Context

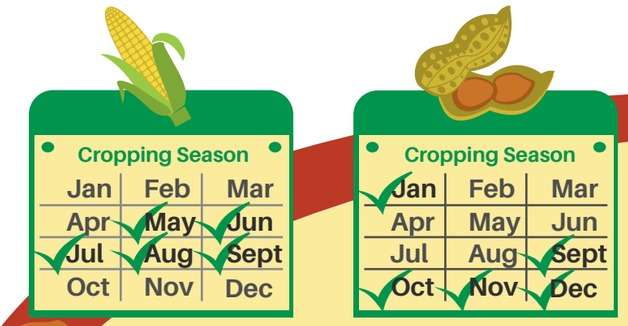
Corn is one of Cebu province's staple foods. The crop is primarily planted in two seasons, normally adopting a corn-corn cropping pattern. However, unpredictable climatic conditions coupled with soil alkalinity (pH level greater than 7*) often limit corn production [1]. Corn monocropping is also prone to pests such as stemborers during the second cropping, thereby reducing productivity levels. Rotating corn with peanut provides much needed nutrients to the alkaline soil as well as breaks pest cycles.

*Based on 1,078 soil samples analyzed by the DA RFO7 Soils Lab, soil pH in Cebu province ranges from 3.86-8.75 with majority of the areas having alkaline soils at pH levels greater than 7.

Corn-Peanut Crop Rotation

Corn-Peanut Rotation is highly feasible in upland and hilly areas where corn is the major crop. This practice is done by planting peanuts after the corn is harvested. Peanuts can fix atmospheric Nitrogen through the aid of the N-fixing bacteria called rhizobia. This allows for much needed nutrients to enter the soil, improving soil fertility for the succeeding cropping. Furthermore, this CRA practice lowers the incidence of pest and diseases by breaking the cycle of pests under monocropping. Therefore, this practice reduces material costs as well as labor costs for fertilization and pest management. Hence, this strategy could result to higher profitability due to lower production cost.

Additionally, the main purpose of planting peanut after corn is to utilize the organic matter derived from decomposing crop residues into the succeeding cropping periods.



Corn-Peanut Crop Rotation

can replace:

1. Corn monocropping
2. Other nutrient-depleting practices such as Corn-Sweet Potato crop rotation

uses:

1. Traditional corn variety: ex. Tiniguib
2. Open pollinated variety (OPV)
3. Hybrid corn variety: ex. pioneer

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 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

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

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 Submerence-Tolerant Rice Variety in Negros Occidental
- Organic Red Rice Production in Negros Occidental

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

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 XII-SOCCSKARGGEN
- 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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Ocampo & Zamora (2016). Carbon Storage of Corn-based cropping systems in Isabela, Philippines. Philippine Journal of Crop Science. vol. 41 pp. 20-39

Philippines Statistical Authority (PSA) (2014). A Review of the Agriculture Sector in Central Visayas. Accessed from: https://psa.gov.ph/content/review-agriculture-sector-central-visayas

Philippine Statistical Authority (PSA) (2016). Philippines Statistics Authority Country Stat, Regional Profile: Central Visayas. Accessed from: http://countrystat.psa.gov.ph/?cont=16&r=7

About the Authors

This technical brief was produced through the VSU-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 Cebu Province (Central Visayas Region).

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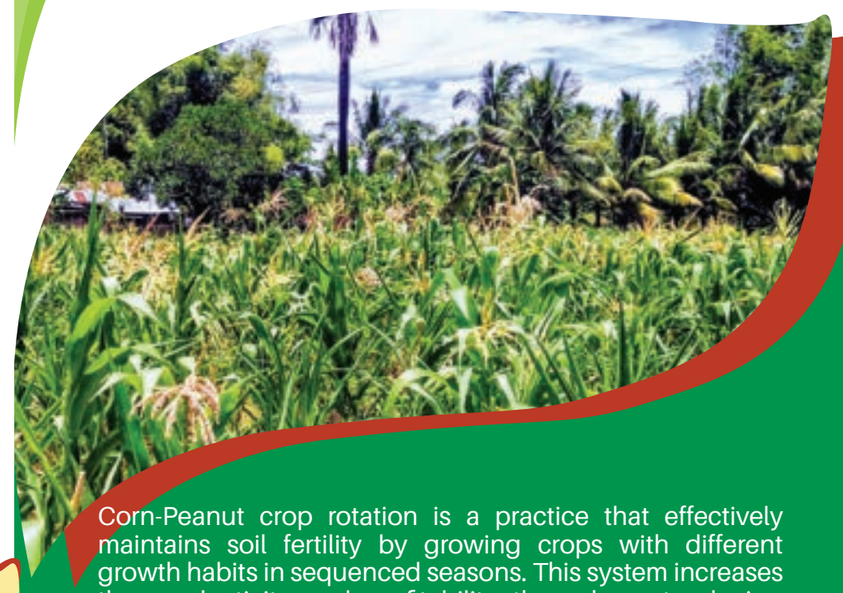
TECHNICAL BRIEF
on Climate-Resilient Agriculture (CRA)
Central Visayas (Region VII)

Corn-Peanut Crop Rotation



Corn-Peanut crop rotation is a practice that effectively maintains soil fertility by growing crops with different growth habits in sequenced seasons. This system increases the productivity and profitability through cost-reducing options pertaining to fertilizer and pesticide applications. As such, the carbon emission associated with crop production is less than that of conventional monocropping, thus contributing to climate change mitigation.

Productivity

Higher annual farm income due to higher crop yield compared to non-adopters

Adaptation

Improved resistance to drought and rising temperatures

Mitigation

Improved soil fertility through nitrogen fixing leading to fewer inorganic fertilizers used

Cost & Benefit

Initial Investment / ha
PhP 51,500

Payback Period
1 year

**On top of profit from conventional practice*

Estimated Additional Annual Profit / ha*
PhP 25,250
USD 492

Yield & Prices

Without CRA

Corn Monocropping

Average annual farm yield

1st cropping season + 2nd cropping season

769 kg/ha corn grits

vs

With CRA

Corn-Peanut Rotation

Average annual farm yield

1st cropping season + 2nd cropping season

529 kg/ha corn grits + **750 kg/ha** peanuts

Price

PhP 38/kg corn grits

PhP 30/kg peanuts

5 Reasons to Invest

1. **Increased soil fertility** through Nitrogen-fixation
2. **Lower risk of pests and diseases**
3. **Higher potential farm yield and income** due to diversity in production
4. Decreased use of fertilizers and pesticides leading to **lower GHG emissions**
5. **Increased carbon sequestration** by peanut and corn in the soil

Externalities

Social and Environmental NPV
PhP 140,976
USD 2,747

Social IRR
168%

Financial Analysis

Net Present Value	IRR
PhP 134,972 USD 2,630	162%

Sensitivity Analysis

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

- Yield of corn decreases by **50%**
- Yield of peanut decreases by **50%**

Aggregate Impact*

**within the Province of Cebu*

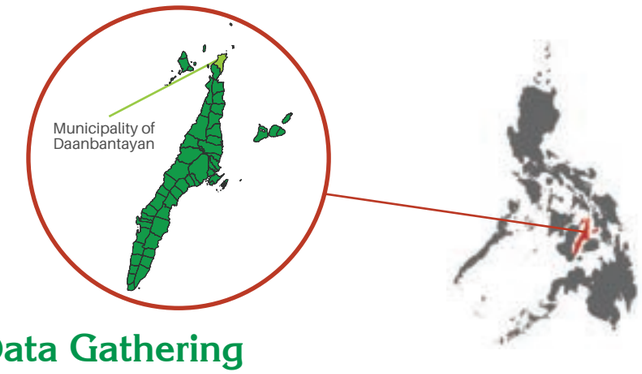
Current Adoption Rate	Projected Adoption Rate
10%	50%

Total Area Planted (ha)	Aggregate NPV
1,400 ha	PhP 52.9 million

Assumptions:

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

Study Site
Cebu Province



Data Gathering

1. Analysis of 18 case farms identifed by the Municipal Agriculturists in Daanbantayan, Cebu.
2. Conduct of Experts' Workshop with experts from the academe (Visayas State University) and the government (Department of Agriculture Region 7) pooling knowledge and insights on emerging climate resilient farm practices.
3. Conduct of workshop with 40 Municipal Agricultural Officers (MAO) to validate and add to results from Experts' Workshop and case farms.
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

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

Recommendations

When & Where?

All parts of Cebu province are recommended to invest in this cropping system.

Although recommended in all parts of Cebu, the mid and northern parts of the province have better edaphic factors in growing corn than in southern Cebu.

What?

Support and training may be provided.

The local government unit, the provincial agriculture office and Department of Agriculture Regional Field Office – 7 (DA-RFO7) may provide inputs such as seeds and fertilizer subsidies to farmers opting to adopt corn-peanut rotation. Training components can also be provided so that aspiring farmers will be encouraged to adopt this CRA practice.

Who?

Large and small scale farmers are encouraged to invest in corn-peanut rotation.

Large scale farmers can sell to the private sector while small scale farmers can cater to the the local market. The DA-RFO 7 in coordination with other agencies (e.g. Philippine Crop Insurance Corporation, state colleges and universities) should take the lead in scaling out this CRA practice.

Initial Investment Breakdown

Initial Investment
PhP 51,500

Labor & Services
PhP 12,300

Carabao & Equipment
PhP 29,500

Inputs
PhP 9,700

Cost of Adopting CRA

Initial Investment
Installation costs (Year 1)
PhP 51,500

Maintenance
Annual costs (Years 2-10)
PhP 24,600

Operations
Irregular/ non-permanent costs
PhP 8,300