Artichoke to Ziziphus: Using Agrobiodiversity to improve the availability of fruits and vegetables

Gina Kennedy

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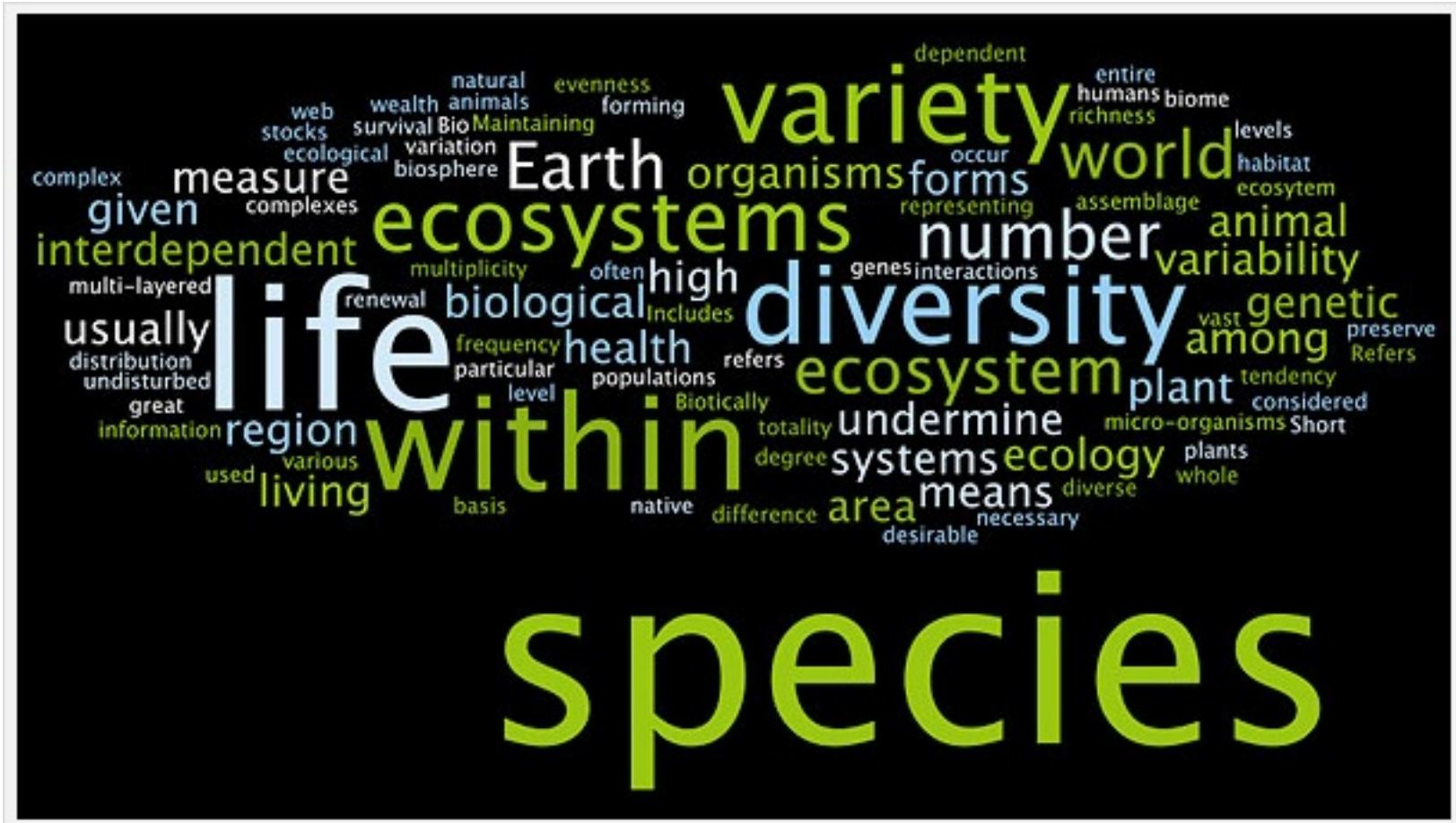
Outline

- What is agrobiodiversity (ABD) and why is it helpful?
- Fruit and vegetable research highlights
- Fruit and vegetable case studies

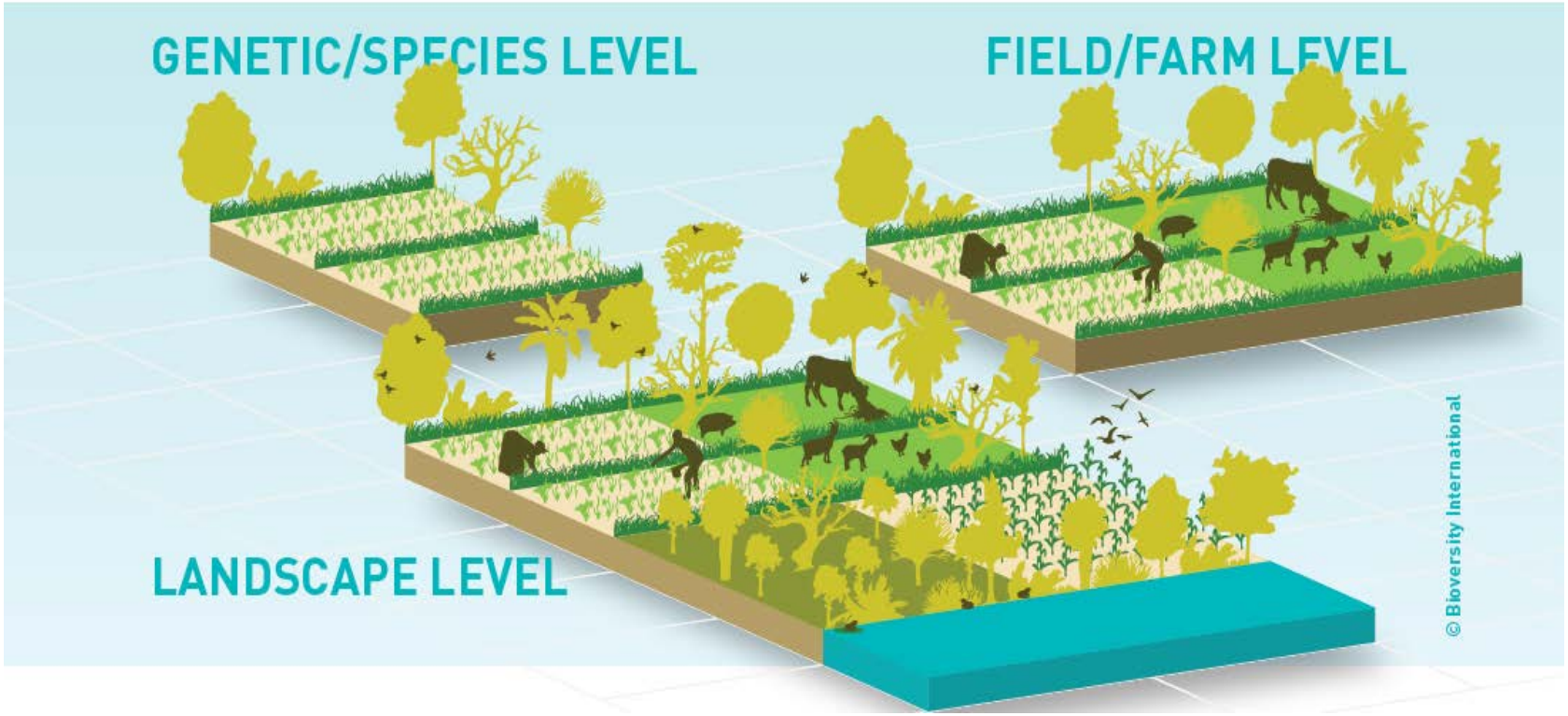
Biodiversity



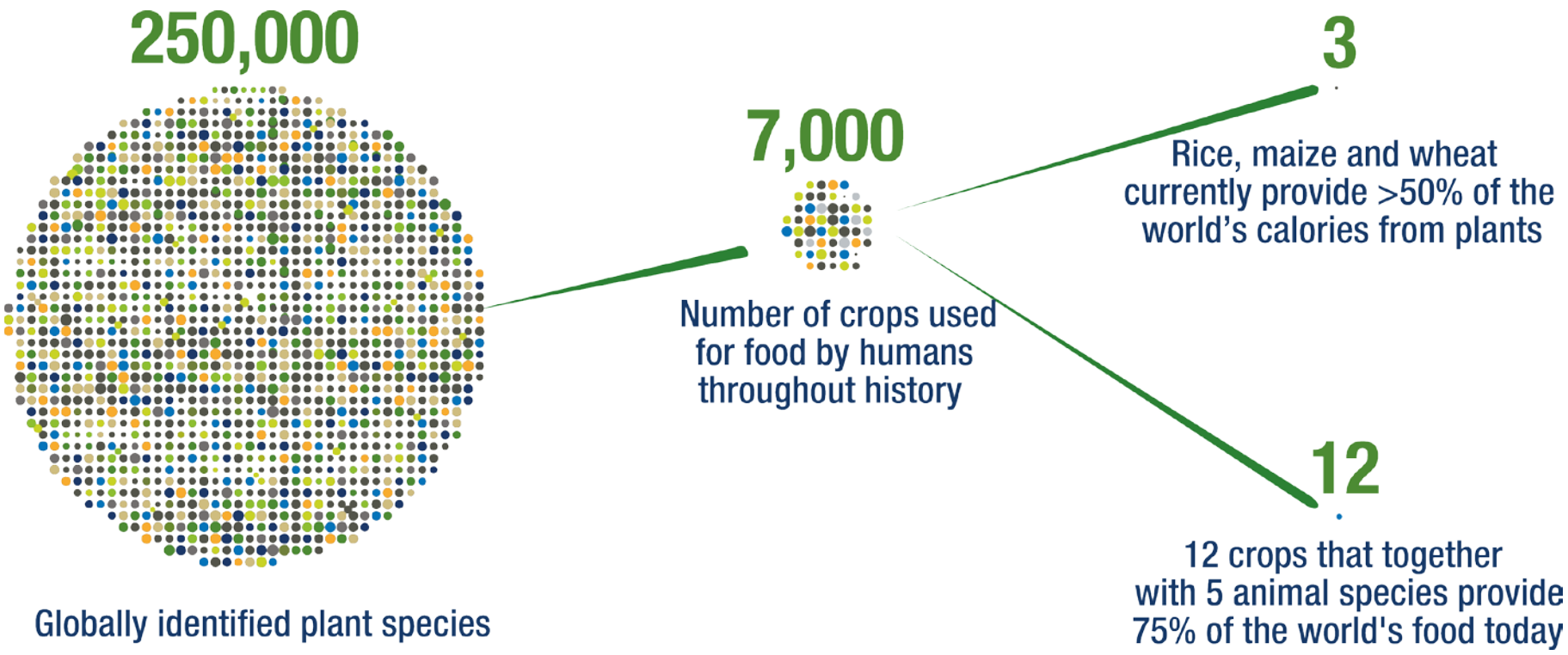
Word cloud created from definitions of biodiversity found with Google search.

Agricultural Biodiversity

Agricultural biodiversity – the diversity of crops and their wild relatives, trees, livestock and landscapes – is a source of nutritious foods, which are culturally acceptable and often adapted to local and low-input agricultural systems. It is also a source of important traits for breeding stress-tolerant, nutritious crops and animal breeds.



Shrinking biodiversity



(Data source: FAO, 1997)

Diets for many children around the globe look like this

India

This example of a child's meal in India includes wheat, eggplant, and potato.

Kenya

This example of a child's meal in Kenya includes corn flour and cabbage.

Senegal

This example of a child's meal in Senegal includes cassava and milk.

Guatemala

This example of a child's meal in Guatemala includes corn flour, black beans, and greens.

Chicago Council - HEALTHY FOOD FOR A HEALTHY WORLD, 2015

But diets should look like this

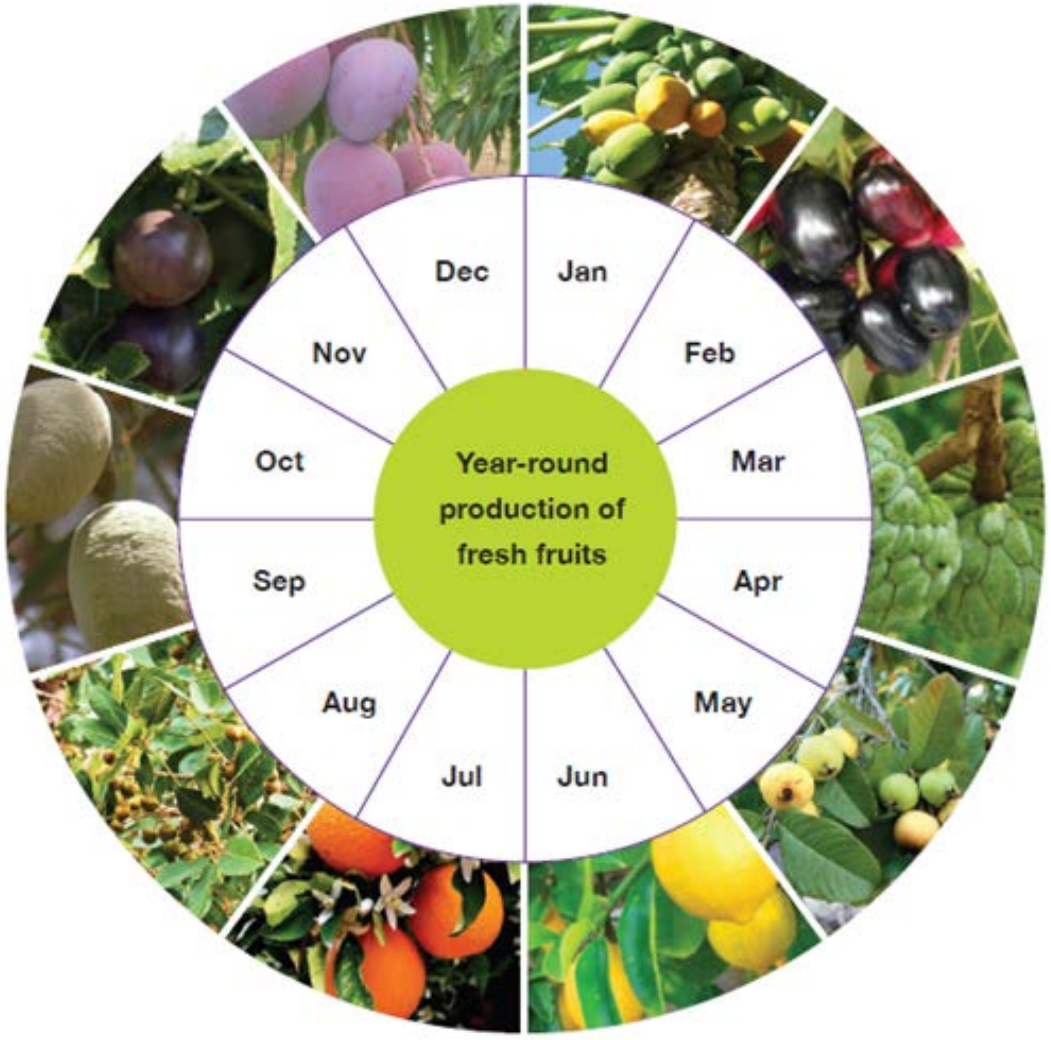
Brazil Food Based Dietary Guidelines, 2014. Ministry of Health, Brazil

Agrobiodiversity to increase food environment of F/V

- Use species diversity to create year-round availability
- Use intraspecies diversity to select early, late and perennial varieties
- Select across and within for **diverse nutrients:** micronutrients, fibre, anti-oxidants
- Select across and within to meet **nutritional needs of individuals (Vitamin A, Iron, Zinc)**
- Select across and within to response to **climate change (drought tolerant, flood tolerant, heat resistant)**
- Respond to **cultural identity and also international curiosity**

Research Highlights

Fresh Fruit Available All Year Round



Year-round fruit harvest of vitamin A and C rich fruits Machakos County, Kenya, Source: Kehlenbeck K, McMullin S (2015) *Fruit Tree Portfolios for Improved Diets and Nutrition in Machakos County, Kenya* (Nairobi).

Fruit production and consumption: practices, preferences and attitudes of women in rural western Kenya

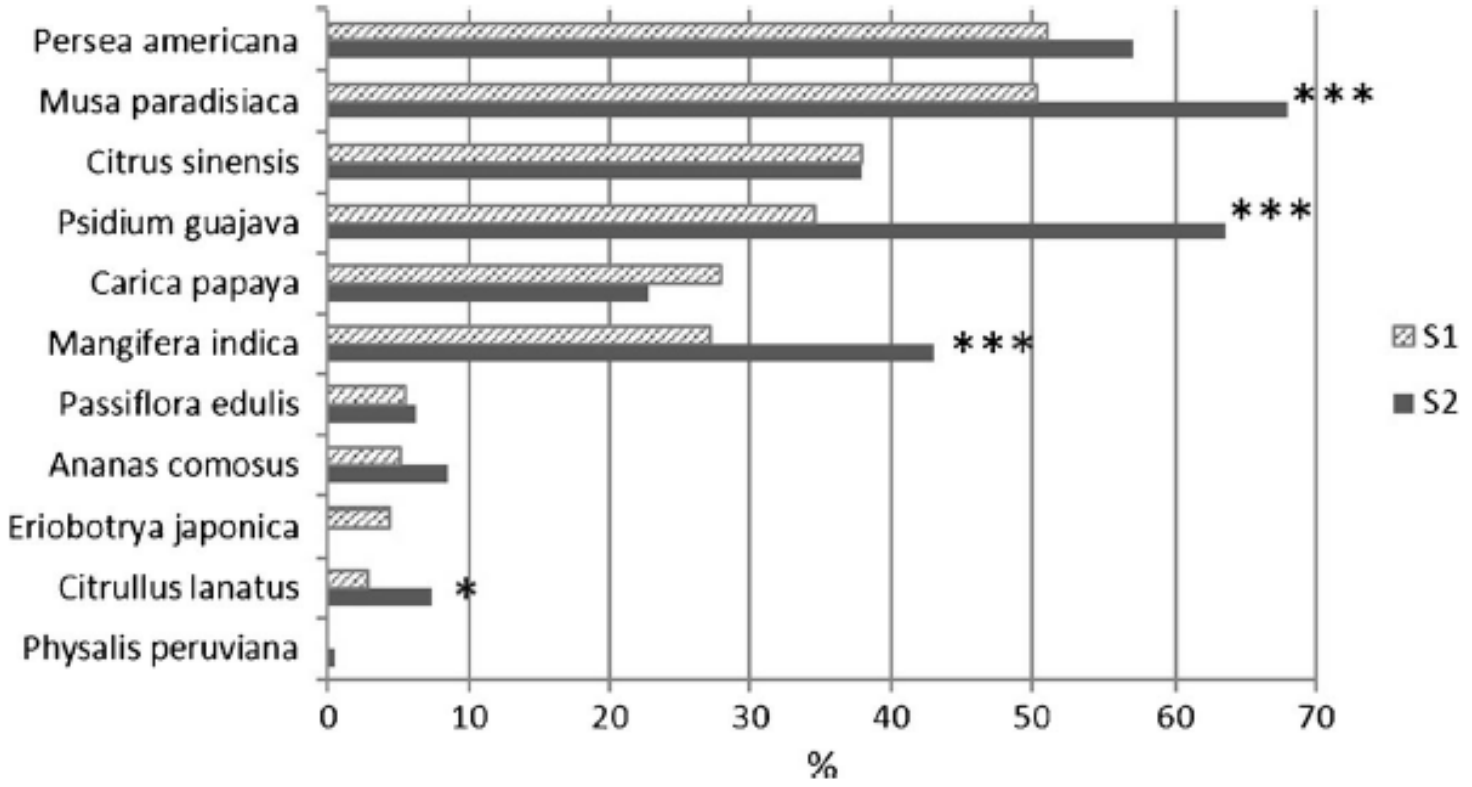
Keding, G. B., Kehlenbeck, K., Kennedy, G., & McMullin, S. (2017). Fruit production and consumption: practices, preferences and attitudes of women in rural western Kenya. *Food Security*, 1-17.

Results of Fruit study in Western Kenya

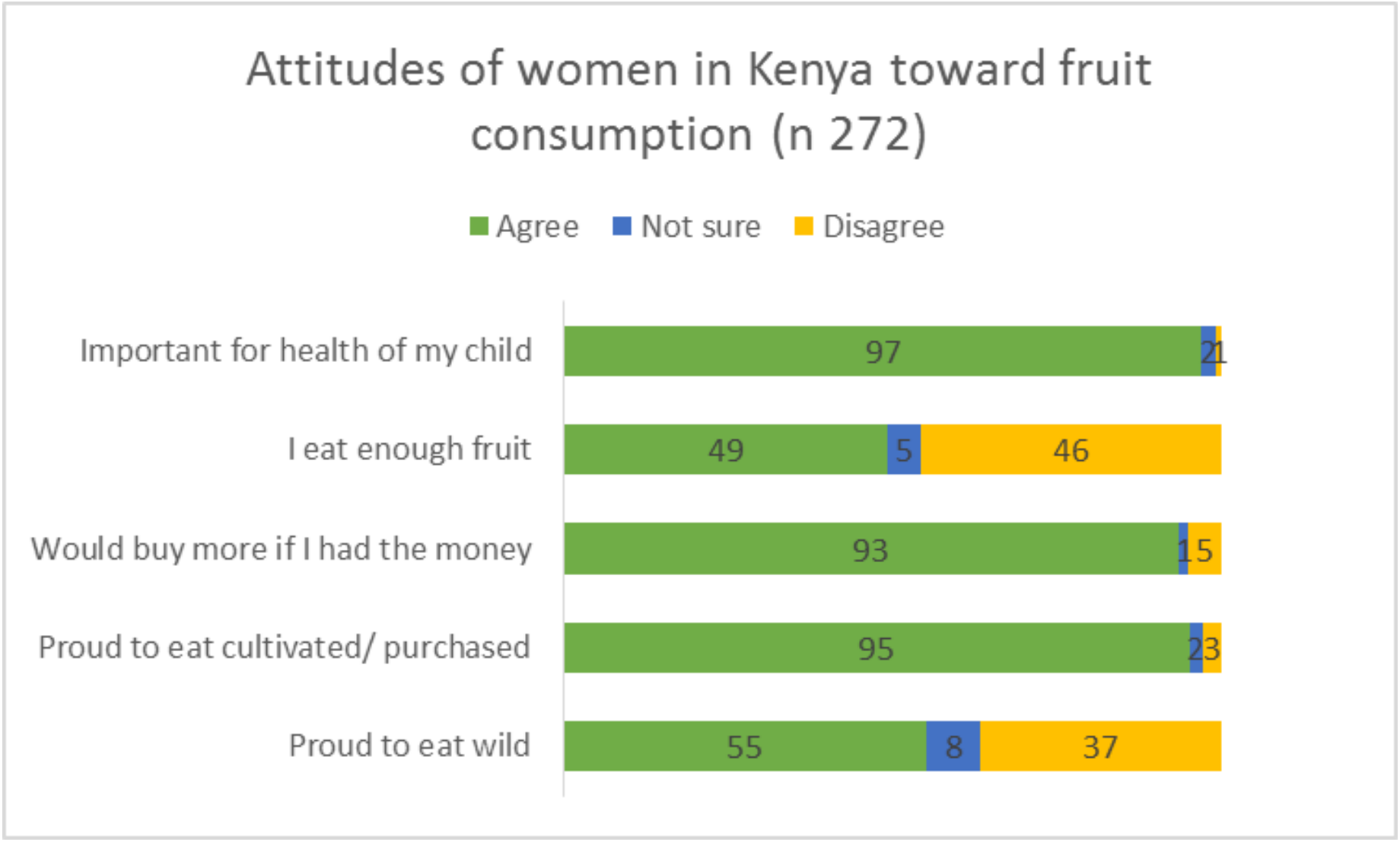
- 2 cross-sectional studies (S1 and S2)
- 272 female respondents
- Low reported consumption 25% of women S1 and 37% of women S2 consumed fruit the day prior to the interview
- Significantly higher intakes (g/day) in S2
- 80% under an intake of 200 g/d

Keding, G. B., Kehlenbeck, K., Kennedy, G., & McMullin, S. (2017). Fruit production and consumption: practices, preferences and attitudes of women in rural western Kenya. *Food Security*, 1-17.

Fruit consumption (%) of households over past seven days (n 272)



Source: Keding, Kehlenbeck, Kennedy and McMullin, 2017



Source: Keding, Kehlenbeck, Kennedy and McMullin, 2017

Drivers of vegetable consumption in urban Nigeria Lagos and Ibadan, November 2016

- Household expenditures for both Veg and Fruit declined in rural areas from 2010 to 2012 (10 % down to 8% and 2% to 1%) remained at 9% and 2% in urban (LSMS Nigeria)
- Most vegetables were purchased at open and traditional markets. Supermarkets are the least common outlet for vegetables.
- Almost all respondents consumed fresh vegetables (99.8%), tomato, onion, hot peppers, DGLV, carrots most common

Source: Thom Achterbosch (Wageningen Economic Research) with Ireen Raaijmakers, Gemma Tacken, Harriette Snoek and Bussie Maziya-Dixon

African leafy vegetables come out of the shade

Nutritious traditional African leafy vegetables disappearing from farmers' field and people's menus

Bioversity International works with partners in Kenya to revive the interest of researchers, growers and consumers in African leafy vegetables (ALV).

ALV results in Kenya

Initial 8 year initiative in Kenya (now continuing in new areas):

- 12 nutritious species (nightshade, spider plant, cow pea) introduced into formal market
- 450 farmers (mainly women) trained on cultivation
- Increased income, increased dietary diversity & economic empowerment of women

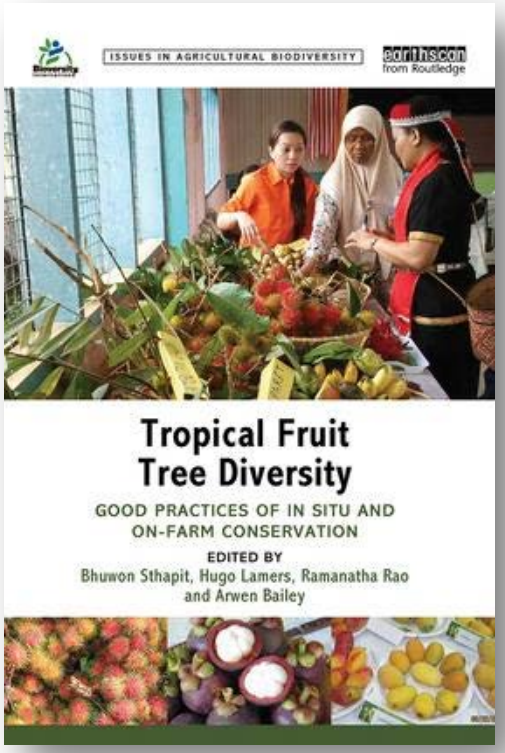
TFT UNEP-GEF Project (2009-2014)

"*Conservation and sustainable use of cultivated and wild tropical fruit diversity: promoting sustainable livelihoods, food security and ecosystem services*"

Countries: India, Indonesia, Malaysia, Thailand

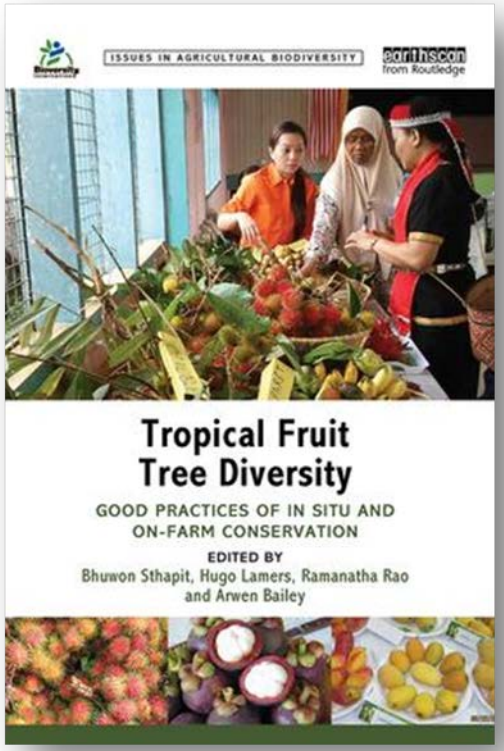
Focus species:

- *Mangifera spp.*(mango), Anacardiaceae
- *Garcinia* spp. (mangosteen), Clusiaceae
- *Citrus* spp (citrus), Rutaceae
- *Nephelium* spp. (rambutan), Sapindaceae



Mango:
Intra-specific diversity of *Mangifera indica:* 211 named varieties recorded across 36 communities in 4 countries

Farmer ABD custodians

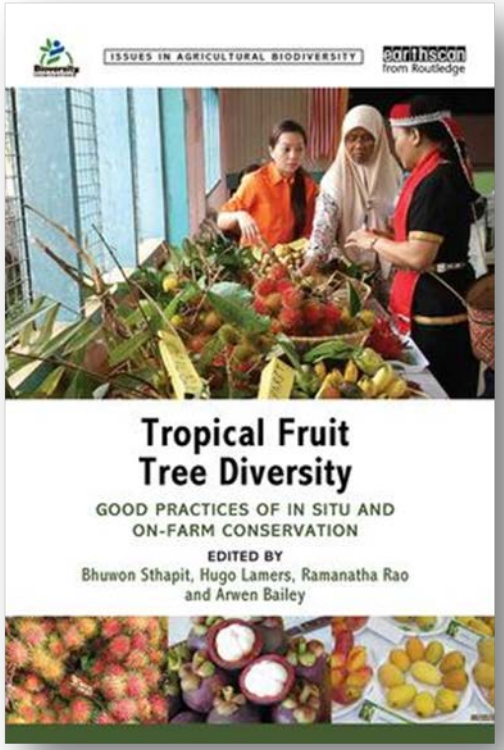


Type 1: Maintains 1-4 varieties, mostly due to market/income orientation (81 farmers)

Type 2: Maintains 5-9 varieties including commercial and local varieties for improved pollination and home consumption (68 farmers)

Type 3: Maintains 10 or more varieties for many reasons, a hobby, cultural/historic interest in diversity, helpful to explore different characteristics and uses (7 famers)

Reasons why farmers maintain mango diversity



Lengthens months that farmers earn income (Mr. Chhote Lal's income from mango begins in May/June with early sale of the fruit from varieties suitable for mango pickle, and continues after July"

Farmers avoid the dip in market price associated with the most popular commercialized varieties.

The flowers of some varieties attract more pollinators and can increase yields by 10-25 per cent

Farmers maintain mixture of commercial and traditional varieties for income and their diverse culinary home use (pickle, juice, spices and fresh fruit)

Some traditional varieties are taller, so birds are attracted to these and this minimizes damage to commercial varieties

Bioversity International

BFN UNEP-GEF Project (2012-2017)

"'Mainstreaming biodiversity for nutrition and health"

Context: Part of the CBD Cross-cutting initiative on biodiversity for food and nutrition (COP 8 Decision VIII/23 -2006)

Target countries: Brazil, Kenya, Sri Lanka and Turkey/ Bioversity coordinated

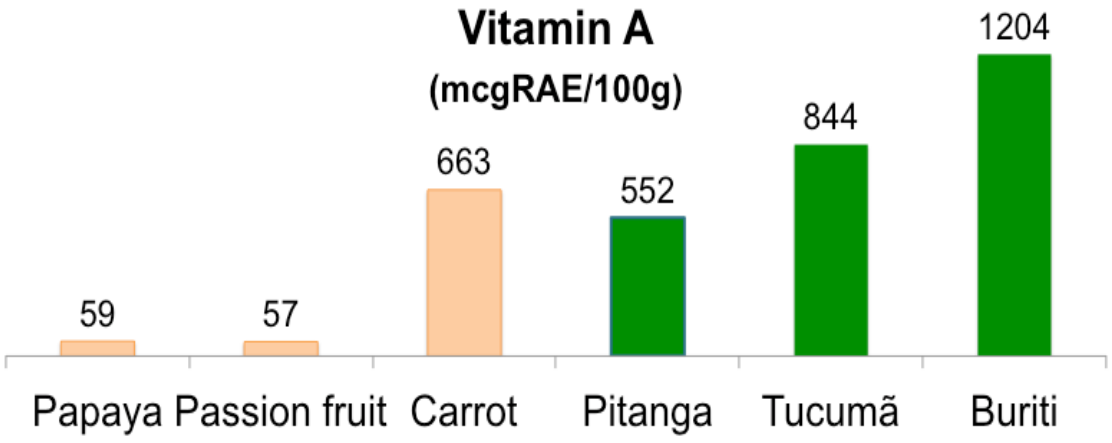
Time frame: 2012 – 2017

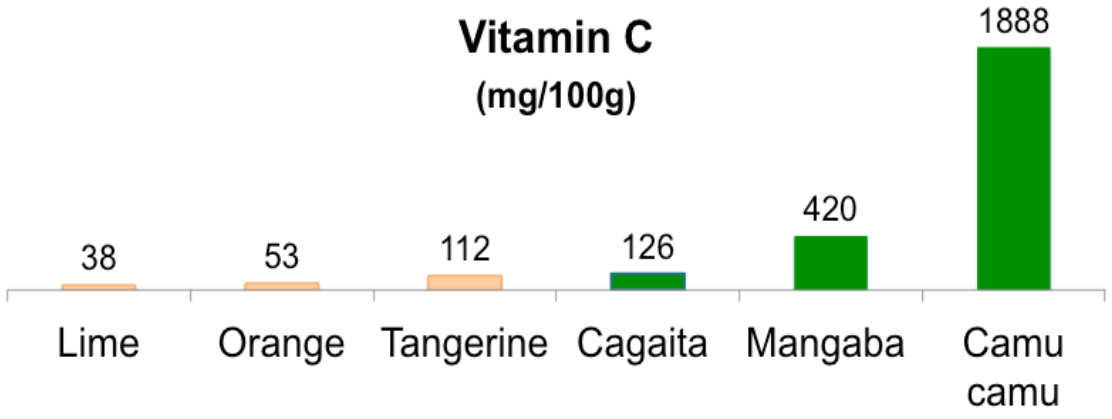
General objective: strengthen the conservation and sustainable use of agricultural biodiversity by providing evidence of its benefits for nutrition and well-being and mainstreaming into national/global nutrition policies and strategies

Specific objectives:

- Widen knowledge base of how underutilized native species can contribute to food security
- Increase awareness on how biodiversity can contribute to food and nutrition

Case of Brazil: of the 73 target species (many native) 49 characterized for nutritional content





ABD in school feeding programme

Provision of healthy meals = at least 20% of the nutritional needs during the school year

Law passed in 2009 which stresses that 30% of food procured for school feeding under the PNAE must be sourced from local family famers

>40 million students – future consumers

Lobbying and advocacy by key actors to link Food Acquisition Program (PAA) and the National School Feeding Program (PNAE)

Source: Hunter et al., 2016

Food procurement programme

Beneficiaries: family farmers and people in situation of food insecurity

Programme activities:

- purchasing from family farms and donates to social assistance entities
- establishes networks to tie different local associations
- pays 30% more for organic and agro-ecological food
- prioritizes indigenous communities and *quilombolas*

Photo credit: Conab

2016 Ordinance on Sociobiodiversity

Public policy signed by Brazilian Ministry of the Environment and Ministry of Social Development and Fight Against Hunger.

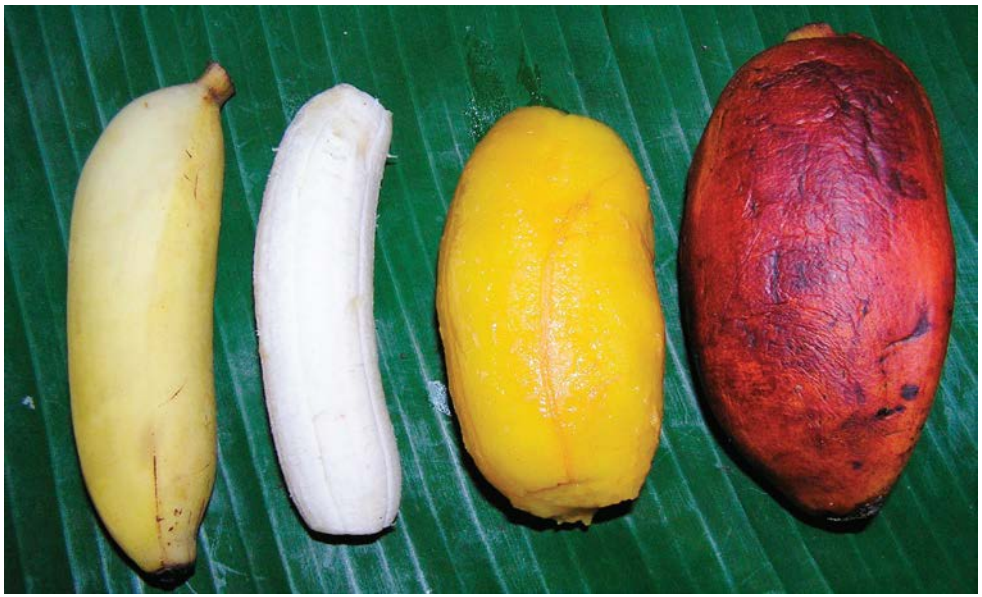
The Ordinance is the first to define and support nutritionally important native species.

Photo: Sterculia (tropical chestnut) Credit: Fernando Tatagiba

More at www.b4fn.org

Vitamin A Banana

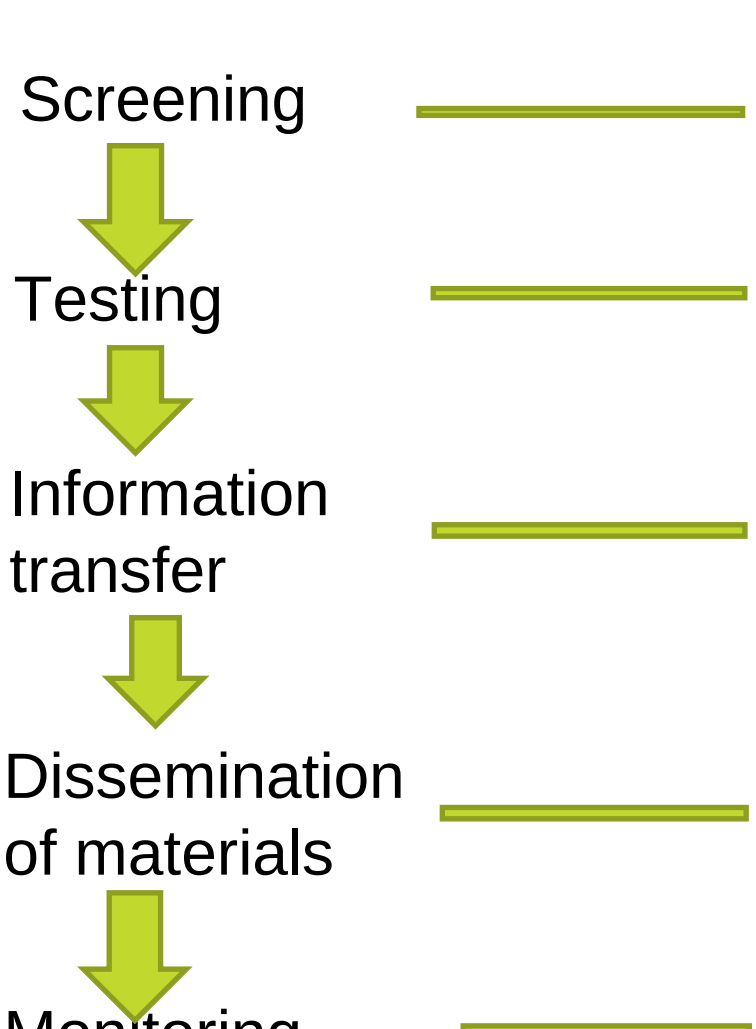
Banana	β-carotene content (mcg/100 g)
Cavendish	26
Utin Iap	8508



Outscaling nutrient-dense bananas in Eastern Africa

- Banana are an important crop to the livelihoods of millions of rural poor people in East Africa
- Bananas are a food security crop (perennial, mixed/intercropped)
- Together Uganda, Rwanda and Burundi, consumption is about 3-11 bananas/day
- An affordable banana-dish for any social-economic group

Project Pathway



>400 accessions screened, (2005-2008)

12 accessions selected & agronomic trials established for testing, organoleptic trials involving local farmers (2010-2012: on going)

Used TOT approach to reach community resource persons & community members (From 2013)

Multiplication carried out, mother gardens maintained, macro-propagation (From 2014:on-going)

To access adoption on farm and for diets (begun 2014:on -going

Key Findings

- 5 accessions with good agronomic attributes in Eastern Africa: (Lai, Lahi, Apantu, Pelipita, Bira
- Overall sensory acceptability score ranged from 3–4 on a 1 to 5 Likert scale.
- Overall acceptance of Apantu, Bira & To'o not significantly different from the local cultivars.

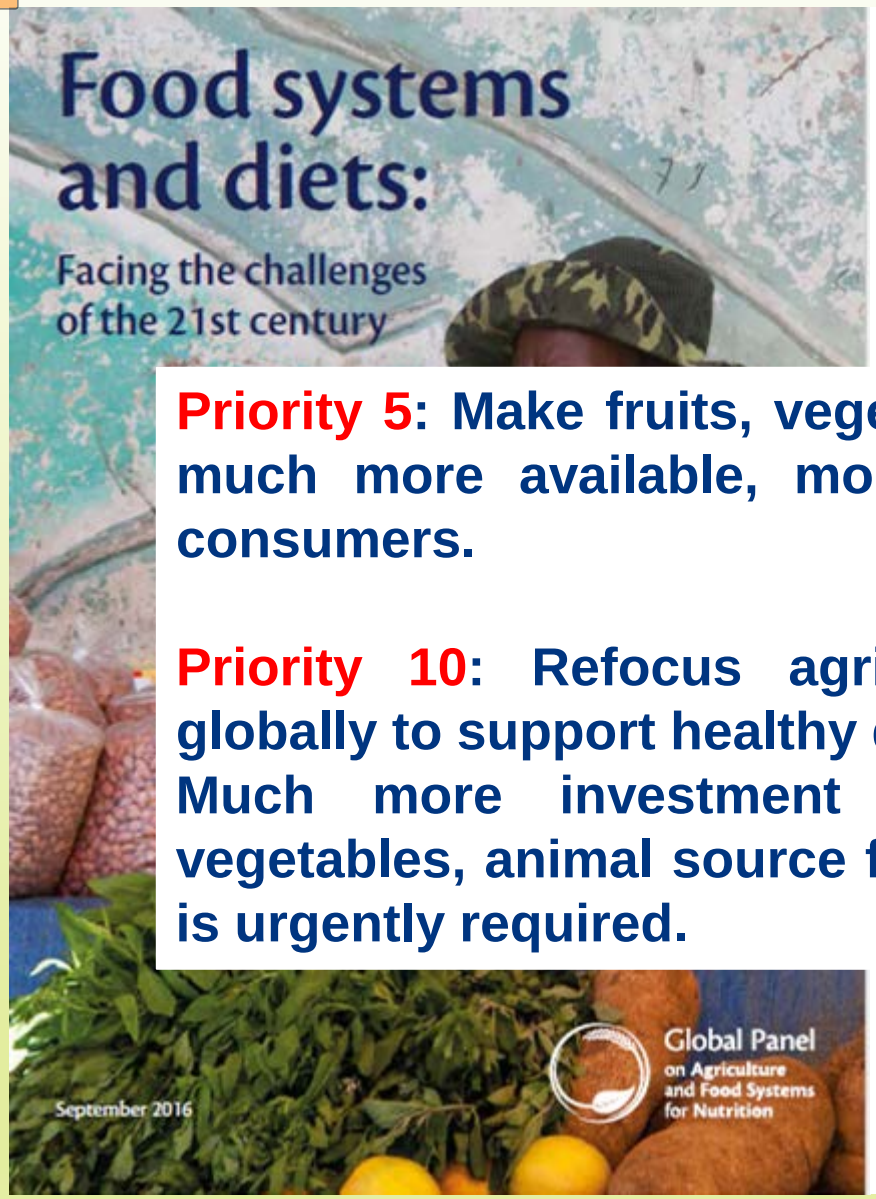
Apantu (Plantain)

Lai (Dessert)

Pelipita (Cooking)

Lahi (Cooking)

The President of Uganda learns about Vitamin A banana



8.2 Specific priorities for action

While most actions to improve food systems and diets will depend heavily on local contexts, the following are universally applicable

1. **Focus food and agriculture policies on securing diet quality for infants and young children.** These are woefully inadequate in many countries. Improved policy choices are needed which recognize the centrality of high-quality diets for the youngest.

6. **Make policies which regulate product formulation, labelling, advertising, promotion and taxes a high priority.** These are needed to create disincentives for companies to allocate resources to forms of processing that undermine diet quality. Policies to educate consumers of the adverse health effects of consuming these products more than occasionally are also needed.

7. **Improve accountability at all levels.** Governments committed to reshaping food systems toward healthy diets

investment in the infrastructure required to produce, store and transport these foods.

in research on fruits and vegetables, animal source foods, legumes, nuts and seeds is urgently required. Better national-level and subnational data are needed on diet, consumer food prices, food safety, food loss and waste. The Access to Nutrition Index that assesses the conduct and performance of companies should be strengthened at the country level.

Priority 5: Make fruits, vegetables, pulses, nuts and seeds much more available, more affordable and safe for all consumers.

Priority 10: Refocus agriculture research investments globally to support healthy diets and good nutrition. [..]
Much more investment in research on fruits and vegetables, animal source foods, legumes, nuts and seeds is urgently required.

2016 Foresight Report, *Food systems and diets: Facing the challenges of the 21st Century*. Global Panel on Agriculture and Food Systems for Nutrition.

Cultivate ABD Champions

Thank you

Gina Kennedy

g.kennedy@cgiar.org

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