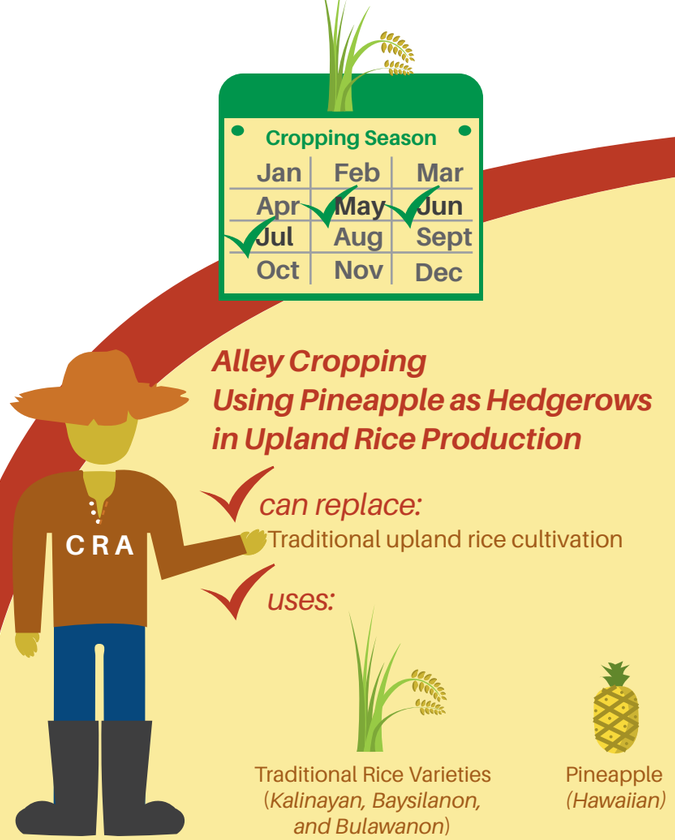
Context

Rice, being the staple food in the province of Samar and in Eastern Visayas (Region 8), accounts for 21.86% of the total agricultural output of the region. Among all provinces in Eastern Visayas, Samar has the largest upland rice environment, covering 3,798 hectares of the total 6,286 hectares in the region. However, farming practices in Samar are very traditional and often result to low productivity (DA8, 2013). Furthermore, the area receives heavy rainfall throughout the year and is frequently visited by typhoons. As such, the province is increasingly prone to rain-induced landslide, sea level rise and flooding during heavy rainfall events.

Alley Cropping Using Pineapple as Hedgerows in Upland Rice Production

Alley cropping using pineapple as hedgerows in rice production promotes the use of *Kalinayan* rice, a peculiar and popular aromatic upland rice variety in the region. Despite its relatively higher price, *Kalinayan* is a sought-after rice variety because of its excellent aroma, pinkish kernel and good quality (DA8, 2012). Similar to other aromatic varieties, it potentially has a higher milling recovery as well (Mante, 2016).

This practice makes use of a high-value crop such as pineapple as vegetative barrier. Its effectiveness in mitigating soil erosion is comparable to shrubs and trees. It also prevents run-off and loss of nutrients, particularly N and K, thus, maintaining soil pH balance and contributing to higher organic matter and available N and K (Sharma et al., 1997).



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
- Early Maturing 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

References

Department of Agriculture Region VIII. 2013. Assessing the market potential of upland rice in Region 8 through value chain approach. Retrieved from http://da08.da.gov.ph/index.php/media-resources/da-news/678-assessing-the-market-potential-of-upland-rice-in-region-8-through-value-chain-approach2 on June 28, 2018

Department of Agriculture Region VIII. 2012. Agri-pinoy rice program. Retrieved from http://da8.da.gov.ph/index.php/da-agri-biz-matching/rice/384-agri-pinoy-rice-program on June 28, 2018

Department of Agriculture Region VIII. 2012. Kalinayan: A peculiar aromatic rice variety from Region 8. Retrieved from http://da08.da.gov.ph/index.php/services/research/426-kalinayan-a-peculiar-aromatic-rice-variety on June 28, 2018

Mante L. B. 2016. Tillage and crop establishment of aromatic rice's: Their influence on the population dynamics of insect pests. *World Wide Journal of Multidisciplinary Research and Development* 2(1): 89-96

Nakalevu T., Ratukalou I., Waradi J., Elder M., and Dowling A. J. Undated. Vetiver and cash crop erosion control systems for sustainable sloping land farming in Fiji. Ministry of Agriculture, Fisheries and Forests, Nausor, Fiji

PLGU-Samar. 2016. Provincial agricultural profile.

Sharma N. N., Sarma D., Paul S. R., Dey J. K., Bora P., and Singha D. D. 1997. Effect of countour-strip cropping pineapple (*Ananas comosus*) on rice (*Oryza sativa*) – sesame (*Sesamum indicum*) and maize (*Zea mays*) – sesame cropping sequences and their effect on soil properties. Indian Journal of Agricultural Sciences 67(1): 20-22

Wolz K. J., Lovell S. T., Branham B. E., Eddy W. C. et al. 2018. Frontiers in alley cropping: Transformative solutions for temperate agriculture. *Global Change Biology*, Vol. 24, Issue 3

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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 Samar Province (Eastern Visayas Region).

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CIAT Centro Internacional de Agricultura Tropical
Desde 1967 Ciencia para cultivar el cambio

TECHNICAL BRIEF on Climate-Resilient Agriculture (CRA)

Eastern Visayas (Region VIII)

Alley Cropping

Using Pineapple (*Ananas comosus* L.) as Hedgerows in Upland Rice Production

Alley cropping is one of the strategies for climate change adaptation in rice farming. It involves planting pineapple (Ananas comosus) along the contours as vegetative barrier. Upland rice, the aromatic Kalinayan variety, is planted between hedgerows. Aside from providing farmers diversified income to help limit financial risk, the practice also bears ecological benefits. It can buffer alley crops to withstand adverse weather conditions as well as increase biodiversity, reduce soil erosion, improve soil properties and water use efficiency (Wolz et al., 2018).

Productivity

Increase in potential income from additional pineapple production

Adaptation

Diversified income source to reduce risk of financial losses

Improve biodiversity

Mitigation

Reduce soil erosion by 16.33 Mg/ ha/ yr.

Improve soil properties and water use efficiency.

Cost & Benefit

Initial Investment / ha
PhP 64,000

Payback Period
3 years

*On top of profit from conventional practice

Estimated Additional Annual Profit / ha*
PhP 20,685
USD 403

Yield & Prices

	Without CRA	With CRA
Traditional Upland Rice Cultivation / Alley Cultivation		
Average annual farm yield	1,430 kg/ha	455 kg/ha + 1,040 kg/ha
Price	PhP 32.5/kg	PhP 32.5/kg + PhP 37.5/kg

vs

5 Reasons to Invest

1. Diversification of income source to **reduce risk of financial losses**
2. **Preservation of the *Kalinayan*** upland rice variety
3. Increase **farm biodiversity**
4. Improve **nutrient and water use efficiency**
5. **Reduce soil erosion**

Externalities

Social and Environmental NPV
PhP 75,595
USD 1,473

Social IRR
89%

Financial Analysis

Net Present Value	IRR
PhP 74,876 USD 1,459	87%

Sensitivity Analysis

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

Yield of **pineapple** decreases by **40%**

Aggregate Impact*

*within Samar Province

Current Adoption Rate	Projected Adoption Rate
10%	30%

Total Area Planted (ha)	Aggregate NPV
6,286 ha	PhP 69 million

Assumptions:

Period of Analysis	Discount Rate	Exchange Rate
10 years	12%	$1 = PhP 51.32

Recommendations

When & Where?

Alley cropping using pineapple as hedgerow is profitable for upland rice farmers in the provinces of Samar and Northern Samar.

Farmers can complete one cropping season over the period of April-October.

What?

Conduct activities to increase awareness and uptake of CRA technologies.

- Establishment of upland rice technology demonstration farms and upland rice seed banks
- Participatory community-based farming system for upland rice
- Participatory varietal selection and sensory analysis for upland rice varieties

Who?

Farmers engaged in upland rice production are encouraged to adopt the practice.

The Government is encouraged to promote the adoption of the CRA practice and ensure programs to support the availability of pineapple suckers and quality seeds of *Kalinayan* rice variety. The Government and the academe can continuously conduct research programs to deepen knowledge on the practice, its yield impacts and environmental externalities.

Initial Investment Breakdown

Initial Investment
PhP 64,000

Labor & Services
PhP 32,000

Equipment
PhP 26,000

Inputs
PhP 6,000

Cost of Adopting CRA

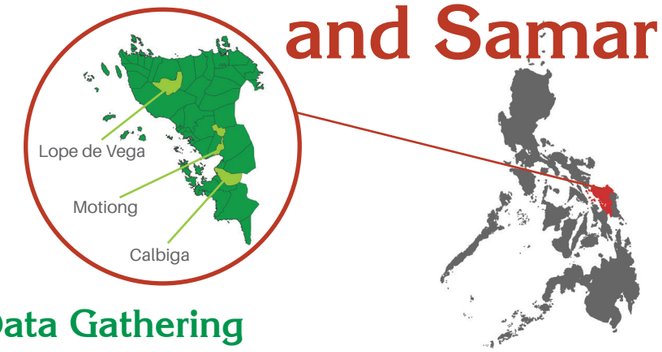
Initial Investment
Installation costs (Year 1)
PhP 64,000

Maintenance costs
(Years 2-10)
PhP 32,500

Operations
Irregular/ non-permanent costs
PhP 7,500

Study Site

Northern Samar and Samar



Data Gathering

1. Analysis of experiences of 6 case farms in the municipalities of Calbiga and Motiong in Samar and in the municipality of Lope de Vega in Northern Samar
2. Validation of KIIs using results of field trials in the region by the Philippine Rural Development Program (PRDP) project of the Department of Agriculture (DA)
3. Conduct of Experts' Workshop with experts from Visayas State University and DA-Region 8 pooling knowledge and insights on emerging climate resilient farm practices
4. Conduct of workshop with Municipal Agricultural Officers (MAO) for validation
5. 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/