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Unleashing the value of neglected and underutilized crop diversity:

Linking climate adaptation, nutrition, markets and agrobiodiversity value chains for smallholders in Guatemala

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Biodiversity International and the International Center for Tropical Agriculture (CIAT) are CGIAR Research Centers. CGIAR is a global research partnership for a food-secure future.

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A group of women in traditional colorful clothing, likely at a market or community gathering. The women are wearing vibrant, multi-colored blouses and headbands. One woman in the foreground is smiling, while others look on with various expressions. The background shows more people and trees, suggesting an outdoor setting.

Outline

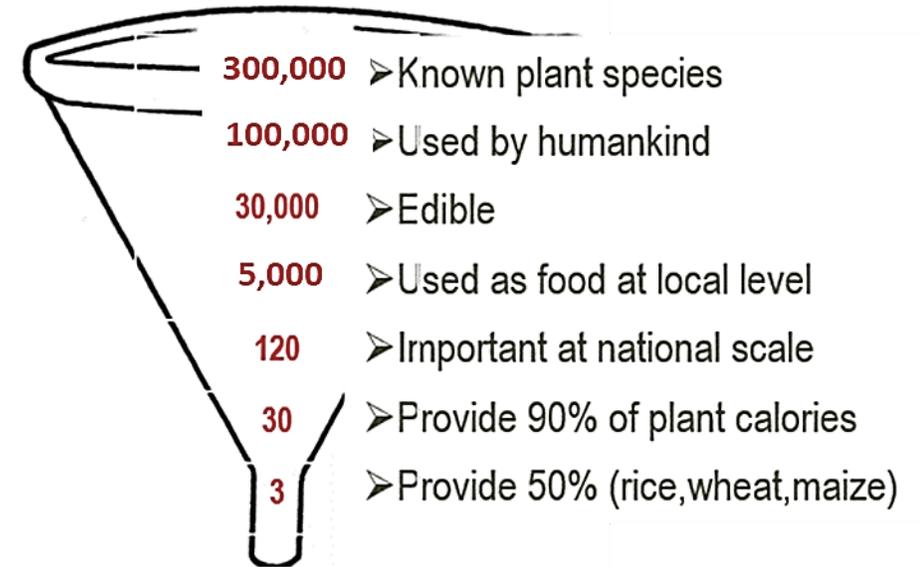
1. Introduction and background information
 - *Agricultural markets*
 - *Neglected and Underutilized Species*
2. Chaya: value chain analysis and development
3. Concluding remarks

Introduction and background information

1. Introduction

The economic problem and its importance

- Agricultural productivity and food security is threatened by scarce resources, environmental degradation and climate change
- Climate change will depress agricultural yields in most countries in 2050, given current agricultural practices and crop varieties (World Bank 2008)
- Shrinking of the world food basket causing greater food & nutrition insecurity, especially among the poor
- Importance of promoting nutrition sensitive crops
- Market failure determines the rate & pattern of growth



1. Introduction

Access to markets of small-scale agricultural producers

- Poor small-scale farmers have no access to markets or only limited access on very unfavorable terms, due to:
 - Lack of resources
 - Expensive, imperfect and asymmetric information
 - Low levels of production
 - Active discrimination (especially against women)
 - Low market power



1. Introduction

Market opportunities

- Agricultural development driven by markets, not by supply
- Link between indigenous population - native crops - markets
- New niche markets: native crops = climate smart crops
 - High value: traditional production, culinary characteristics, color & flavor
 - Neglected and underutilized species (NUS)
 - Strategic assets for food security, livelihood improvement and to fight climate change
 - Hot spots of diversity coincides with regions inhabited by indigenous peoples (identity & culture)



2. Neglected and Underutilized Species (NUS)

- Multiple and synergistically linked benefits of NUS

Climate resilience & sustainable production

- Stress tolerant/hardy crops
- Resilience to biotic/abiotic stresses
- Lower irrigation requirements
- Grow on marginal soils with low fertilizer
- Good adaptability

Nutrition

- Nutritional value (often superior to major crops) and more reliable in marginal conditions
- More favorable nutrition profile, nutrient balance, micronutrient content
- Nutraceutical values (e.g. low glycemic index, antioxidants, gluten free)



2. Neglected and Underutilized Species (NUS)

- Multiple and synergistically linked benefits of NUS

Income

- Novel, high value products, 'superfoods'
- Unique opportunities for poor producers on marginal lands
- Versatility in use (meeting many livelihood needs)

Empowerment

- Socio economic opportunities for poor smallholders, indigenous peoples, women and youth
- Richly associated food culture and traditions (safeguarding identity)



All potentials not necessarily present in all species

2. Neglected and Underutilized Species (NUS)

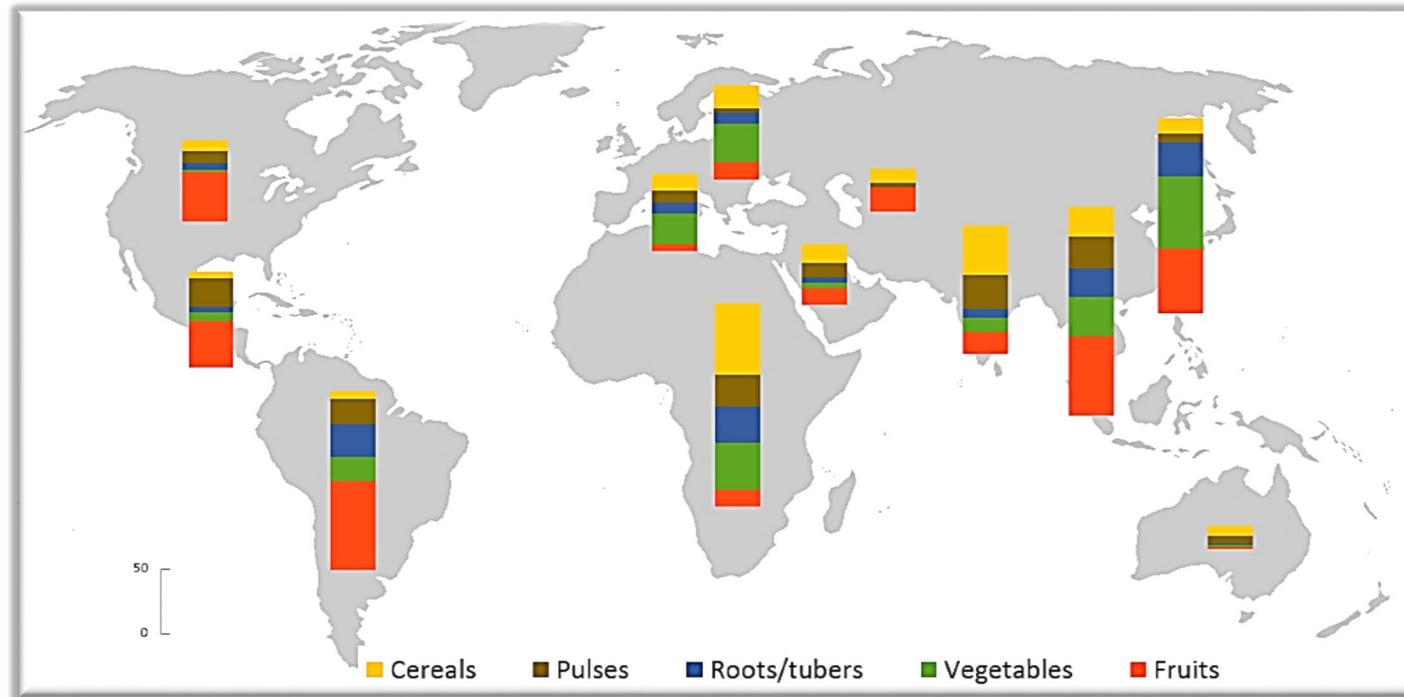
Negative traits

- Poor economic competitiveness with commodity crops
- Lack of improved varieties or poor cultivation practices
- Often drudgery in value addition
- Disorganized/ non-existent market chains
- Perception of being “food of the poor”
- Scarcely represented in ex situ collection

2. Neglected and Underutilized Species (NUS)

NUS: A global untapped wealth

- Estimated number of cultivated NUS (cereals, pulses, roots/tubers, vegetables, and fruits) in regions of crop origin and diversity around the globe:



- The richness in wild NUS around the world can be estimated in the order of several thousand species

2. Neglected and Underutilized Species (NUS)

- *Examples of nutritional and stress resilience of NUS in LAC*



Cnidocolus aconitifolium



Cucurbita maxima



Amaranthus cruentus



Ullucus tuberosus



Mammea americana



Byrsonima crassifolia

Chaya

Value chain analysis and development

1. Introduction

Background

- The project: “Linking agrobiodiversity value chains, climate adaptation and nutrition: Empowering the poor to manage risk”
 - Target countries: Guatemala, India and Mali (2015-2019)
 - In the case of Guatemala the project focused on:
 - Underutilized crops that can support better nutrition and climate resilience
 - Promoting the cultivation and use of **chaya** and tepary bean
 - Study area: Different communities in the Department of Chiquimula (Dry Corridor)
 - ❖ High rates of extreme poverty and chronic malnutrition
 - ❖ Seasonal famine is common

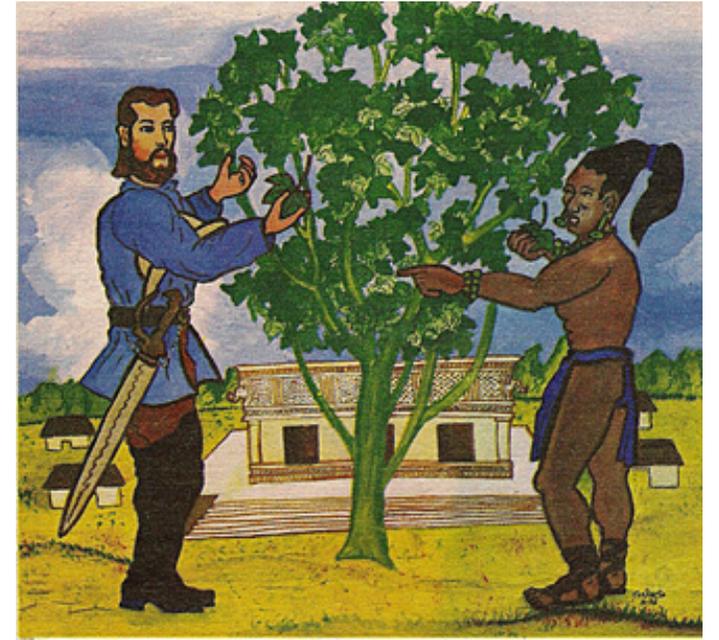


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2. Chaya (Mayan spinach)

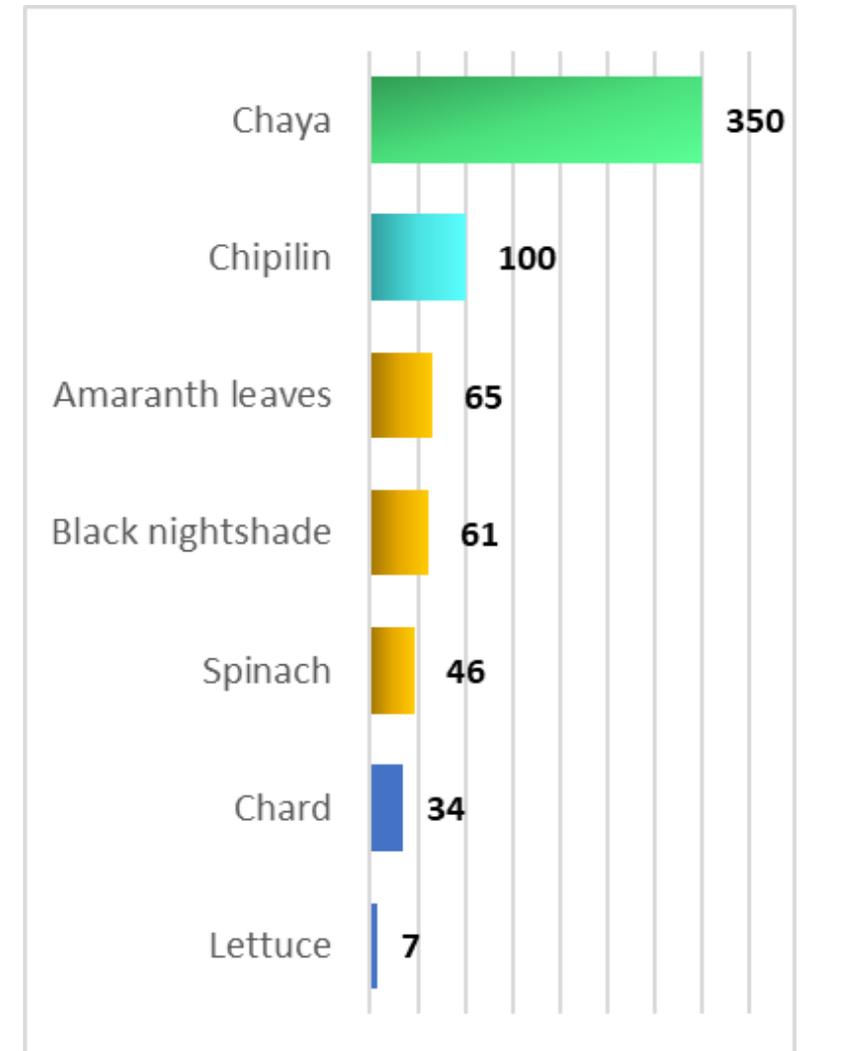
- Domesticated shrub grown throughout Mesoamerica (Mexico, Guatemala, Belize and Honduras) (Ross-Ibarra 2003).
- Has been cultivated since pre-Hispanic times in the Mayan region (Ross-Ibarra & Molina-Cruz 2002)
- The highly nutritious leaves are consumed for food & medicine
- Highly resistant to extreme heat and drought conditions
- Although its nutritive and agronomic potential has been recognized for decades, there has been little research and promotion of its use (Ross-Ibarra & Molina-Cruz 2002)



2. Chaya (Mayan spinach)

- Chaya has strong potential to enhance nutrition in communities in the Dry Corridor but also more widely in Guatemala
- Highly nutritious plant, important source of:
 - Vitamins (A and C), minerals (calcium, iron, zinc, phosphorus, magnesium)
 - Proteins, carbohydrates and healthy fatty acids
- Dry protein content higher than common beans:
 - 31% vs 25%
- Vitamin C:
 - 10 times more than chard / 8 times more than spinach

*Content of vitamin C content (mg / 100 g)
in chaya leaves and other edible leaves*



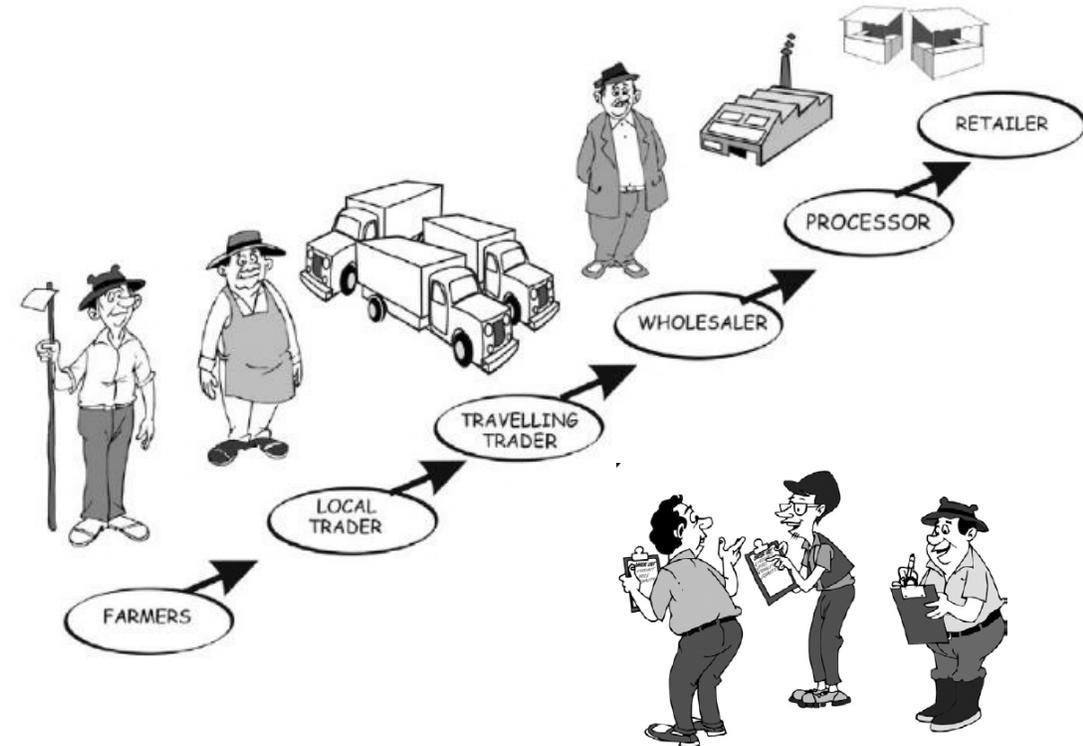
3. Value chain analysis of chaya

- Value chain analysis of chaya
 - Detect key bottlenecks and market opportunities
 - Determine women's involvement in the production and use of chaya
 - Identify opportunities for women's empowerment
- Support, design and implement value chain interventions for chaya
 - Connects farmers to technology, resources and best practices for a steady and more resilient value chain (market access)



3. Value chain analysis of chaya

- Methodology used: Rapid Market Appraisal (RMA)
 - Quick, flexible and effective way of collecting, processing, and analyzing data
- RMA relies on a combination of secondary and primary data collected through:
 - Literature Review
 - Semi-structured interviews of key informants at different stages of the chaya value chain
 - Sample size: min. 3-5 interviews per link
 - Market visits and direct observation
 - Consumer acceptability testing



4. Key findings

- The value chain of chaya was found to be short and composed primarily of production, basic processing (if any), insignificant marketing and decreasing consumption
- Bottlenecks were detected across the value chain, which hinder integration of chaya in markets
- Agronomic constraints did not stand out as a major limiting factor for chaya
 - Easy cultivation, requires few inputs and generates a harvest even under challenging climate conditions
 - However, producers are not motivated to produce chaya commercially due to low demand



4. Key findings

- Critical commercialization constraints include:
 - Low demand
 - Poor profitability
 - High transaction costs
 - Weak value chain organization
 - Perishability



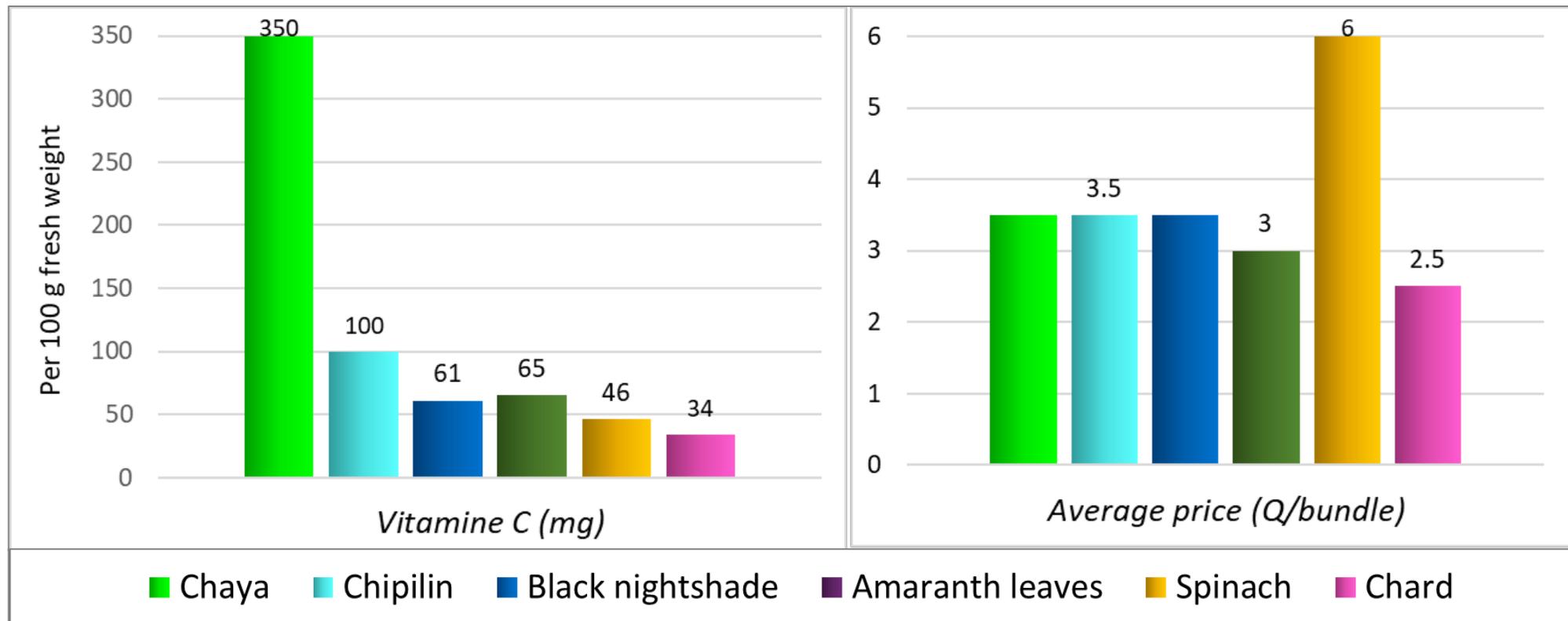
4. Key findings

- Lack of demand stood out as the primary limiting factor for chaya marketing, due to:
 - Low awareness of the crop and processing methods
 - Reluctance to grow, consume or sell a crop perceived as “food of the poor”
 - Culture of consuming native plants is slowly disappearing and reaching levels of complete extinction in some regions of Guatemala
 - Loss of knowledge of ancestral foods, especially by traditional Mayan groups



4. Key findings

- The lower price of chaya compared to other leafy vegetables presents an opportunity for low-income consumers to affordably increase their vegetable consumption
- At almost half the price of spinach, chaya provides:
 - 8 times more vitamin C
 - 4 times more Calcium
 - 2 times more protein



4. Key findings

Chaya value chain development, Indigenous Peoples & Women's Empowerment in Guatemala



5. Key interventions to promote chaya in Guatemala

Establishment and strengthening of a farmers' cooperative to:

- Promote and sell chaya
 - Connect farmers with local and regional markets
1. School feeding programs
 2. Gastronomy sector (restaurants and culinary schools)
 3. Processing industry: using on-pack messaging and social media to connect consumers with the purpose behind the brands
 4. Promote partnerships, facilitate dialogue and collaborative work with multiple stakeholders



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5. Key interventions to promote chaya in Guatemala

1) School feeding programs



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GUATEMALA
 MINISTERIO DE EDUCACIÓN

No.	Nombre del menú	Evaluación técnica	Observaciones
			alimentos no perecederos. Utilizar agua segura
6.	Refresco de Jamaica, Picado de pollo con chatate (chaya), tortilla y fruta de la temporada	APROBADO	Conservar la cadena de frío del pollo durante el transporte y almacenamiento. Verificar la correcta manipulación de alimentos y su desinfección. Verificar el buen estado de alimentos perecederos y fechas de vencimientos de los alimentos no perecederos. Utilizar agua segura
7.	Horchata de arroz, pan con picado de carne y espinaca	APROBADO	Conservar la cadena de frío de la carne durante el transporte y almacenamiento. Verificar la correcta manipulación de alimentos y su desinfección. Verificar el buen estado de alimentos perecederos y fechas de vencimientos de los alimentos no perecederos. Utilizar agua segura
8.	Refresco de tamarindo Pollo guisado con arroz y tortilla	APROBADO	Conservar la cadena de frío del pollo durante el transporte y almacenamiento. Verificar la correcta manipulación de alimentos y su desinfección. Verificar el buen estado de alimentos perecederos y fechas de vencimientos de los alimentos no perecederos. Utilizar agua segura
9.	Atol de harina fortificada con leche Huevo revuelto con loroco, tortilla y Fruta de la temporada	APROBADO ²	Si se compra leche líquida se tiene que asegurar que llevó un proceso de pasteurización y conservar la cadena de frío. Verificar la correcta manipulación de alimentos y su desinfección. Verificar el buen estado de alimentos perecederos y fechas de vencimientos de los alimentos no perecederos. Utilizar agua segura
10.	Refresco de semillas Tacos de pollo con pico de gallo y fruta de la temporada	APROBADO	Conservar la cadena de frío del pollo durante el transporte y almacenamiento. Verificar la correcta manipulación de alimentos y su desinfección. Verificar el buen estado de alimentos perecederos y fechas de vencimientos de los alimentos no perecederos. Utilizar agua segura
11.	Refresco de limón con chaya (chatate)	APROBADO ¹	Conservar la cadena de frío del pollo durante el transporte y almacenamiento.



3. Key interventions to promote chaya in Guatemala

2) Gastronomy sector



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5. Key interventions to promote chaya in Guatemala

3) Processing industry



5. Key interventions to promote chaya in Guatemala

3) Processing industry



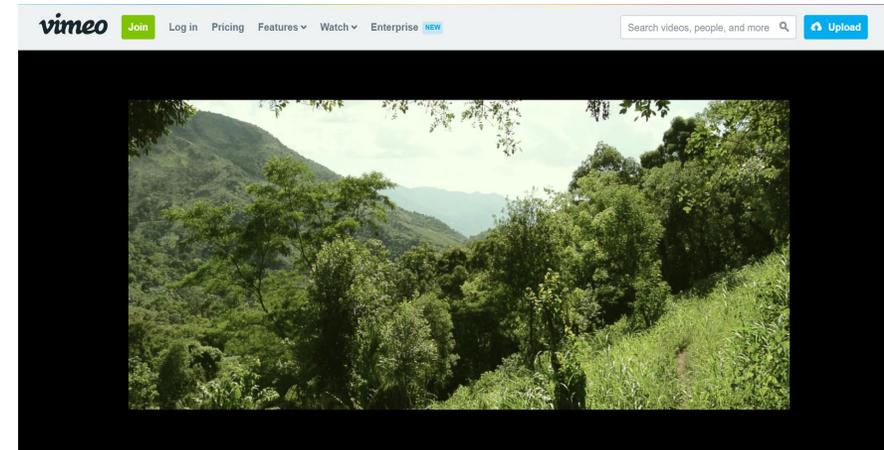
5. Key interventions to promote chaya in Guatemala

4) Promotion activities



3. Key interventions to promote chaya in Guatemala

4) Promotion activities



4. Concluding remarks

- This research, first of its kind applied to chaya in Guatemala, has provided a better understanding of the chaya value chain in the country, which can guide sustainable development of this crop
- Chaya is a promising yet neglected plant that if properly harnessed could:
 - Present a nutritional food source year-round that is readily available & affordable
 - Help rural or urban-marginal communities to tackle problems of malnutrition, hunger and food scarcity
- There are more profitable markets that could be accessed by chaya producers with improved organization and marketing strategies
 - E.g. super food, nutraceutical products and chaya-specialized restaurants

5. Recommendations

- Advocate for more integrated and holistic approaches that improve farmers' livelihoods and allow sustainable agriculture
- Design and implement inclusive strategies using a cyclic learning process that links rural producers with buyers (e.g. Responsible Sourcing)
- Develop new products and stories (traceability) that differentiate the product in an increasingly competitive market
- Improve women's empowerment and access to markets to achieve sustainable development goals



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