

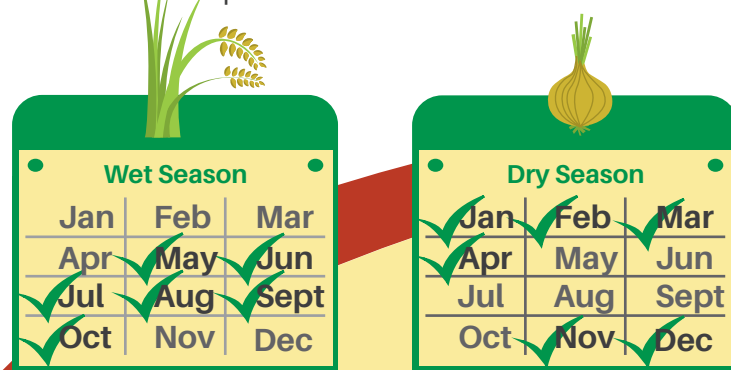
Context

Agricultural production in the province is challenged by its vulnerability to climate variability. The municipality of Bulalacao is situated at the southernmost part of Oriental Mindoro province and experiences prolonged dry period even during the wet season. Bulalacao constitutes only 1.5% of the total rice production area of the province but can produce an average rice yield of 4.44MT/ha per cropping season. However, extreme drought can be devastating to local agricultural production. In 2010, an extreme drought event caused crop losses of up to 90%. To address the adverse effects of drought, farmers in the municipality practice multiple cropping, intercropping and crop rotation.

Rice-Onion Crop Rotation

Rice-onion crop rotation is an indigenous cropping scheme that aims to utilize remaining nutrients from the rice field for onion production while disrupting the cycle of pests and diseases. Onion grows in friable and well-drained soil, which is similar to the type of soil in Bulalacao. The dry climate and moderately high temperature are also suitable for growing onion since the crop's water requirement is low. Moreover, rice and onion have the same periods of maturity, which adheres to the cropping seasons.

The traditional users plant rice for only one season and leave their rice fields unplanted for the next season, while the CRA users plant rice during the first season and onion in the next cropping season. Seasonal rotation of onion in rice fields can significantly intensify land use during prolonged dry seasons. It can optimize production by enhancing soil fertility and preserving the productive integrity of the soil. This practice can deliver higher income to farmers annually as it is proven to be cost-efficient through reduced input cost from irrigation, chemical fertilizers and pesticides.



Rice-Onion Crop Rotation

can replace:

- Rice monocropping
- Excessive use of chemical fertilizers and pesticides

uses:

- Rice (NSIC-RC 222 and NSIC-RC 218)
- Onion (Red Pinoy)

can also cultivate the following during the dry season:

- Garlic
- Squash
- Watermelon
- Mungbean

Available Technical Briefs



LUZON

Cordillera Administrative Region (CAR)

- Water Harvesting Tank for Cabbage in Benguet
- Blight-Tolerant Potatoes in Benguet

Region I-Ilocos Region

- Mango Production in Ilocos
- Rice-Corn Crop Rotation in Ilocos
- Rice-Tomato Rotation in Ilocos

Region II-Cagayan Valley

- Rice-Rice-Mungbean Crop Rotation/Diversification in Isabela
- Climate-Smart Rice in Isabela

Region III-Central Luzon

- Water Conservation Technology (AWD) in Tarlac
- Climate-Smart Rice in Tarlac
- Crop Rotation-Zero Tillage Combination in Tarlac



VISAYAS

Region VI-Western Visayas

- Sloping Agricultural Land Technology for Corn in Iloilo
- Small Water Impounding Project for High Value Crops in Iloilo

Negros Island Region (NIR)

- Use of Submergence-Tolerant Rice Variety in Negros Occidental
- Organic Red Rice Production in Negros Occidental



MINDANAO

Region IX-Zamboanga Peninsula

- Alternate Wet And Drying for Rice in Zamboanga Sibugay
- Coconut-Yellow 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
- Cacao-Coconut Intercropping in Davao

Region IVA-CALABARZON

- Coconut-based Integrated Farming System in Quezon
- Rainwater Harvesting in Vegetable Production in Quezon

Region IVB-MIMAROPA

- Rice-Onion Crop Rotation in Oriental Mindoro
- Stress-Tolerant Rice in Oriental Mindoro

Region V-Bicol Region

- Organic Corn Farming in Camarines Sur
- Climate-Smart Rice (Green Super Rice) in Camarines Sur

Region VII-Central Visayas

- Corn-Peanut Crop Rotation in Cebu
- Protected Vegetable Cultivation in Cebu

Region VIII-Eastern Visayas

- Alley Cropping Using Pineapple as Hedgerow in Upland Rice Production in Samar
- Protected Vegetable Cultivation in Samar

Region XII-SOCCKSARGGEN

- Organic Rice Farming in North Cotabato
- Integrated Rice-Duck Farming System (IRDfS) in North Cotabato

Region XIII-Caraga

- Corn-Rice-Green Corn Crop Rotation in Agusan Del Norte
- Corn-Squash+Corn Crop Rotation in Agusan Del Norte

Autonomous Region of Muslim Mindanao (ARMM)

- Coconut-White Corn Intercropping in Lanao Del Sur
- Coconut-Banana Intercropping in Lanao Del Sur

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About the Authors

This technical brief was produced through the UPLB-CIAT-DA partnership under DA-BAR project titled "Climate-Resilient Agriculture (CRA) Assessment, Targeting & Prioritization for the Adaptation and Mitigation Initiative in Agriculture (AMIA) Phase 2 in Oriental Mindoro (MIMAROPA Region).

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TECHNICAL BRIEF on Climate-Resilient Agriculture (CRA) MIMAROPA (Region IV-B)

Rice-Onion Crop Rotation



Rice-onion crop rotation is practiced by farmers in the municipality of Bulalacao in Oriental Mindoro province to optimize production inputs through nutrient cycling and to intensify land use during dry season. Bulalacao is known to be highly vulnerable to drought. Producing rice during the dry season is becoming increasingly difficult. These climatic conditions, however, are suitable for onion production as it requires moderately high temperature and low precipitation. In response, rotating production from rice to onion allows farmers to efficiently cultivate their land even during dry spells.



Productivity

Preserve quality and productive integrity of the soil leading to higher crop yield
Cost-efficient production leading to potentially higher income



Adaptation

Rotation of crops to minimize production risks and losses in drought-prone and/or rainfed areas
Better pest and disease management



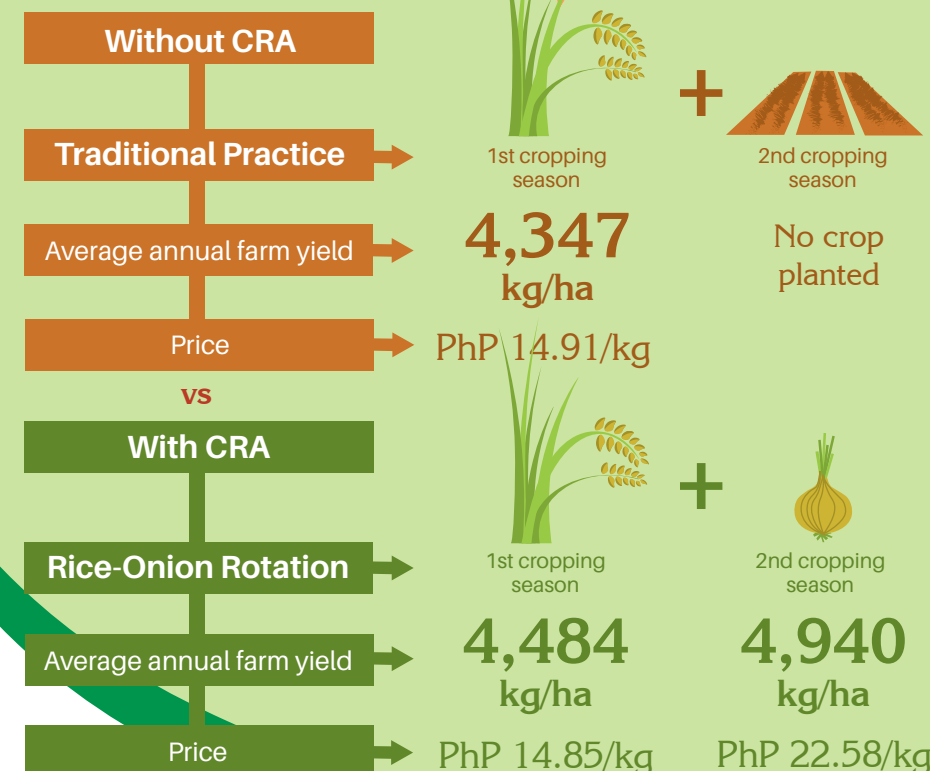
Mitigation

Lower chemical input use leading to better soil quality

Cost & Benefit



Yield & Prices



Recommendations

- Plant in rainfed areas especially during the dry season.**
 When & Where? Full advantage of this practice can be obtained in rainfed areas especially during the dry season. This is also an effective strategy in areas with prolonged dry season (October-June).
- Plant other high value crops.**
 What? With the climatic conditions of Bulalacao, high value crops such as onion, garlic, watermelon, squash and legumes can be grown during dry season.
 Farmers are often challenged in securing the investment capital. A comprehensive crop insurance could help the farmers sustain this practice by reducing the risk from climate variability.
- LGUs should empower farmers to adopt the rice-onion crop rotation.**
 Who? LGUs together with the municipal and provincial agriculturist should empower farmers in practicing rice-onion crop rotation to adapt to the impacts of drought. They are encouraged to help farmers avail appropriate crop insurance products.

5 Reasons to Invest

- Intensified land use and increased production during prolonged dry season
 - Reduced input cost leading to higher income
 - Reduced chemical input use leading to better soil quality
 - Enhanced soil productivity
 - Better pest and disease management
- Externalities**
 Further research is needed to quantify the externalities.

Financial Analysis

Net Present Value	IRR
PhP 201,585 USD 3,928	47%

Sensitivity Analysis

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

- Yield of rice decreases by 20%
- Yield of onion decreases by 20%

Aggregate Impact*

*within the Province of Oriental Mindoro

Current Adoption Rate	Projected Adoption Rate
3%	53%

Total Area Planted (ha)	Aggregate NPV
2,010 ha	PhP 123.1 million

Assumptions:

Period of Analysis	Discount Rate	Exchange Rate
10 years	8.5%	\$1 = PhP 51.32

Initial Investment Breakdown

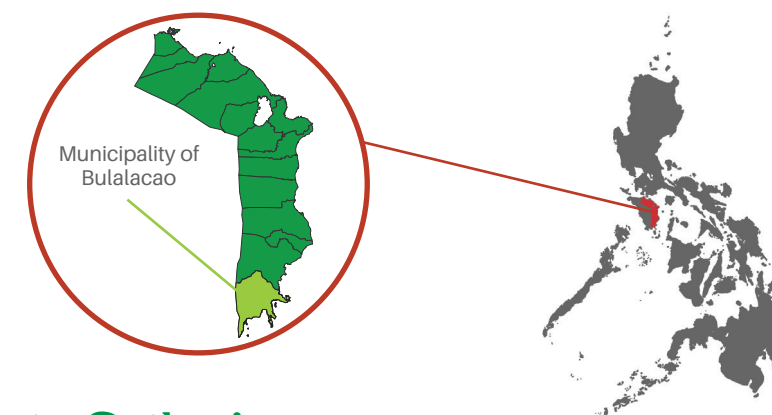
- Initial Investment
PhP 97,600
- Labor & Services
PhP 59,000
- Inputs
PhP 38,600

Cost of Adopting CRA

- Initial Investment
Installation costs (Year 1)
PhP 97,600
- Maintenance costs
(Years 2-10)
PhP 97,600
- Operations
Irregular/ non-permanent costs
PhP 14,500

Study Site

Oriental Mindoro



Data Gathering

- Analysis of experiences of 59 farmers in six barangays in the municipality of Bulalacao in Oriental Mindoro province.
- Conduct of Experts' Workshop with experts from the academe (University of the Philippines Los Baños) and the government (Municipal Agriculture Officers and Department of Agriculture Region 4B) pooling knowledge and insights on priority commodities and emerging climate resilient farm practices in the province.
- 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:

- Quantify economic and some environmental trade-offs of adopting CRA practices.
- Provide sensitivity analysis
- Estimate the level of peak adoption