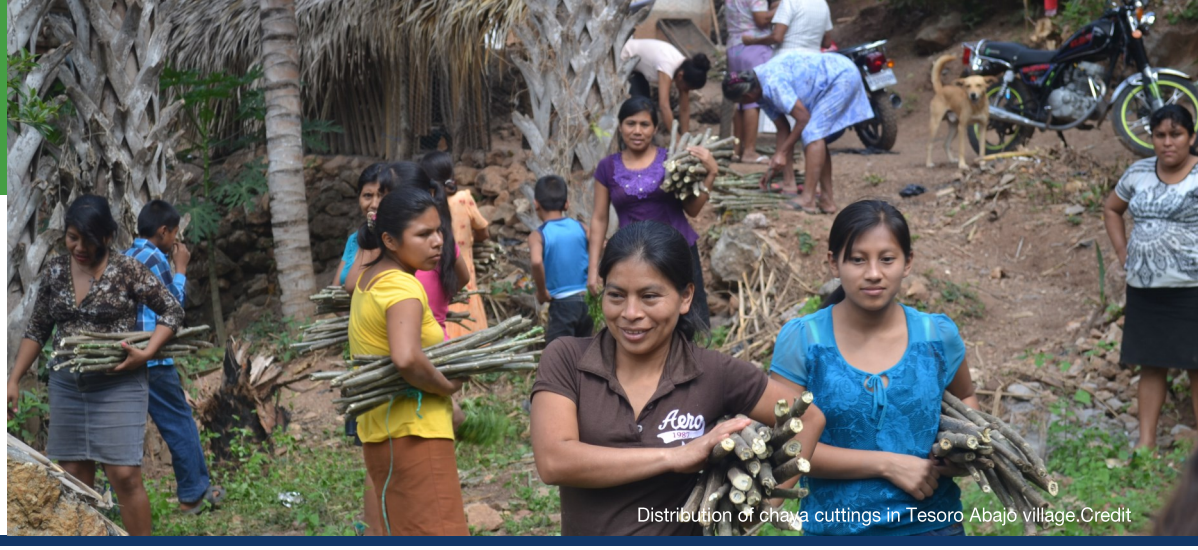


Distribution of chaya cuttings in Tesoro Abajo village.Credit

Bioversity International

IMPACT BRIEF

Promoting chaya and tepary bean to improve diet quality, climate resilience, and incomes in Guatemala

This Project was supported by the International Fund for Agricultural Development (IFAD), the European Commission and the CGIAR Research Programmes on Climate Change, Agriculture and Food Security (CCAFS) and Agriculture for Nutrition and Health (A4NH). The activities were carried out in close partnership between Bioversity International, Universidad del Valle de Guatemala (UVG) and Mancomunidad Copan Ch'orti' with inputs from numerous collaborators

UVG UNIVERSIDAD DEL VALLE DE GUATEMALA

Copanch'orti' Mancomunidad

IFAD Investing in rural people

European Commission

CGIAR RESEARCH PROGRAM ON Agriculture for Nutrition and Health

CGIAR RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security CCAFS

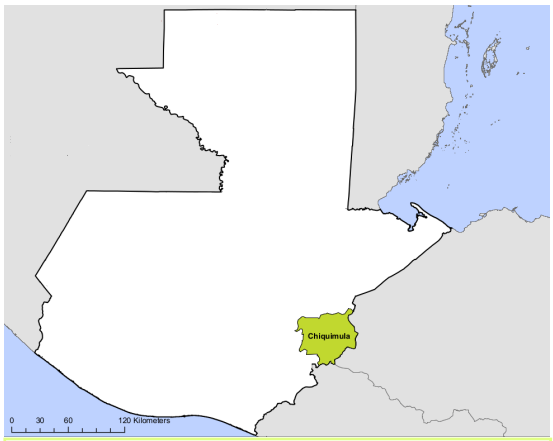
Guatemala is a center of origin and diversity for globally-important crops such as maize, common bean, pumpkin, papaya, avocado, cocoa, cassava, sweet potato, and chili, as well as numerous lesser-known crops. This bounty of agrobiodiversity derives from the diverse terrain and flora and fauna in this hotspot of global biodiversity, as well as the rich cultural diversity of this land, where numerous distinct ethnic groups coexist.

Unleashing multiple benefits from neglected native crops

Many native plants used by communities in Guatemala have received little attention from research and development—even if some have stronger nutritional values and tolerance to climate stress compared to popular introduced crops. The Project "Linking agrobiodiversity value chains, climate adaptation and nutrition: Empowering the poor to manage risk" aimed to help fill this gap to strengthen the capacities of farmers to manage risks associated with climate change, poor nutrition status, and economic disempowerment. From 2015 to 2019, the Project focused on chaya (*Cnidoscolus aconitifolius*) and tepary bean (*Phaseolus acutifolius*), which stood out among other crops as strong assets to improve nutrition, climate change adaptation and income opportunities. A holistic value chain approach addressing multiple bottlenecks in supply and demand was applied to promote use of these crops. Activities sought especially to connect producers to markets and to enhance and multiply impacts for food security, conservation, profitability, and women' empowerment.

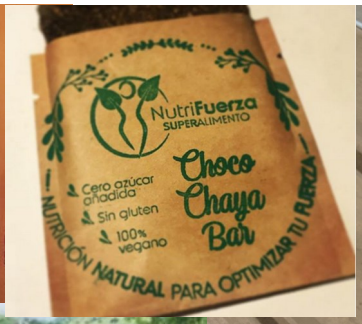
Chaya

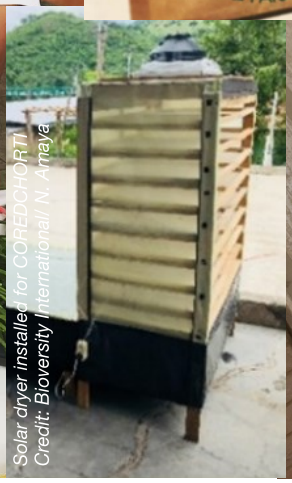
Chaya, also called Mayan spinach, is a shrub cultivated since pre-Hispanic times in Mesoamerica that produces nutrient-rich leaves year round. Because of its easy cultivation under marginal conditions, this crop can offer important livelihood contributions in vulnerable communities. Yet at the start of the Project, the scale of its production, marketing and consumption were



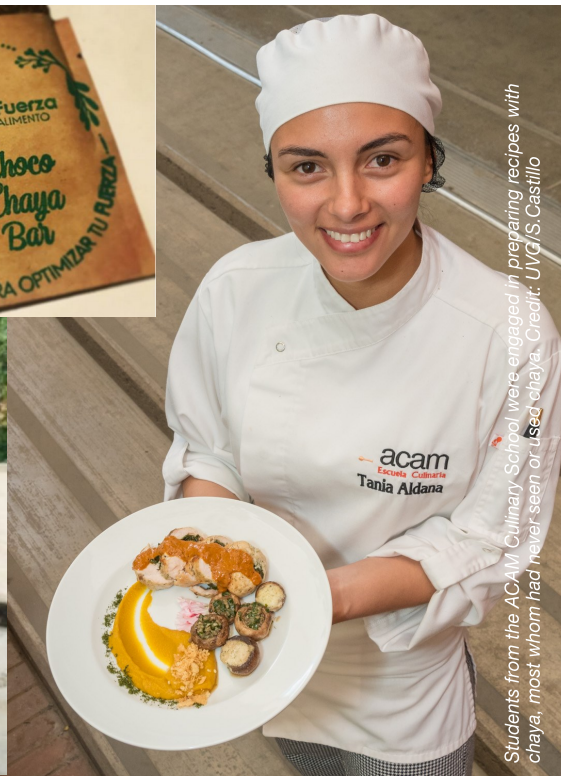
The Project was implemented in Chiquimula Department that is part of the Central American Dry Corridor, a region characterized by poor soils and high incidence of climate hazards, where communities face widespread poverty, food insecurity and malnutrition. At least 25 villages were reached with activities on the focal crops. The baseline survey was completed in 3 villages (N=88) and the endline with in 10 villages (N=170), including all baseline sites.

Extracting protein from chaya.Credit: Bioversity International/ N. Amaya





Solar dryer installed for COREDCHORTI Credit: Bioversity International/ N. Amaya



Students from the ACAM Culinary School were engaged in preparing recipes with chaya, most whom had never seen or used chaya. Credit: UVG/S.Castillo

found to be small relative to its potential.

Agronomic factors did not stand out as a major limitation for using chaya. Producers described its cultivation to be easy, requiring few inputs and generating a harvest even under challenging climate conditions. Lack of demand was identified as a primary factor limiting chaya marketing, resulting from low consumer awareness, perception of chaya as a "food of the poor", unattractive recipes, changing food habits, and easy availability in home-gardens. High transaction costs, weak value chain organization, and poor profitability were other bottlenecks detected. To help overcome these issues, the Project intervened at multiple levels in the value chain through activities defined through multi-stakeholder consultations.

To encourage cultivation of chaya and raise its supply, 18,700 chaya cuttings were distributed for planting in home gardens, *milpa* fields, and community nurseries. Many of the cuttings introduced were from the 'Estrella' variety that has higher yield, nutritional quality, marketability and ecological adaptability compared to the 'Mansa' variety that was most prevalent in the study area prior the interventions. Farmers were also trained and provided a manual on good cultivation and propagation methods.

- ⇒ Significant adoption of chaya occurred from 31% of households cultivating this crop in 2015 to 97% following the interventions
- ⇒ The percent of growers producing chaya Estrella increased from 18% to 32%
- ⇒ The number of chaya plants households held increased from mean 7.7 to 22.9
- ⇒ By 2018, household chaya harvests tripled as compared to 2015, from 10 to 28 kg leaves/year

* Figures from same communities as baseline

To enhance value chain organization, reduce transaction costs, and increase profitability, the Project supported the establishment of a farmers' collective—the Integral Chorti Marketing Cooperative (COREDCHORTI)—aimed at producing, processing and marketing chaya, as well as other local products. Its 300 members, mostly women, were encouraged to first cultivate chaya for self-consumption, and then process and market any surplus. Members were trained on processing techniques including protein extraction (60gr of protein can be extracted from 1kg of leaves), dehydration, grinding and packaging, as well as business management skills. The necessary equipment (e.g. solar panel) was also provided.

Various activities were undertaken to link COREDCHORTI with markets and buyers. A cooperation was established with EarthEmpower, a company that is buying powdered chaya from COREDCHORTI to make tea, energy drinks (smoothies), granola and energy bars. Advocacy and events were organized with the gastronomy sector to promote uptake of this crop in restaurants in Guatemala City and to link COREDCHORTI as a supplier. A policy change was successfully advocated by the Project team to include chaya in local school meals, and COREDCHORTI was supported in its legal establishment so it can now participate as a supplier for the schools.

The Project worked at multiple levels to stimulate demand for chaya among urban and rural consumers, using the "kitchen as a development tool". Working with the gastronomy sector and media influencers (esp. Kreadi), marketing and consumer awareness campaigns were organized in urban areas to popularize chaya as a highly nutritious

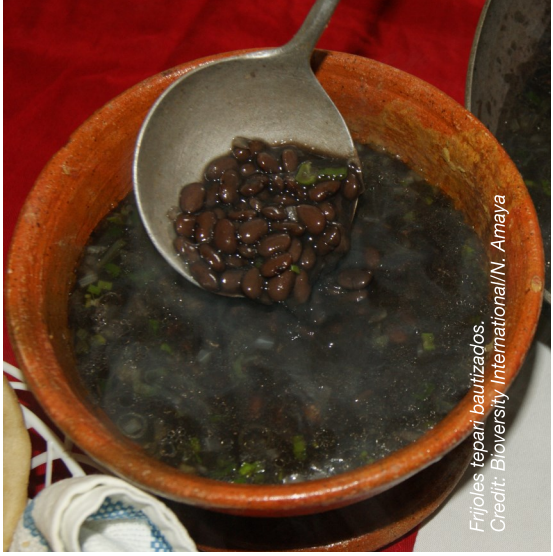
food and as part of a movement to re-discover Mayan food culture. Tasting events with chaya dishes were organized in markets in Chiquimula district during which chaya recipe books and leaflets on the importance of chaya and its benefits were disseminated. A press conference was organized in Guatemala City that sparked coverage by popular newspapers and radio programmes, while the nutritional values and virtues of chaya were further promoted through local magazines, Instagram, Facebook, and Twitter.

Community members in focal villages were also trained on the nutritional relevance of chaya and new recipes that could be prepared with materials readily available in the local context. One of these workshops was led by an expert from Mexico who trained women on protein extraction from chaya as an easy approach to enrich *tortillas,* while maintaining desirable organoleptic qualities.

Tepary Bean

Tepary bean, also known as *escumite*, is a legume considered among the most drought and heat tolerant crops in the world. The plants can outyield common bean (*Phaseolus vulgaris*) by at least 1.5 times in hot environments, while providing a similar nutritional composition. Because of these traits, tepary bean was recognized for its potential to enhance food and livelihood security in Chiquimula, where increasingly frequent and severe drought spells are challenging common bean production.

There are historical records of tepary bean in Guatemala, but the status of this crop was unclear at the start of the Project. Initial surveys revealed it was unknown in the focal sites. An exploration to the southwestern coast was organized, where the crop had been observed to be widely grown decades ago and the project team was able to collect a local variety. This discovery confirmed that—contrary to common knowledge— tepary bean is still being grown in Guatemala, although the difficulty in locating its fields indicated that this pulse has become a relict crop and greater efforts for its conservation are therefore urgently needed. Seeds purchased from the custodian farmer were integrated in a local seed savers network. Given that tepary bean was a new crop in the Project sites, it was promoted as a complementary food source to diversify the portfolio of pulses.


Frijoles tepari bautizados.
Credit: Bioversity International/N. Amaya

- ⇒ In 2015, no households surveyed was selling chaya, whereas in 2018, 11.8% of growers (in the same communities) were selling chaya, which provided an estimated mean gross income between 7 and 21 USD/year
- ⇒ At the start of the Project, two processed products with chaya (capsules and flour) from one company were found to be sold on a small scale in a few sales points in Guatemala. EarthEmpower has since expanded this offering, now selling 4 products with chaya in 18 stores in Guatemala
- ⇒ Whereas no restaurant offered dishes with chaya in Guatemala City in 2015, by 2019 two restaurants ranked among the best in the country had introduced chaya in their regular menus
- ⇒ Chaya was approved as an ingredient in 2 of 20 school meals for Chiquimula Department in 2019 and as an alternative ingredient in an additional 4 meals
- ⇒ 43% of respondents surveyed in the focal villages in 2018 said they had increased their chaya consumption in the last three years


Promoting chaya in Camotan, Chiquimula Department
Credit: Bioversity International/N. Amaya

To determine the production potential of tepary bean under local conditions in Chiquimula, experimental field trials were implemented using 12 varieties introduced from Honduras (N=8) and Puerto Rico (N=4). Additionally, farmers were engaged in evaluating tepary bean through a crowdsourced citizen science approach in which they compared the performance of three randomly assigned varieties in their own plots. Based on different agronomic parameters studied, tepary bean was found to perform better than a popular common bean variety used as a control. Tepary bean yields ranged from 620 to 1,100 kg/ha, with a mean yield that was double that of common bean. Varieties with superior performance were also identified, notably 11F-3854 from the Zamorano Pan-American Agricultural School. Tepary seed obtained in the experimental trials was multiplied and distributed to communities, producers' organizations and public institutions to promote its uptake.

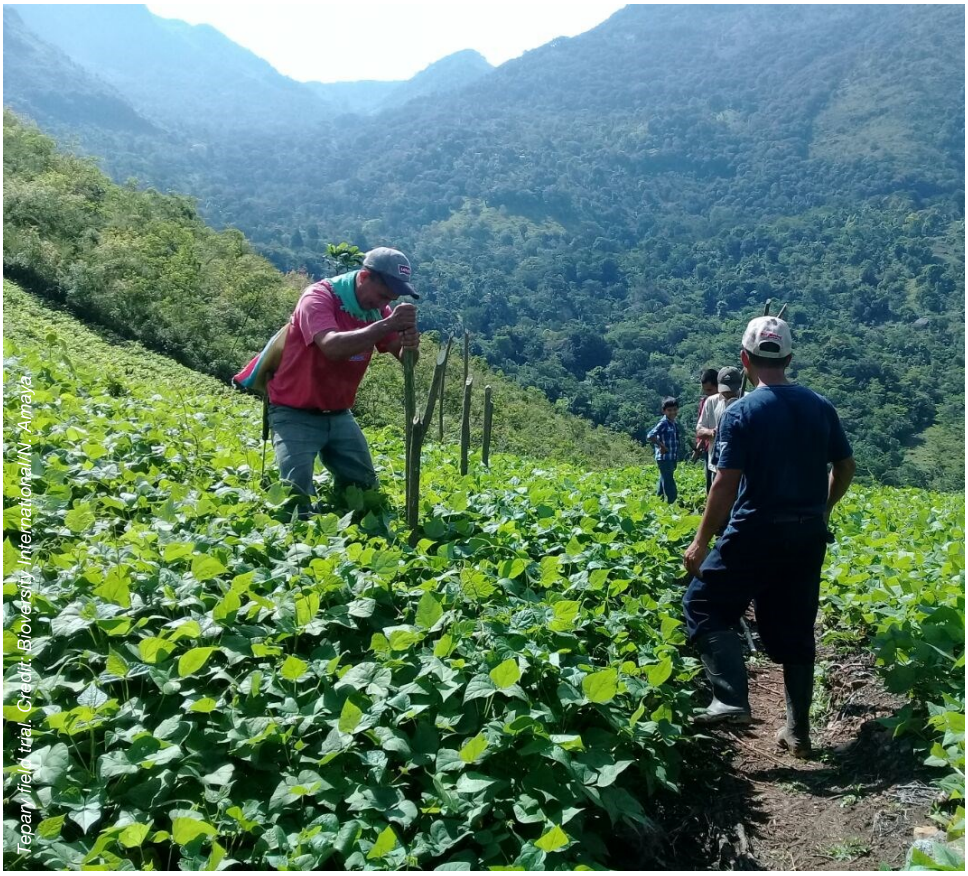
The potential for commercialization of tepary bean was assessed through consultation with bean value chain stakeholders. The study revealed concrete opportunities for tepary beans to enter the dry bean value chain in Guatemala due to its remarkable drought tolerance. Leaders from bean producers' organizations in the region were optimistic that as long as it has good productive features, tepary bean can provide a good alternative for food security under mounting drought pressure. Wholesalers suggested the best moment to introduce a new type of bean to the market is during the period of low bean availability (esp. June-July), when the price is high and consumers may be more tolerant of the smaller size and wrinkled appearance of tepary bean. Based on its production features, one of the biggest processing companies in Central America, with approximately 100,000 sales points in Guatemala, expressed interest in performing controlled laboratory trials to assess the processing qualities of tepary bean and the project team diligently supplied seed for their use.

To explore urban and rural consumers' acceptability of tepary bean, a sensory analysis was conducted that produced encouraging results. Three dishes were rated neutral' to 'extremely like' on average. *Frijoles colados* (blended and fried with onions and garlic) and *frijoles volteados* (refried) were the best ranked preparations. *Frijoles parados* (cooked whole beans) was the least preferred, especially among urban consumers, partly because tepary bean generates a thin clear broth when cooked, while Guatemalans typically prefer a thick and dark both. A recipe book for tepary bean consistent with local taste preferences and practices was developed with help of women from Chiquimula to promote uptake and use of this crop.

- ⇒ 81 kg of tepary bean seed was distributed to producers and local organizations in 2018
- ⇒ Whereas no household was cultivating tepary bean in 2015, two households surveyed in 2018 had produced tepary bean in the past three years, another had received the seed, and 6.5% were aware of this novel crop to the region

Conclusions

In its five years of implementation, the Project has shed light on factors hindering the sustainable use of chaya and tepary bean in Guatemala and contributed to bring these strategic resources back in support of better livelihoods in the Dry Corridor of Guatemala and beyond. Building capacities of local people—especially women—on ways to cultivate, market and consume these native crops has revealed to be highly strategic in bringing them back to the table. The policy change in support of the introduction of chaya and other nutritious local crops into school meals is also expected to play a multiplier effect on the long term impact that the Project has successfully initiated.



Tepary trial. Credit: Bioversity International/N. Amaya.

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CGIAR
Science for a food-secure future

Bioversity International
Via dei Tre Denari, 472/a
00054 Maccarese (Fiumicino), Italy
Tel. (+39) 06 61181
bioversity@cgiar.org
www.bioversityinternational.org

Project coordinators:
Stefano Padulosi (Bioversity International)
Rolando Cifuentes and Silvana Maselli (UVG)
Adolfo Vasquez (Mancomunidad Copan Ch'orti')

Analysis and brief by: Nadezda Amaya, Gennifer Meldrum and Stefano Padulosi

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