



# ICIPE's RESEARCH & CAPACITY BUILDING STRATEGY

Presented by

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# 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 11 countries worldwide.
- **International Staff:** 280 total, 35 PhD scientists, 20 visiting scientists and PDFs, 30–35 MSc, PhD students in residence.



- Governance by 14-member international **Governing Council**.
- An organization with a **unique history** — genesis in Africa, for Africa, but with a pan-tropical mandate.

# Where we work

- Africa-focused.
- 24 African countries — **E, S, W, N, Central.**
- Collaborative work in Middle East, South America, Asia.
- International Headquarters in Kasarani, Nairobi.
- Field Stations and sites:
  - Kenya Coast (Muhaka)
  - Thomas Odhiambo Mbita Campus (Mbita Point, Lake Victoria)
  - Oyugis, Kuja River (western Kenya)
  - Nguruman (Rift Valley)
  - Port Sudan, Red Sea Coast
  - Over 500 ha covering most ecozones of Africa.



**Mbita Campus**

# How we work (1)

- In multidisciplinary teams of insect scientists — biologists, ecologists, entomologists, behaviourists, agronomists, molecular biologists, social scientists, etc.
- In a Matrix Structure — program areas receive input from disciplinary specialists in science departments.
- With over 140 collaborators worldwide.
- Within the 4H's paradigm.



# How we work (2)

- **The 4Hs paradigm — Major Programme Areas**

*Human Health*

*Animal Health*

*Plant Health*

*Environmental Health*

Bioprospecting •  
Commercial Insects •  
Biodiversity and  
Conservation



• Malaria  
• Human Sleeping  
Sickness



Staple Food Crops •  
Horticultural Crops •  
Locusts and Migrant  
Pests



• Tsetse  
• Ticks  
• Biting Flies

- **Capacity Building**  
Universal Throughout All Programmes
- **Research Departments —**  
Disciplinary Expertise
- *Behavioural and Chemical Ecology; Molecular Biology & Biotechnology; Population Ecology & Ecosystem Science; Social Sciences and Technology Transfer*
- **Research Units**  
Specialist Expertise and R&D Support
- *Biostatistics, Arthropod Pathology, Arthropod Rearing & Containment, Information & Publications, Information Technology*





## Classical biological control of stemborers (contd.)

A 10% reduction in stemborers in eastern and southern Africa means a savings of US\$ 25 million per annum, or enough food to feed 27 million people.





# New tools, products and knowledge (1)

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- Natural enemy for maize stemborers released in 11 countries in eastern and southern Africa with higher yields achieved.
- Habitat management strategy developed to control stemborers and striga weed with doubling of milk and fodder production.
- Grasses and associated arthropods diversity surveyed.
- Chemical ecology of desert locust elucidated.
- Pheromone for disrupting locust hopper bands discovered.



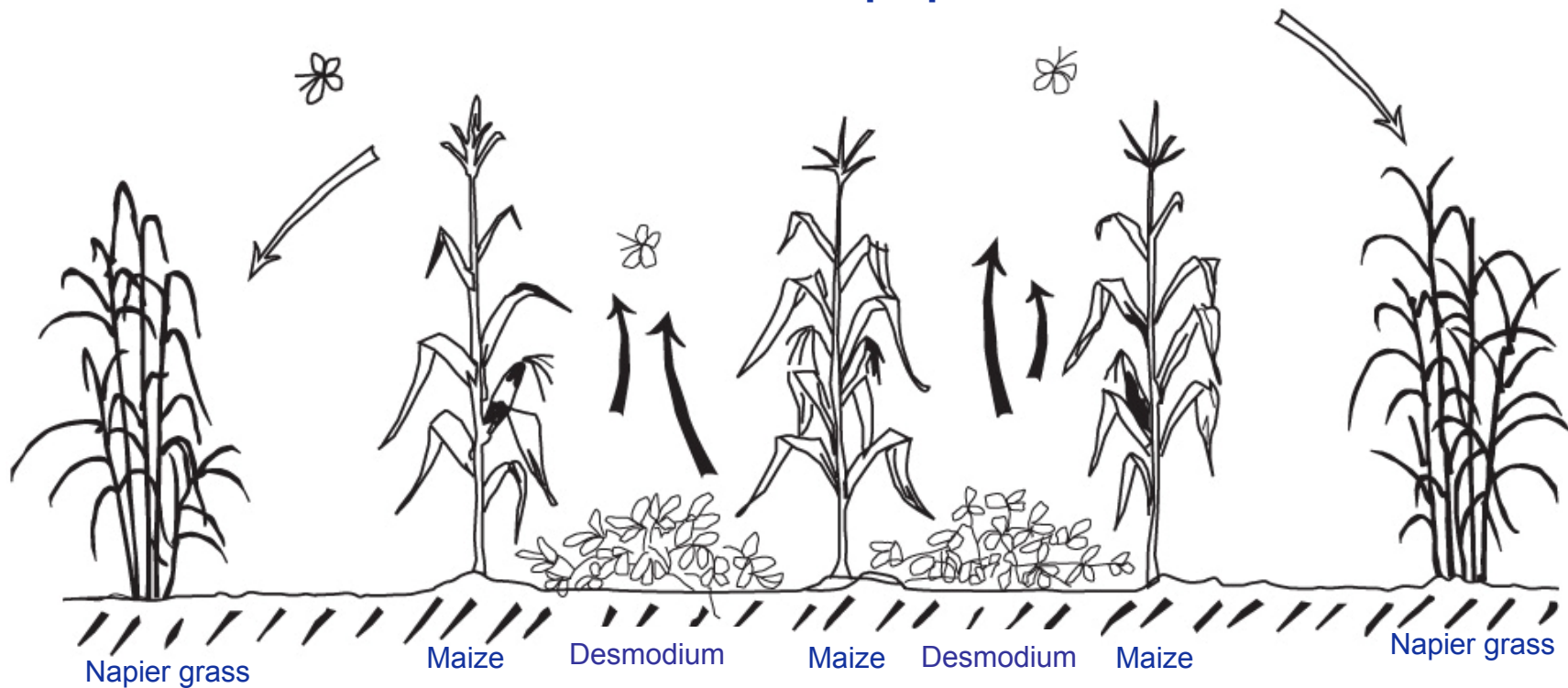
# “Push – Pull” for striga and stemborer control

## ‘Pull’

Volatile chemicals from Napier border attract moths to lay eggs

## ‘Push’

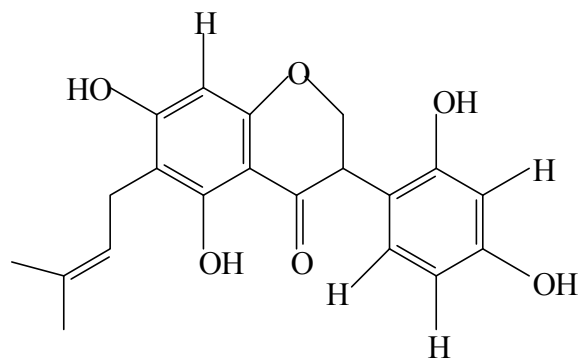
Volatile chemicals from *Desmodium* intercrop repel moths





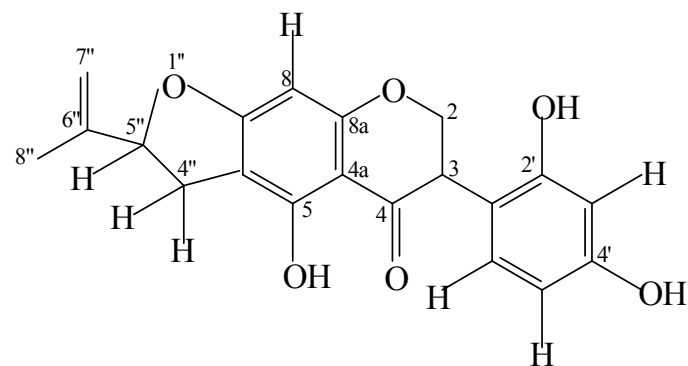


# Compounds released from the *Desmodium* roots involved in suppression of striga weed, a parasite of maize



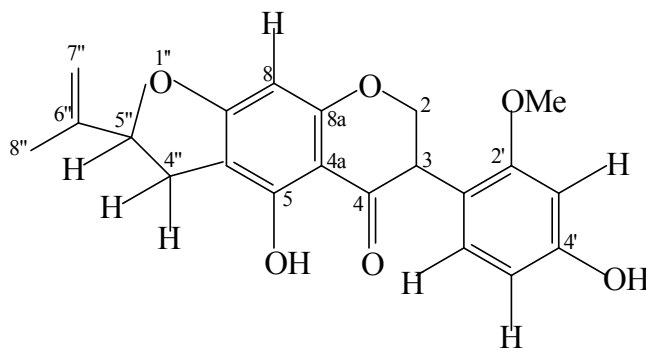
**Uncinane A**

Mild inhibitor of  
RADICAL growth



**Uncinane B**

Stimulates "suicidal  
striga germination"



**Uncinane C**

Inhibits attachment of  
striga onto maize roots

Three new isoflavanones have been isolated and characterised spectroscopically.



# Parasitoids introduced against cereal stemborers in eastern Africa

## Classical biological control



Larval parasitoid: *Cotesia flavipes*  
1993–2003



Pupal parasitoid: *Xantopimpla stemmator* 2003–2005



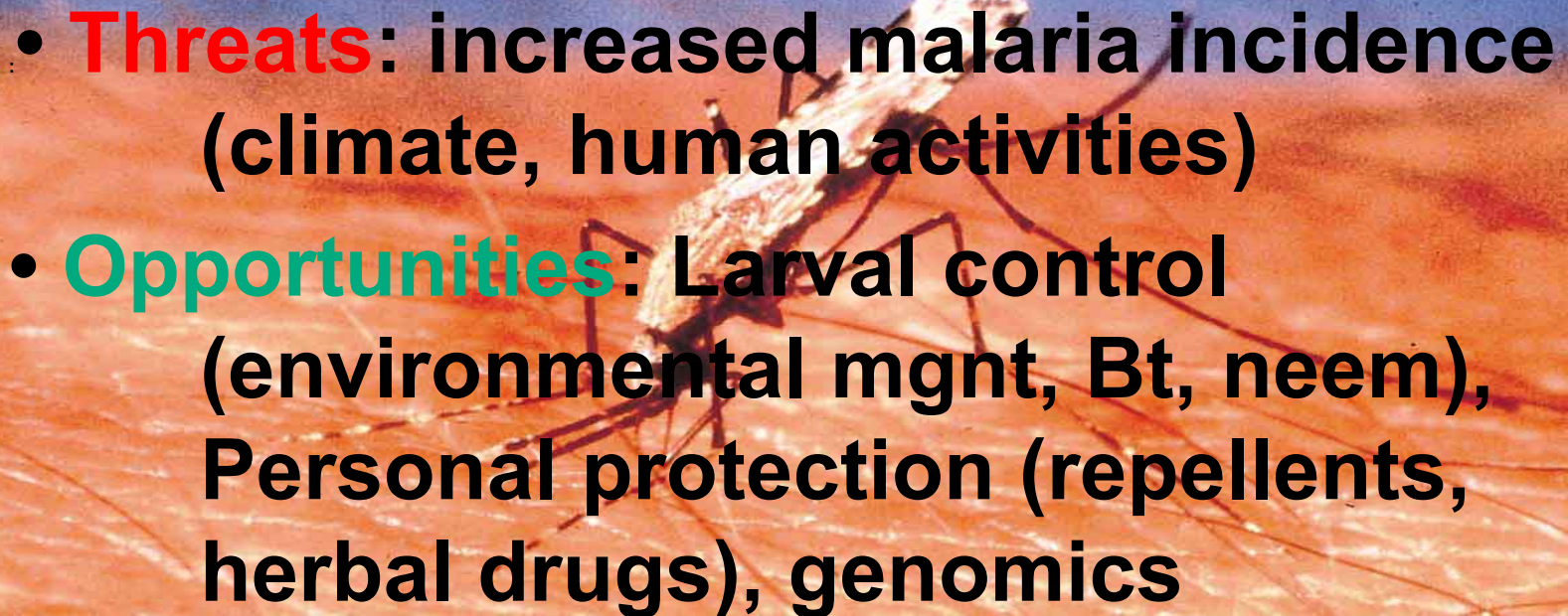
# “Push–pull” for striga and stemborer control

(Contd.)





# Future trends of threats and opportunities : Human Health

- 
- **Threats:** increased malaria incidence (climate, human activities)
  - **Opportunities:** Larval control (environmental mgnt, Bt, neem), Personal protection (repellents, herbal drugs), genomics



# od & ehod



Brickmaker's pits make up some 80 % of the mosquito breeding sites in highlands

*icipes*, our Human Health research contributes to a productive workforce

# Future trends of threats and opportunities: Animal Health



- **Threats:** increased tsetse/tryps incidence, shortage of draught power, milk, meat (climate); tick acaricide resistance
- **Opportunities:** Push-Pull approach (trap/repel), pathogens, semiochemicals, genomics (Roll Back T&T - Human & animal)



Managing tsetse vs eradication or bottom up vs top down, or sustainable vs un-sustainable

**PUSH**



**Repellent**

**PULL**



**Trap**





# **CAPACITY BUILDING IN INSECT SCIENCE**

**Challenges and  
Achievements of the  
ARPPIS Network**



# CONTEXT

Capacity Strengthening activities must meet need-driven imperatives for R&D in Africa, engage and connect with international and regional discussions such as:

- **The Millennium Development Goals** (especially in meeting the poverty alleviation goal)
- **NEPAD** (especially the CARDP programme & support for centres of excellence)
- **Commission for Africa**
- Foundation's programme on **revitalization of the African University**
- World Bank sponsored **IAASTD** (focusing on agricultural revitalization programmes)
- Institutional Rearrangements especially in Agricultural Research (**FARA, CGIAR**)
- Forums (e.g. **Mandela Foundation** promoting new advances in sciences in areas such as genomics and bioinformatics)

# Dear Leaders of the World

You have the chance of a lifetime!

At the 2005 World Summit on September 14–16, we have a golden opportunity to make the world a better place by stepping up efforts to achieve the Millennium Development Goals.

The process of halving poverty by 2015 has already begun. We urge you to continue the good work. It is time to speed up!

15  
9  
2005





## ROLE

**The role of university as an agent of change** in modern day African society needs to be emphasized.

The challenge is to deliver programmes that positively influence the lives of people by contributing to sustainable growth and poverty reduction through increasing the availability of quality food, protecting the health of communities and their livestock, and creating employment to help raise the poor from subsistence level

While at the same time effectively linking with the private sector for wealth creation.





# CHALLENGES

**University Postgraduate Programmes therefore need to begin to transform:**

- their mandate to the current needs of society
- their funding profile to meet the development needs
- their research programmes and curricula to produce graduates that are:
  - **well trained**
  - **highly motivated**
  - **able to respond to the varied development needs**
  - **competitive within the global R&D marketplace**



# ICIPE's GOAL

## ***Building human and institutional capacity in Africa***

ARPPIS: train a cadre of science researchers and experts at PhD and MSc level in collaboration with 30 African universities (ARPPIS)

PhD training – at ICIPE

MSc – at 3 sub-Regional Centres in Ghana, Ethiopia, Zimbabwe

- Offer opportunities to non-Africans with self-funding
- Help modernize African university curricula and facilities
- Offer professional development opportunities at Visiting Scientist, PDF level
- Network via biotechnology researchers network (BioNET)
- Technology transfer through training of trainers (ToTs), special short courses, community participation at farmer level.

# Mechanism of Training

The capacity building activities are intricately in-built into ICRIPE's R&D programmes and projects.

These span the whole continuum, from fundamental strategic research, to applied research, and technology development and validation.

Thus, ICRIPE's training goals at all levels are achieved as the Centre undertakes its core research work in fulfillment of its mandate.

# Opportunities for Research Training at ICIPE

The 4Hs paradigm — a holistic development approach for improving well being:

- **Human Health:**
  - ✓ *African malaria vectors/mosquitoes*
  - ✓ *African human trypanosomosis (sleeping sickness)*
- **Animal Health:**
  - ✓ **Tsetse/trypanosomiasis**
  - ✓ **Ticks, tick-borne diseases**
- **Plant Health:**
  - ✓ **Staple food crop pests (maize, sorghum, millet, legumes, bananas)**
  - ✓ **Horticultural crop pests (vegetables, fruits, flowers)**
  - ✓ **Locusts and migrant pests (especially the Desert Locust, Migratory Locust)**
- **Environmental Health:**
  - ✓ **Biodiversity conservation**
  - ✓ **Bioprospecting (of plants and insects) as raw material for sustainable rural enterprises**
  - ✓ **Commercial insects (apiculture, sericulture)**





# Types of Training Programmes

- **Higher degree training** for leadership in scientific research & policy formulation
- **Non-degree training**, targeting practitioners in national agricultural & health research & extension systems
- **Professional development schemes**, for postdoctoral fellows, research associates & visiting scientists come to ICIPE to develop and share expertise
- **Interactive on-site training**, as collaborative research work is carried out with ICIPE's national partners

# Structure of the Capacity Building Programme

**Six Major Components over a five year period:**

- **Regional Training Fellowships (30 PhD, 45 MSc)**
- **Technology Dissemination (5 Group Courses)**
- **Development of Training Manuals**
- **Fostering Cooperation and Networking**
- **Institutional support to partnering universities**
- **Support for coordination Secretariat**

# Capacity Outputs

- Over 170 PhD students from 29 African countries trained
- Over 120 MSc students trained at sub-centres
- Over 14,000 farmers trained
- About 600 extensionists and IPM specialists trained
- ICIPE's technologies being transferred via a special training unit
- Active scientists-level exchange programme in place
- ***International Journal of Tropical Insect Science*** hosted by ICIPE provides forum for peer-reviewed publishing



## Partnership with African Universities through the ARPPIS Network

- April, 1983: ARPPIS founded as partnership between ICiPE & 7 African Universities admitting its inaugural class of 8
- December, 1990: Network grown to 21 Universities from all regions of Africa training 86 PhD and 10 MSc
- August, 1991: Launching of the three Sub-Regional MSc Centres
  - Southern Africa — University of Zimbabwe, Harare (1992)
  - Western Africa — University of Ghana, Legon (1994)
  - Eastern and Northeastern Africa — Addis Ababa University (1997)
  - Dschang selected but not operational
- August, 2005: Network grown to 30 African Universities, 177 PhD enrolled from 29 countries. A total of 108 MSc enrolled in the regional centres.



# DRIP – Dissertation Research Internship Program

- Started in 1995 for students wishing to join ICIPE training programmes and have own resources
- Scholarships for partial support available
- 149 PhD scholars enrolled to date
- 86 MSc scholars enrolled to date
- Total post-graduate enrollment at ICIPE as of 2005:

	ARPPIS	DRIP	TOTAL
PhD	170	149	319
MSc	108	86	194



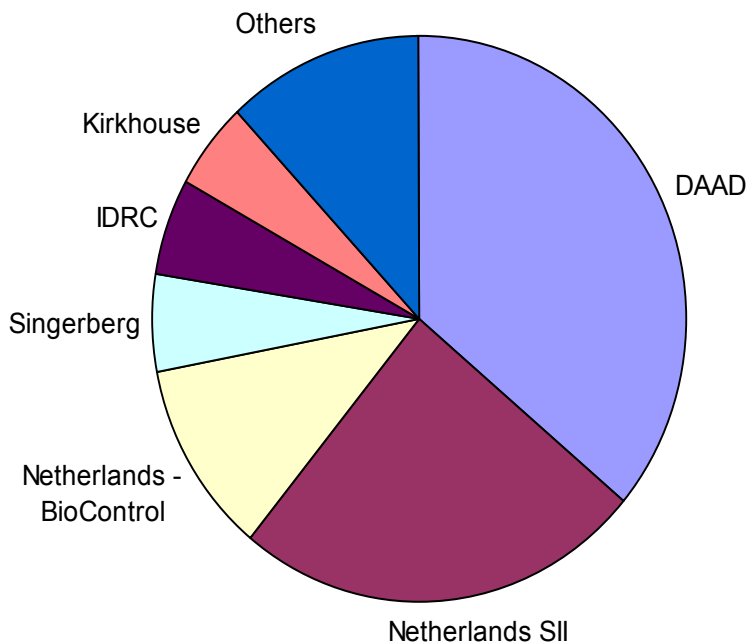


# PhD Training through the ARPPIS Network

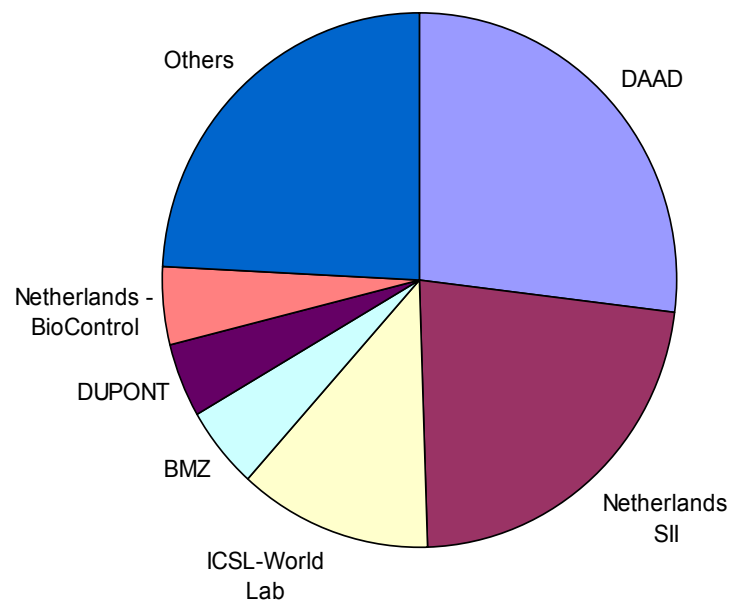
- Collaborative training programme between ICIPE and 30 African universities.
- Funded by a consortium that includes DAAD, Netherlands-SII, Kirkhouse Foundation, etc.
- Average of 15–20 PhDs enrolled in any one year under ARPPIS (and 10 others under DRIP).
- Students do research under ICIPE programmes; universities award the degrees *and joint supervision*
- Academic quality verified by the ARPPIS Academic Board (AAB) of staff from both institutions.
- Almost all graduates remain in Africa — a unique record.

# Support for Postgraduate Research and Training, 2005

*PhD Postgraduate Students*



*MSc Postgraduate Students*



# The ARPPIS Network

