



RESEARCH PROGRAM ON
Climate Change,
Agriculture and
Food Security



RESEARCH
PROGRAM ON
Agriculture for
Nutrition
and Health

International Conference

Chaya in Guatemala: Participatory consultation on needs, challenges and opportunities for use enhancement

13 March 2018, Guatemala City, Guatemala

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This conference was held as part of the project "Integrating agro-biodiversity value chains, climate change and nutrition: empowering the poor to manage risk" supported by the International Fund for Agricultural Development (IFAD), the European Commission and the Research Programs of the CGIAR on Climate Change, Agriculture and Food Security (CCAFS) and Agriculture for Nutrition and Health (A4NH) from 2015-2018. The project is led worldwide by Bioversity International and is implemented in Guatemala by the Universidad del Valle de Guatemala (UVG).

Proceedings

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Background

Chaya (*Cnidoscolus aconitifolius*) is a perennial vegetable native to Guatemala that has an enormous potential to make important nutritional and health contributions in vulnerable communities due to its high nutritional value and ability to produce leaves throughout the year. While considered a nutrient dense and economic food for the Guatemalan population, chaya is also being marketed as a "superfood" with a high value niche market. Despite chaya's potential to enhance nutrition and livelihoods its production, consumption and marketing have received little research and promotion.

The project "Integrating agro-biodiverse value chains, climate change and nutrition: empowering the poor to manage risk" supported by the International Fund for Agricultural Development (IFAD) and the European Commission since 2015-2018. The project seeks to enhance the production, use and marketing of forgotten and underutilized species to support adaptation to climate change, strengthen food security, nutrition and income of poor communities in Mali, India and Guatemala. In Guatemala, the project promotes local crops that are resistant to abiotic and biotic stresses linked to climate change and have excellent nutritional profiles, such as the chaya. The holistic value chain approach applied in the project involves interdisciplinary and intersectoral initiatives, including the improvement of product quality, cultivation and processing (including plant reproductive materials), as well as the increasing consumer demand through specific marketing and awareness activities.

In 2017 an evaluation of the value chain and marketing of chaya in the Dry Corridor of Guatemala was undertaken. In order to share the results of the evaluation and increase awareness of other interesting activities involving chaya in Guatemala, a conference was held in Guatemala City at the Universidad del Valle on March 13, 2018. The conference brought together key stakeholders identified throughout the study that are working with chaya. The conference was an important opportunity for cross-pollination and cooperation between institutions in Guatemala, Mexico and the United States.

The conference informed participants about the current state of knowledge about the chaya value chain in Guatemala. Participating organizations shared unique approaches to enhance the use of chaya and other native plants for better nutrition and income, including innovative production and preparation techniques. The conference concluded with an open forum discussion where civil society, the public sector and national and international organizations identified the needs, challenges and opportunities to improve the value chain of this highly nutritious vegetable. This document shares the results of the conference.

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Program

13 March, 2018

8.30-8.45	Welcome and introduction to the event (Stefano Padulosi/Bioversity y Mónica Stein/UVG)
8.45-9.05	Research on chaya in Guatemala carried out by UVG (Rolando Cifuentes/UVG)
9.05-9.25	Nutritional and functional value of leaves used in ancestral Mesoamerican cuisine (Alfredo Lopez/EuroTropic representing Armando Cáceres/Farmaya)
9.25-9.45	Presentation of the National Strategy for the prevention of chronic malnutrition (ENPDC) in Guatemala and the role of native plants (Sergio Ruano/Ministerio de Agricultura)
9.45-10.00	Research on underutilized crops and experiences with chaya (EEUU) (Cecilia Gonzales/ECHO)
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10.00-10.30	<i>Coffee Break</i>
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10.30-11.10	Presentation of the results of the chaya value chain analysis in Guatemala for the IFAD-EU project (Nadezda Amaya/Bioversity)
11.10-11.30	Experiences and lessons learned in the promotion of chaya in Guatemala: Promoting Chaya through Green Tortillas (Andrea Guzmán/Maya Health Alliance and Penny Rambacher/Miracles in Action)
11.30-11.50	Popularising the use of chaya in school gardens and lunches in Guatemala (Jaime Marroquin/Aldea Maya)
11.50-12.10	Commercial processing of chaya in Guatemala (Alfredo López/EuroTropic)
12.10-12.30	Taking advantage of the nutritional values of the chaya through the extraction of protein (Javier Rodríguez / Secretaria de Educación Pública, México)
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12.30-14.00	<i>Lunch (An edible exhibition of innovative recipes showcasing chaya as the main ingredient)</i>
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14.00-14.20	Role of gastronomy in the promotion of native plants. Linking producers with potential clients: the Kreadi experience (Paula Enríquez/Kreadi)
14.20-15.30	Discussion forum: perspectives on the needs, challenges and opportunities to enhance the chaya value chain in Guatemala (Margarita Palmieri/UVG)
15.30-16.00	Conclusions (Nadezda Amaya/Bioversity)

Welcome and introduction to the event



Mónica Stein, Universidad del Valle de Guatemala

Good morning associates from Bioversity International, International Fund for Agricultural Development (IFAD), European Union (EU), Research Programs of the CGIAR on Climate Change, Agriculture and Food Security (CCAFS) and Agriculture for Nutrition and Health (A4NH), special guests, UVG community, and other colleagues.

It is a pleasure to welcome you to UVG, especially for an event as relevant as this one. Research on native plants especially the chaya, as well as nutritional herbs and their use has been a major focus of the researchers in this institution for many years. With the support of Bioversity International, today we take a step to further this effort, in this conference agronomic and nutritional studies are complemented by important economic studies to better understand the dynamics impacting the use and adoption of chaya as food.

Multidisciplinary research is extremely important to understand the problems impacting a topic in an integral way, but even more so to find the solutions to the problems in a more pertinent way. We can not address cross-cutting issue, such as agriculture and food, only from the technical aspects of a discipline. Application of the agronomic, nutritional, chemical, and biological results fall short without anthropological and economic components that allow us to design strategies that promote behavior change that leads to the adoption of discoveries, innovation and technology.

For this I congratulate the organizers and researchers involved in the event today, since they are combining disciplines and knowledge in order to improve access to quality food in the best possible way.

I am sure that the day will be very productive and I urge you to continue forward in your efforts. Welcome to UVG.

Stefano Padulosi, Bioversity International

A very warm welcome to all of the participants of this conference organized in collaboration with the Universidad del Valle de Guatemala. This event is part of an international Project funded by the International Fund for Agricultural Development (FIDA) and the European Union, launched in 2016 and implemented in Guatemala, Mali and India. The project concludes at the end of this year.

The objective of this project is to promote underutilized crops to strengthen resilience to climate change, nutritional security and income generation of vulnerable populations. Today, we are pleased to share the results of our work on chaya, a symbol of the incredible richness in agrobiodiversity that Guatemala has and that we seek to be more appreciated in the country.

We thank the women and men of the local communities, the national and international organizations and institutions, as well as the many experts in Guatemala and Mexico who have accepted our invitation to contribute their experiences. In the discussion forum at the end of this event to we hope to bring together these collective experiences to identify better ways to promote this fantastic crop. In addition to being an opportunity to share, this discussion forum will also guide the implementation of our activities in support of the chaya promotion.

I hope you all enjoy this event and the opportunity we have created to strengthen the future of the chaya in Guatemala.



Stefano Padulosi giving his opening speech. Credit: Bioversity International/G. Meldrum

Research on chaya in Guatemala carried out by UVG

Rolando Cifuentes, Universidad del Valle de Guatemala

Introduction

Among the main activities carried out by the University of the Valley of Guatemala regarding chaya are: locating material in the national territory, establishment of a clonal garden, identification of agronomic trials (ie characterization, growth, physiology, production, fertilization, insects, diseases and humidity), chemical composition analysis, increasing household chaya consumption through the promotion and introduction in rural areas.

Results

- Preparation of an informative video about chaya, which includes information about its production, consumption and nutritional importance ([See the video “Chaya una planta muy nutritiva” on Youtube](#))
- The nutritional value of chaya is superior when compared to other edible herbs. The composition was analyzed by 100 grams of fresh chaya from 4 collections planted at 20 masl (Masagua, Escuintla) and then compared to the analysis made by INCAP on the nutritional content of the blede, chipilín, hierba mora, calabaza, spinach, swiss chard and lettuce.
- The chemical composition of the different chaya varieties in an altitudinal range of 20 to 1500 masl has been analyzed
- Development of Food Products Based on Local Raw Material. Biological tests were carried out with Wistar rats and with goats for the evaluation of a particular producer in Alta Verapaz
 - The determined Protein Efficiency Ratio (Increase in weight / Food consumed) and Percentage of Digestibility ((N ingested -N in stool) / N ingested) * 100.
 - 13 bioassays were carried out and 103 diets (corn, sorghum, beans and vegetables) were evaluated to determine the nutritional quality and digestibility of the formulated products.
- New food products were developed based on corn flour (*Zea mays*), sorghum flour (*Sorghum bicolor*), bean flour (*Phaseolus* spp.), Soybean meal (*Glicine max*), vegetable flours (chaya (*Cnidioscolus aconitifolius*), barley (*Amaranthus* ssp.), moringa (*Moringa oleifera*), white leaf (*Brassica* spp.) and quilete (*Solanum* spp.) and egg flour.
- The products selected for the Protein Efficiency Ratio (PER) and percentage of Digestibility in Wistar Rats were: Conventional Maize - Beans - Edible Herbs (Chaya, Quilete or Chipilín) (75 - 20 - 5). With a Protein Efficiency Ratio (PER): 2.0 to 2.1. Other leaves such as the leaf of sordo, moringa, chard or watercress presented a PER below 2, but higher than the PER of Corn only (0.8 to 0.9)
- The promotion and introduction of the chaya was carried out in the rural area: Some communities of Escuintla and Suchitepéquez, Sanarate and Sansare, El Progreso, Chiquimula, Pilot test in SESAN project and donation of vegetative material to INCAP projects, New Seed, MAGA, among others.

Conclusions and recommendations

- Important information has been generated in relation to the composition (Proximal analysis, vitamin C, provitamins A, minerals, HCN), biomass productivity, tolerance to low soil moisture contents,

natural enemies and nutritive properties of the chaya. It is considered important to deepen its composition as amino acid profile and fatty acid profile among others.

- It has started with the development of products. It is important to consider evaluations in pilot tests to ensure acceptability and include professionals from social areas.
- Promote the use of this nutritious plant in areas suitable for cultivation, especially in regions with problems of food insecurity and malnutrition.
- Consider evaluations to study medicinal properties.

[View the presentation online](#)



Rolando Cifuentes presenta el trabajo de UVG en chaya. Crédito: UVG/S.Castillo

Nutritional and functional value of leaves used in ancestral Mesoamerican cuisine

Armando Cáceres, Farmaya and Universidad de San Carlos de Guatemala represented by Alfredo López*, Eurotropic S.A.

Mesoamerica is one of the two Vavilov centers in America. The "Vavilov Centers are eight regions of the world where the interaction of people with their environment allowed the collection of seeds that were cultivated, giving rise to the main food crops of the planet" Armando Cáceres.

Among the main leaves of ancestral culinary use in Mesoamerica are: *Amaranthus hybridus* (bledo), *Cnidoscolus aconitifolius* (chaya), *Crotalaria longirostrata* (chipilín), *Solanum nigrescens* (Makuy), *Lycianthes synanthera* (quilete), *Solanum americanum* (blackberry), *Dysphania ambrosioides* (apazote), *Sechium edule* (guisquil), and *Solanum wendlandii* (quixtán).

A proximal analysis of these herbs was performed. Among the results it is worth highlighting that the highest levels observed were the following: Protein (moringa, bledo), Vitamin A (chipilín and bledo), Thiamin, Riboflavin and Niacin (chaya, quilete, chipilín, bledo, makuy), and Vitamin C (chaya, quilete, chipilín, makuy).

The following trace elements (required for proper growth, development and physiology of the organism) were also identified, in Mayan herbs:

- Calcium and magnesium: in chaya, quilete, chipilín, moringa, spinach, macuy
- Zinc, iron and manganese: in chaya, spinach and makuy
- Oxalate (compounds that inhibit the absorption of calcium): in quilete, spinach and makuy
- Phenols (important micronutrients in the human diet): in spinach and makuy
- Determination of antioxidant activity (DPPH): in quilete and spinach

The results from a simulation of iron absorption after digestion and dialysis are the following:

- Soaked: bledo, chaya, apazote, makuy, moringa, espinaca
- Digested: apazote
- Dialysis: bledo, chipilín, apazote, makuy, quixtán, moringa, espinaca

Several mixtures of herbs were made, different flours were produced and, based on the elemental minerals, the best ones were identified:

- Super Mix: 20% amaranto (s), 20% chia (s), 30% moringa (h), 30% chia (h)
- Superfood: 25% chaya (h), 25% chía (s), 25% moringa (h), 25% amaranto (s)
- Mezcla 1: 30% chaya (h), 40% amaranto (s), 30% amaranto (h)
- Mezcla 2: 30% chaya (h), 40% amaranto (s), 30% chía (s)

Functional value of Mesoamerican herbs and solanaceae

- • Bledo: annual herb with dark green leaves. They have antioxidant activity and inhibition of xanthine oxidase (low uric acid); and contains essential amino acids, carotenoids and flavonoids.
- • Chaya: shrub with dark green leaves. Presents antioxidant, anti-inflammatory, antibacterial, hypoglycemic, hepatoprotective and galactogoga activity. It contains flavonoids, amino acids (lysine, tryptophan), minerals (Fe, Mg, Zn) and vit (A, C).

- Apazote: medium-sized aromatic shrub, its leaves have ascaricidal and antioxidant activity. Contains ascaridol, tocopherols and minerals (Se).
- Chipilín: bush whose leaves have antioxidant and sedative activity, for some non-toxic alkaloids; It has a particular aroma and flavor. It contains minerals (Fe, Zn) and vitamins (B6).
- Quixtán: woody vine, evergreen leaves, which grows in tropical and subtropical climate. Contains: Saponins, flavonoids, flavonoids, minerals and vitamins
- Hierba mora: shrub that grows on both coasts. The leaves show antimicrobial activity. Contains: Solanine, steroids, glycosides, saponins, flavonoids (apigenin) and minerals (Fe).
- Makuy: temperate climate annual shrub. The leaves are antifungal, spasmolytic and anti-inflammatory. Contains mineral alkaloids and saponins (Fe, Zn) and vitamins.
- Quilete / chomté: humid climate bush. The leaves have antioxidant activity. Contains glycosides, steroids and flavonoids.

16 traditional dishes with native herbs were identified: e.g. caldo de chaya, soufflé de chaya and quilete, quixtán in sauce, rice with chipilín.

Mesoamerica has an interesting history of using native biodiversity in its ancestral cuisine, which has an important nutritional and functional composition, can be produced and used with "denomination of origin". However, there is a clear deterioration in the production and consumption of these foods, including by more traditional groups, who prefer products and crops introduced or imported and industrialized. Therefore, it is necessary to return the status of these materials to improve rural nutrition, recover the culinary tradition, strengthen the national identity and promote innovative mergers to project nationally and internationally.

[See the presentation online](#)



Black corn and chaya tamalito, topped with a traditional tomato-based sauce, sesame seeds, pumpkin, cinnamon and chili peppers. It was served during the refreshment break.

Bioversity International/G. Meldrum

Presentation of the National Strategy for the prevention of chronic malnutrition (ENPDC) in Guatemala and the role of native plants

Sergio Ruano, Ministerio de Agricultura Ganadería y Alimentación (MAGA)



Sergio Ruano presents the ENPDC. Crédito: UVG/S.Castillo

Strategic Framework

The general national policy of the Government 2016-2020 has 6 Goals and the second goal focuses on the prevention of chronic malnutrition, defined in the national policy as poor physical and intellectual development due to insufficient food intake. The main moments of the life of a child in which it is affected more its nutrition is during its development in the womb (25%), with the development between 0 to 12 months (60%) and during its development between 12 at 24 months (80%). Among the main factors that most affect malnutrition are the availability / accessibility to food (26.1%), environmental health (19.3%), status of women (11.6%), and education of women (46%).

The objective of the National Strategy for the Prevention of Chronic Undernutrition (ENPDC) is to prevent chronic malnutrition in children under two years of age, in order to reduce the level of national chronic malnutrition by ten percentage points in three years, from 41.7% (ENSMI 2014/2015) to 31.7% in 2019.

The actions are divided into two phases. The first phase, plans to cover 82 municipalities in the departments of Alta Verapaz, Huehuetenango, Quiché and Chiquimula. The second phase focuses on 57 municipalities in the departments of San Marcos, Totonicapán and Solola. To address the prevention of chronic malnutrition as proposed, mobilizing political will, and the guarantee of sufficient, timely and sustainable resources is important.

The strategy has 4 program axes: the first is care, under the responsibility of the Ministry of Health, the second is education for behavioral change by the Presidential Commission, the third is water and sanitation, municipal governments and the fourth is the availability and family economy, managed by MAGA. There are also 5

transversal axes: behavior change with a focus on gender and interculturalidad, governance and alliances, information system, monitoring and evaluation, and social auditing.

Action Plan/PAFFEC–ENPDC–MAGA 2018

It seeks to improve the availability of food, in quantity and quality, of families with children under 2 years of age, contributing to increase the proportion of mothers and children with a balanced and varied diet. This plan is guided by the following 4 objectives:

- Strengthen and develop the capacity of farming families.
- Strengthen and develop the capacities of rural households to consume more variety of the best producible / locally available foods.
- Promote productive and nutritious actions, according to the needs and culture of the families (those in greatest demand). "Less is more".
- Achieve the necessary population scale (hundreds of thousands of families)

The PAFEC is focused on serving 160,500 rural families in 2018, who practice family farming and are served by the first level of care of the MSPAS and other programs in the seven selected departments. It also works with an Intersectorial scheme and Territorial basis.

In order to reduce the 10 percentage points of chronic malnutrition in children under 2 years of age, in three years, PAFEC - MAGA - ENPDC will operate with 7 interventions (actions). The first 3 are the most important and universal, the remaining four will be made according to the needs of each community.

- Action 1 - Increase the availability of animal protein at the family level: Protecting the health of poultry through self-sustaining community poultry kits; promoting management practices and other species of small livestock, and including confinement or semi-confinement and feeding with local resources.
- Action 2 - Promote the consumption of native plants and other vegetables: Promoting the cultivation and availability of plant foods with cultural relevance, rich in vitamins, minerals and protein, through disseminating the benefits and uses of high quality local foods. Actions include nutritional food education processes, establishing family and school gardens, working with community seed banks to increase the availability and distribution of seeds and vegetative material of native plants and other vegetables.
- Action 3 - Increase the productivity of basic grains: Promoting good conservation practices and soil improvement, agroforestry and organic agriculture.
- Action 4 - Post harvest management: Safeguarding family food reserves, with promotion of silos, improved logs and other innovations, food conservation practices such as artisanal processing, including those that are packaged and dehydrated
- Action 5 - Promote the productivity and consumption of local fruits: By increasing the availability and distribution of plants with municipal and community nurseries, their sowing and management.
- Action 6 - Improving the availability and management of water: training in good management practices and water harvesting for food production, irrigation and conservation of moisture and fertility through soil conservation and agroforestry structures
- Action 7 - Linkage to the national and export markets for additional income generation

To carry out the aforementioned actions, we work through the National System of Rural Extension (SNER) with groups of families organized in the Learning Centers for Rural Development (CADER). The work is complemented with training in preventive health and the nutritional issues, mainly related to the interventions (actions) indicated above.

[See the presentation online](#)



Research on underutilized species and experiences with chaya

Cecilia Gonzales, ECHO

Strategy of ECHO

ECHO is an international Christian organization with the primary objective of reducing hunger and improving the lives of people affected by malnutrition and poverty. This is achieved through collaboration and partnerships with organizations and people working with small-scale farmers, providing them with practical information and training in tropical agriculture. ECHO's vision is: to honor God by empowering the undernourished with sustainable solutions against hunger. The mission is: to follow Christ by reducing hunger and improving lives around the world through partnerships that equip people with information and skills in agriculture.

ECHO was founded in the 1970s and its vision was realized by Dr. Martin Price, its Executive Director in 1981. Its headquarters is in Fort Myers, Florida, with a small demonstration farm and global research programs that provide the following opportunities: courses in tropical agriculture, seed conservation and underutilized crops, etc. In addition, ECHO organizes internships for young people interested in a career in agricultural development, the Annual International Conference on Agriculture, practical learning opportunities on the farm and the Global Seed Bank.

ECHO has four Regional Centers: one in Thailand for Asia, Tanzania for West Africa, Burkina Faso for West Africa and in Florida-USA for Latin America and the Caribbean. The Regional Team for Latin America and the Caribbean aims to serve its partners and expand the work of ECHO in this tropical region, particularly where hunger and malnutrition are a concern. We partner with people, organizations and institutions that work to reduce hunger and malnutrition with vulnerable populations and families of farmers in these communities. Cecilia is the regional leader of this team. She has had the opportunity to study various aspects of food, agriculture and nutrition, with a great passion to reduce hunger and malnutrition, and improve lives through integral development.

The ECHO community has around 2,500 members working in the region, who access the platform from Argentina to Canada. To supplement the ECHO Development Notes, members are also sent a quarterly digital magazine. ECHO also holds a biannual regional conference, training and consultancies. A great strength of ECHO is the formation of networks, provision of practical information and the fact that they share these contacts and information freely, which they do through ECHO community, an online platform with free membership. With more than 12 thousand members around the world, ECHO community provides access to its practical information resources, as well as communication tools to help development workers connect with each other. It also allows access to database of publications contributed by participating members, as well as access to the Global Seed Bank, with its online catalog and seed orders.

Research

ECHO's research work focuses on the needs of small-scale farmers with limited resources. We strive to contribute in areas that have not been widely researched. In many cases, this implies starting with innovations (eg the use of green manures) that have proven to be successful, but for which there may be unproven variations or modifications that could be of benefit to farmers. Many of the experiments written in the ECHO Development Notes were completed by interns at the Global Farm in Florida-USA. There are also

investigations that take place in our Regional Centers. The results are published through our Development Notes, Technical Notes and Research Notes.

ECHO works with underutilized crops with good nutritional and agronomic value. We work with tropical fruit trees and edible leaves (eg moringa, katuk and chaya). We also work with green manure and cover crops.

In the case of the chaya, the interest initiated by Dr. Martin Price, co-founder of ECHO, who considered this plant to be one of the five most important underutilized food plants that ECHO distributes. Chaya was singled out because of its ability to thrive in arid regions and rainy, little need for special care or extra fertilization, resilience to pests and pests, high yield, and the exceptional nutritional value of its cooked leaves.

To build the body research on chaya, analysis using Cyantesmo Paper to detect cyanide were carried. This paper can determine if a plant is safe to consume, either by humans or livestock. Cyantesmo Paper could be used in several applications, for example to determine boiling time series for leaves of different varieties of cassava which naturally tend to contain different levels of cyanogenic glycosides. Alternatively, this paper could be used to test how well cyanide is removed with other methods of food preparation, such as drying or frying. The paper tape could also be used to determine the presence of cyanide in animal feed by comparing HCN levels in different vegetative materials using different methods of food preparation.

Another investigation that was carried out to determine which vegetal parts of chaya contain hydrocyanic acid: the results showed that the petioles and the green stems of the chaya need a boiling time of 20 minutes to eliminate the cyanogenic components. While the fresh roots indicated high concentrations of HCN release, only a 10 minute boiling time was needed to adequately reduce the cyanogenic components in the root material.

[See the presentation online](#)



Cecilia Gonzales poses a question during the forum discussion.
Credit: UVG/S.Castillo

Production, consumption, and comercialization of chaya in Guatemala

Nadezda Amaya, Bioversity International

Introduction

The results I am going to present today are findings made in the context of the project "Integrating agro-biodiverse value chains, climate change and nutrition: empowering the poor to better manage risk" coordinated by Bioversity International and financed by IFAD and the EU. In Guatemala the project is implemented by the University of the Valley of Guatemala (UVG), where one of the principle actions is to promote the cultivation and use of the chaya (*Cnidoscolus aconitifolius*).

During 2017, an evaluation and mapping of the chaya value chain was carried out, which helped to determine the participation of women, identify opportunities and constraints to improve the chain; and generate recommendations for future interventions.

We used the methodology called Rapid Market Assessment (ERM), which collects qualitative data through semi-structured interviews with different actors in the chaya value chain. The study area included Chiquimula, Petén, Guatemala City and the city of Mérida in Mexico, the latter was considered due to its high levels of production and consumption of chaya.

Results: Production at the community level in Chiquimula and Petén

The most important edible leaves that are produced are hierba mora, chipilin and chaya, mainly for household consumption and to a lesser extent for the markets. Although all the interviewees produce chaya, 75% prefer the the other commly produced edible leaves.

Main reasons people continue to produce chaya include: nutritional value, ease of production, good taste and custom. Among the main reasons for not producing chaya include: low yields, low demand in the market, and the perception of chaya as a "food of the poor".

Unlike Petén, in Chiquimula the main problem is the periods of intense drought and limited access to water, especially in summer. As a result only farmers who have access to irrigation can obtain extra production for the market.

Level of production and use: Though they vary according to the season of the year and region, a family can harvest on average between 5 to 10 bundles per week. The production is used mainly for household consumption, giving to neighbors, to a lesser extent for feeding animals or bringing to the market.

Production costs are minimal as chaya does not require many inputs or special care. It is estimated that growing 5 plants (labor) can cost between: 2 - 4 USD / month. Los costos de producción son mínimos.

Sale of leafy vegetables in the markets

Sample: 15 markets were visited for this assesment in Guatemala (12) and Mexico (3). 64 vendors were interviewed in Guatemala (54) and Mexico (10) - women (80%)

In Guatemala the most popular herbs are: hierba mora, chipilín, bledo, spinach, chard, lettuce, watercress, pumpkin leaves. These occur at different altitudes and consequently their availability in markets is much wider than the chaya. Average prices are from 2 to 8 GTQ / bundle. The herb that has the least demand is chaya, of the 57% of interviewees know chaya, but only 26% sell it.

Contrarily, in Mexico, chaya is the most demanded herb due to its use as main ingredient in the Mexican cuisine and that there is little competition. Chaya is sold twice a week year around in considerable quantities. Chaya is also sold in supermarkets.

Of 12 markets visited in Guatemala, chaya was present in 8 but neither the number of vendors nor the quantity of chaya that they sell is significant (about 1-4 times / week and selling an average 12 bunches). Prices vary from 1 to 5 GTQ / bunch. It should be noted that although the price of chaya was found to be equal to or lower when compared to other herbs, its nutritional composition is considerably higher. Therefore the low price of chaya is identified as an opportunity for consumers to diversify their diets.

Consumption of chaya

In Guatemala, people in the communities visited produce and have access to chaya, but their levels of consumption are minimal and are noted to be in decline. Consumption is 1 to 4 times / month in the amount of about 2 bunches / time. Chaya is consumed in soups, tamales, scrambled eggs, rice, beans, and pinol. The limited knowledge of recipes of dishes that include chaya as an ingredient was noted to limit consumption. On the contrary, in Mexico, chaya is consumed 1 to 2 times / week in the amount of about 3 bags / week. In Mexico it is consumed in many different dishes, mainly in scrambled eggs, soda, tamales, soups, empanadas and stews.

Restaurants that sell prepared food with chaya: In Mexico - Merida "La Chaya Maya" and in Guatemala in Peten "La Chaya". Its main motivation is to preserve the cultural tradition of eating chaya and to promote the Mayan culture and gastronomy.

Processing chaya

Several post-harvest processing and handling options were identified, such as the use of dehydrated or powdered leaves to add to prepared foods. Interest in this plant is growing slowly and interesting initiatives are emerging to promote it. Products processed with chaya in Guatemala: EuroTropic - Flour and chaya capsules or powders as food supplements. In Mexico, spicy sauces, cookies, pills, soft drinks and teas are prepared.

Research and interventions

41 experts from 29 organizations working with chaya in Guatemala, Mexico and the US were interviewed. Most of their work focuses on: research and extension, promotion, awareness of their benefits, distribution of cuttings and establishment of gardens, processing of chaya.

Conclusions

Although in Guatemala, people have the culture of producing and consuming native plants and flowers, many still consider them as "food of the poor". The problems of malnutrition and food insecurity are not only due to the lack of availability and access to food, but also to the loss of knowledge and lack of appreciation of ancestral foods. It is an important priority to rescue this threatened wisdom.

Currently research has been focused on the level of production and less in the processing, sale, consumption and promotion of ancestral crops. In addition, much of this research has been carried out independently, duplicating the efforts.

A chaya also has been noted to have many medicinal benefits, however, many of them have not been tested experimentally. The development of chaya has the potential to create a global market either the raw edible green leaf or processed products.

Recomendations

- Future interventions should consider the important role that women play in achieving food security and nutrition at home.
- Implement and promote sustainable family, community and school gardens, while increasing home consumption as well as creating opportunities for commercialization.
- Promote chaya as functional food, capitalizing on the following market niches: organic, vegetarian and vegan markets. Recognize the potential income generation opportunity for women as they are the principle vendors of the crop.
- Promote the chaya with denomination of origin, such as "Mayan superfoods", "Mayan food" or "Mayan spinach". Promote awareness and publicity campaigns, participate in agricultural and nutritional fairs, culinary events, conferences and use different media outlets.
- Develop nutrition education programs for children, organize cooking workshops at the community level, helping families to incorporate chaya into their diet and / or teach them new ways to consume it.
- Increase consumer awareness through Guatemalan cuisine to re-value traditions, Mayan culture and cultural identity with the dual purpose of helping chaya and other native plants recover their status. Work with chefs and gastronomy schools to promote the use of native plants and thus contribute to the gastronomic tourism of the country.
- Carry out more studies on preparation and how one can use chaya flour to fortify other food products.
- Create a collaborative network between organizations / people working with chaya, so that interventions are more effective and efficient, and that the information generated is more accessible and easily disseminated.

[See the presentation online](#)



Nadezda Amaya and Stefano Padulosi. Credit: UVG/S.Castillo

Experiences and lessons learned in the promotion of chaya in Guatemala

Penny Rambacher, Miracles in Action represented by Andrea Guzman, Maya Health Alliance

Chronic malnutrition is a major problem in Guatemala, it is observed in up to 80% of indigenous children under 5 years old living in rural areas, leading to reduced motor and cognitive development. Miracles in Action sought a solution to this problem and found it in ECHO through Dr. Martin Price (founder of Echo) who argued that the solution is "Reintroduce chaya to the Maya."

The variety that Miracles in Action decided to introduce was the chaya estrella for the production of large leaves, and because it has a nutritional level a little higher than other varieties. In addition, they are softer than the picuda variety yet still serve very well as a fence.

It is important to highlight the nutritional value of chaya, compared with spinach, corn tortillas and black beans. Between 25 and 30 leaves of chaya has protein comparable to 4 corn tortillas. Yet, chaya complements these protein levels with high levels of iron, calcium, potassium, vitamin A and vitamin C.

Chaya was distributed in different communities in Guatemala. We visited the Universidad del Valle de Guatemala who provided information about students working with chaya and were given a packet of chaya and corn soup.

During that year, we began the promotion of chaya through press outlets; publishing article in Prensa Libre about chaya.

A brochure about Chaya and its importance was produced. Likewise, recipes were developed in rural women's kitchens with common ingredients they have and know about. There is also a chaya recipe book with many photos for people who can not read. This book includes recipes for children of 6 months, as well as healthy snacks.

Chaya classes and nutrition, and videos of Chaya (www.MiraclesInAction.org/photos-docs/videos) were also made about tortillas with chaya and chaya-nachos, entitled Chaya: a solution of nature against malnutrition and the rainbow of food.

Participation in ECHO World Conference: Demonstration of green tortillas with chaya.

Green Tortilla Contest Organization Sponsored by: Nueva Semilla and Miracles in Action. The tortillas were evaluated for: flavor, texture, nutrition, explanation of nutritional benefits and presentation of the dish.

Andrea, nutritionist and nutrition program manager at the Maya Health Alliance, where she manages complex cases of malnutrition, continues to build capacity within the nutrition team and assesses the impact of nutritional interventions carried out in the communities. The Maya Health Alliance seeks innovative solutions to persistent health problems for poor, marginalized and indigenous communities in Guatemala.

[See the presentation online](#)

Promoting Chaya through Green Tortillas

Andrea Guzman, Maya Health Alliance

Chemical and sensory analysis of green tortillas

Work on forming a good quality vegetable protein using 90% Corn: Methionine + 10% Herbs: Leucine a.a. sulfur, lysine, tryptophan (chipilin, hierba buena, chaya) = Complete protein

The flour was made with chaya flour, hierba buena, and chipilin. The process that followed includes: 1) selection, washing of the leaves with water to remove dirt and insects, 2) Scalding: 85° C for three minutes in an industrial scalding, 3) Centrifuged: 5 minutes in industrial centrifuge, 4) Dehydration: 60-65 ° C for 24 hours in a hot air oven, 5) Grinding: Blade mill, 6) Proximal chemical analysis: Moisture, ash, protein, dietary fiber, fat, cyanogenic glycosides, oxalates, minerals (Zn, Fe, Na).

Once the product was taken, a bio-test was carried out with rats and sensory analysis.

Obtaining the following results:

- Hierba mora is the herb that comes closest to the protein efficiency of an animal protein
- Digestibility was better in chaya, followed by the hierba mora and the last chipilín. Fiber was a determining factor in absorption.
- Sensory analysis: Taste, color, texture, appearance and smell. Chaya and chipilín were those that presented higher values in the hedonic scale
- Preference: Chipilín- aroma and flavor.

Use of chaya by the Maya Health Alliance

- Chaya at the clinic: Publicize the benefits of the chaya to nutrition techniques and health promoters
- Promote its use by incorporating chaya into nutrition classes, planting chaya in clinics, as a Green fence, and by incorporating it into tortillas.

[See the presentation online](#)



Andrea Guzman. Credit: UVG/S.Castillo

Popularizing the use of chaya in school gardens and lunches in Guatemala

Jaime Marroquin, Aldea Maya

Aldea Maya and the community Chuk Muk

In 2010, most of the survivors of the Panabaj landslide triggered by Hurricane STAN (2005) moved to the new village of Chuk Muk, which lies on a rocky plateau. They received homes, but there was no way to earn money and, as a result, the Tzu'tujiles inhabitants became poorer than ever and therefore had little chance of getting ahead. In addition, to date, residents of Chuk Muk pay twice in transportation costs to get to their place of work. At present the community or village Chuk Muk has 900 families. Most of the inhabitants of Chuk Muk are practiced in cultivation and working in the fields.

Aldea Maya are a registered Canadian and Guatemalan association that focuses on sustainability in the Chuk Muk community, in the municipality of Santiago Atitlán, department of Sololá. The founder of Aldea Maya, Louise Sosa, who is a nutritionist, was very aware of the malnutrition that the new community was suffering. Therefore she decided to start some projects that taught nutrition in a very dynamic way, using physical demonstrations instead of posters. Our first project was the "Papaya Project", which is carried out with third grade students. It was decided to focus our attention on the future of the community, in essence: the children.

Nutrition classes and projects of: Papaya, banana and citrus

In this class students learn about the nutritional properties and care of each plant, they are also taught about other fruits and vegetables that share the same nutritive properties. The students make a small poster where they draw the fruits and vegetables that contain the vitamins taught about during the class. At the end of the class, a delicious smoothie or a delicious salad is prepared.

After participating in the class, the students take care of the school's garden. After completing the period assigned by the teacher, each student goes home with a plant, be it banana, papaya or a citrus tree, and an organic compost bag to ensure their growth and nutrition as Chuk Muk has some of the worst soils in Santiago Atitlán.

School garden: construction, composting, preparation of beds, nursery, planting, maintenance, harvest

In soil class, students learn to produce organic fertilizer and detect the type of soil suitable for planting. They are taught to classify the trash and take it to its respective place after the school day.

The construction or implementation of orchards in the school was a challenge for us. The type of soil was not the best to begin with, and it was a very rocky terrain. To work with the terrain we took advantage of the rocks by using them to build our medicinal garden. Then we bought organic fertilizer to start the second phase of the work. In the end everything we succeeded, thanks to the support of volunteers and our team.

Over the years we have always been working with students and teachers to improve and maintain optimal conditions in the orchards. For the soil classes and classification of garbage, it was important to build knowledge so students could understand to classify them properly.

For the preparation of garden beds or plots the students used the fertilizer obtained from the compost. We let the students use their imagination and decide which design to use and what was convenient for their plants. The collection of disposable cups, as a way of recycling was also explored. Not only do students learn

how to sow but they also learn the different techniques or ways to make a waste seedbed out of trash for community and reduce waste.

We try to have all schools, students and teachers participate in the learning process. When the harvest arrives, the students themselves are in charge of harvesting everything. Each grade that has participated receives a portion of each harvest and prepares a delicious salad or whatever dish they prefer.

Chaya in the kitchen: Learning center, super cake, omelet with chaya, egg cake with chaya

Based on programs we had implemented (previously listed), the addition of the chaya in the kitchen and school store was less complex, as we had already encouraged a diversity of organically produced foods.

To coordinate implementation of chaya with the school management and teaching staff. We located a learning center where the cooks, teachers, mothers were trained for the proper preparation of this plant. Each participant was given a free mortar and pestle for chaya to enhance personal or family consumption.

Schools serve meals twice a week. Initially the chaya was introduced in the form of a green tortilla for each student, to which the students reacted positively, it was different but positive to see a green tortilla. At the end, the chaya was also added to the beans, rice and potatoes (items that the school commonly served without chaya). Currently the school serves 520 students and Aldea Maya has given chaya workshops to over 200 people to date.

[See the presentation online](#)



Producers from Chiquimula with Silvana Maselli. Credit: UVG/S.Castillo

Commercial processing of chaya in Guatemala

Alfredo López, Eurotropic S.A.

The company Eurotropic, S.A. focuses on the organic production, import and export of Mayan Super Foods including seeds, herbs, flowers, fruits and roots native to Mesoamerica.

Native crops that we work with:

- Chaya (*Cnidoscolus aconitifolius*): Perennial plant, native to Mesoamerica, with traditional uses. It grows wild or cultivated in both hemispheres, in temperate- tropical climates of 0-1,400 meters above sea level. The leaves contain vitamin C – antioxidants that prevent cancer absorb iron, Beta carotene - source of vitamin A which improves vision and prevents diseases, and protein. It is also rich in minerals such as calcium, phosphorus, iron, thiamin, riboflavin and niacin.
- Chia (*Salvia hispanica*): Annual plant, oval seeds, white, brown to black, used as a traditional food. Native to Mesoamerica, it grows wild or cultivated in both hemispheres, in temperate- tropical climates of 1,500-2,500 masl. Average yields of 800-1,200 kg / ha. The seeds contain protein (15-26%) balanced in amino acids, Omega-3 (67%).
- Amaranto (*Amaranthus cruentus*): Annual plant, native to Mesoamerica, ancestral use, grows wild or cultivated in both hemispheres, in temperate climates of 0-3000 masl. The seeds contain 12-17% of protein balanced with amino acids, vitamins, fiber and low levels of saturated fats.

In order to determine the agricultural potential of native plants, agricultural experiments were carried out in 27 farms (14-2,749 meters above sea level) with four plant species for three years. The advantages and limitations in each place were demonstrated, with the following results:

- Up to 1,200 masl the growth of chaya and moringa is very good and supported multiple harvests. From 1,300 meters above sea level amaranth and chia were optimal; although they developed well at low altitudes, with abundant foliage, they did not flower or produce seeds. There is also a clear interest of the inhabitants in its cultivation and use. The study sites include: Jutiapa, Totonicapán, Jalapa, Quiche, Chimaltenango, Santa Rosa
- Fixed oil analyses of seeds of white chia, chia coffee, black chia (Jalapa, Totonicapán and Guatemala) were carried out and demonstrated high levels of Omega 3
- Elemental minerals were identified in native herb flours for development as ingredients or finished products (green flours). Also transformations of seeds and herbs were made in innovative products, bars, teas, juices, with finely ground 100% natural flours. Looking for opening in international markets for these high value products e.g. ANUGA FOODTEC (Germany)

Conclusions and recommendations

Guatemala has the potential to cultivate and export chia, chaya, and amaranth in the volcanic belt from Mexico to Honduras and El Salvador in association with crops such as coffee, vegetables, pulses, and incipient forests.

Given the variation and luminous intensity that Guatemala has, short photoperiodism induces a better harvest in dry season in grains (chia and amaranth). Chaya can be harvested all year round.

From the seashore to 1,400 masl the herbs (chaya) produce trace elements abundantly. From 1,400 masl to 3,200 masl the grains (Chia and Amaranth) produce better quality fixed oils, protein and minerals.

Processing recommendation: it is important to dehydrate the grains and herbs to <10% of relative humidity, cleaning by densimetry and air flow improve the quality to present a quality exportable supply to the world markets given the high qualities found.

Promote the scaling of production to open markets to new ingredients and finished products that can be part of an exportable offer with denomination of origin.

Health as a trend

In 2013, the market in Central America for healthy beverages was already showing signs of growing expansion.

Studies of five main trends in non-alcoholic beverages in North and South America reveal that Costa Rica witnessed the emergence of aloe products as a popular soft drink option among consumers, Guatemala is turning its attention to alternatives such as healthy natural juices, while in the Dominican Republic was the fastest growing in the energy drinks sector.

The boom has occurred despite the fact that the production costs of a healthy beverage company exceeds 50% of the traditional industry, which mainly includes gaseous water.

The price variation is due to factors such as the selection of raw materials, the packaging technology that is usually more expensive and requires cold distribution.

There is growing interest in the categories of water, juices, energy drinks with protein and in purchase plans or associations of companies that have research and development in food in these areas.

[See the presentation online](#)



Taking advantage of the nutritional values of the chaya through the extraction of protein

Javier Rodríguez, Secretaria de Educación Pública, México

Objective

Training rural families in the practice of extracting the protein and implement it in the enrichment of food for daily consumption.

Challenges

One of the problems that afflicts many developing countries is the malnutrition of their marginalized populations.

In the Yucatan, there are many food and medicinal plants, which have amazing effects for good health and nutrition. Chaya among these important native plants, acknowledged them for its remarkable amount of vitamins, salts, minerals, elements and enzymes for the benefit of the human body.

Our job is to diversify the uses of the chaya in gastronomy and to reincorporate the use of local ingredients to the diet of the Yucatecans. Through the cultivation in the Mayan sites and the conservation of diverse species, the Mayan garden or *solares* is a model that allows the conservation of elements of the natural environment and to continue with the genetic flow of wild species. With this, we aim to stimulate the small-scale cultivation of these plants, guaranteeing nutrition among the families.

Materials used for the process: hand mill, medium skillet, plastic containers, cloth napkins, stove, glass jar, wooden spoon.

Processing

1. Washing and cutting the leaves: wash and cut the leaves of chaya, then remove the peduncle
2. Grinding leaves: Grinding leaves with hand mill
3. Pressing (obtaining fiber): The ground leaves are strained using the cloth napkins, with this procedure we obtain the fiber, which is used to cook them with egg, and the surplus can be allocated to the animals of the pen.
4. Cooking and filtering (Precipitation of the protein by temperature): The juice obtained from the pressing on the cloth is heated in a pan until the protein is agglutinated.
5. Obtaining protein: Then the protein is separated from the ammonia, which is obtained by a second filtration with the cloth napkin. So what is left inside the napkin is the protein and the result of the filtering is the ammonia. Ammonia can be used to fertilize crops.

Products to which you can add the concentrate of chaya include: cakes, cookies, tortillas, tamales, fresh water, ice cream and pasta soups, etc.

[See the presentation online](#)



Javier Rodríguez presents how to extract chaya protein. Credit: UVG/S.Castillo



Lemonade enriched with chaya served as a refreshment at the conference. Credit: UVG/S.Castillo

Role of gastronomy in the promotion of native plants.

Paula Enríquez, KREADI

A point that I want to highlight in my presentation is the ability to turn the discourse into an action: "the importance of gastronomy in the promotion of native herbs". It was this important action that made me realize that the new generations (and even the current and older generations) of chefs in Guatemala, do not know how to use and also have much less access to native herbs.

Including students of ACAM (Culinary School of the Americas) in the promotion of native plants became a practice for them of awareness of knowledge and place that should be acquired when cooking. It is true that our work within the kitchens is to cook with passion and creativity, yet implicitly we strive to feed and nourish our clients. We are a generation of chefs with the intention of triggering changes in the industry because nowadays you have access to information more quickly and easily, therefore a small change can have a large ripple effect.

Through my participation in the activities of promotion of the chaya carried out by UVG and Bioversity International I have seen our efforts echo throughout the field of gastronomy. Several of the most important chefs in the country have begun communicating with me about using our local biodiversity and that it makes me think that indeed the path is made by walking. Above all I want to think that, although the work is great, there is already a path that has been laid out and it is allowing a vision within the gastronomic field that generates an increasingly strong national movement.

To mention another relevant point, very relevant, is the level of collaboration between key actors for the promotion of herbs and native products with high nutritional value, as I see that there are people and institutions doing important work and management that do not know each other. Activities with such developed initiatives such as those of Bioversity International have become positive mediators, bringing together key stakeholders from all sectors.

[See the video "Hamburguesa guatemalteca" online](#)



Paula Enríquez. Credit: UVG/S.Castillo

Lunch of chaya prepared by the Academia Culinaria de las Américas (ACAM)

Paula Enriquez's (Kreadi) passion for Guatemalan cuisine was shared at the conference by involving a team of students from the Culinary Academy of the Americas to prepare lunch and dinner. These talented chefs integrated chaya into all the dishes, which were made with various local ingredients. The recipes, sweet and savory, helped to highlight the great versatility of the chaya and thus demonstrate the gastronomic and nutritional potential of this underutilized vegetable. The commitment of the young chefs in the training was an important (and delicious) result of the conference to promote greater use of the chaya in Guatemalan cuisine. Before the event, most of the young chefs had never seen or used chaya. The students were invited to the stage during the event to share their reflections on the experience of cooking with chaya. They expressed their appreciation for the flavor, nutritional benefits and culinary properties of the crop and their interest in including chaya as an ingredient in their future culinary preparations.



Conference lunch: Chicken breast stuffed with chaya and walnut, accompanied by a pumpkin puree dusted with chaya dehydrated and mushrooms stuffed with chaya and goat cheese. Credit: UVG/S.Castillo



ACAM students with Paula Enriquez during the conference Credit: UVG/S.Castillo

Discussion Forum

In the last session of the conference, participants identified and shared different perspectives on the needs, challenges and opportunities to improve the value chain of Guatemala in Guatemala. The discussion was structured around six areas of action:

- 1) Integrate the different actors (direct and indirect) of the Chaya value chain so that they work in a joint and coordinated way, in order to avoid isolated and duplicated efforts
- 2) Seek greater involvement of government institutions (e.g. Ministry of Agriculture, Ministry of Education) to promote the production, consumption, marketing and processing of native plants
- 3) Organizing, capacity building and technical assistance for young people and leaders from different communities, mainly in vulnerable areas
- 4) Promotion high-profile informative campaigns about the nutritional and medicinal benefits of the chaya, a highly nutritious low-cost plant
- 5) Identifying local and national markets for the chaya, which will motivate the communities to increase their production

The opportunities and challenges for each of these areas of action were discussed, facilitated by Nadezda Amaya, Bioversity International. The results of the discussions are detailed below.

1) Integrate the different actors (direct and indirect) of the Chaya value chain so that they work in a joint and coordinated way, in order to set aside isolated and duplicated efforts

Opportunities:

- Take advantage of the progress made through the study of the chaya in the last 15 years, which is quite promising. One way is through the dissemination of the information generated e.g. theses from different universities
- Participate in the establishment of a Documentation and Information Center for ancestral native plants organized by AGER
- Use the platform that ECHO has to share information at a national and international level
- Take advantage of the growing interest in native plants and seek strategic alliances between different actors and institutions that work to promote them
- Promote a network of ancestral nutritional foods to improve the distribution and access to information

Challenges:

- Determining potential links between different actors to promote the institutional work done with the chaya
- Connecting to the institutions that are already working with chaya and promote the culture in a more integral way
- Encouraging the publication of different research carried out by universities and public and private institutions, which are widely accessible

2) Seek greater involvement of government institutions (e.g. Ministry of Agriculture, Ministry of Education) to promote the production, consumption, marketing and processing of native plants

Opportunities:

- Take advantage of the existence of the School Feeding Law (2017) in Guatemala, which promotes adequate food for students, assigning each 3.1 GTQ / per student/day. This could be a space to promote the consumption and use of chaya as well as other native plants. One approach to can be to collaborate with nutritionists who are preparing recipes in the MAGA. For example, see the proper way to incooperate chaya in pinol
- Promote the production and consumption of native plants in schools, replicating successful experiences already carried out by Aldea Maya and Vamos Adelante

Challenges:

- Integrating the theme of native plants into the educational curriculum at the primary level, teachers, technicians and agronomists, highlighting their importance nutrition.
- Promoting comercial scale parcels at the community level to provide the required quantity and quality of native plants to schools for use in government school feeding programs.

3) Organizing, capacity building and technical assistance for young people and leaders from different communities, mainly in vulnerable areas

Opportunities:

- Work with women, as they are responsible for feeding the family and have alot knowledge about native plants

Challenges:

- Increasing the presence of MAGA in rural areas, mainly in training and extension of groups in rural areas, where there has been an abandonment

4) Promote high-profile information campaigns on the nutritional and medicinal benefits of chaya, as highly nutritious, low-cost plant

Opportunities:

- Take advantage of the growing interest of the gastronomic sector to promote the consumption of ancestral native crops and use the kitchen to créate social cohesion
- Promote the incorporation of native plants in culinary schools so that new generations of cooks know and promote them
- Conduct culinary events with native cultures from different regions
- Identify influential people with passion in Guatemala that help promote ancestral native plants
- Learn the marketing techniques that large companies (e.g., Coca Cola) use to sell their products around the world, and see how to use this information in the promotion of native plants
- Work with the Marketing Department of UVG and other universities to promote native plants
- Work with restaurants that have a social commitment to promote native crops such as chaya

Challenges:

- Building an information, education and communication strategy using a slogan, brand and image that is innovative and attracts attention e.g. "Mayan spinach that will make Guatemalan children stronger". Let there be pride in its consumption
- Making native products attractive / sexy to consumers
- Recovering lost ancestral knowledge

5) Search for local and national markets for chaya, which will motivate the communities to increase their production.

Opportunities:

- Start with local consumption, where there is already a minimum demand for chaya
- Promote the functional properties (i.e. nutritional and medicinal) of chaya and other native plants
- Participate in forums, seminars, conferences and symposia on ancestral plants, to promote their consumption
- Super Food Promotion Commission - AGEXPORT

Challenges:

- Competing with other cheap, innovative and less nutritious products, at the expense of the value of native plants
- Giving chaya a commercial value and increase its demand
- Promoting the participation of the producers of chaya, since they are the ones who should lead the change and the promotion of native crops
- Diversifying the way food is consumed, and go beyond the tortilla and bean
- There is not enough supply to cover the potential demand of local and / or international markets

Conclusions

The conference was very useful to share information about chaya in Guatemala, both at the level of research and concrete actions to promote it. We all benefited from learning and sharing different experiences. It is important to highlight the interesting and enriching work that several institutions are undertaking with chaya, noting that it is little known among them.

One issue that was mentioned in all the presentations is all participants agree that there is importance and great potential for chaya in the area of nutrition. It was also expressed that chaya alone is not the solution to the problem of malnutrition in Guatemala, but it can play a role as a part of the solution in combination with other complimentary foods.

In many presentations a great diversity of recipes and different ways of consuming chaya were presented, which is very important for its promotion. Also, different ways of processing chaya was shared, demonstrating that food technology has advanced in recent years in the processing of native plants.

Although the chaya is a very nutritious, medicinal and easily produced plant, its supply and demand is still relatively low. One of the explanations for this phenomon is the status of chaya as a "food of the poor".

An important challenge for the promotion of chaya is the lack of coordination between different direct and indirect actors of the chaya value chain. It is vital to improve coordination between different institutions, to create a network / platform or some type of mechanism that improves the dissemination of information, and to take advantage of the synergies that can be generated, so that key stakeholders work in a more efficient and effective way.

An interesting area that needs further exploration is the inclusion of ancestral native crops such as chaya in school feeding programs.

It is important that certain organizations, such as the Universidad del Valle de Guatemala, take the lead in carrying out similar events for other important ancestral crops.



Students of ACAM serving tamales with chaya during the coffee break.
Credit: Bioversity International/G. Meldrum

Bioversity International is a member of the CGIAR Consortium. CGIAR is a global research partnership for a food-secure future.



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