



Root and Tubers Crops: Production-use Systems and Food Resilience in Agro-forestry Ecosystems in Central Philippines Results of a Scoping Study

There is increasing recognition that root and tuber crops (RTCs) can help make people food- and nutrition-secure, with the Philippine government now including sweetpotato and cassava in its Food Staple Sufficiency Program (DA, 2012). RTCs also have great potential to reduce poverty by providing income from marketing of both fresh roots and processed products for a range of food and non-food uses. In addition, RTCs can serve as reserve crops for vulnerable communities following extreme weather events and disasters.

In rural areas such as Bohol province, RTCs are an important part of the farm and food systems of poor households. In order to improve food security and nutrition, raise incomes, and strengthen resilience among these RTC producer-consumer households; FoodSTART+ has partnered with the Integrated Natural Resources and Environmental Management Project (INREMP) in Bohol province.

INREMP is a seven-year project implemented by the Department of Environment and Natural Resources funded through a loan obtained by the Philippine Government from the Asian Development Bank and IFAD with minor grant components from the Global Environmental Facility and the Climate Change Fund. It covers four river basins: Chico in the Cordillera Region, Bukidnon in Northern Mindanao, Lake Danao Watershed in ARMM, and Wahig-Inabanga in Central Visayas, specifically Bohol Province. The objective is to improve the quality of life of rural communities by sustainably managing natural resources with stakeholder participation and ensuring that local institutions effectively govern river basin resources

Research Highlights:

- RTCs are traditionally grown in gardens or small farms in the focus sites for food or additional income. Farmers often experience low yields due to poor crop management, degraded soils, and use of low yielding cultivars.
- RTCs have potentials to significantly contribute to an emerging health-food market, especially since Bohol is a prime tourist destination. Purple yam and cassava are already commercially produced, while other RTCs abound in the focus sites.
- RTCs can be integrated in the agroforestry system-based livelihoods in the project sites as they are naturally adapted to these environments, however, production can still be improved with available technologies as well as the provision of livelihood development support services systems through collaborative development.

as an enterprise that generates revenue from conservation and livelihoods. The INREMP-FoodSTART+ collaboration seeks to improve livelihoods and food resilience within the agro-forestry context in the Bohol watersheds of Wahig-Pamacsalan, Danao and Dagohoy (Fig. 1).

Research Site Description

Bohol is the 10th largest island province of the Philippines and a major tourist destination. It comprises 30 coastal and 17 inland municipalities, and one city. It also has 61 offshore islets. Bohol is mainly lowlands with highlands in the northeastern part of the island suitable for agriculture and tree plantations.

The province is one of the 20 poorest in the Philippines (rank #16) and is highly vulnerable to natural disasters such as typhoons and earthquakes. Development of agro-forestry based livelihoods is important both for improving incomes and

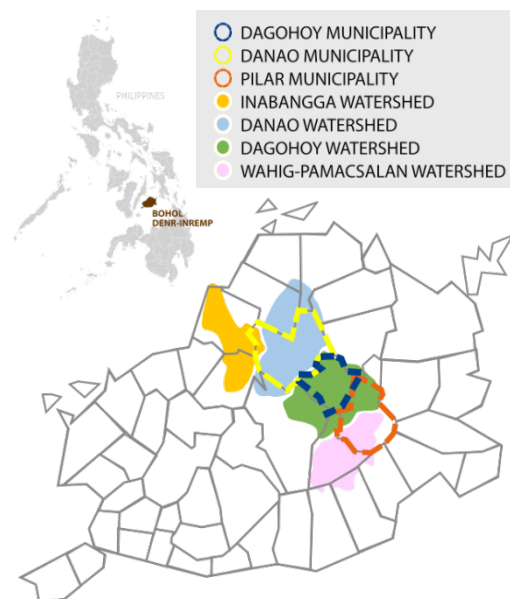


Figure 1. Location map of INREMP-FoodSTART+ sites in the watersheds of Bohol, Eastern Visayas, Philippines.

About FoodSTART+ Food Resilience Through Root and Tuber Crops in Upland and Coastal Communities of the Asia-Pacific (FoodSTART+) is a three-year project (2015-2018) that builds on and expands the scope of the recently-concluded IFAD-supported Food Security Through Asian Root and Tuber Crops (FoodSTART) project. It is coordinated by the International Potato Center (CIP), in collaboration with the International Center for Tropical Agriculture (CIAT) in Asia. The project is also working closely with the CGIAR Research Program on Roots, Tubers and Bananas (RTB); and the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). It is funded by the International Fund for Agricultural Development (IFAD) and the European Union (EU).

The project aims to enhance food resilience among poor households in upland and coastal communities of the Asia-Pacific region through introducing root and tuber crops (RTCs) innovations. To achieve this goal at scale, the project will develop, validate and implement effective partnership strategies with IFAD investment projects to promote RTCs for food security.

The project's key components are:

1. Project start-up and scoping studies including mapping on food vulnerability of RTC production and use;
2. Research for development (R4D) partnership development;
3. Needs and opportunities analysis on gender sensitive RTC innovations;
4. R4D action planning and launching; and
5. Documentation and knowledge products development.

This issue of the FoodSTART+ Research Brief features the results of the country scoping studies under Component 1. It will present an in-depth look at the RTC production trends, vulnerabilities and opportunities in the target countries. The scoping study was conducted through primary and secondary data gathering during the first year of the project (2015-2016).



for preventing forest loss and degeneration within the target watersheds.

The INREMP-FoodSTART+ sites are located in upland areas where RTCs are traditionally an important component of food systems. The recommended RTC interventions can be integrated into agro-forestry systems development activities implemented by the Peoples' Organization beneficiaries of INREMP.

Scoping Study Highlights

Production, area, and yield. RTCs production ranges from a few square meters to about 0.25 ha. The very few market-oriented farmers have between 0.5-1.0 ha. RTCs such as sweetpotato, yam, taro, and other aroids are grown in mixes, in rotation, or intercropped with vegetables, bananas and ginger. In the Dagohoy-Danao areas, mostly outside the agro-forestry zone, market-oriented cassava production (0.5-2.0 ha) is found, both for fresh roots and starch. RTCs are mostly grown year-round on rainfed areas, on sloping land and uplands, whenever planting materials are available.

Local RTCs are relatively low yielding due to reliance on traditional varieties, plus limited extension and other support services. RTCs production declined by 26.5% from 2000 to 2014 due to the high incidence of phytoplasma in cassava, anthracnose in purple yam, and SP weevil in sweetpotato.

Postharvest, utilization, and marketing.

Most RTCs are grown by farmers for subsistence, particularly during times of food shortage or when there is no rice harvest, while surplus production is sold for cash. Sweetpotato, taro, and other aroids are made into local delicacies for neighborhood markets or school canteens. Purple yam is also processed into food products of significant commercial value for the tourist market in Bohol. RTC rejects are used as feeds for backyard animals.

On the other hand, cassava production grew in the early 1980s mainly to supply raw materials for industrial starch plants but declined in the 1990s when production at the starch plant in Carmen, Bohol scaled down due to supply chain and internal problems. The plant is currently being modernized and is slowing increasing production, presenting an opportunity for larger scale cassava producers (>.25 ha).

This opportunity may not be applicable for small scale farmers in the upland agro-forestry context of INREMP sites; therefore the RTC value chain above (Fig. 2) did not include the cassava chain for the starch factory. It shows that about 90% of upland RTC production is home-consumed. Marketing options are limited by the lack of links to bigger towns and city markets and by competition from Northern Mindanao growers who supply the Tagbilaran City markets. This is mainly due to farm inefficiency, logistics, absence of trading links, and unstable supply; which then lead to low prices for local fresh roots.

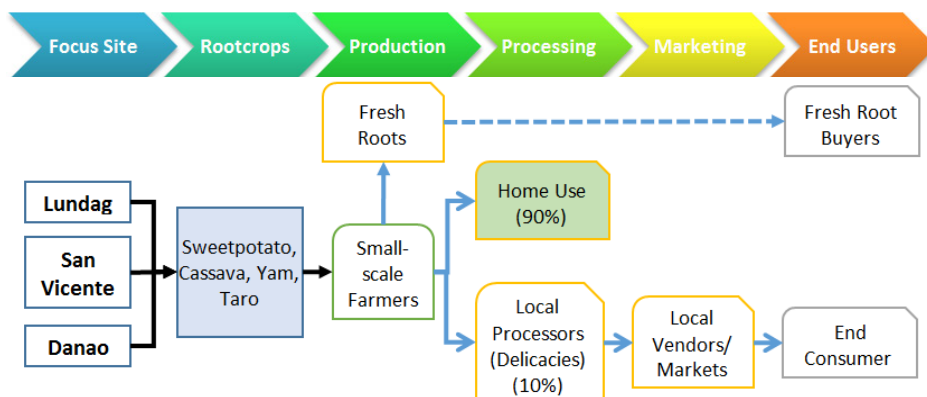


Figure 2. RTC value chain map in INREMP-FoodSTART+ sites in Bohol, Philippines.

Gender roles. RTC production is a model of gender equity and women empowerment even among the marginal households in the upland communities of Bohol. Both women and men are engaged in RTC farming, but the women are usually more involved in production for household consumption and marketing in local markets while men are more involved in wider markets beyond their locale.

Climate change, vulnerability, and food resiliency. RTCs are adaptable even to extreme environments, easy to manage (low labor needs) and less vulnerable to extreme weather conditions such as droughts. Thus, they play an important role as reserve food and cash crops during or after natural calamities, especially among upland households. They significantly contribute to household and community food resilience.

Food security and nutrition. RTCs are a convenient food alternative, especially when rice is unavailable. They are nutrient-rich and have huge potential to address undernutrition among children in Bohol. However, most consumers and farmers are neither aware nor conscious of the nutrient and health benefits of RTCs.

Constraints and Opportunities

- RTC production in Bohol is mainly subsistence or semi-commercial, and is challenged by low productivity due to a host of factors including poor crop management, use of low yielding cultivars, and depleted soils.
- RTC growers are resource-poor, and are reluctant to improve production as they are not linked to markets, have little contact with traders and lack information on RTC opportunities for tradable products and markets. Farmers also do not have access to technologies or business service providers.
- To improve and sustain production, farmers need access to support services for capability development, financing, and product and market development.
- INREMP's livelihood design within agro-forestry enables the incorporation of RTCs in the farm system where available technologies can be applied.
- Bohol is a first rate tourist destination where demand for culture-related and health-food options is increasing.

Conclusions and Recommendations

RTCs such as sweetpotato, taro and aroids, yam and cassava are important parts of the mixed crop systems in the upland farm pockets of the watersheds of Bohol. They are **integrated in the agroforestry systems**, mainly in a subsistence scale.

RTCs are suitable agro-forestry components of the watershed and are **ideal for climate change adaptation and mitigation**.

Technologies for RTCs and related complementary uses are available, and R&D agencies are present to support enterprise/value chain development.

Agro-ecotourism has huge potential for RTC businesses, as well as community-based endeavors in Bohol in particular, as a major tourist destination

Multi-faceted social marketing activities for RTCs information are essential for creating awareness of the uses, benefits and technologies to help change attitudes and behavior; and most importantly, to increase RTC uses and develop markets.

INREMP-FoodSTART+ partners and relevant agencies should be facilitated to establish and deepen collaborative partnerships. They should also be **oriented on the approach and processes involved in RTC development**, and on how findings from specific sites can be effectively implemented and scaled up.

Literature Cited

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