Context
The Caraga Region is located in the northeastern part of Mindanao, where the climate is Type 2 (no pronounced dry season), leaving the region prone to flooding. Climate risks are points of great concern in the region due to its economy being largely agriculture-based. In the province of Agusan del Norte, the climatic variability hampers rice and corn farming. This is especially evident in the municipality of Jabonga and other towns situated near Lake Mainit, the fourth largest lake in the country. Every November to February, the municipality experiences inundation when the water from the lake swells due to heavy rains. The inundation can reach up to 4-5 meters high affecting the low-lying barangays. As the water overflows, it washes away crops in farmlands, destroys poultry and swine production, and turns the area into a fishing ground for 3-4 months.

Corn-Squash+Corn Crop Rotation

The Corn-Squash+Corn Crop Rotation allows the farmers to produce corn for two straight seasons (March-June and July-October) and squash for one season as intercropped with corn. This enables the farming household to establish a diverse income stream, periods and by the intercropping of corn and squash. This enables the production during the off-season.

The squash produced in the second cropping is either sold (Suprema) or is used as a Nutrient Management (Pioneer Yellow Hybrid) in the third cropping. The squash produced in the second cropping is either sold (Suprema) or is used as a Nutrient Management (Pioneer Yellow Hybrid) in the third cropping.

Available Technical Briefs

**LUZON**
- Cordillera Administrative Region (CAR)
  - Water Harvesting Tank for Carabao in Benguet
  - Field Toward Profitability in Benguet

**Region III-Central Luzon**
- Mango Production in Ilocos
- Rice-Corn Crop Rotation in Ilocos
- Rice-Tomato Rotation in Ilocos

**Region II-Cagayan Valley**
- Rice-Rice-Mungbean Crop Rotation/Intercropping in Isabela
- Climate Smart Rice in Isabela

**Region III-Central Luzon**
- Water Conservation Technology (WRD) in Tarlac
- Climate Smart Rice in Tarlac
- Crop Rotation Zero Tillage Combination in Tarlac

**VISAYAS**
- Region VI Western Visayas
  - Stopgap Agricultural Land Technology for Corn in Iloilo
  - Protected Regulated Outplanting in Iloilo

**Region VIII-Eastern Visayas**
- Alleviating Cropping Using Pineapple as Hedgerow in Iloilo for Production in Samar
- Protected Vegetable Cultivation in Samar

**MINDANAO**
- Region IX-Zamboanga Peninsula
  - All-weather Multi Cropping for Rice in Zamboanga Sibugay
  - Coconut-Harvest-Corn Intercropping in Zamboanga Sibugay

- Region X-Northern Mindanao
  - Biodynamics in Corn Production in Bukidnon
  - Corn-Banana Crop Diversification in Bukidnon

- Region XI-Davao Region
  - Crop Rotation with Integrated Nutrient Management in Davao
  - Cassava-Corn Intercropping in Davao

- Region XII SOCCSKARGEN
  - Organic Rice Farming in North Cotabato
  - Integrated Rice-High-Quality Farming System (IRHQS) in North Cotabato

- Region XIII-Caraga
  - Corn Rice-Green Corn Crop Rotation in Agusan Del Norte
  - Corn Squash-Green Corn Crop Rotation in Agusan Del Norte

- Autonomous Region of Muslim Mindanao (ARMM)
  - Organic White Corn Intercropping in Lanao Del Sur
  - Coconut-Harvest-Corn Intercropping in Lanao Del Sur
  - Cassava-Corn Intercropping in Lanao Del Sur

References


About the Authors
This technical brief was produced through the CSII-CIAT-DA partnership under DA-BAR project entitled “Climate-Resilient Agriculture (CRA) Assessment, Targeting & Prioritization for the Adaptation and Mitigation Initiative in Agriculture (AMIA): Phase 2 in Agravnado Norte Province-Caraga Region”.

Caraga State University Team
- Dr. Rosario P. Vasina, Project Leader (Agriculturist)
- Dr. Raulito M. Balayani, Agricultural Economist
- Engr. Arnold L. Apdohan, GIS Expert
- Mr. Glenn Arthur A. Garcia, Agriculturist
- Engr. Arnold L. Apdohan, GIS Expert
- Ms. Pattricia Eliz M. Legaspi, Research Assistant

CIAT Team
- Ms. Paula Beatrice M. Macandog, Environmental & Water Resources Economist
- Dr. Seriao Almudin, Agronomist
- Engr. Arnold L. Apdohan, GIS Expert
- Mr. Rowell C. Dikitanan, Socio-Economist
- Ms. Maelene Angelita L. Geogofy, Research Assistant
- Ms. Patricia Di D. Legaspi, Research Assistant

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CROP ROTATION
Corn-Squash+Corn Crop Rotation

The Corn-Squash+Corn Crop Rotation allows the farmers to produce corn for two straight seasons (March-June and July-October) and squash for one season as intercropped with corn. High yielding variety of yellow corn is planted in the 1st season followed by yellow corn intercropped with squash in the 2nd season. The squash produced in the second cropping is either sold (Suprema) or used as a Nutrient Management (Pioneer Yellow Hybrid) in the third cropping.

This can replace corn monocropping and uses squash (Suprema) or corn (Dekalb or Pioneer Yellow Hybrid)

TECHNICAL BRIEF on Climate-Resilient Agriculture (CRA)
Caraga (Region XIII)

CORN-SQUASH-CORN CROP ROTATION

Crop rotation is a time-tested strategy that ensures crop harvest even with climate change. It is a production system that promotes biodiversity conservation while protecting crops from pests and diseases as well as promoting nutrient cycling. It also provides an economic buffer during times of inundation of the area.

Productivity
Year-round productivity for continuous flow of income for farmers

Adaptation
Optimized cropping calendar Better pest and disease management
Financial Analysis

**Cost & Benefit**
- Initial Investment/ha: PhP 28,600
- Payback Period: 2 years
- Estimated Additional Annual Profit/ha: PhP 12,368 USD 241

**Yield & Prices**
- **Without CRA**
  - Corn: 3,742 kg/ha, PhP 15.14/kg
  - Corn: 1,123 kg/ha, PhP 12.4/kg
- **With CRA**
  - Corn: 3,742 kg/ha, PhP 15.14/kg
  - Corn: 2,350 kg/ha, PhP 12.4/kg
  - Squash: 4,591 kg/ha, PhP 3.00/kg

**Sensitivity Analysis**
The CRA practice will still be more profitable than non-CRA practice even when:
- Yield of Yellow Corn in 2nd cropping decreases by 20%
- Yield of Squash in 2nd cropping decreases by 30%

**5 Reasons to Invest**
1. Diversification of income source to reduce risk of financial losses
2. Higher potential farm income
3. Optimized cropping calendar
4. Better pest and disease management
5. Nutrient cycling

**Externalities**
- Social and Environmental NPV: PhP 106,848 USD 2,082
- Social IRR: 110%

**Cost-Benefit Analysis**
- **Net Present Value**: PhP 62,610 USD 1,220
- **IRR**: 70%

**Aggregate Impact**
- Total area planted to Corn: 232 hectares
- Aggregate NPV: PhP 3.9 million

**Factors**
- **Current Adoption Rate**: 3%
- **Projected Adoption Rate**: 30%

**Assumptions**
- Period of Analysis: 10 years
- Discount Rate: 10%
- Exchange Rate: PhP 51.32

**Study Site**
**Agusan del Norte**

**Data Gathering**
1. Analysis of experiences of 30 farmers in three barangays in the municipality of Jabonga in Agusan del Norte province.
2. Conduct of Experts’ Workshop with experts from the academe (Caraga State University) and the government (Department of Agriculture Region 13) pooling knowledge and insights on emerging climate resilient farm practices
3. Conduct of interviews with the Municipal Agricultural Officer (MAO) and Barangay Captains to validate results from Experts’ Workshop
4. Review and synthesis of secondary information

**The CIAT CBA Methodology**
Cost-Benefit Analysis (CBA) is used to determine the relative profitability of alternative cropping practices, involving the comparison of the annual flows of incremental benefits with that of incremental costs. The CIAT CBA Online Tool analyzes the full benefits and costs of identified practices and adoption response at both individual farmer level and at aggregate level for a particular area.

Specifically, the tool can:
1. Quantify economic and some environmental trade-offs of adopting CRA practices.
2. Provide sensitivity analysis
3. Estimate the level of peak adoption

**Recommendations**
The CRA practice can be adopted year-round in corn-producing areas of Agusan del Norte that are susceptible to flooding that lasts for 2-4 months.