# Food and nutritional security: what does it take?



**Segenet Kelemu, Director General, *icipe***

# The food production challenge –year 2050

Drivers are population growth, economic development and diet change (incl animal protein demand), food waste, diversions to biofuels, climate change





# How will the world meet the challenges ahead

No silver bullet, action needed on many fronts





# Action pathways – reducing demand

- ✓ Reduce waste along the food value chain
- ✓ Reducing over-consumption in human diets
- ✓ Rebalancing livestock component of future diets
- ✓ Develop “smart biofuel” policies and technologies

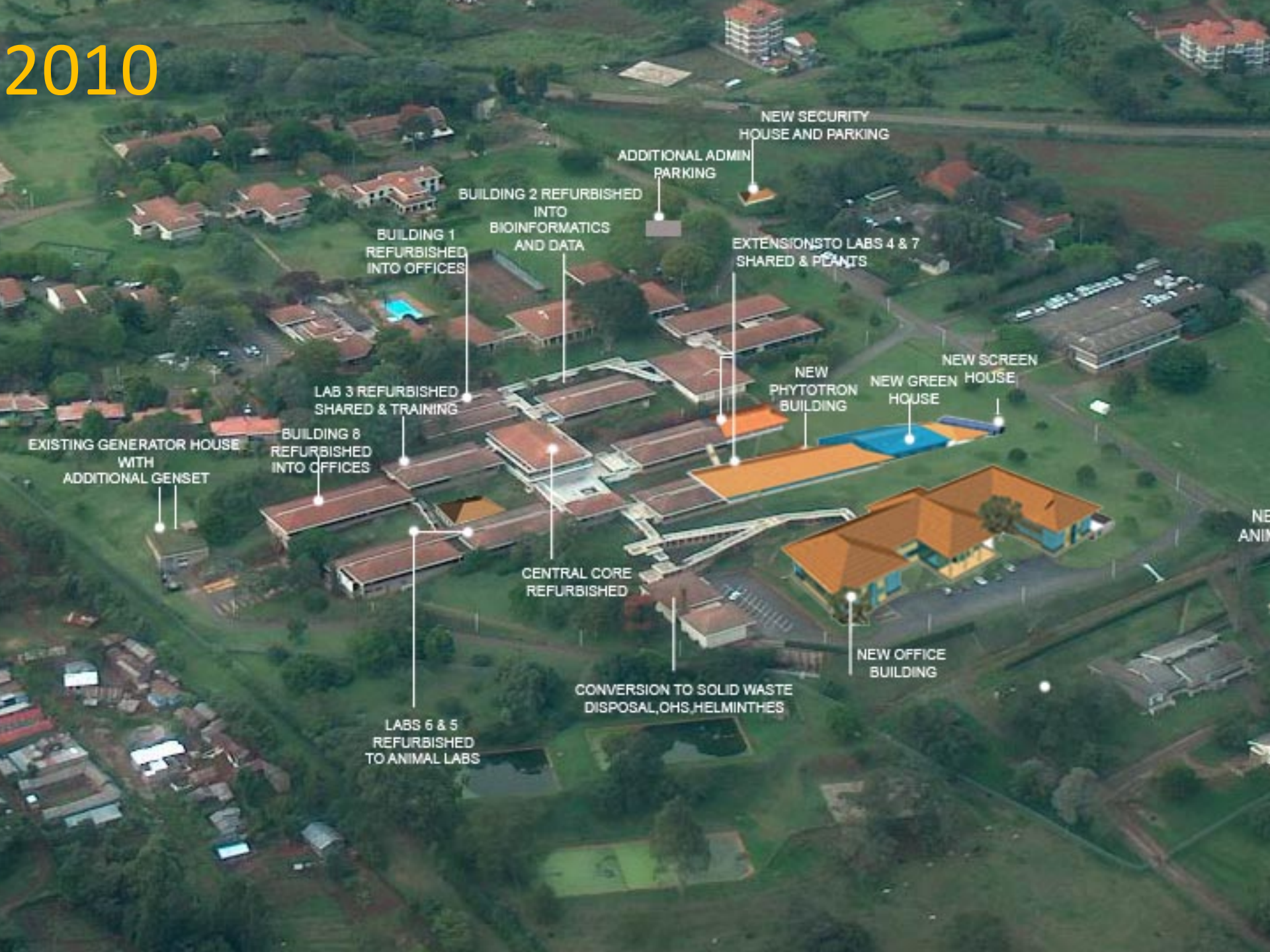
# Action pathways – filling the production gap

- ✓ Net expansion of the land footprint
- ✓ Net expansion of the irrigation footprint
- ✓ Expanding aqua-culture based production
- ✓ Increasing cropping intensity
- ✓ Closing yield gaps (including raising eco-efficiency)
- ✓ Raising the yield ceiling through new technologies

## Action pathways – avoiding losses of productive capacity

- ✓ Maintaining pest and disease resistance and biosecurity
- ✓ Avoiding further soil and water degradation
- ✓ Climate change mitigation without loss of food security
- ✓ Adapting to unavoidable climate change

- Note: all the action pathways require enhanced human and infrastructure capacity


2010
NEW SECURITY HOUSE AND PARKING
ADDITIONAL ADMIN PARKING
BUILDING 2 REFURBISHED INTO BIOINFORMATICS AND DATA
BUILDING 1 REFURBISHED INTO OFFICES
EXTENSIONSTO LABS 4 & 7 SHARED & PLANTS
NEW SCREEN HOUSE
NEW PHYTOTRON BUILDING
NEW GREEN HOUSE
LAB 3 REFURBISHED SHARED & TRAINING
EXISTING GENERATOR HOUSE WITH ADDITIONAL GENSET
BUILDING 8 REFURBISHED INTO OFFICES
CENTRAL CORE REFURBISHED
NEW OFFICE BUILDING
CONVERSION TO SOLID WASTE DISPOSAL,OHS,HELMINTHES
LABS 6 & 5 REFURBISHED TO ANIMAL LABS

# The Biosciences eastern and central Africa Hub

## Principles:

- Access and affordability
- Quality: high quality and relevant research, training and services---translated to impact
- Motivated and high quality human capital
- Financial sustainability
  - Fixed cost
  - Variable cost
  - Capital for equipment



# BecA Hub Core competencies

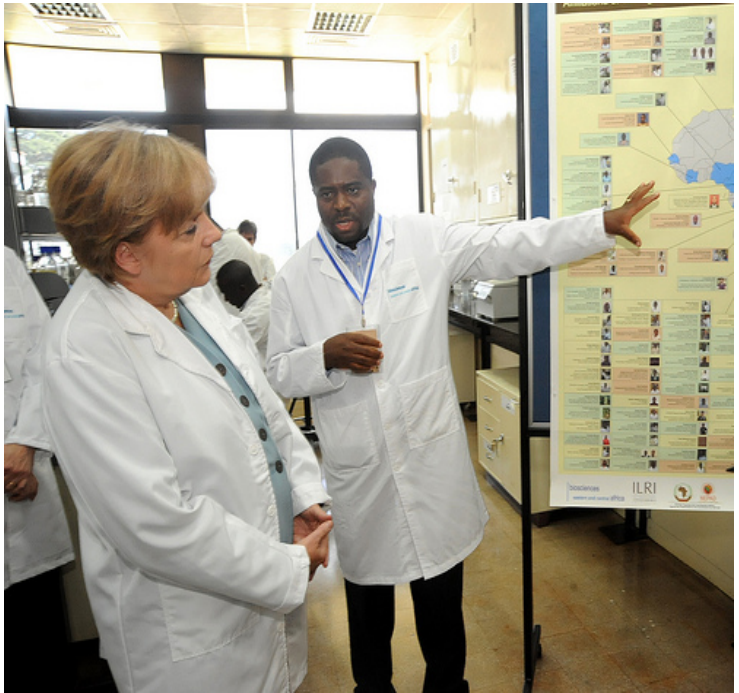
- Genomics/Metagenomics
- Functional genomics
- Bioinformatics
- Genetic engineering
- Diagnostics
- Molecular breeding (marker development and application)
- Proteomics
- Vaccine technology/Immunology
- Vectors (e.g. ticks)
- Mycotoxins



# BecA in the news

- Bill Gates (Dec. 2009)
- The President of Kenya (Nov. 2010)
- Chancellor of Germany Angela Merkel (July 2011)
- More than 1,500 visitors/year






ILRI
INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

# Examples of outputs by young African scientists at BecA




- Striga resistance in sorghum
- Passion fruit virus diagnostics
- Maize-sorghum hybrids
- PPR thermostable vaccine
- East Coast fever: rapid sero-diagnostics
- Disease studies
  - Cassava virus - CBSD - first description in DRC
  - Potential new races of wheat stem rust Ug99 (Kenya)
  - Possible new Taro virus (Ethiopia/Burundi)
  - New virus (Ndumu) in pigs - (Uganda)
  - African Swine Fever diversity (Uganda)

# *icipe*-General Facts

A *centre of excellence* in Africa — for research and capacity building in insect science and its applications

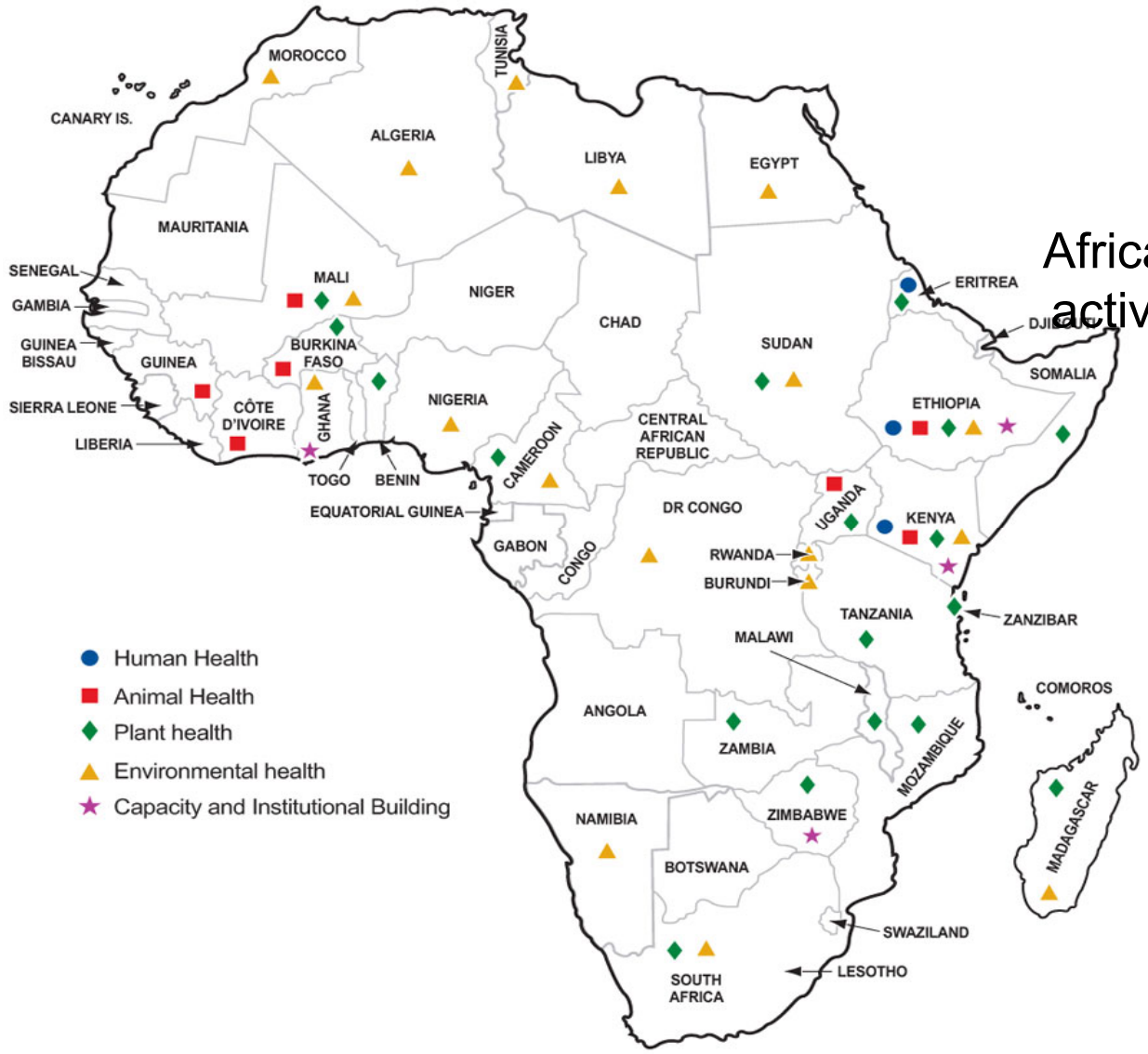
An *intergovernmental organization* — charter signed by 13 countries worldwide



≈ 400 staff total, 50–70 MSc, PhD students in residence
Many contracted workers

An organization with a *unique history*
— 40+ years old, genesis in Africa

# Where we work




Africa focused- currently activities in 30 countries



## *4-Hs paradigm*

R&D on *human, animal, plant & environmental health, and capacity building*

- Common denominator *insects/ arthropods*

# *Plant Health*

Improve food security, nutrition and farmers' income through Integrated Pest Management (IPM)

Build on basic knowledge of key crop pests for developing IPM tactics



**Broad areas in IPM focus on:**

- Staple Food Crops
- Fruits
- Vegetables
- Plantation crops
- Post harvest

# What is *Desmodium*?





***Desmodium uncinatum*** ***Desmodium intortum***

- **Perennial fodder legumes indigenous to South America**
- **Important cattle feed in eastern Africa**
- **Can fix~ 110-160 Kg N/ha/year**

# Long term trials with maize-legume intercrops




Maize + Beans




Maize + Green gram



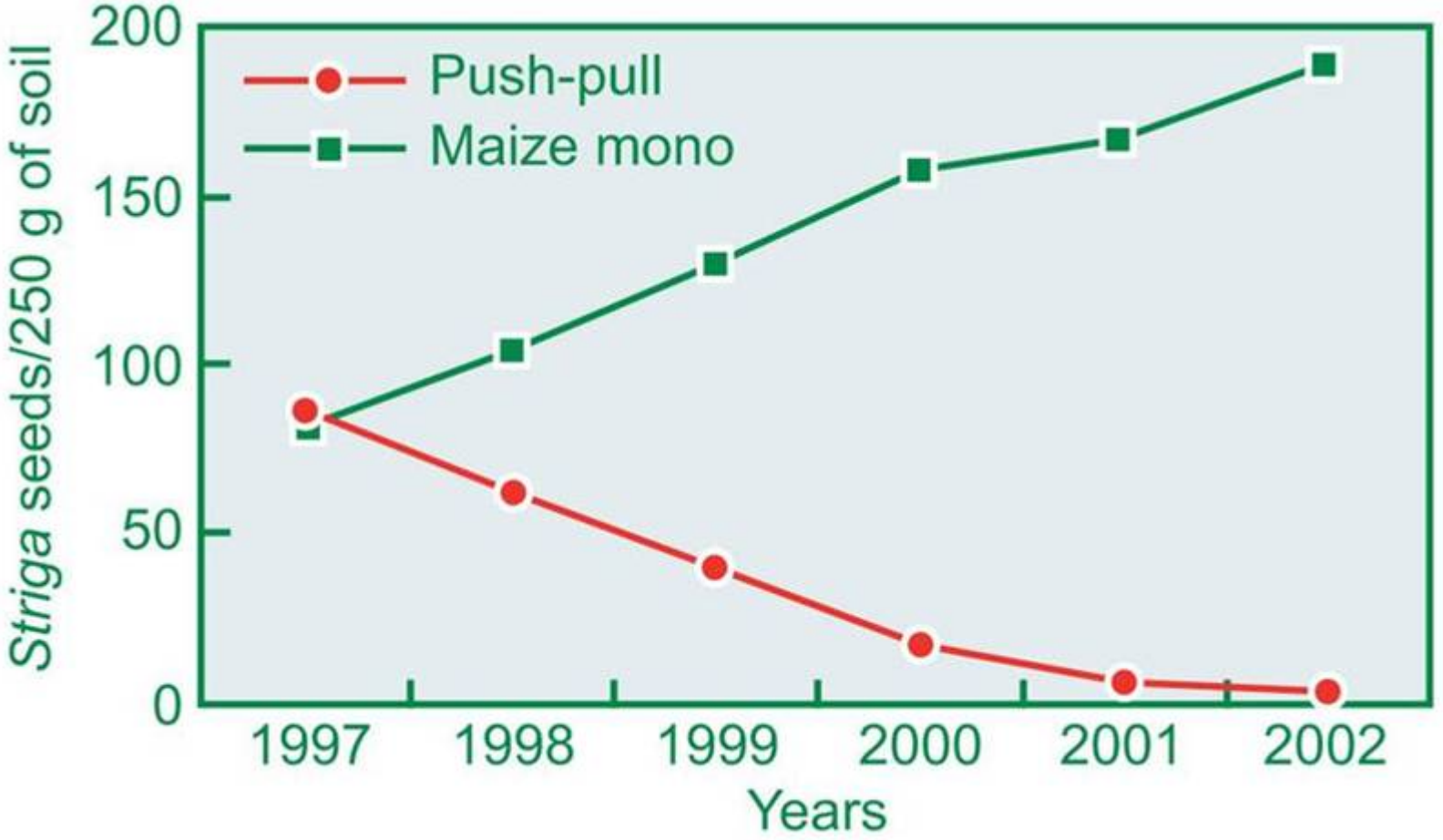

Maize + cowpea




Maize + Desmodium

Khan et al. 2007. Crop Sci. 47:730-734; Midega et al. 2014. Field Crop Res.155: 144–152

# *Desmodium* intercrop efficiently depletes striga seed bank




Khan et al. 2008. Weed Research 48:302-306

# *Desmodium* effectively inhibits striga in upland rice



Rice monocrop

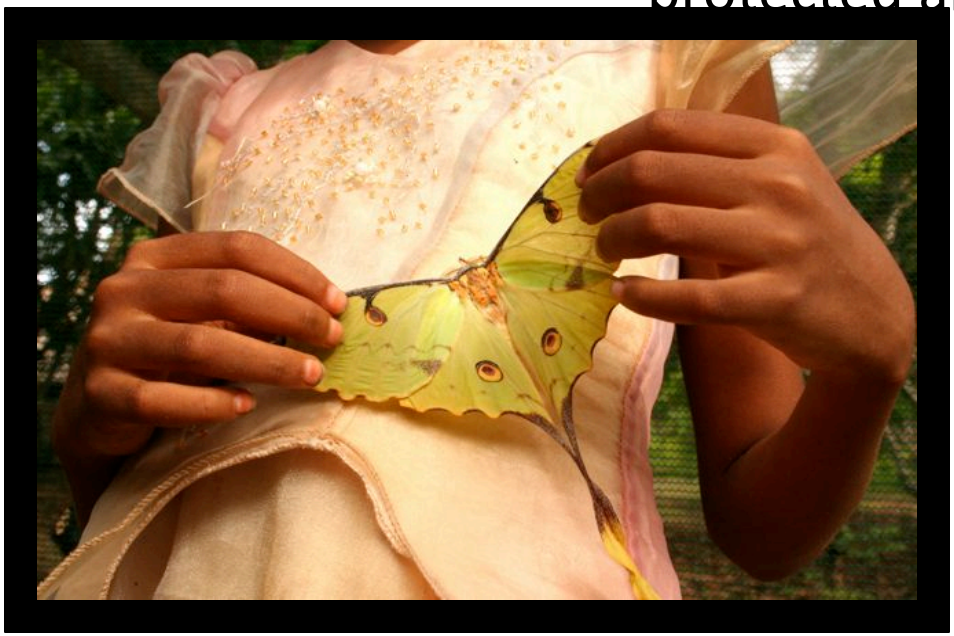


Rice + *Desmodium uncinatum*

Pickett et al. 2010. Annual Review of Phytopathology 48:161–77

# *Environmental Health*

Contribute to biodiversity conservation through development of tangible strategies that
improve the livelihood of communities
living in the vicinity of
protected areas



**Broad areas in focus:**

- Sericulture
- Apiculture/Bee Health
- Bioprospecting
- Climate change

# *Essence of Pollination: Honeybees and nutrition*

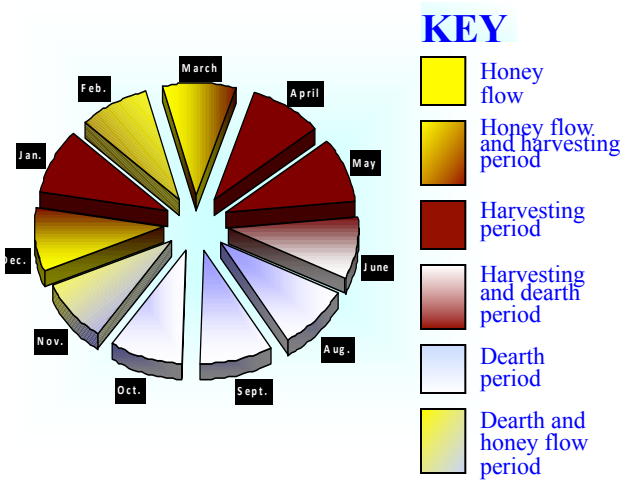


# *Nutrition without bees*



# Beekeeping as a business for rural income

## Floral calendar




## Types of Hives



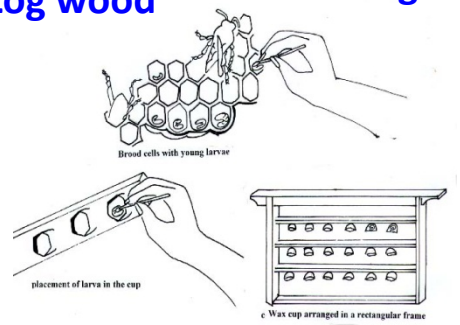
Log wood



Langstroth



Langstroth honey frame




Breeding queens



Artificial insemination of Queen



*Acacia seyal* Blossom



Queen cells with royal jelly



Introduction of new Queen

# Enhancing capacity: critical to development











# Issues

- Access to land/land size
- Access to finance
- Gender inequality
- Illiteracy/education
- Production cost (lack of mechanization, fertilizer cost, etc)

# Doing things differently

**1) Ensuring inclusive investments/growth**

- Creating jobs : youth and women

**2) Where do we want smallholder farmers to be in 20-30 years?**

**3) Capacity building and retention**

**a) number trained relative to what is needed**

**b) quality of the training provided**

**c) incentives**

**5) Approaches regionally (e.g. developing varieties for similar regions)**

# Some more thoughts



- Can we truly transform

African agriculture with hoes?

- Dependency on rain
- Energy (electricity)



# Africa's bright outlook

**Yes, Africa is a continent of many contradictions, it is not a continent to pity.**

- According to the Economist, **six of the world's 10 fastest growing economies are in Africa between 2001 and 2010**. **The IMF says that between 2011-2015, African countries will account seven of the top 10 spots.**
- Africa is rich in commodities: oil, iron ore, copper, platinum, gold.
- **How Africa's resources fuel the world : Out of Africa: The minerals that make the world go round (**July 25, 2013 – CNN)

http://edition.cnn.com/2013/07/25/world/africa/africa-resources-fuel-world

- **Vast arable land/water resources**
- **People**

The challenge is to translate this natural wealth into significant, sustainable benefit for the people of Africa.

# Conclusion

- **Africa is on the move; in a much better economic position;**
- **By 2040 Africa is expected to have the largest working age population on the planet;**
- **Significant contributions to the world's agriculture by supplying unique sources of resistance to diseases and pests of crops and animals. The continent has also provided the world with invaluable medicinal plants.**
- **Africa needs to invest in its people; continue developing its infrastructure;**
- **Education: Education is the key to unlocking a country's potential for economic growth;**
- **Has the largest arable land available, needs to have a progressive land tenure policies;**
- **Needs to address the gender disparity**



# THANK YOU

