education in local schools	
	Teacher-student ratio(%)
	No. of classrooms and school bldg.
Adults in households	Age dependency ratio
Health	
i. health centers	1. Public Health Facilities
ii. Health workers	i. Number of Public doctors
	2.Private Health Facilities
	i. Number of Private doctors
Nutrition Sufficiency	% of malnouri children bel

ANTICIPATORY CAPITAL	INDICATOR
Farmer/Fisher Awareness of climate change and local impacts	No. of Trainings held
Disaster Preparedness Committee	Presence
Existing Early Warning System	Presence
Access to early warning information	% covered
Access to communication technology	No. of telephone subscribers

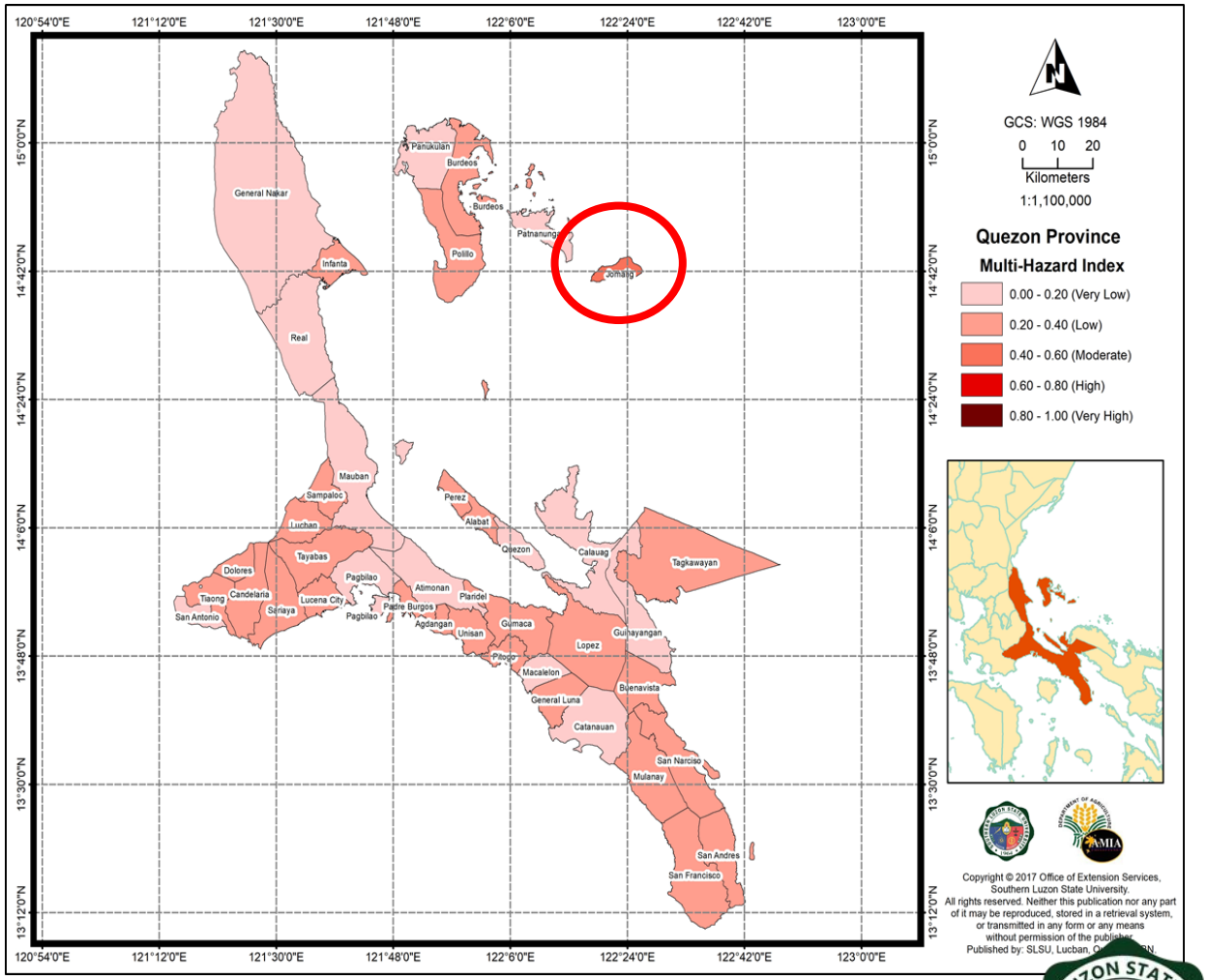
INSTITUTIONAL CAPITAL	INDICATOR
Effective Gov't and CSO programs for Climate Change	Yes/No
Adequate Gov't Response to previous shocks	Yes/No
Farmer's visited by or consulted with agricultural officer	% covered

PHYSICAL CAPITAL	INDICATOR
Land Tenure	% of farmers owing their agricultural prod'n land
Farm Size	Ave. HA
	Rice
	Corn
	Eggplant
	Squash
	Cacao
	Coffee
	Tilapia
	Napier
Value of Machinery and equipment owned	No. of Equipment owned
Value of livestock owned	No. by species
	Carabao
	Horse
	Cattle
	Goat
	Swine
	Poultry
Access to irrigation infrastructure	Area Irrigated
Access to post-harvest infrastructure	No. of post-harvest
Access to quality seeds	No. of seed growers/ha
Access fertilizer and pesticides	No. of dealers
Reliable Infrastructure	Concrete roads(k

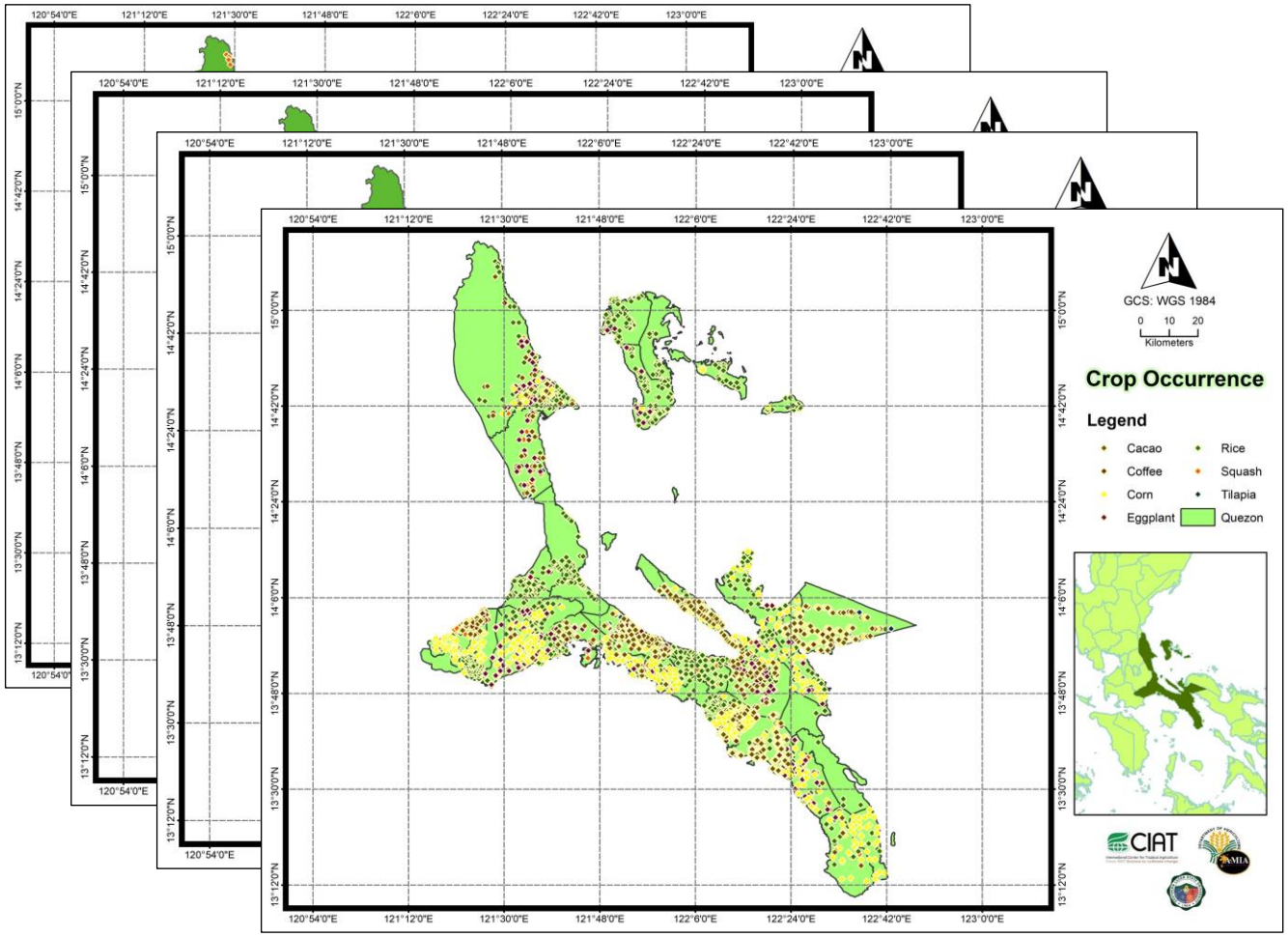
RESULTS

Multi Hazard Exposure Map

- Quezon province <u>will be less exposed to hazard</u>
- Out of the 41 municipalities, only 2 municipalities (Jomalig and Patnanungan) were assessed to be moderately exposed to climate related hazards comes year 2050
- <u>Jomalig, an island municipality, have 0.44 hazard exposure index</u>



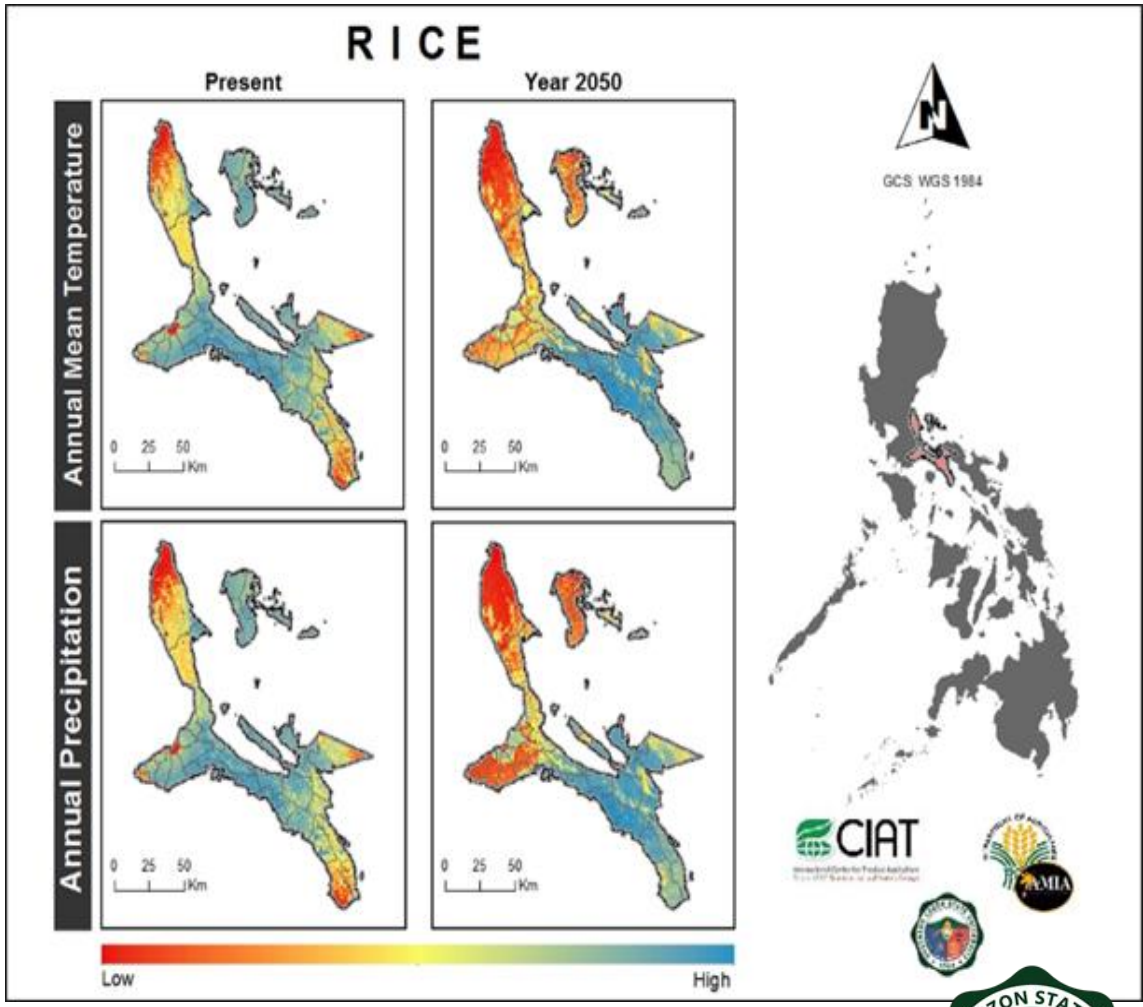
RESULTS



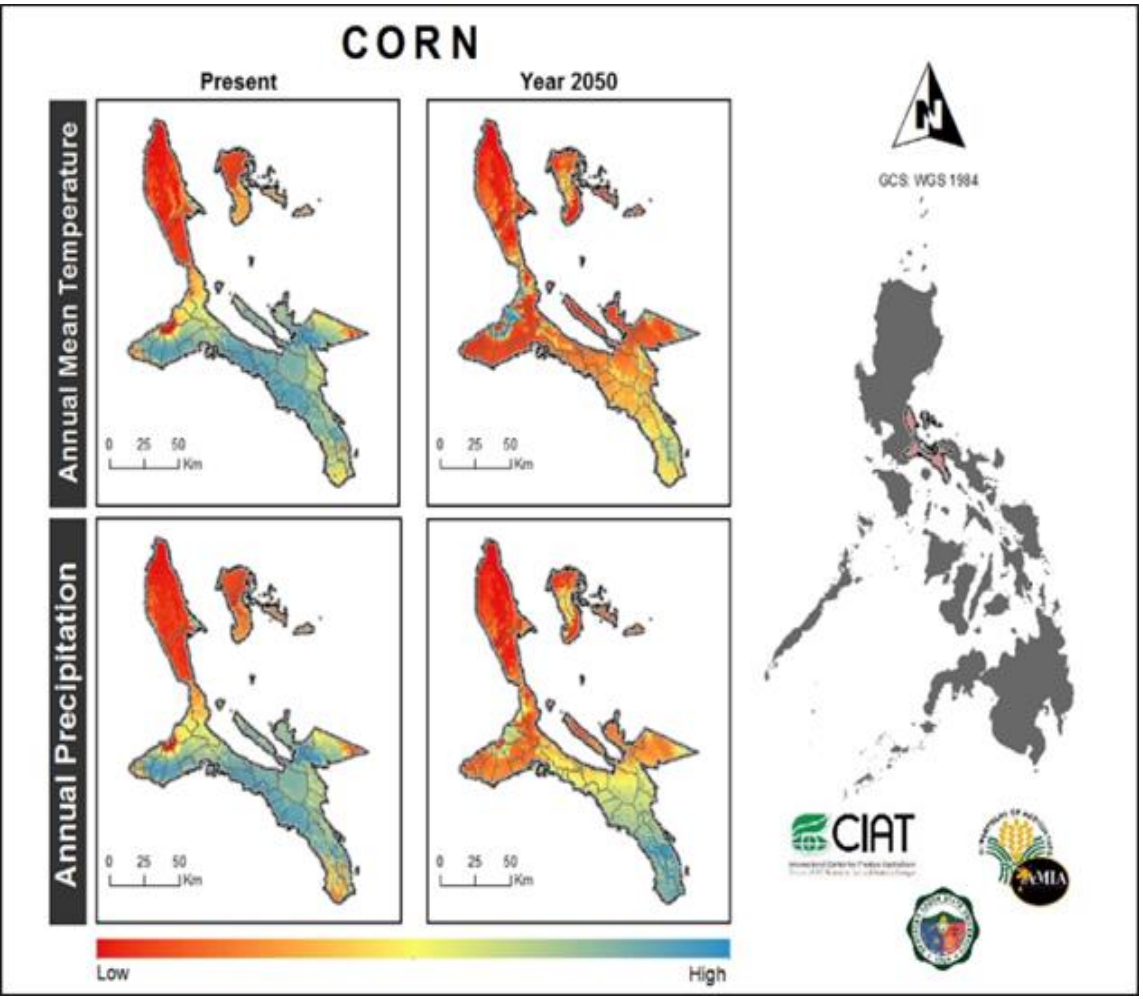
Sensitivity/Suitability Analysis

RESULTS

- Tiaong, Candelaria, Sariaya, and Lucena City found to be highly suitable in the area, particularly the lowland areas.
- By year 2050, the same areas were found to be no longer suitable for rice production because the crop is sensitive to availability of water. It means that by year 2050, there will be temperature increase in these areas that can lead to drought.
- However, municipalities surrounding Mt. Banahaw are found to be suitable for crop production, due to Mt. Banahaw Watershed



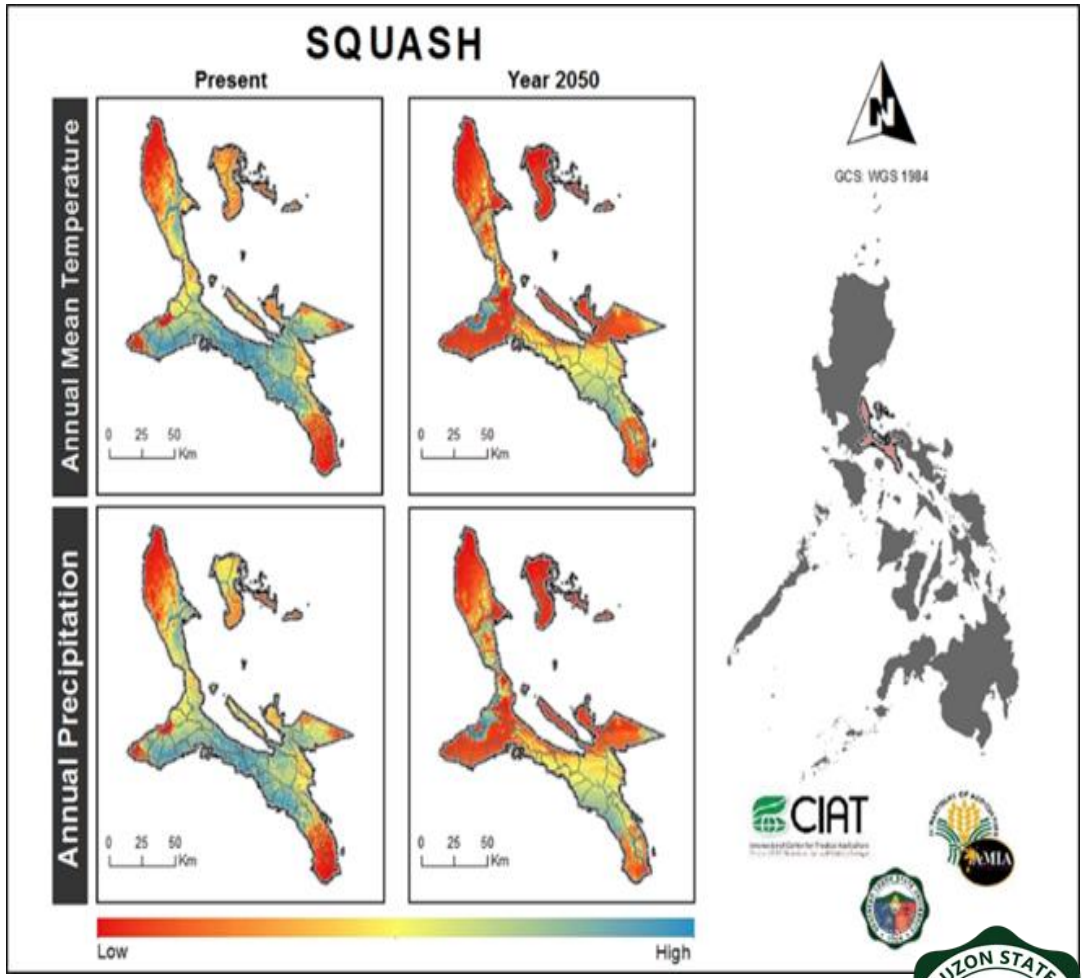
RESULTS



- Corn suitability is high at present condition in the municipalities in the 3rd & 4th congressional districts.
- However, due to changing of climate or weather patterns, corn suitability by year 2050 will change and classified as low suitability on the same district.

RESULTS

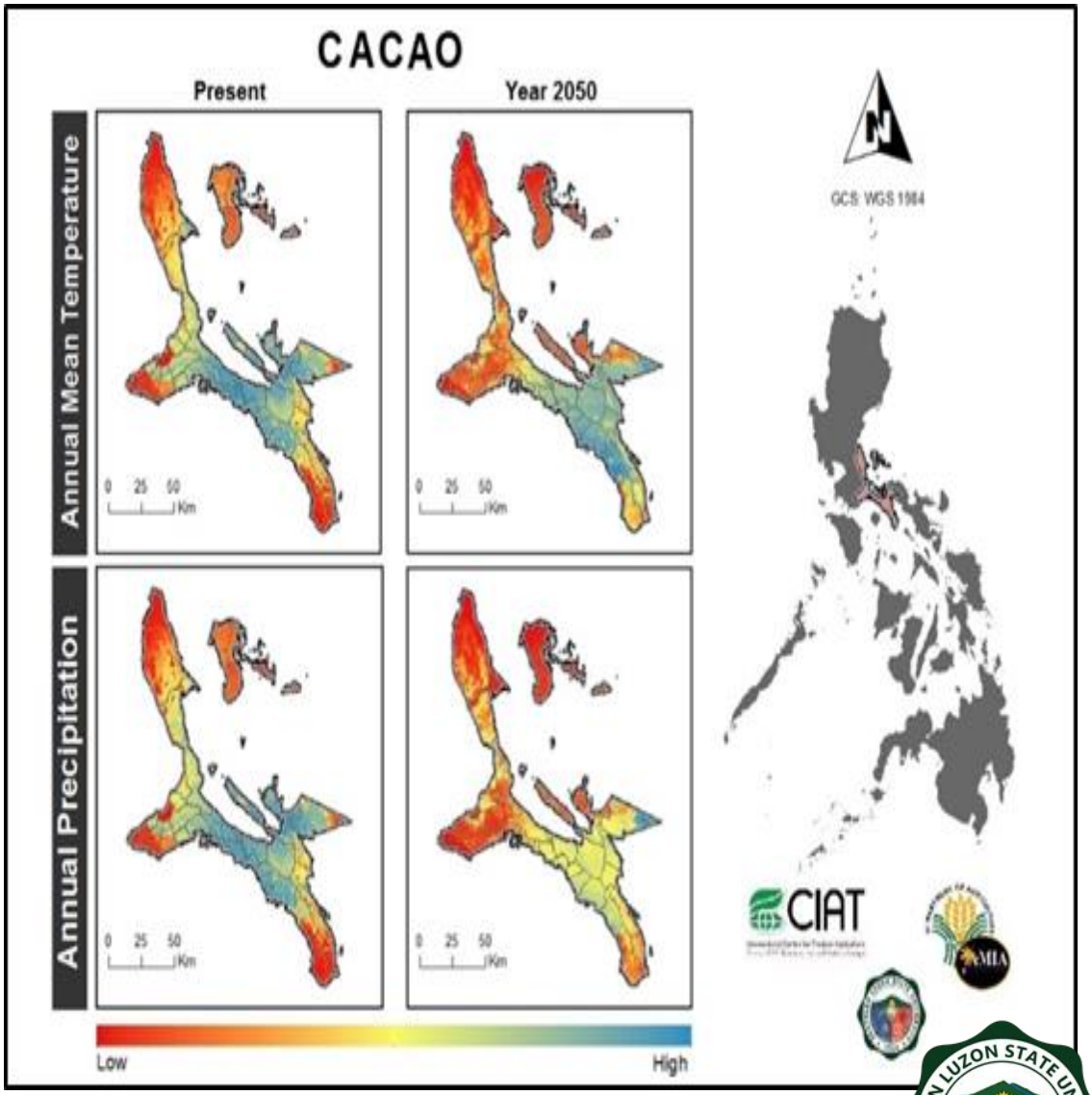
- Squash were sensitive to areas located in 2nd district and 4th district given the largest change areas in terms of suitability.
- In present condition these areas are <u>experiencing high suitability, but in year 2050 low suitability will happen</u>
- This indicates that if the area experiences low annual mean temperature with high annual precipitation, squash resulted to be highly suitable.
- Alarmingly, in year 2050, <u>low suitability might happen due to low annual precipitation with moderate mean temperature.</u>



RESULTS

- The biggest change that affect cacao production <u>from high suitability at present to low suitability in year 2050 are found in 2nd district and 4th district of Quezon.</u>

- This explains that <u>changing of climatic variables has an implication to the productivity of cacao.</u>

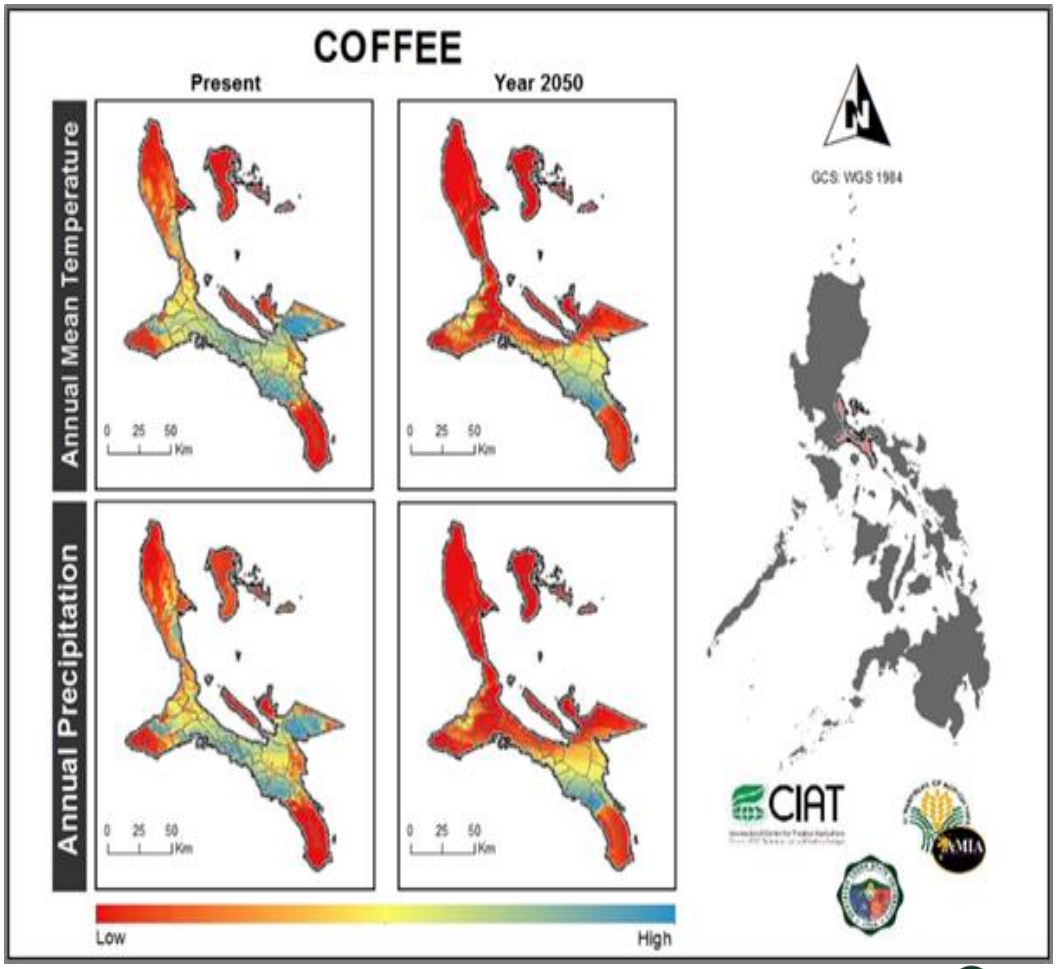


RESULTS

- Coffee production will have major changes in 1st, 2nd and 4th districts of Quezon from moderately suitable to low suitable, respectively.

- At present condition, the annual mean temperature and the annual precipitation affects cacao production

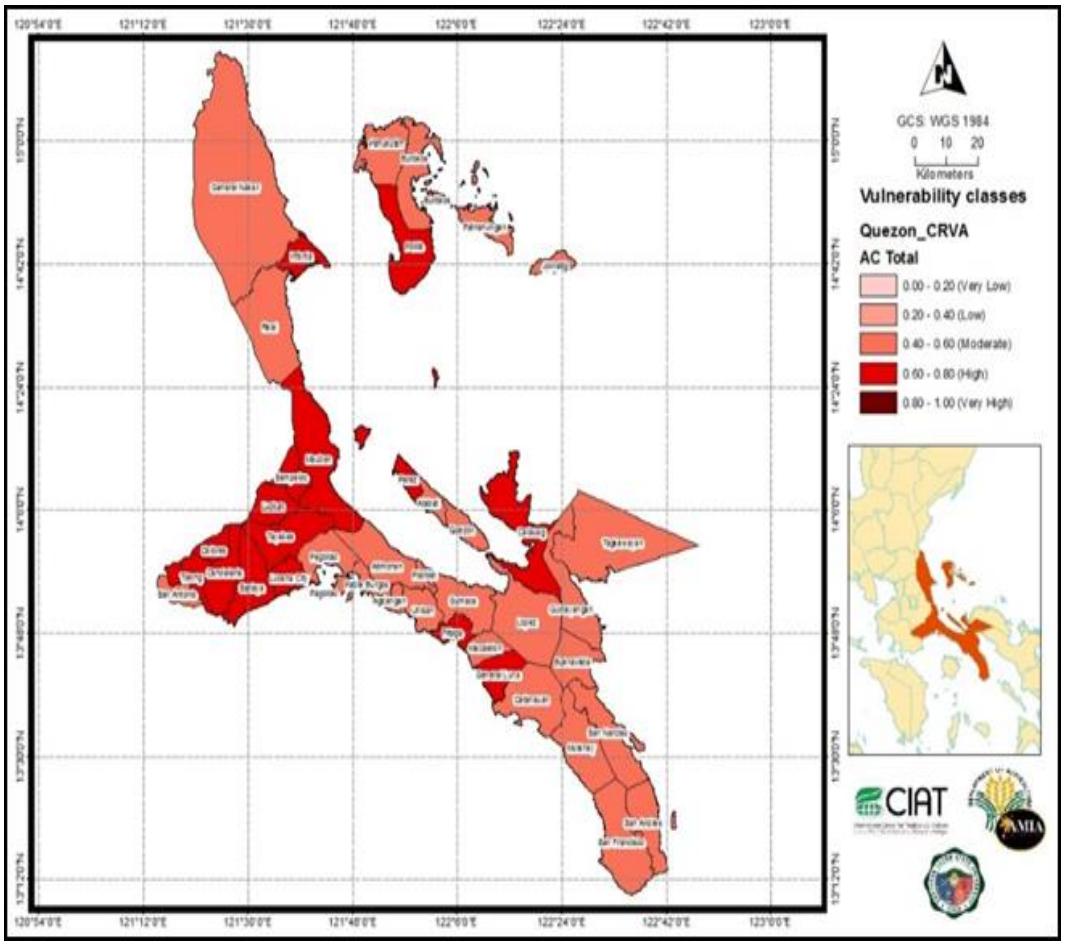
- While in year 2050, a decreasing temperature and precipitation will be experienced as compared to present condition but still the same result of the present condition can be observed.



RESULTS Adaptive Capacity

- High adaptive capacity were in 1st to 3rd class municipalities and cities located mainly at the 2nd District

  - Availability of needed data for adaptive capacity analysis.
  - High natural capital (goods and services) that can support and satisfy the need of their constituents.
  - The area also shows low poverty incidence rate.
  - Institutional capital and good governance in terms of having functional DRRM and CCA committees and municipal agriculture office and SUC
  - The programs, projects and services rendered by these local government offices were felt and rolled-out at the barangay levels,



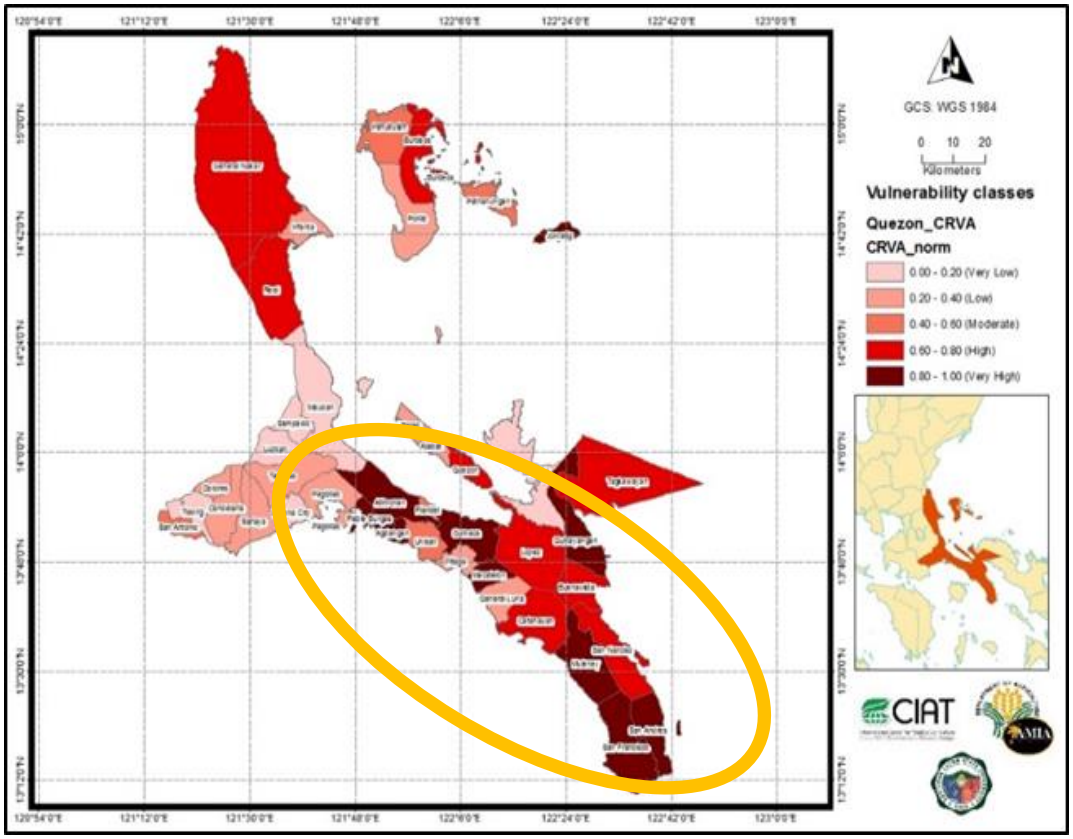
RESULTS Climate Risks Vulnerability Assessment

- San Francisco has the highest vulnerability index with a normalized value of 1.101 followed by Guinyangan with 1.00 vulnerability index.

- Both have low hazard index, but found to have several crops that are sensitive to changes in climate and have low adaptive capacity index leading to its high vulnerability index.

- In the case of Quezon Province, a factor that influences the vulnerability of the area is the low adaptive capacity of most municipality.

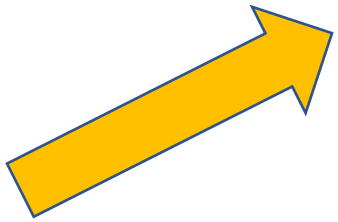
- San Francisco town was found to have very low adaptive capacity due to the poor economic condition, poor human and social capital



RESULTS

Local CRA practices to support science-based planning

32 Climate Resilient Agriculture (CRA) Practices in Quezon Province



Coconut-based Integrated Farming System

RainWater Harvesting System

RESULTS

- An extension program, *Building Resilient Communities (BRaCe) in Quezon province* was implemented along the 13 municipalities in Tayabas Bay in 3rd District.

- Aims to capacitate the community members and barangay officials to cope up with changing climate and reduce the disaster risks brought by climate change in the municipality, including agriculture sector.

- The results of the CRVA were mainstreamed throughout the three (3) days training for barangay officials and farmers in 5 batches that commenced from November 2018 to May 2019.

RESULTS

Table 1. T-Test Result for the Pre-test and Post-test the DRR/CCA Training Program

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	BRACE Pretest - BRACE Posttest	-1.043	2.242	.268	-1.577	-.508	-3.891	69	.000

- 70 participants provided their answers to the pre-test and post-test conducted during the training proper.
- Using the SPSS, the T-test results revealed that the CCA/DRR training was statistically significant at 95% level of confidence, during its conduct.

It only implies that the training program which aims to capacitate the community and barangay officials using science-based information was effective.

CONCLUSION

- This study being a decision-support tool for science-based and investment planning found out the province of Quezon was exposed to several hazards such as typhoon, flooding, drought, storm surge and landslides.

- The most vulnerable to climate risks, specifically, changing temperature and change in precipitation, were **found at the 3rd Congressional District of Quezon Province**, specifically the municipalities of San Francisco, Guinayangan and Padre Burgos, due to low adaptive capacity and high poverty incidence.

- However, in order to cope up with the negative effects of climate change, farmers and communities in the province had 32 CRA strategies of which rainwater harvesting and coconut based integrated farming system were recommended for farmers' adoption to withstand the impacts of changing climate at the community levels.

- Likewise, an extension program that utilized science-based information must be practiced regularly to sustain the food production system in the area as the study revealed that this kind of program was effective using the T-test for paired samples.

RECOMMENDATIONS

- Pilot testing/replication of the CRVA methodology in the municipality (as unit of analysis) to cover the barangay levels; so that the community members will be capacitated and decide for themselves using empirical data/science-based information.

- Integration of the CRVA results to the long term LCCAP/LDRRM Plans of the local government units (both provincial and municipal levels) such as changing crop rotation, crop rotation, change of planted crops.

- Continuous roll out of the results to other congressional districts of the province to increase the awareness and knowledge of farmers and policy makers for institutionalization of science-based planning.

- Presentation of the results to the regional development council for replication to other provinces in the region and served as inputs for policy making and planning.

ACKNOWLEDGEMENT

Thank You

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