Context
Agusan del Norte, one of the provinces in Caraga Region, produces rice, corn, coconut, banana, and mango, with rice and corn farming being the dominant agricultural activities. However, climatic variability generally hampers farming activities, particularly in towns situated near Lake Mainit, the fourth largest lake in the country. This is the case in Jabonga, Agusan del Norte where every November to February, the municipality experiences inundation when water from the uplands flows into the lake. 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. The rotation of crops and adjustment of the cropping calendar to suit the onset and end of flooding has been the practice of farmers to minimize damages during flooding periods.

Corn-Rice-Green Corn Crop Rotation

The Corn-Rice-Green Corn Crop Rotation is done through the production of corn grain in the 1st cropping, followed by the production of rice in the 2nd cropping. With the anticipated onset of heavy rains and flood, the 3rd is a shortened cropping period for green corn production, which can be harvested within 60-70 days after planting. Even though green corn sells lower than yellow corn, planting green corn in the 3rd cropping compensates for the price difference by shortening the production period, allowing the farmers to harvest early and avoid significant flood-induced crop damages.

Against the usual practice of corn production following the normal cropping calendar, the CRA practice on corn-rice-green corn rotation can help farmers realize optimal earnings by ensuring harvest before the onset of the flood. This income serves as buffer income during periods when land is submerged and unavailable for harvest before the onset of the flood. This income serves as buffer income to farming households. With crop rotation and the adjusted production timing, farmers still obtain the optimum income while avoiding crop damage caused by floods.

Available Technical Briefs

**LUZON**
Cornbelt Administrative Region (CAR) - Water Harvesting Tank for Cabbage in Benguet
Bicol or Pioneer Yellow Hybrid in Burun
Region III: Soccsksargen - Rice-Rice Corn Rotation in Sorsogon City
Region II: Cagayan Valley - Rice-Rice Corn Rotation in Cagayan
Region IVB: Mimaropa - Rice-Rice Corn Rotation in Oriental Mindoro
Region V: Bicol Region - Rice-Rice Corn Rotation in Camarines Sur

**VISayas**
Region VI: Western Visayas - Stopping Agricultural Land Technology for Corn in Iloilo
Region VII: Central Visayas - Rice-Pea Crop Rotation in Calbayog
Region VIII: Eastern Visayas - Rice-Rice Corn Crop Rotation in Lamberto
Region IX: Mindanao - Corn-Pea Crop Rotation in Davao
Region X: Northern Mindanao - Rice-Duck Farming System (IRDFS) in North Cotabato
Region XII: Soccsksargen - Rice-Duck Farming System (IRDFS) in North Cotabato

**MINDANAO**
Region IX: Zamboanga Peninsula - Alternative Fish and Shrimp for Rice in Zamboanga
Region X: Northern Mindanao - Rice-Duck Farming System in Bukidnon
Region XI: Davao Region - Rice-Duck Farming System in Davao
Region XII: Soccsksargen - Rice-Duck Farming System in Davao

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### Production
Reduction of risk induced loss caused by floods
Potential to attain maximum yield and higher income

### Adaptation
Optimized cropping calendar
Better pest and disease management

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Reduction of risk induced loss caused by floods
Potential to attain maximum yield and higher income

### Adaptation
Optimized cropping calendar
Better pest and disease management
Cost & Benefit

**Initial Investment/ha**

PhP 39,500

**Payback Period**

3 years

**Estimated Additional Annual Profit/ha**

PhP 17,860

USD 348

Yield & Prices

**Without CRA**

**Corn Production**

<table>
<thead>
<tr>
<th>Plant</th>
<th>Average annual farm yield</th>
<th>Price per kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>3,742 kg/ha</td>
<td>PhP 15.14</td>
</tr>
<tr>
<td>2nd cropping</td>
<td>2,245 kg/ha*</td>
<td>PhP 15.14</td>
</tr>
<tr>
<td>1st cropping</td>
<td>3,742 kg/ha</td>
<td>PhP 15.14</td>
</tr>
<tr>
<td>2nd cropping</td>
<td>2,245 kg/ha*</td>
<td>PhP 15.14</td>
</tr>
</tbody>
</table>

**With CRA**

**Corn-Rice-Green Corn Rotation**

<table>
<thead>
<tr>
<th>Plant</th>
<th>Average annual farm yield</th>
<th>Price per kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow Corn</td>
<td>3,742 kg/ha</td>
<td>PhP 15.14</td>
</tr>
<tr>
<td>1st cropping</td>
<td>4,020 kg/ha</td>
<td>PhP 16.5</td>
</tr>
<tr>
<td>2nd cropping</td>
<td>4,746 kg/ha</td>
<td>PhP 5.25</td>
</tr>
<tr>
<td>Rice</td>
<td>4,746 kg/ha</td>
<td>PhP 5.25</td>
</tr>
<tr>
<td>Green Corn</td>
<td>2nd cropping</td>
<td>PhP 5.25</td>
</tr>
<tr>
<td>1st cropping</td>
<td>PhP 5.25</td>
<td></td>
</tr>
</tbody>
</table>

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

Externalities

<table>
<thead>
<tr>
<th>Social and Environmental NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>PhP 121,013</td>
</tr>
<tr>
<td>USD 2,358</td>
</tr>
</tbody>
</table>

Social IRR 60%

Sensitivity Analysis

The CRA practice will still be more profitable than non-CRA practice even when:

- Yield of Yellow Corn in 1st cropping decreases by 10%
- Yield of Rice in 2nd cropping decreases by 10%

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

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.

FFS is encouraged to include sessions on experience sharing among CRA practitioners for proper and effective adoption of the corn-rice-green corn rotation strategy.

LGUs could strengthen information dissemination campaigns to inform farmers of the advantages of the Corn-Rice-Green Corn Crop Rotation practice.

The government is encouraged to offer special fund support packages and capacity building training with technical and entrepreneurial modules for farmers adopting the CRA practice to increase adoption rates.

Study Site

**Agusan del Norte**

Data Gathering

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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

http://cbatool.ciat.cgiar.org/