



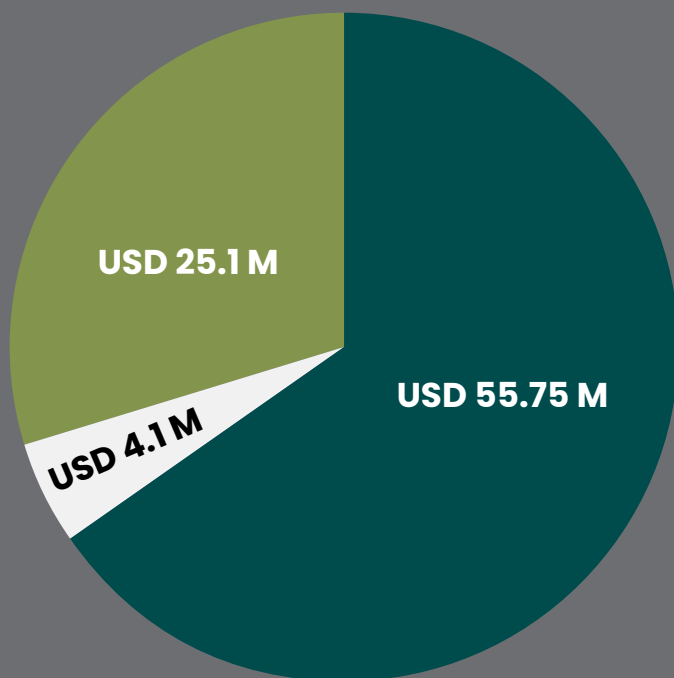
AND



# Transforming lives through research cooperation

November 2025

Contribution by the  
Swedish International Development Cooperation Agency  
to the  
International Centre of Insect Physiology and Ecology (*icipe*)  
(1970 - 2025)



- CORE FUNDING
- PROGRAMMATIC & SPECIAL INITIATIVE GRANTS
- CAPITAL

# Overview

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*Cover photo: Evalyne Ndotono purifying genomic DNA from mealworms, using centrifuge acquired through Sida-support.*

*Photo on the right: Endegena Getie, a beekeeper from East Gojjam Zone, Amhara Region, Ethiopia, with wheels of beeswax, an emerging commercial product.*





▲ **Dr Abdou Tenkouano**  
*icipe Director General*

# Foreword

## A partnership for research, scientific excellence and impact

+ For more than five decades, Sida and *icipe* have had a deep and enduring partnership. Sida was among institutions that supported *icipe* at the Centre's founding in 1970. This milestone marked the start of a collaboration grounded in shared commitment to scientific excellence, sustainable development and equitable global partnerships.

Sustained core funding from Sida has helped to shape *icipe's* evolution, fueling innovations in agriculture, health and environmental sustainability. Through an equipment grant in 2021, Sida boosted *icipe's* scientific infrastructure, transforming various laboratories into hubs of discovery and innovation.

By managing BiolInnovate Africa, a Sida-supported programme that fosters bio-based innovation and entrepreneurship across eastern Africa, *icipe* is championing the emergence of a bioeconomy in Africa.

We are grateful to Sida for funding the Accelerate One Health project, which we have been implementing with partners since 2024. This seminal initiative has highlighted the urgency of addressing one health threats in Africa, and the promise of coordinated, science-based interventions.

The partnership between Sida and *icipe* has been enriched by personal and institutional connections. Several Swedish scientists have graciously contributed to our Governing Council as Chairs, among them Dr Bo Bengtsson, Prof. Bill Hansson, and Dr Ylva Hillbur. Many others have served the Centre, lending their expertise and mentorship to our scholars. *icipe* also has collaborates with a range of Swedish institutions.

As we launch the *icipe Vision & Strategy, 2026-2030*, we envision a continued partnership with Sida. Together, we will impact nature and society with insect science.

# 01 Enduring Support

**“Sida’s long-term core funding to *icipe* has led to stability to innovate, retain talent and generate global public goods for sustainable development.”**

*icipe* is among a group of institutions that has, over the years, benefited from Sweden’s sustained investment in research cooperation through Sida. Our partnership is anchored in the belief that while research takes time, the returns are profound, transforming lives, strengthening resilience and enabling lasting change.

For *icipe*, Sida’s long-term core funding has been transformative. It provides the stability to generate global public goods, sustain operations and invest in visionary planning. Core funding ensures uninterrupted research, talent retention and institutional resilience during funding gaps. It also enables innovation, through modern laboratories, advanced

data systems, and strong management, communication, and financial structures. Crucially, core funding underwrites early-stage, high-risk research that often seeds new partnerships and future investments.

Sweden, one of the world’s most research-intensive nations, is committed to research cooperation as a foundation for development and wellbeing.

Research cooperation is Sweden’s most enduring instrument for combating poverty. Through Sida, Sweden supports high-quality research relevant to sustainable development and local needs, while strengthening national research systems in low- and lower-middle-income countries.

*icipe*’s capacity-building model at Masters, PhD and postdoctoral levels is aligned to this mission.

Recognising biodiversity loss as a major global challenge, in 2023, Sweden mandated Sida to integrate biodiversity across all programmes. This goal resonates with *icipe*’s agenda to conserve biodiversity and promote the sustainable use of ecosystem services that enhance health and food security across Africa.

Sida and *icipe* continue to travel together on a journey aimed at transforming livelihoods, against a background of challenges, and more importantly, emerging opportunities in Africa.



With support from Sida and other donors, icipe has become a leading R&D institution, driving insect-based, nature-positive innovations that manage native and invasive crop pests and enhance sustainable agriculture across Africa.

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Jackline Ngunjiri, Research Assistant, Plant Health Theme, observing fruit flies in the laboratory.

# 02 Selected Achievements

- + **Creating employment**, with a staff of about 551 from 24 countries in Africa and beyond.
- + **Developing scientific and science leadership capacity** in Africa. Since 1983, *icipe* has trained over 1000 PhD and MSc graduates, and numerous students on internships.
- + **Providing policy support** to governments and agencies by generating evidence-based knowledge and recommendations, and through membership on various local, regional and global committees, boards and advisory panels.
- + Creating **partnerships for impact**, with over 300 partners globally.
- + **Reaching over 300 million households and stakeholders** across Africa and beyond, with various gender-responsive technologies, approaches and innovations.



Jimmy Pittchar (right), *icipe*, pictured with Dr Hermogene Nsengimana, Secretary General, African Organization for Standardization (ARSO), who presented a certificate of recognition to *icipe*, in appreciation of outstanding support and partnership. This includes development of 15 African Standards for Edible Insects and Capacity Building on Good Farming and Harvesting Practices, launched on 22-23 September 2025.



An icipe technician collecting data on sandflies in Uganda, as part of the Kala-Azar Mapper project, a collaborative initiative being led by icipe, which aims to develop a sophisticated data management framework to map risk, vector and epidemiology of visceral leishmaniasis.

## Tackling key insect-borne diseases

Through sustainable, evidence-based solutions that safeguard communities and strengthen Africa's health security.

### + Innovations and contributions include:

- Integrated vector management for mosquito control and malaria elimination, including use of *Microsporidia MB*, a malaria blocking microbe.
- Eco-friendly tools to control and neglected tropical diseases such as leishmaniasis and tungiasis.
- Strengthened preparedness for emerging viruses like Rift Valley fever, yellow fever and dengue fever.

## Supporting sustainable livestock keeping

Through systems that integrate productivity, environmental stewardship and community resilience across Africa.

### + Innovations and contributions include:

- Pioneering control strategies for tsetse flies, biting flies and ticks; zoonotic diseases; and groundbreaking insights into livestock-rumen-microbes interaction.
- Practical tools such as the tsetse fly repellent collar, insect traps and bioacaricides; rapid, affordable and easy-to-use diagnostic technologies for livestock diseases; improved livestock nutrition (better feed, and feed efficiency), thus reducing greenhouse gas emissions; and overall, promoting climate-smart livestock keeping.

A community member in Ngurunit, northern Kenya with a camel herd, protected by a biting fly repellent developed by icipe, which has been inserted into the camel collar.





Healthy tomato seedlings, a part of icipe IPM package

## Transforming agrifood systems

Through integrated pest management (IPM) strategies and approaches that increase crop productivity, yield and quality, and food safety and nutritional security.

### + Innovations and outputs

- Strategies to address indigenous species, invasions and outbreaks of above and below-ground, and soil dwelling crop pests, as well as soil health and impacts of climate change.
- Prediction models, community-based pest monitoring and early warning systems; biological control using natural enemies, attractants and protein-based baits, biopesticides, insect-based organic fertilisers and pest control products resistant varieties, cultural control and good agronomic practices, circular economy approaches.
- Flagships include: climate-smart push-pull IPM for pests of cereals; fall armyworm IPM; fruit pests IPM; vegetable IPM and desert locust control innovations.

Through the joint icipe-Real IPM-BioWorks public-private partnership, 4 biopesticides have been registered in 13 countries in Africa, and are being used by 54,996 farmers in Africa farmers on a total area of 137,490 ha, directly benefitting 329,976 grower household members. Several biopesticides are in the pipeline for registration and commercialization in African countries, EU, UK and USA.

## IPM Technologies

# Impact Snapshots

**8.1**

Benefit-cost ratio, and an internal rate of return of 21%, comparable to returns from improved crop varieties

**641,000**

People with improved food security

**2.7 million**

Million tonnes of carbon dioxide equivalent sequestered, valued at USD 12.2 million

**445,349**

People lifted above the poverty line, representing 2% of the poor population

**USD 5**

Average income per capita annual increase

**USD 500M**

Combined net present value

**526,000**

Litres of pesticide use reduction



Youth partners of the More Young Entrepreneurs in Honey and Silk (MOYESH) programme, an initiative between icipe and the Mastercard Foundation, pictured during a Youth Learning Summit, held in Addis Ababa, Ethiopia, on 27 March 2025, to recognise and discuss the transformative impact of the project.

## Promoting biodiversity conservation and circular economy innovations

By linking science, enterprise and sustainability through inclusive beekeeping, sericulture value chains and edible insect enterprises across Africa. This strategy empowers communities, particularly women and youth, supports agrifood systems, creates green jobs, and strengthens resilience.

### + Innovations and outputs include

- Beekeeping for honey and hive products, and mainstreaming of pollination services.
- Market access improvement and product diversification through bee colony trading, honey certification and characterisation, and Geographic Indications for unique honeys.
- Silkworms rearing for yarn, sericin and biofertilisers.
- Integrated farming systems that mix insect rearing with crop and livestock systems.
- Biodiversity conservation and innovation through digitisation, molecular barcoding and citizen science.
- Documenting insect biodiversity, and advancing nature-based bioprospecting.
- Digital tools, barcoding and citizen science, thus enhancing biodiversity monitoring across Africa.

## Impact Snapshots

**1.5M**

People reached with beneficial insect innovations

**15 – 20%**

Yield improvement for pollination dependent crops through pollination services by stingless and honey bees

**84,000**

Insect specimens databased by icipe

**500**

Farmers involved in Geographic Indications (GI) for unique and traditional honey in Africa

## Forefront in the insect farming movement

Through a One Health framework to translate the reality of insects in the transformation of the current food system into a more sustainable and vibrant circular economy.

- Optimised rearing protocols and substrates for cost-effective, sustainable insect mass-rearing, harvesting, and post-harvest techniques, and established mass rearing units for demonstration and training.
- Mainstreamed the use of insects as alternative, affordable, nutritious and healthier protein options for animal feed.
- Introduced insect-based, food-to-food biofortification to counter malnutrition.
- Promoted the use of insects in the effective recycling of organic wastes into high-value organic fertilisers, and plastic waste for safer environments.
- Designed technologies to produce novel, high-value products such as insect oils, enzymes, pharmaceuticals and bio-energy.
- Contributing to the development of national standards for the edible insect farming sector, and collaborating with ARSO for continental policies
- Expanded insect farming technologies to the Asia-Pacific and Caribbean regions.

## Impact Snapshots

**575,000**

Tonnes of organic waste recycled

**28,720**

Tonnes of frass fertilizer per year produced

**> 4,000**

Insect farming enterprises

**> 23,000**

Tonnes of dried black soldier larval meal for animal feed formulation produced

**60,000**

Tonnes of carbon and 145 metric tonnes of methane mitigated per year through waste recycling

**160,000**

People trained, 15 million reached through publicity and awareness campaigns, 50% women; 90% youth

**> 200**

Partnerships created in 60 countries



Beyond core funding, Sida also provides targeted project support to *icipe*, which has contributed to One Health research, championing of the bioeconomy, and infrastructural upgrades.

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Victor Omondi, a research assistant, conducting metabolomics analysis, in the *icipe* Behavioural and Chemical Ecology Unit.

# 03 Sida Funded Project

In February 2024, with the support of Sida, *icipe* and partners launched the **Accelerate One Health (AOH) project**, a seminal initiative that is leveraging on existing expertise and partnerships in Ethiopia and Kenya, to respond to developmental challenges related to pest and diseases, through integrated system thinking.

## Key focus

- + Three threats that erode human, animal, plant and ecosystem health: the invasive *Parthenium* weed, leishmaniasis, a neglected tropical disease, and aflatoxin contamination. These challenges contribute to food insecurity, economic losses, rising health risks, and ecological decline, disproportionately affecting smallholder farmers, women, and youth.

## Achievements

Highlighted both the urgency of addressing One Health threats in Africa and the promise of coordinated, science-based interventions, and achieved major milestones across innovation, policy, evidence generation and capacity development.

- + Over 45,000 beetles released in Ethiopia as biological control agents to combat *Parthenium*, while two bioherbicides were developed, and circular economy models created to convert the invasive weed into insect-based feed and biofertilizer, opening opportunities for youth employment and soil restoration.
- + A low-cost paper-based ELISA test for aflatoxin monitoring was piloted, biological control agents were validated and a mass-rearing facility was established in Ethiopia.
- + Gender-disaggregated evidence on leishmaniasis exposure, ecological insights on *Parthenium*, and socioeconomic analyses, were generated, to inform policy. Mapping of hotspots enabled targeted interventions, while Ethiopia's One Health strategy was revised to include plant health.
- + Regional and international dialogues secured political commitment, and capacity was strengthened among researchers, farmers and value chain actors through training and partnership. A new One Health Data Repository was set up at *icipe*.



(Top) *Parthenium*: A noxious invasive weed of One Health importance

(Left) Dr Samira Mohamed, Principal Scientist, icipe, during the release of beetles to control *Parthenium* weed in Ethiopia.

## Impact Snapshots

- + 256 individuals ( 99 of the women) trained in One Health, gender, safeguarding and human rights
- + 186 participants ( 84 of them women) engaged in a regional workshop
- + 5 postgraduate(2 female) students supported
- + 1,000+ stakeholders reached through webinars, outreach and international forums
- + 1 national One Health Strategy (Ethiopia) supported and validated
- + 1 Plant Health Clinic constructed in Arba Minch, Ethiopia
- + 10+ strategic MoUs signed with national, regional, and global partners

# 04 BiInnovate Africa

BiInnovate Africa, one of Africa's largest regional science and innovation-driven initiatives, was established in 2010 with support from Sida, its first phase running up to 2015. The Programme enables scientists in universities, research institutes and firms in eastern Africa, to translate biologically based research outputs into practical uses in society, while contributing significantly to the region's innovation ecosystem. In 2016, Sida and *icipe* reached an agreement for the Centre to host and manage the Programme.

## Phase II (2016 – 2022)

+ **Implemented across six eastern African countries**  
(Burundi, Ethiopia, Kenya, Rwanda, Tanzania and Uganda)

- Promoted waste-to-value, biobased innovations, particularly in agriculture and environmental sustainability.
- Successfully closed 20 innovation projects, denoting a 74% success rate.
- The innovations are: biofertilisers, biopesticides and seed systems, along with nutrient-enriched foods, edible insect-based products, and mushroom substrates; vermicompost from coffee waste, orange-fleshed sweet potato products, and an industrial wastewater treatment solution; aroma honey toffees, black soldier fly larvae for chicken feed, and herbal insect repellents.



*Ms Ann Kitisa, Manager, Mimea International Kenya Ltd, inspects tissue culture blooms to develop virus free sweet potato vines, in a project supported by BiInnovate Africa Programme.*

## Phase III (2022 – 2026)

+ **Implemented in eight Eastern African countries**  
(Burundi, Ethiopia, Kenya, Rwanda, Tanzania and Uganda; and new entrants – Democratic Republic of Congo (DRC) and South Sudan.)

- Health innovation added as a thematic area, particularly in epidemic response, biopharmaceuticals and diagnostics, and the harnessing of indigenous knowledge, for example in traditional medicine.
- This Phase is also marked by emphasis on the advancement of a sustainable bioeconomy in eastern Africa, through policy analyses and support and stakeholder engagement.



H.E. Caroline Vicini, former Swedish Ambassador to Kenya, addressing the GBS 2024 conference.

**+ Consists of seven competitively selected projects that are developing:**

- Rhizobia-mycorrhizae-based biofertiliser; Novel biodegradable carrier from banana fibre technology for efficient crop protection; Nano encapsulated-bromelain from pineapple and seafood waste for improved livestock production; Biobased supplements to artemisinin-based combination therapy for malaria treatment; Novel bio-rational products to control Tungiasis in East Africa; Biofungicides to manage coffee wilt disease in East Africa, Eco-friendly packaging products from cassava and other biowastes.

**+ Global Bioeconomy Summit (GBS) 2024**

- BioInnovate Africa helped to bring this event to Africa, for the first time ever. Held on 23 – 24 October 2024, the GBS was held in Nairobi, Kenya, the Summit was co-hosted with the East African Science and Technology Commission (EASTECO), Stockholm Environment Institute (SEI) and the International Advisory Council on Global Bioeconomy (IACGB).

**+ Enhancing gender equity in Africa’s bioeconomy**

- In 2019, BioInnovate Africa launched a Women Scientists Fellowship, to provide opportunities for early and mid-career female researchers to work with and learn from the Programme’s projects and networks in the region. A five-year gender strategy (2023-2028) and Action Plan (2023- 2024) was developed.

**+ Capacity building in techno-economic analysis (TEA)**

- BioInnovate Africa partners with the Thayer School of Engineering, Dartmouth College, USA, to build capacity for techno-economic analysis (TEA) in eastern Africa through a six-month tailor-made online course.

## Impact Snapshots

**USD 20M+**

Invested by Sida since 2010 to strengthen Africa’s science, innovation and entrepreneurship through BioInnovate Africa

**27**

bio-innovation projects supported across 8 countries

**45**

women scientists have benefited from the BioInnovate Africa Women Scientists Fellowship (2019 – 2024)

**7**

competitive projects ongoing in Phase III (2022 – 2026)

**560**

in-person participants + large virtual audience, Global Bioeconomy Summit (GBS 2024)

**23**

scientists (4 women) trained in Techno-Economic Analysis (TEA) with Dartmouth College, USA

# 05 Sida Funded Equipment

In 2022, Sida provided *icipe* with USD 2.6 million to acquire state-of-the-art scientific instruments that have greatly strengthened the Centre's research capacity in addressing the challenges of climate change.

## Advanced analytical and chemical ecology capacity

The state-of-the-art instruments have expanded *icipe's* analytical frontiers, through capacity to perform high-resolution metabolomics, lipidomics and proteomics.

### + Key highlights:

- Identifying biomarkers that have led to a non-invasive diagnostic tool to detect diseases in people and animals.
- Studied vector gut metabolites revealing novel disease control strategies.
- Isolated natural therapeutic molecules from the blood of animals that have recovered from certain ailments, offering potential for nature-based livestock treatments.
- Detected trace contaminants in honey, thus confirming honey as a natural bioindicator of environmental pollution.
- Enhanced capacity to assess micro and macro nutrients, as well as safety risks such as pesticide residues, minerals and heavy metals in food, insects, soil and the environment.



Urine-based biomarker diagnostic test.

## Scanning Electron Microscope (SEM)

The equipment has transformed *icipe's* research by revealing the intricate nanoscale structures of insects, microbes and plants.

### + Key highlights:

- Studied the minute structures of insects, microbes and plants, to understand their ecological interactions and adaptation.
- Expanded studies on insect sensory systems, leading to the design of smart, eco-friendly pest traps inspired by insect sensory systems.
- Designed nano-inspired devices, such as advanced pest dispensers, attractants and repellents for sustainable pest control.

## Multi-gas analyzer

### + Key highlights:

- Conducted greenhouse gas monitoring including measurements of methane, carbon dioxide, nitrous oxide and ammonia.
- Identified the production sites of greenhouse gas emissions in livestock, and traced them to specific microbes and metabolic processes. By treating rumen waste with natural catalysts, boosted green energy (methane) generation while reducing carbon dioxide emissions by over 90 percent.
- Formulated chicken feed, blending insect-based and conventional ingredients, which significantly cut methane and nitrous oxide emissions from poultry manure, offering practical, sustainable solutions for reducing agriculture's climate footprint.

## Gas Chromatography–Single Sensillum Recording

- Uncovered how insects detect and process smells, leading to innovative, eco-friendly pest and disease control solutions.
- Identified natural repellents for sustainable fruit pest management and revealed unique odour signatures in trypanosome-infected tsetse flies, offering new options for disease monitoring.
- Discovered that black soldier flies produce natural “perfumes” that boost mating success, improving mass breeding for insect-based feed production and supporting Africa's growing circular bioeconomy.



*Samantha Karanu at work in the icipe Molecular Biology and Bioinformatics laboratories.*

## Next-generation molecular tools

The technologies have greatly expanded the Centre's capacity in genomics, proteomics and microbiome research. They enable rapid pathogen detection, real-time monitoring, and precision biological control against emerging pests and diseases.

### + Key highlights:

- Discovery of how friendly gut microbes help or harm pests disease vectors by affecting their survival, immunity, and reproduction.
- Found that natural fungi can weaken insect defences and, when used with the Sterile Insect Technique (STI), can effectively control tsetse fly.
- Identified key genes in pests, that aid them to adapt to stress and chemicals, providing insights for control.
- Confirmed the benefits of eco-friendly pest control options like fungi, legumes, microbes, botanicals and nanosilica.

## Biobanking and biopesticide production facilities

### + Key highlights:

- Boosted capacity to safely store and preserve biological samples.
- Enhanced long-term research continuity, innovation in biopesticide and bioproduct development.
- Supported collaborations and global data-sharing initiatives.



*Jane Kimemia, Research Officer, icipe, examining entomopathogenic fungal isolates in the Arthropod Pathology laboratories.*

## Spectroradiometer (RS 8800)

### + Key highlights:

- Captures light data from plants, soil, and livestock, helping scientists monitor crop health, detect diseases, and study pollination and animal-vector interactions.
- Outputs include knowledge on the superiority of climate-smart push-pull systems in coping with pests, drought, and climate stress, compared to other maize farming, revealing how different systems.
- By combining light data, artificial intelligence and satellite images, *icipe* can map resilient farms and design sustainable, biodiversity-friendly agricultural and livestock systems.

## MacroSolutions Macropod photographic system

### + Key highlights:

- This technology, which produces ultra-high-resolution images of insects, has revolutionised taxonomy research at *icipe*.
- It enables clear visualisation of microscopic features, particularly in tiny wasps that naturally control crop pests.
- The system is also advancing science communication through projects such as Insect of the Week, which showcases insect diversity and supports conservation awareness. *icipe* plans to develop a digital image library and a coffee-table book, using these striking visuals to celebrate and document Africa's rich insect biodiversity.



*Robert Copeland, acting Head of Biosystematics, observing wasps on the Macropod photographic system*

## Fish feed extruder line

### + Key highlights:

- Produces high-quality extruded pellets for aquaculture, with a capacity of 200 kilogrammes per hour.
- Enables the production of floating fish pellets with an extended shelf life, contributing to improved feed efficiency and overall animal performance.
- Strengthened research and innovation by supporting the efficient formulation of experimental diets for *icipe* and its partners.
- Serves as a training hub, for women, youth, farmers, entrepreneurs, feed millers, researchers, extension officers, and nine postgraduate students, with hands-on skills in the formulation and production of insect-based aqua feeds.

## Modern aquaculture glasshouse system

### + Key highlights:

- Supports year-round research on sustainable aquaculture and feed innovation.
- Maintains stable conditions by controlling temperature, light and humidity, creating a secure and efficient space for experiments.
- Enables studies on optimum fish rearing, using advanced sensors for water monitoring, precision feeding, and recycling of natural resources like biofloc and aquaponics, and how fish respond to changing environments.
- Advanced design of affordable, climate-smart aquaculture models tailored to Africa's diverse needs.



The aquaculture glasshouse system at *icipe*.

# 06 Looking to the Future

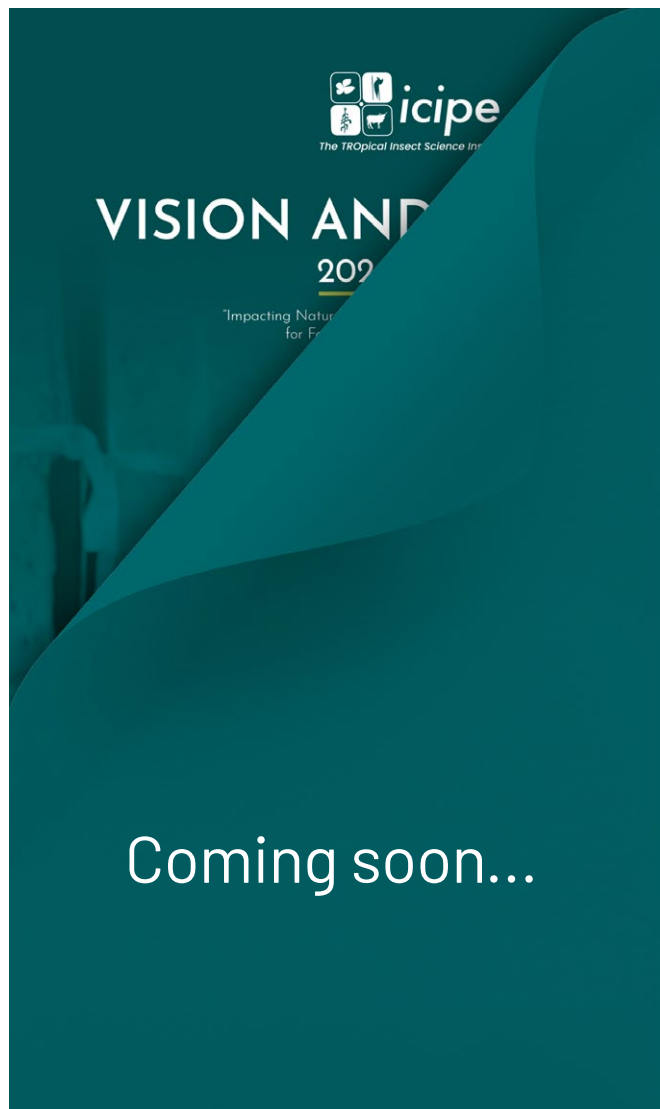
At *icipe*, we take pride in our partnership with Sida – a remarkable success story and a shining example of how long-term, values-driven investment in science and development can create lasting impact.

Looking ahead, the forthcoming launch of the *icipe* Vision and Strategy 2026-2030 will usher in a bold new chapter. We aspire to deepen our contribution to Africa's development, true to our mandate of advancing insect science and transforming this knowledge into innovative pathways for progress.

We gratefully anticipate continued partnership with Sida as we address Africa's evolving needs and contribute to global solutions through the transformative potential of insects and insect science.

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*The icipe Vision & Strategy 2026- 2030, will be launched on 21 November 2025*



*icipe's vision* is to pioneer global science in entomology, to improve the well-being and resilience of people and the environment to the challenges of a changing world, through innovative and applied research, alongside deep exploratory study, impact assessment, evaluation, and sustainable capacity building.

*icipe's mission* is to help alleviate poverty, ensure food security and improve the overall health status of peoples of the tropics by developing and extending management tools and strategies for harmful and useful arthropods, while preserving the natural resource base through research and capacity building.

The *mandate* of *icipe* is to research and develop alternative and environmentally friendly pest and vector management strategies that are effective, selective, non-polluting, non-resistance inducing, and are affordable to resource-limited rural and urban communities.

[www.icipe.org](http://www.icipe.org)

