Creating Opportunity for Underutilized Fruits and Emerging Crops from Research to Industry: Greening Landscapes

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Nearly 3 in 4 Kenyans live in rural areas and depend primarily on agriculture. Of these, roughly 1 in 2 live in poverty. Agriculture is four times as effective as other sectors in reducing US$1.25/day poverty.

Food Security: e.g. Kenya

Hunger and malnutrition: In Kenya, 46% suffer from hunger and $\frac{1}{3}$ of the population is malnourished.

Biodiversity: 90% of the calories in the human diet come from 4 crops (maize, potato, wheat and rice).

Poverty: Nearly 50% of the country's 46 million people live below the poverty line. More than 75% of the population lives in rural areas.

Climate: In Kenya, droughts and floods are having a devastating effect on the environment, society and the economy.

Postharvest losses: 40% losses - up to 100% in maize.
National Strategic Focus for the Agricultural Sector Development

- Increasing **agricultural productivity** and incomes, especially for smallholder farmers
- **Emphasis on irrigation** to reduce over-reliance on rain-fed agriculture in the face of limited high potential agricultural land
- Encouraging **diversification** into non-traditional agricultural commodities and **value addition** to reduce vulnerability (modern agriculture)
- Enhancing the **food security** and reduction in the number of people suffering from hunger
- Encouraging **private-sector-led development** in the sector
- Ensuring **environmental sustainability**
Demand for heirloom tomato varieties in the US
Concerning Global Challenge – We have lost 50% of crop varieties in the last century

- **Heirloom varieties** - In the US over 90% of the varieties have vanished
- **Apples** – 7,000 types in 1800; and now only about 100
- In China 90% of wheat varieties have disappeared
- **Rice** previously 1,000s of varieties now only 100s
- Comparison of 66 crop seed varieties in 1983 to 1903, 93% varieties have become extinct

Source: National Geographic, 2011
Facts!!

Narrowing of the World’s Food Basket

- 350,000 Known plant species
- 100,000 Used by humankind
- 30,000 Edible
- 7,000 Used as food at local level
- 120 Important at national scale
- 30 Provide 90% of plant calories
- 4 Provide 60% (rice, wheat, maize, potato)

Increased reliance on major crops due to globalization

Source: Bioversity, 2012
Many cultivated and wild species and varieties have potential to contribute to diets and nutrition.

With increasing globalization and social change processes, traditional knowledge on local agrobiodiversity is rapidly declining (Sogbohossou et al., 2015).

Currently we are sacrificing biodiversity for monoculture.

Now the focus is on locally cultivated foods or “orphan” foods.
Why Conserve: Different Types of Foods Consumption is Essential

Different Nutritional Values

Optimum dosage of nutrition
Eg: Vit B – Madder, Berry

Vit C – Drums stick

Carbohydrates

Protein

Lipid

Micro nutrients

Pregnancy
Lactation
Young children
Adults
Elders
Older age
People living with non communicable disease

Antibiotic Action
Disease Prevention
Eg: Cancer, Heart disease, Kidney disease, Diabetic, Hepatitis B

Nutrition Absorption
Eg: Acid - Fe

Digestion
Eg: Fibrous foods

Catalytic value of the food

Source: Chandradasa, 2014
Kenya is rich biodiversity and has about **400 indigenous fruit species** (Maundu, 1999)

Replacing traditional foods by “**modern feeding habits**” has resulted in the **loss of genetic diversity** in traditional food species and a **decline in cultural diversity** (Maundu, 1996)

Well-balanced diets are often disturbed when **traditional products are replaced by imported foods** or newly introduced species, thereby initiating nutrient deficiencies (Weinberger and Swai, 2006)
Indigenous and Local Foods

- Local knowledge on **agricultural biodiversity** must be documented.

- **Scientific evidence** is required to **maintain and promote nutritional health** and to **preserve genetic and cultural diversity** (Terashima and Ichakawa, 2003).

- Traditional food species have adapted to local environmental conditions and have a role in:
  - building ecosystem resilience
  - increasing ecosystem services
  - improving pest and disease management
  - stabilizing yields
  - managing risk
  - supporting household subsistence
Facts!!- What we must do in Kenya

- Kenya has **high rates of malnutrition** that necessitate increase utilization of **local foods and food systems** to provide adequate diets and good nutrition (Termote *et al.*, 2014)

- Despite the rich agrobiodiversity e.g. in Busia County, the **level of malnutrition among children is quite high** (Wasike *et al.*, 2014)

- Must explore and harness the **best that local food systems** have to offer in a cost effective and sustainable manner

- Kenya has broad and **excellent variety of neglected and underutilized species**
Examples of Rich Biodiversity
Guava (Psidium guajava) Production in Kenya

- Guava is grown **mainly for the fresh local market**
- Mainly grows from seeds dispersed unintentionally
- Area under guava is **1,260 ha** which produced **11,327 tons** valued at **111.6 million** in 2014
- Continuous growth:
  - Area - 19% increase
  - Production - 46% increase
  - Value - 28%
- **Guava production** - Lading regions in guava production are Nyanza, Western and Eastern
- **Sale of guava** – Meru (58%), Mandera (10%), Kisii (6%), Migori (5.9%), Bungoma (3%) and Kisumu (2%)
Tree Tomato (Solanum betaceum, syn. Cyphomandra betacea) - 2014

- **Statistics for Kenya** - area (619 ha), production (5,111 tons) and value (KES 156.3 million) of tree tomato

- **Rapid growth of tree tomato** –
  - Area increase by 31%
  - Production increase by 26%
  - Value increase by 28%

- **Major production areas** of tree tomato are Nyandarua, Meru and Nakuru

- **Production constraints** –
  - lack of suitable varieties
  - losses from insect pests and diseases
  - unavailability of quality planting material
  - limited knowledge on appropriate agronomic and postharvest practices
White Sapote (*Casimiroa edulis*)

- White sapote use as *source of sugar* in the confectionery industry
- 2013 - area of production area (50ha); production (375 tons)
- **Decline** - area (24%); production (15%) and value declined (33%) – poor reporting
- **Constraints** - lack of awareness on the crop and poor marketing; lack of suitable varieties, unavailability of quality planting material and limited knowledge on appropriate agronomic practices
- **Major counties** in production of white sapote are Kakamega, Bungoma, Nyeri, Meru, Nakuru and Elgeyo Marakwet
Loquats (Eriobotrya japonica) - 2014

- Loquat is grown for **local fresh market**
- Production area **182 ha** producing **934 tons** of fruits valued at **KES 14.59 million**
- Increase in area (by 6%) and yield (by 7%)
- Value of loquat **dropped by 20%** in 2014 due to low market prices
- **Major counties in production** of loquat are Meru Makueni, Bungoma, Machakos, Elgeyo Marakwet, Kiambu and Kisii
- **Constraints** are –
  - high postharvest losses
  - lack of suitable varieties
  - prevalence of insect pests and diseases
  - unavailability of quality planting material
Revitalize and Harness Edible Landscapes

- Traditional food plant species are adapted to local environmental conditions
- They play additional roles in stabilizing yields and access to food
- Their resilience lowers pest and disease management
- Deliver a range of other vital ecosystem services (e.g. pollination), managing risk
- Building system and household resilience to shocks
Emerging Foods: Eating Locally and Preserving Flavour

Gooseberry

- Production practices
- Packaging
- Gooseberry jam
- Gooseberry pie for hotel industry
- Good varieties
- Eaten fresh
- Consumed by youth
What should we do?

1. Harness **edible plants for diet diversity** and improved nutrition

2. Complimentary **conserve underutilized crops** and **crop wild relatives**

3. Strengthen **traditional food-ways** in Kenya by strengthening endangered food systems, and **conserving agrobiodiversity** and its cultural practices for enhancing local livelihood.

4. Integrating farmer and scientist knowledge by promoting a ‘**Seeds for Needs**’ initiative
What should we do???

- Reduce **sectoral overlap** of mandates
- Increase **synergy** leading to reduced **duplication** of research
- Promote efficient use of **resources**
- **Strengthen** role of plant genetic resources in **climate change adaptation** planning

What should we do???

- **Increase contribution** of genetic resources to **food, feed and fuel**
- **Increase contribution** to industry and tourism
- **Strengthen institutional, policy frameworks and lack of coordination**
- **Develop structures or platforms to share knowledge**
- **Increase funding** for increased utilization genetic resources
What should we do???

- Enhance conservation of biodiversity
- Demonstrate resilience to climate change
- Ensure sustainable intensification of smallholder enterprises
- Promote diversified farming systems

What should do we do???

- Increase technology and innovation development
- Promote technology adoption
- Increase researcher and academia involvement
- Link farmers with private sector and markets
Increasing globalization in food culture, diets and farms have become less diverse as monoculture is encouraged.

1. Dietary diversity is associated with improved nutrition.

2. Nutritionally adequate diets based on underutilized fruit can be identified and promoted.

3. Traditional knowledge on indigenous or local agrobiodiversity is rapidly declining.
Setting the Stage

- Promoting sustainable nutrition interventions
- Increasing cultivation of underutilized fruit
- Enhancing utilization of underutilized fruit
- Promoting product diversification of underutilized fruit
Linking Underutilized Fruit to Industry

How do we link underutilized fruit to end-users?
“An old technology in a new bottle”

1. Get out of the laboratories and drive productivity of underutilized fruit

2. Integrate underutilized fruit in every part of value chains to promote farming as a business

3. Money obtained from commercialization translates to a nutrition and a good life
Partners
Thank you for listening