icipe

The TROpical Insect Science Institute

VISION AND STRATEGY

2026 - 2030

"Impacting Nature and Society with Insect Science Solutions
for Food, Health and Climate Resilience"

Humbug Tortoise Beetle,
Conchyloctenia hybrida
(Chrysomelidae: Coleoptera)

Location: Keroka, Kenya

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The TROpical Insect Science Institute

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Cover image: Winnie Wambui, an insect farmer and entrepreneur, observing Black soldier fly larvae feeding on fruit waste.

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icipe is also deeply grateful for the continued support and commitment of donors to *icipe*'s mission and belief in the transformative power of insect science solutions.

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This Vision and Strategy represents a collective effort of staff and *icipe* stakeholders, which is crucial for its implementation.

icipe acknowledges the contribution of Professor Thomas Risley Odhiambo (TRO) – *icipe*'s Founding Director General, whose simple yet visionary philosophy of putting people and talent first—"Get the very best people and then if you have more money, put buildings and equipment around them"—led to the creation of *icipe*.

FOREWORD

Imagine for a moment a world without insects! It would not be a liveable planet. Insects are a significant part of the environment, food and health systems. They create ecological balance and participate in a range of ecosystem services.

icipe's Vision and Strategy 2026-2030 builds on the Centre's achievements and experiences in insect science and its applications to impact nature and society in a positive way. As a unique organisation dedicated to insect science, and that brings plant, human, animal, and environment health under the one-health paradigm, *icipe* generates world-class science while delivering affordable, accessible, and nature-positive insect-based solutions for a sustainable bioeconomy.

This Vision and Strategy builds on *icipe*'s uniqueness and success over the years and makes new concerted efforts to contribute to agri-food systems transformation, resilience to climate risks, global health, environment and biodiversity management, policy, and creation of enabling environments for insect science research and innovation. Addressing these impact domains contributes to the global and African development priorities for human capital development, innovation and sustainable industrialisation, jobs for the youth, and overall socio-economic transformation.

The Vision and Strategy balances investments in basic research and applied aspects to ensure that *icipe* not only maintains a cutting edge in scientific frontiers but also delivers impact to society and nature. It also extends *icipe*'s insect science solutions to communities facing humanitarian crises arising from conflicts and natural disasters, which are exacerbated by climate risks and resource scarcity.

icipe will strengthen partnerships, gender integration, capacity and organisational development, communication, and resource mobilisation to deliver the promise in this Vision and Strategy.

icipe staff, students, partners, and stakeholders are invited to co-implement actions in this Vision and Strategy, and together, realise the great contribution of insects in making the planet a place worth living in for generations to come.

Ylva Hillbur, *PhD*
Chair, Governing Council

Abdou Tenkouano, *PhD*
Director General & CEO

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Ant-mimicking egg parasitoids of Praying mantis eggs (Eupelminae: Eupelmidae: Hymenoptera).

Location: Karura forest, Kenya

LIST OF ACRONYMS AND ABBREVIATIONS

AI	Artificial Intelligence
AIRCA	Association of International Research and Development Centres for Agriculture
ARPPIS	African Regional Postgraduate Programme in Insect Science
AU	African Union
CAADP	Comprehensive Africa Agriculture Development Programme
CGIAR	Consultative Group on International Agricultural Research
DNA	Deoxyribonucleic Acid
DRIP	Dissertation Research Internship Programme
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
icipe	International Centre of Insect Physiology and Ecology
IPM	Integrated Pest Management
IVM	Integrated Vector Management
KPIs	Key Performance Indicators
MEL	Monitoring, Evaluation, and Learning
NTD	Neglected Tropical Disease
OCHRA	Organisational Capacity and Human Resource Assessment
PASET	Partnership for Skills in Applied Sciences, Engineering and Technology
POPs	Persistent Organic Pollutants
R4D	Research-for-Development
RSIF	Regional Scholarship and Innovation Fund
SDG	Sustainable development goal
STISA	Science, Technology and Innovation Strategy for Africa
TRL	Technology Readiness Level
TRO	Thomas Risley Odhiambo
UNEP	United Nations Environment Programme
USA	United States of America
USD	United States Dollar
VBD	Vector Borne Disease
WOAH	World Organisation for Animal Health
WHO	World Health Organization

EXECUTIVE SUMMARY

Insect science plays a crucial role in addressing global challenges such as food and nutrition security, climate risks, and biodiversity loss. This Vision and Strategy 2026–2030 outlines a comprehensive plan for the International Centre of Insect Physiology and Ecology (*icipe*) to contribute to the impact domains of agri-food systems, global health, environment and biodiversity and policy and enabling environment through innovative insect-based solutions. The Vision and Strategy was developed in a highly consultative manner and incorporates recommendations of the *icipe* Periodic External Review 2018–2022, a comprehensive Organizational Capacity and Human Resource Assessment (OCHRA) and views of staff, partners, donors, and other stakeholders.

The Vision and Strategy 2026–2030 emphasises strengthening partnerships, fostering gender integration, and enhancing capacity development to deliver sustainable solutions. By aligning with global development agendas, *icipe* aims to transform livelihoods and ecosystems, contributing to a sustainable bioeconomy.

This Vision and Strategy 2026–2030 underscores the importance of integrating scientific excellence with practical impact, ensuring that insect science continues to be a pivotal force in global development.

The strategy is aligned with the UN Sustainable Development Goals (SDGs) and the African Union (AU) Agenda 2063, and contributes to impact domains of:

- **Agri-food systems,** ensuring food and nutrition security by combating invasive species as well as native pest and vectors, enhancing soil health, integrating crop-livestock systems, reducing postharvest losses, and promoting edible insects.
- **Global health**, mitigating vector-borne diseases through innovative vector control technologies, advanced surveillance tools, and early warning systems.
- **Environment and biodiversity**, conserving ecosystem services through nature-positive technologies, driving a circular bioeconomy, reversing biodiversity loss, increasing access to pollination services, monitoring and reducing pollution, and using insects as bioindicators.
- **Climate change mitigation and adaptation**, building resilience and driving sustainable solutions by understanding climate impacts on disease vectors and pests, developing climate-resilient livelihood strategies, scaling up circular and regenerative production systems, and building capacity for climate action.
- **Policy and enabling environment**, fostering an ecosystem for insect science impact by bridging the research-policy gap, strengthening policy capacity, supporting evidence-based policies (including standards and guidelines) and creating enabling environment for innovation, and fostering science diplomacy and regional and international cooperation.

The Vision and Strategy 2026-2030 balances investments in basic and applied research while emphasising impact delivery. *icipe* will strengthen its integrated platforms for research and innovation. It will build strategic partnerships, develop human capital, enhance communication, ensure gender integration, and increase resource mobilisation efforts as well as accountability as enablers for achieving its mission. *icipe's* unique thematic approach to research for development that brings together plant health, human health, animal health, and environmental health under the One Health paradigm will be enhanced.

Sunflower Seed Bug, Agonoscelis versicoloratus (Pentatomidae: Hemiptera) - an edible stink bug and source of protein, edible oil and gelatin.

Location: icipe, Nairobi, Kenya

01

EVOLUTION OF THE VISION AND STRATEGY

Background

The International Centre of Insect Physiology and Ecology (*icipe*) is at the forefront of addressing the most pressing challenges in Africa and globally like climate risks, biodiversity loss, poverty and hunger, and unemployment through insect science-based solutions. This Vision and Strategy builds on decades of excellence in scientific research for development, capacity development and innovation that address development challenges in Africa and beyond. It introduces agri-food systems transformation, resilience to climate risks, global health, environment and biodiversity management, policy, and creation of enabling environments for insect science research and innovation as new impact domains to which *icipe* will contribute.

icipe has demonstrated remarkable adaptability, maintaining an unwavering commitment to scientific excellence and practical impact since its establishment. The Centre's evolution is marked by its resilience to changing development landscapes over time and its commitment to addressing interconnected challenges in human, animal, plant, and environmental health using a One Health approach.

This Vision and Strategy was informed by *icipe* Periodic External Review 2018 – 2022, the Organisational Capacity and Human Resource Assessment 2024, and views and aspirations of *icipe* staff, donors and several stakeholders. It is hinged on three core pillars:

- **Research excellence:** continue pursuing advanced research in insect science, integrating cutting-edge technologies, and focusing on generating practical solutions for African and global challenges.
- **Impact delivery:** strengthen capacity to translate research into practical solutions, implementing evidence-based interventions, empowering communities, and rigorously monitoring and evaluating the outcomes.
- **Capacity development:** invest in developing African scientific leadership, strengthening institutional partnerships, enhancing regional and national research infrastructure, and engaging in science diplomacy to promote the uptake of research findings as well as calling for increased investment in research and innovation.

(l-r) icipe Human Health Theme team members: Steve Kiplagat, Research Assistant; Lydia Chepkemoi, Research Officer; and Crispin Ochieng, student; identifying sandflies species, as part of our studies on leishmaniasis.

Development Challenges

The global context is rapidly evolving. Geopolitical shifts and dynamics influence development priorities and funding flows. The growing emphasis on demonstrating research impact, implies more effort at diversifying funding sources, including engagement with the private sector. At the same time, several interconnected global issues influence the landscape in which *icipe* operates. Some of these global challenges include:

- **Climate change:** The intensifying impacts of climate change, including increased frequency and severity of extreme weather events, are exacerbating existing vulnerabilities in African agriculture, health, and ecosystems. *icipe*'s research on insect adaptation and resilience, and the development of insect-based solutions for climate-smart agriculture, are critical to mitigating these impacts.
- **Biodiversity loss:** The accelerating decline in biodiversity threatens the essential ecosystem services upon which human well-being depends. *icipe*'s work on insect biodiversity conservation and the sustainable use of insect resources is aligned with global efforts to protect and restore biodiversity.
- **Food security and nutrition:** With a growing global population and increasing pressure on agricultural systems, ensuring food and nutrition security is essential. *icipe's* research on insect-based food and feed and its work on integrated pest and vector management, offers sustainable solutions that can enhance food production and improve nutritional outcomes.
- **Global health:** Emerging and re-emerging infectious diseases, many of which are vector-borne, are posing significant threats to global health security. *icipe*'s expertise in insect vector biology and disease transmission complements efforts to develop effective prevention and control strategies.

To effectively address these challenges and opportunities, *icipe* will strengthen partnerships at all levels. With strong partnerships, *icipe* will leverage its expertise and resources to contribute to sustainable development in Africa and beyond. These partnerships will include:

- Collaborating with leading scientific institutions and universities to generate cutting-edge knowledge and technologies.
- Partnering with development organisations, governments, and the private sector to translate research findings into practical solutions and deliver them at scale.
- Working with universities and training institutions to develop the next generation of African scientists and strengthen institutional capacity.
- Engaging with development partners and investors to secure funding.

icipe will maintain its close association and partnership with the One CGIAR to provide complementary research for development services and support related to insect science, capacity development and innovation. As a member, *icipe* will actively participate in activities of the Association of International Research and Development Centres for Agriculture (AIRCA), ensuring that innovations contribute to diverse, safe, nutritious, and climate resilient food systems for health, livelihoods, and environment. Further, *icipe* will continue participating as a member of the Association of African Universities, being a strategic partner in fostering high quality graduate education, skills and overall capacity development in the continent.

Outlook

icipe is committed to ensuring excellence in science, and innovation that integrates traditional (indigenous) knowledge to build a sustainable bioeconomy. Towards this end, *icipe* will continue identifying issues, challenges, problems and co-developing solutions with stakeholders and partners. In this respect, *icipe* will continue carrying out foundational research, while focusing on impact through scaling successful interventions through partnerships in the different geographies, where it has presence, in all regions of Africa and across the world. This approach balances immediate needs with long-term sustainability, ensuring that investments in *icipe* today contribute to lasting positive change tomorrow. However, it also calls for strengthening existing collaborations and building new ones involving both public and private sector, civil society and the media through enhanced stakeholder engagement.

02

icipe–A CENTRE OF EXCELLENCE IN INSECT SCIENCE FOR DEVELOPMENT

Background

icipe is globally recognised as a Centre of Excellence in insect science and its applications. Founded in 1970 by visionary scientists led by Professor Thomas R. Odhiambo, a renowned Kenyan entomologist, *icipe* aims to improve food security, health, and well-being in Africa and other parts of the world.

Headquartered in Kenya, and with staff of over 40 nationalities represented, *icipe* has grown significantly and fosters a diverse and inclusive environment for research and innovation.

Box 1: *icipe*'s resilience over 50 Years

Since its founding in 1970, *icipe* has grown from a single Nairobi campus to a pan-African network in over 30 countries in Africa. The Centre has continuously adapted its insect-science platforms to meet shifting challenges: pioneering agroecological pest-management and pollinator strategies that transformed farming and deepening its expertise in vector ecology to roll out integrated control approaches that limit transmission of vector-borne diseases to both humans and livestock.

Parallel investments in human capital, through flagship MSc and PhD programmes that have produced over 1,300 African scientists now leading research and policy efforts, have created a self-renewing network capable of sustaining impact over the long term.

In response to emerging needs, *icipe* began embedding climate-risk analysis into its programmes, anticipating how shifting temperature and rainfall patterns affect insect dynamics and guiding proactive mitigation. Anchored by gender equity, youth engagement and deep stakeholder partnerships, these combined strengths ensure that *icipe*'s science delivers lasting development outcomes across Africa and globally.

Scientific Excellence and Capacity Development

icipe's research portfolio has expanded significantly since its inception. Initial research focused on key pests of staple food crops, including locusts and vectors of neglected tropical diseases like tsetse flies, ticks, and mosquitoes. Over time, research expanded to encompass diverse crop pests and diseases, such as trypanosomiasis and leishmaniasis.

Understanding how insects interact with their environment led to pioneering research on visual and olfactory cues, resulting in easy-to-use technologies like the odour-baited Ngu tsetse trap, which effectively controls tsetse fly populations. *icipe*'s contributions to understanding the ecology, biodiversity, disease epidemiology, and vector status of various pests and beneficial insects have been substantial.

More recent work has focused on developing biopesticides, agroecological interventions, and insect-based solutions for food and feed. *icipe*'s innovative solutions include endosymbionts for malaria control, the tsetse repellent collar, and technologies for postharvest treatment and integrated pest and vector management.

icipe runs a vibrant postgraduate programme, the African Regional Postgraduate Programme in Insect Science (ARPPIS), established in 1983 to train world-class scientists. It also offers the Dissertation Research Internship Programme (DRIP), attracting students from around the globe. With over 150 postgraduate students at any given time, *icipe* has a significant concentration of entomologists. Regional capacity development and innovation collaboration initiatives within *icipe* such as the Regional Scholarship and Innovation Fund of the Partnership for skills in Applied Science, Engineering and Technology (PASET RSIF) and BioInnovate Africa, elevated *icipe's* profile to become the go-to organisation for regional training, research, and innovation.

Global Recognition

icipe's achievements have earned global recognition, including the *2020 Curt Bergfors Food Planet Prize* and recognition by United Nations organisations like the *Stockholm Convention Regional Centre for Persistent Organic Pollutants*, the *Food and Agriculture Organization (FAO) Reference Centre for Vectors and Vector-Borne Diseases*, and the *World Organization for Animal Health Collaborating Centre for Bee Health in Africa*. *icipe* scientists have received numerous awards for their research and impact, such as the *2024 Norman E Borlaug Award for Field Research and Application, the 2024 TWAS Award in Agricultural Science,* the *2022 TWAS Siwei Cheng Award in Economic Sciences, and the Justus von Liebig Award for World Nutrition 2025.*

THE CURT BERGFORS
FOOD PLANET PRIZE
WINNER 2020

Box 2: Insects, foundational to life and development

Insects and related arthropods are the most abundant and diverse animal group on earth, representing a critical component of global ecosystems. With millions of species, they constitute a significant portion of terrestrial animal biomass and have been integral to life for over 400 million years. Their global distribution and interactions with various organisms and environments underscore their ecological importance.

Insects play dual roles: while some act as agricultural pests and disease vectors impacting human, animal, and plant health, others contribute to essential ecological services like pollination, organic recycling, pest control, and soil health. For example:

- **Agricultural pests** like locust and fall armyworm cause significant agricultural losses, impacting food security and livelihoods. Recent locust outbreaks alone have resulted in billions of dollars in crop losses.
- **Disease vectors** like mosquitoes transmit diseases such as malaria, dengue fever, and Zika virus, causing millions of deaths annually and significantly influencing societal development. Tsetse flies, vectors of trypanosomiasis, continue to hinder agricultural progress and economic development in Africa.
- **Pollinators** particularly bees, are crucial for global food production, with their pollination services valued in the hundreds of billions of dollars.
- **Organic waste recycling** using insects like the black soldier fly produce insect based biofertilisers and protein supplements in animal feed that improve soil health and enhance sustainable food production, presenting significant economic, social and environmental benefits. Other edible insects like crickets, locusts, and grasshoppers, offer insect enriched proteins that supplement human diets in many communities in Africa and around the world.

Vision

Transformed livelihoods through insect science and innovation.

Mission

To deliver innovative nature-positive insect science solutions for people and planet.

Core values

icipe's core values, **ARISE,** are explained as follows:

Accountability for scientific and financial actions at all levels and making decisions with openness and honesty.

Respect for each person and ensuring the diversity and safeguards for staff, partners and others, while ensuring equal opportunity to everyone irrespective of race, age, gender, colour, class, ethnicity, disability, location and religion.

Integrity of research practices and adherence to sound ethical principles and compliance with standards and regulations.

Sustainability embedded in all operations, practices and technologies produced to ensure resilience.

Excellence in everything, and encouraging creativity, reflective thinking, flexibility and adaptative learning in approaches to work.

With these core values *icipe* will conduct cutting edge research and innovate solutions that transform Africa and beyond.

Value Proposition

As a premier Centre of Excellence for insect science, *icipe* offers holistic solutions that enhance agri-food systems, health, ecosystem services and environmental sustainability. *icipe*'s internationally competitive standards in research, capacity development, and innovation contribute to livelihood transformation and advance a sustainable bioeconomy in Africa and globally.

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

03

STRATEGIC ALIGNMENT WITH GLOBAL AND CONTINENTAL DEVELOPMENT AGENDAS

Aligning with the SDGs and AU Agenda 2063

icipe's strategic impact pathways and outcomes are intrinsically aligned with the UN Sustainable Development Goals (SDGs) and the African Union (AU) Agenda 2063, as well as key sectoral continental development frameworks. These include, but are not limited to, the African Fertiliser and Soil Health Action Plan 2033, Comprehensive African Agriculture Development Programme (CAADP) 2035, Science, Technology and Innovation Strategy for Africa (STISA) 2034, Continental Education Strategy for Africa 2035, and the Africa Health Strategy 2030.

Box 3: Alignment with SDGs and AU Agenda 2063

- **Poverty and Hunger Reduction (SDG 1 and 2):** *icipe* delivers innovative solutions, such as nutrition-smart insects for food and feed and climate- and pest-smart agriculture, to transform agro-ecological systems, enhance resilience, and contribute to a sustainable bioeconomy.
- **Improved Health and Well-being (SDG 3):** *icipe* focuses on reducing the burden of neglected tropical diseases (NTDs) and vector-borne diseases (VBDs), particularly malaria, through targeted interventions for marginalised communities.
- **Climate Action and Resilience (SDG 13 and AU Agenda 2063):** *icipe*'s nature-positive technologies, including biological pest control and integrated vector management, enhance agro-ecosystem resilience and mitigate greenhouse gas emissions.
- **Human Capital Development (SDG 4, 5, 8, 10 and AU Agenda 2063):** Through ARPPIS, farmer field schools and training programs and other regional initiatives like PASET RSIF and BioInnovate Africa, *icipe* builds capacity, fosters green job creation, and supports socio-economic transformation.
- **Biodiversity Protection (SDG 15):** *icipe* develops insect-based indicators and tools for ecosystem monitoring, ensuring sustainable access to ecosystem services like pollination and pest regulation.
- **Innovation and Partnerships (SDG 9 and 17):** *icipe* advances its mission through innovation and strategic partnerships, contributing to a prosperous, equitable, and sustainable future for Africa

Geographical Scope

While *icipe* maintains physical offices in Kenya, Ethiopia, Uganda and Benin, its influence extends across Africa and globally through strategic partnerships, including Alumni networks. Research for development activities are implemented in the East and Southern Africa, West and Central Africa, North Africa, Middle East, the Pacific and Caribbean Islands, Latin America, Asia, Europe, and Oceania.

The Picasso bug, Sphaerocoris_annulus
Sphaerocoris annulus (Scutellaridae: Hemiptera)

Location: icipe, Nairobi, Kenya

04

IMPACT DOMAINS

4.1 Impact Domains

4.1.1 Agri-Food Systems

Context

Africa's population is expected to reach 2.5 billion people by 2050. Ensuring sustainable food and nutrition security of this growing population requires transformation in African agrifood systems. Challenges such as the devastating impacts of native and invasive species, climate risk, weak access to- and adoption of innovative and sustainable management technologies contribute to low crop and livestock productivity, postharvest losses, soil and environmental degradation, poverty, malnutrition, unemployment, and inequalities. These challenges can be addressed by integrating climate resilience, sustainability and equity in efforts to transform agrifood systems. The key drivers for food systems transformation are scientific knowledge, eco-friendly technologies and innovations, produced and applied within a bioeconomy that incorporates forward-looking agroecological principles, community engagement, market access, jobs and youth and women empowerment.

icipe's strategic contribution

icipe uses classical biological control to manage invasive species, which are more common due now to climate change and inadequate phytosanitary and zoo sanitary systems. The total annual cost of invasive alien pest to agriculture in Africa is estimated at USD 65.58 billion[1]. *icipe's* tools and technologies support early diagnosis[2], distribution[3], and prediction[4] of invasive species as well as native pests. *icipe* also improves soil health through integrated soil fertility management methods (e.g., crop diversification and insect-based fertilisers)[5], monitoring soil microbiomes and macrofauna, and mitigating soil-borne constraints. *icipe* addresses challenges posed by vectors like ticks, tsetse, thrips, aphids, and whiteflies, as well as vector-borne diseases like East Coast fever and African animal trypanosomiasis, which threaten crops and livestock productivity. *icipe* integrates crops and livestock through technologies like push-pull and vegetable integrated push-pull technology, effectively controlling pests while providing high-value forage. *icipe* also tackles postharvest losses due to pests, and moulds, and mycotoxins contamination due to unsafe food handling. *icipe* offers integrated postharvest treatment technologies for staple crops and unique solutions for high-value fruits and vegetables contributing to extended shelf life, reduced spoilage and improved food safety. Low-cost, easily deployable solutions such as insect-based food and feed technologies and nature-based IPM tools, promote circular bioeconomies that build resilience and diversify income streams for vulnerable

1 Eschen, R., Beale, T., Bonnin, J. M., Constantine, K. L., Duah, S., Finch, E. A., ... & Taylor, B. (2021). Towards estimating the economic cost of invasive alien species to African crop and livestock production. CABI Agriculture and Bioscience, 2, 1-18

2 Ajene, I.J., Khamis, F., Ballo, S., Pietersen, G., van Asch, B., Seid, N., Azerefegne, F., Ekesi, S., & **Mohamed S.A**. (2020b). Detection of Asian *Citrus Psyllid* (Hemiptera: Psyllidae) in Ethiopia: A New Haplotype and its Implication to the Proliferation of Huanglongbing. *Journal of Economic Entomology*. https://doi.org/10.1093/jee/toaa113

3 Azrag, A. G., **Mohamed, S. A.**, Ndlela, S., & Ekesi, S. (2022). Predicting the habitat suitability of the invasive white mango scale, *Aulacaspis tubercularis*; Newstead, 1906 (Hemiptera: Diaspididae) using bioclimatic variables. P*est Management Science, 78*(10), 4114-4126. https://doi.org/10.1002/ps.7030

4 Rasowo, B. A., Khamis, F. M., Mohamed, S. A., Ajene, I. J., Aidoo, O. F., Ombura, L., Sétamou M., Ekesi S. & Borgemeister, C. (2019). African citrus greening disease in east africa: incidence, severity, and distribution patterns. Journal of Economic Entomology, 112(5), 2389-2397. https://doi.org/2310.1093/jee/toz2167

5 Mutyambai, D. M., Mutua, J. M., Kessler, A., Jalloh, A. A., Njiru, B. N., Chidawanyika, F., Dubois, T., Khan, Z., Mohamed, S., Niassy, S., & Subramanian, S. (2023). Push-pull cropping system soil legacy alter maize metabolism and fall armyworm, Spodoptera frugiperda (Lepidoptera: Noctuidae) resistance through tritrophic interactions. Plant and Soil, 498(1), 685-697. https://doi.org/10.1007/s11104-023-06467-9

communities. These can also be adapted to support communities facing humanitarian crises.

Strategic objective

To improve productivity and resilience of agrifood systems in farming communities.

Expected outcomes and indicators

a. Increased productivity of agri-food systems. This outcome will be measured by (i) % increase in yields of target crops, (ii) % increase in livestock productivity.

b. Enhanced resilience of agri-food systems to climate change. This outcome will be measured by rate of adoption of climate smart insect-based solutions by target communities.

c. Improved nutrition in target communities. This outcome will be measured by the changes in dietary diversity scores in target communities.

4.1.2 Global Health

Context

Africa faces numerous health challenges due to climate change, population growth, urbanisation, increased trade, and human movement. Vector-borne diseases (VBDs) cause over 1 million deaths annually[6] and disproportionately affects vulnerable populations. These diseases exacerbate poverty, hinder economic development, and impact livestock and companion animals. Mosquito-borne diseases like malaria and dengue threaten half the world's population[7], while one million new cases of leishmaniasis are reported annually[8]. Hundreds of insects, mites, and ticks transmit human and livestock diseases[9]. The growing impact of VBDs, including zoonotic diseases, is exacerbated by global travel, urbanisation, agricultural practices, demographic shifts, and climate change. Diseases like dengue, chikungunya, Zika, yellow fever, Rift Valley fever, and West Nile fever and Crimean-Congo haemorrhagic fever highlight the urgent need for integrated proactive control strategies.

> "Global health is an area for study, research, and practice that places a priority on improving health and achieving equity in health for all people worldwide. Global health emphasizes transnational health issues, determinants, and solutions; involves many disciplines within and beyond the health sciences and promotes interdisciplinary collaboration; and is a synthesis of population-based prevention with individual-level clinical care."
>
> Koplan et al, 2009: Towards a common definition of global health. The Lancet

icipe's Strategic Contribution

icipe conducts cutting-edge research into the biology, ecology, and behaviour of vector species that transmit diseases like malaria, arboviruses, and neglected tropical diseases. It develops innovative control technologies, including symbiont-based transmission blocking, spatial repellents, attract-and-kill systems, and environmentally friendly biorational insecticides. *icipe* also advances high-tech surveillance tools like molecular diagnostics and geospatial mapping strategies to strengthen early detection and outbreak preparedness. *icipe* integrates ecological, social, and modelling-based perspectives to predict VBD dynamics and collaborates with stakeholders to promote evidence-based policies sustainable vector control strategies under a One Health approach. It strengthens institutional capacity through specialised training programs in public health entomology and vector surveillance, bridging the gap between science and policy. *icipe* has played a leading role in WHO-African Regional Office initiatives and partnered with national programs to enhance vector surveillance, emergency preparedness, and evidence-driven decision-making.

Strategic objective

To reduce the burden and transmission of vector-borne diseases affecting Africa and the tropics.

Expected outcomes and indicators

a. Improved detection, prediction, and response to VBDs in the context of climate change. This outcome will be measured by (i) availability of tools to monitor and reduce the burden of VBDs, (ii) reduced prevalence of VBDs, (iii) response rate

6 World Health Organization. (2020). Vector-borne diseases. Retrieved from https://www.who.int/news-room/fact-sheets/detail/vector-borne-diseases

7 World Health Organization. (2024). *Malaria*. Retrieved from https://www.who.int/news-room/fact-sheets/detail/malaria

8 Hotez, P. J., & Al-Ameri, R. (2023). Leishmaniasis: the new global endemic. *The Lancet Infectious Diseases*, 23(1), 3-5

9 Gubler, D. J. (2011). The global emergence/resurgence of arboviral diseases as public health problems. *Archives of Medical Research*, 42(7), 617-635

to VBD outbreaks.

b. Improved capacity for VBD control. This outcome will be measured by (i) number of trained and skilled personnel on VBDs, and (ii) Number of facilities using novel screening and surveillance tools.
c. Increased scientific evidence in policies for VBD control. This outcome will be measured by effectiveness of policies and guidelines for management and control of VBDs.

4.1.3 Environment and Biodiversity

Context

Insects, which are among the most diverse and abundant forms of life on earth, play crucial roles in pollination, natural pest control, organic recycling, bio indicators and food provision. Ensuring a healthy environment to sustain biodiversity, especially insect biodiversity, is crucial for sustainable access to ecosystem services and development and livelihoods improvement. In Africa, these services are vital for transforming agriculture from subsistence farming to a market-driven system that includes high-value horticultural crops. Many people in fragile and marginalised areas, rely on insect biodiversity for beekeeping, food, and silkworm farming. Therefore, ensuring a healthy environment to sustain Africa's biodiversity, especially insect biodiversity, is crucial for sustainable access to ecosystem services and livelihoods improvement.

icipe's strategic contribution

icipe actively contributes to insect conservation by engaging in citizen science work that documents and digitises insect species, linking them with biodiversity databases like iNaturalist and Global Biodiversity Informatics Facility. This work helps create maps of insect declines and conservation policies and actions needed to reverse biodiversity loss. *icipe's* work on Black soldier flies opens opportunities to convert biowaste into insect-based biofertilisers and larvae into nutrient-rich protein feeds for poultry and fish. These efforts are examples of a circular bioeconomy in Africa, which aims at reducing environmental pollution, lowering greenhouse gas emissions, conserving biodiversity, and creating economic opportunities that improve livelihoods in urban and rural settings. *icipe,* a Stockholm Convention Regional Centre, has developed and scaled pest and vector management technologies that reduce reliance on harmful pesticides, mitigating pollution from indiscriminate pesticide use, untreated industrial emissions, and effluents that degrade the environment and erode biodiversity. *icipe* also develops capacity of partners and stakeholders to monitor persistent organic pollutants (POPs) from various sources and improve compliance with the Stockholm Convention and other environmental management treaties. Additionally, *icipe* is exploring the use of eusocial insects as sentinels for monitoring environmental pollution and bioindicators for climate change and biodiversity intactness. *icipe* also develops insect-based nature positive technologies such as beekeeping, insects for food, feed, and other uses, sericulture, and applied bioprospecting. These efforts provide green and inclusive job opportunities for the youth and women in sub-Saharan Africa, who constitute over 75% of the population below 35 years of age[10] and slightly more than 50% of the population in Africa[11], respectively. *icipe's* extensive scaling of beekeeping and sericulture in Ethiopia, and bee health initiatives in Kenya, demonstrate the importance of public-private partnerships for building circular bioeconomies.

(l-r): Eyob Kefeni (PhD student, Hawassa university, Ethiopia) and Abyalew Moges (Research Assistant, icipe), pictured with branded black soldier fly products (dried larvae and frass fertiliser).

Strategic objective

To enhance insect-based ecosystem services and environmental health.

Expected outcomes and indicators

a. Improved conservation of economically beneficial insect and arthropod associated biodiversity. This

10 Africa Union Commission, 2019, Policy Brief: AFRICA's Future Youth and the Data Defining Their Lives, Accessed from https://www.prb.org/resources/africas-future-youth-and-the-data-defining-their-lives/ on 26/06/2025

11 N Women, 2021, UN WOMEN AFRICA STRATEGY 2022-2025 FROM COMMITMENTS TO ACTION, Accessed from https://africa.unwomen.org/sites/default/files/2024-12/un_women_africa_strategy_2022_-2025_0.pdf on 26/06/2025

outcome will be measured by increased diversity and abundance of key species.

b. Enhanced equitable access to insect-based ecosystem services. This outcome will be measured by women, men and youth accessing insect-based ecosystem services.

c. Enhanced insect-based entrepreneurship. This outcome will be measured by (i) number of insect-based products developed and businesses established, and (ii) proportion of women, men and youth employed in insect-based enterprises.

4.1.4 Climate Change Mitigation and Adaptation

Context

The global average temperature has risen by over 1.7°C since 1970, causing dangerous climate and weather shifts[12]. This has led to extreme changes in rainfall patterns, increased floods, droughts, heatwaves, and cold waves. These impacts threaten food and nutrition security, especially in sub-Saharan Africa, where agriculture relies heavily on rainfall pattern. In 2023, weather, climate, and water-related hazards affected over 100 million people, causing over USD 8.5 billion in economic damage[13]. Despite accounting for less than 10% of global greenhouse gas emissions, Africa is disproportionately affected by climate change[14]. To adapt, mitigate and build resilience, Africa should promote renewable energy, reduce deforestation, develop climate-smart innovations, and build resilient supply chains, fostering a sustainable bioeconomy.

icipe's strategic contribution

icipe is studying the effects of climate change on disease vectors, such as *Anopheles stephensi,* which carries malaria. Rising temperatures, increased rainfall, and higher humidity levels can accelerate mosquito growth and parasite development, leading to increased transmission and disease impact. Understanding the microbiome of *Anopheles stephensi* and the role of microsporidia in inhibiting malaria transmission is crucial for effective control. *icipe* is also studying the effects of climate change on other migratory and native and invasive pests, such as fall armyworm and locusts, and how climate change may diminish suitable habitats for beneficial insects and reduce the impact of their associated biocontrol agents. These efforts include harnessing climate and geospatial data, climate modelling, establishing early warning systems, and developing climate-smart innovations. *icipe's* research on climate-resilient livestock, such as camels, supports efforts to build resilience to climate risks in communities in arid regions. Studying camels and their health builds on centuries of local knowledge that pastoralists have adapted as a livelihood strategy for resilience. Similarly, *icipe* promotes beekeeping, sericulture, and managing landscapes tolerant to arid conditions, such as Acacia woodland in Kenya and Castor beans for Eri-silkworm farming in Ethiopia, as climate-resilient livelihood strategies. *icipe* promotes circular and regenerative production systems, such as insects for food and feed, cereal and vegetable agroecology, and agroforestry systems around fruit trees, to address pest and disease issues and support climate mitigation and adaptation. *icipe* also builds capacity for climate change mitigation, adaptation, and resilience by training scientists, communities, and policymakers. Through the PASET RSIF, *icipe* runs a PhD programme on climate change in Haramaya University in Ethiopia and Bayero University in Nigeria, supporting climate change research and innovation in these universities. Since 2018, forty-nine scholars have been trained in these programs.

Camel fitted with biting flies repellent collar in Marsabit County, Kenya.

Strategic objectives

To enhance resilience of African agri-food systems and health to climate change.

12 Marvel, K. et al. (2023). Ch. 2: Climate Trends. *Fifth National Climate Assessment.* U.S. Global Change Research Program, Washington, DC, p. 2-11.

13 World Meteorological Organization, 2023, State of the Climate in Africa 2022, WMO-No. 1330, Accessed from https://library.wmo.int/records/item/67761-state-of-the-climate-in-africa-2022 on 26.06.2025

14 Ibid

Expected outcomes and indicators

a. Climate resilient communities. This outcome will be measured by rate of adoption of bundled climate-smart insect-based tools, technologies and practices by communities.
b. Improved reporting of climate and biodiversity information useful for policy making. This outcome will be measured by the level of use of climate and biodiversity data and information in national biodiversity and climate reporting frameworks.

4.1.5 Policy and Enabling Environment

Context

Insect science research is crucial in addressing climate risks, biodiversity loss, food insecurity, health, unemployment, and gender and youth empowerment. It contributes to biobased innovations, policies promoting scientific progress, and knowledge empowering communities to adopt sustainable practices. However, policy incoherence, fragmented regulations, and the disconnect between research and policymaking hinder the impact of insect science research. Scientific research and innovation often advance faster than policy development, slowing down innovation and hindering progress. Additionally, scientists and policymakers have limited capacity to translate research outputs into actionable policies, and implementation of existing policies is weak, with limited data on their impacts. Therefore, scientists and policy makers should collaborate to address societal challenges. Global emphasis on innovation and partnerships, as reflected in SDG 9 and 17, respectively, highlights the importance of collaborative efforts in solving urgent challenges like climate risk, biodiversity loss, hunger, and malnutrition.

Bee-based by-products that have been produced and commercialised with the support of icipe.

icipe's strategic contribution

icipe and partners' efforts over the years have led to development of specific insect science-based policies, strategies, and standards. For example, standards for food/feed work in Ethiopia, Kenya, Rwanda, and Uganda as well as the Africa Union standard on insects for food feed and other uses, policy guidelines for bio acaricides and biopesticides, regional bioeconomy strategy for the East African Community. *icipe* has also participated in consultative processes leading to the preparation of continental development frameworks such the CAADP. Such efforts can be expanded and developed in other countries and within other regional economic blocs recognising the nature positive contribution of insects to the bioeconomy of these countries and regions.

Strategic objective

To create enabling environments for insect science research, and partnerships for innovation.

Outcomes and indicators

a. Improved policy environment for insect-based, nature positive solutions contributing to a sustainable bioeconomy in the communities where *icipe* works. This outcome will be measured by (i) the extent to which scientific evidence generated by *icipe* is used to influence policy making, and (ii) market size of new insect-derived products and services.
b. Enhanced capacity of scientists and other professionals in Africa for translating and using scientific evidence in policy making at national, regional and continent. This outcome will be measured by (i) number of insect science-based policy papers produced, and (ii) participation of *icipe* scientists and students in policy related process.
c. Enhanced gender empowerment in insect science research and innovation. This outcome will be measured by the proportion of women to men participating in insect science related policy processes.

While *icipe* has committed to the above impact domains, the actual transformation within each domain will be benchmarked against baselines that will be carried out as key activity and deliverable. This will be followed by continuous monitoring of progress to assess the extent of *icipe*'s contribution to the impact domains.

4.2 Impact Pathways

The Impact Pathway outlines *icipe*'s strategic approach to delivering insect-based solutions that enhance agricultural productivity, health, and ecosystem resilience (see illustration in Figure 1).

The impact pathway also recognises key challenges, such as climate change, biodiversity loss, health disparities, gender inequality, and youth unemployment, and aims to achieve transformative change in agriculture, health, and environmental systems through those scientific advancements in insect science.

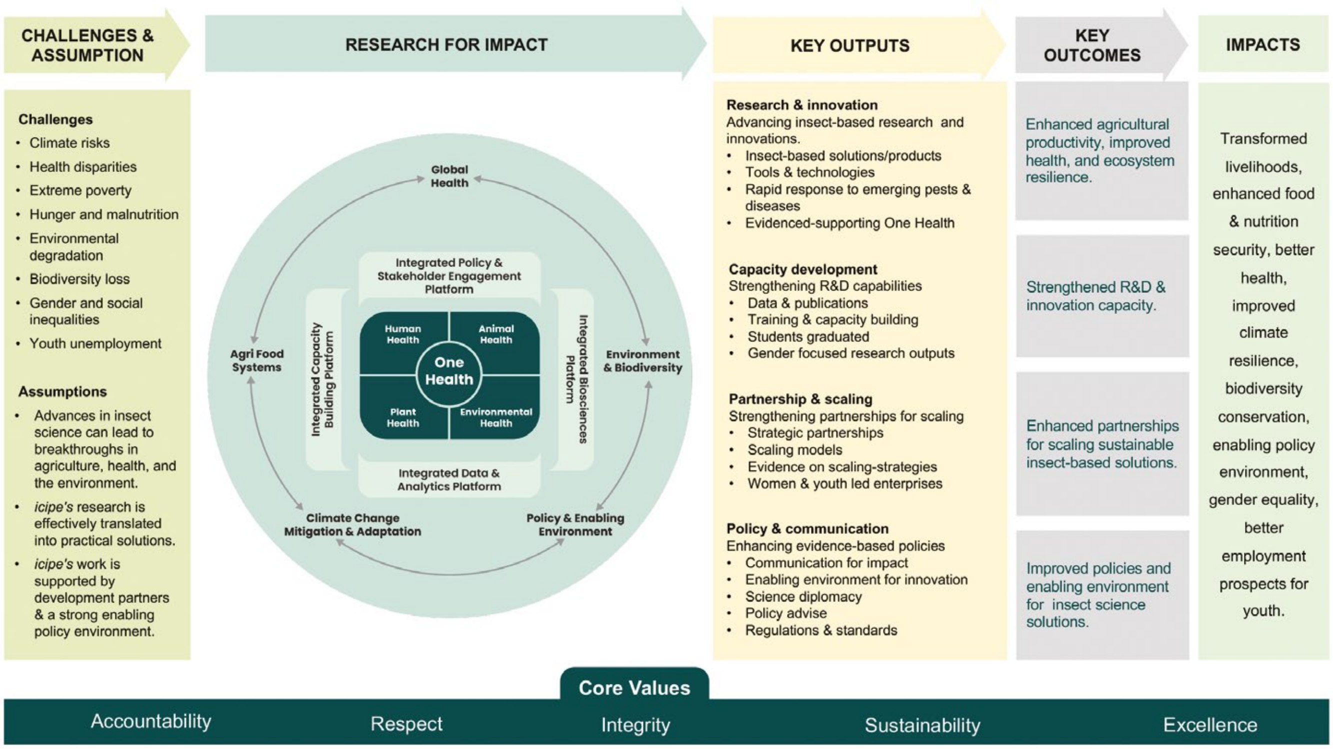


Figure 1: icipe Impact Pathway Illustration

Box 4: *icipe's* Theory of Change (ToC)

If *icipe* – **The TROpical Insect Science Institute** – *strategically invests in cutting-edge insect science* ***r****esearch, develops innovative solutions, strengthens capacity through training and partnerships, and actively engages in evidence-based policy advice,* ***then*** *it will contribute to improved food and nutrition security, enhanced human, animal and environmental health, increased climate change resilience, and sustainable socio-economic* ***t****ransformation across Africa.*

- **Inputs:** *icipe* invests in cutting-edge research, capacity development, and infrastructure development.
- **Activities:** *icipe* conducts research on insects and their interactions with humans, animals, plants, and the environment. It also develops technologies and tools based on this research.
- **Outputs:** *icipe* produces a variety of outputs, including new knowledge, technologies, tools and capacity developed (human, institutions, networks and infrastructure.
- **Outcomes:** *icipe*'s outputs lead to several outcomes, including improved food security, health, and increased capacity for resilience.
- **Impacts:** *icipe*'s outcomes contribute to several impacts, including poverty reduction, economic growth, environmental and social sustainability.

05

DELIVERY MECHANISM

5.1. *icipe* R4D themes

icipe has, since 1995, used an integrated approach – the One Health - to address insect related constraints and opportunities that cuts across the realm of humans, animals, plants, and the environment. One Health is defined as an integrated, unifying approach that aims to sustainably balance and optimise the health of humans, animals, plants and ecosystems[1]. It recognises that the health of humans, domestic and wild animals, plants and the wider environment (including ecosystems) are closely linked and interdependent. *icipe* is one of the few, if not, the only Centre in Africa, which intentionally designs and delivers its interventions under a One Health paradigm. *icipe* will address the impact domains described from a One Health perspective, and through its interventions contribute to a sustainable bioeconomy in the regions and countries where it works.

5.1.1 Plant Health

Plant Health focuses on developing and promoting agroecological and nature-positive solutions for management of above and below ground native and invasive pests (e.g., fruit flies, fall armyworm, potato cyst nematodes, striga, and parthenium) while harnessing beneficial insects. Beyond research, *icipe* under Plant Health, helps farmers and communities to adapt to external shocks, including resilience to climate risks using climate smart technologies. Under Plant Health, *icipe* also has capability in both basic and applied research in pre- and post-harvest management solutions for farming communities and commodity value chains. New frontier of research under Plant Health incorporates indigenous knowledge to tackle emerging and reemerging challenges.

5.1.2 Environmental Health

Environmental Health focuses on sustainable access to and utilisation of ecosystem services from beneficial insects such pollination with focus on bees, organic waste recycling, provision of food, feed, fibre and biofertilisers. Equally important is the monitoring and documentation of arthropods and their associated biodiversity over time, especially with focus on pests and beneficial insects. Biodiversity indices based on insects can be critical indicators of overall ecosystem health. The Africa Reference Laboratory for Bee Health (AFLH) at *icipe* is state-of-the-art facility for assessing and finding solutions for bee health. As such it is the designated Collaborating Centre for Bee Health in Africa by World Organisation for Animal Health (WOAH). Further, Environmental Health is designated as the Stockholm Convention Regional Centre under the Stockholm Convention on Persistent Organic Pollutants (POPs). Under Environmental Health, *icipe* has a large and well curated collection of insects in the continent to support biodiversity monitoring and continues to foster innovative methods of biodiversity monitoring such as citizen-science, and environmental-DNA (eDNA). These approaches strengthen networks and partnerships across the continent to scale the use of insect biodiversity indices to inform conservation policy.

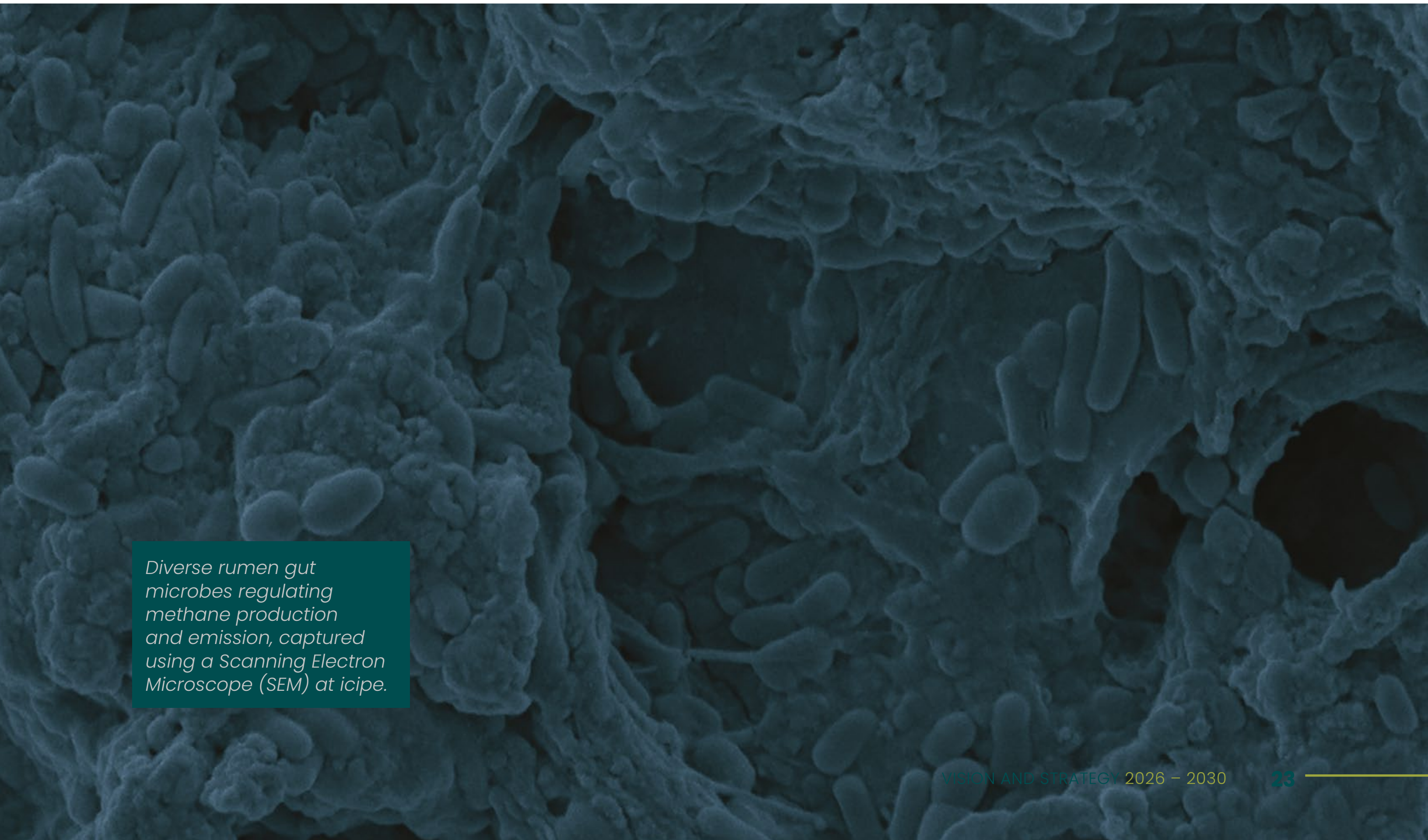
15 FAO, UNEP WHO, and WOAH. 2022. *Global Plan of Action on One Health. Towards a more comprehensive One Health, approach to global health threats at the human-animal-environment interface.* Rome. https://doi.org/10.4060/cc2289en

5.1.3 Human Health

Human Health addresses the most pressing challenges presented by vector-transmitted diseases in Africa, primarily endemic diseases such as malaria, neglected tropical diseases including kala azar (visceral leishmaniasis) and tungiasis, and emerging and re-emerging viral threats like dengue, yellow fever and chikungunya. *icipe's* strength lies in its unique ability to combine entomology, field ecology, epidemiology, genomics, and computational analysis under one roof, enabling transdisciplinary approaches to complex vector-pathogen-host systems. *icipe* under Human Health, advances the development of lures by leveraging insights into what attracts vectors such as mosquitoes and sandflies to hosts for bloodmeals (humans and animals) and sugars (plants) and oviposition site and mating for reproduction. Additional work involves studies on how vectors adapt to environmental xenobiotics (synthetic pesticides, toxins, heavy metals, plant allelochemicals) influencing their biology and behaviour and r(e) emergence of vector-borne diseases. *icipe* under Human Health, is also a continental hub for vector biology training, hosting ARPPIS students, postdoctoral fellows, and regional courses such as the Biology of Disease Vectors. and oviposition site and mating for reproduction.

5.1.4 Animal Health

Animal Health brings together *icipe*'s leading expertise in vector ecology, veterinary entomology, molecular biology, and livestock-focused vector-pathogen surveillance. Supported by world-class infrastructure—including arthropod rearing facilities, Biosafety Level-2 laboratories, and analytical chemistry platforms—*icipe* has pioneered innovative biopesticides, behaviour-modifying attractants, repellents, and vector traps for use against ticks, tsetse, and biting flies. Molecular platforms support cost-effective tools for blood meal analysis, microbial profiling, pathogen detection, and population genetics, enabling advanced understanding of emerging tick-borne diseases and vector adaptation to climate stress. *icipe*'s unique capacity to sustain long-term vector colonies underpins robust, field-relevant validation of repellents, symbiont-targeted approaches, and integrated endectocide deployment. *icipe's* work and advancements in Animal Health are underpinned by rigorous empirical research and partnerships with government laboratories and agencies and regional authorities.



Diverse rumen gut microbes regulating methane production and emission, captured using a Scanning Electron Microscope (SEM) at icipe.

5.2 integrated platforms for delivery of *icipe* science and innovations

icipe R4D and related activities are supported through integrated platforms, which include capacity building, bioscience laboratory facilities, data and analytics and stakeholder and policy engagement. These integrated platforms are staffed with highly skilled and experienced scientists, who not only provide cross cutting services, but also conduct insect science and related research and develop insect-based knowledge and products in support of the impact domains, and other areas of *icipe's* scientific work. These platforms are briefly mentioned below:

5.2.1 Integrated capacity building platform

The integrated capacity building platform strengthens scientific capacity in Africa through comprehensive training, mentorship and institutional development programs that create a sustainable ecosystem for research excellence and innovation in insect-related sciences, engineering and technology. Key functions of this platform include science leadership, research capacity, institutional development and academic partnerships.

5.2.2 Integrated biosciences platform

The integrated biosciences platform is focused on a multidisciplinary approach to sustainable pest management options, insect biodiversity conservation, rapid pest and disease detection, vector-borne diseases management, insect-host interactions, and food safety. It has state of the art scientific instrumentation, insectaries, laboratories. The platform contributes to discovery, development and commercialisation of *icipe's* technologies through arthropod pathology, behavioural and chemical ecology, molecular biology and bioinformatics, and animal rearing and containment.

5.2.3 Integrated data and analytics platform

The integrated data and analytics platform positions *icipe* as a leader in insect-related databases, digital research and tools, and delivery of timely, data-driven decision-making and inclusive solutions. Using analytics and modelling techniques, including artificial intelligence (AI), remote sensing and Geographic Information Systems, the platform generates foresight and impact evidence, builds decision-support systems, and embeds gender and social inclusion across all *icipe*'s research for development work.

5.2.4 Integrated policy and stakeholder engagement

The integrated policy and stakeholder engagement platform enables *icipe* to leverage its expertise in insect science research and foster impactful cross-sectoral partnerships for evidence-based policy making. Regional and continental development frameworks like CAADP, STISA, and the African Continental Free Trade Agreement offer opportunities to engage in the policy making process relevant to scaling insect science research and innovation in the continent and beyond. Young scholars at *icipe* and in the region learn policy research and writing skills to translate scientific outputs into policy.

Samantha Karanu, a research assistant at icipe, performing nucleic acid extraction.

Box 5: A demand driven approach to impact delivery

icipe will unlock insect based innovations by accelerating the translation of its scientific excellence into tangible, sustainable impacts across Africa using demand-driven approaches, such as the technology Readiness Level (TRL), innovation readiness and innovation use frameworks. These frameworks will provide a structured pathway for evaluating technological maturity, prioritising investments and enhancing partnerships. Strategic actions for impact delivery shall include:

- Implementing an innovation audit.
- Establishing dedicated funding mechanisms.
- Strengthening innovation incubation programs.
- Fostering strategic partnerships.
- Implementing vertical and horizontal scaling strategies.
- Developing comprehensive risk assessment protocols.
- Establishing clear metrices and key performance indicators (KPIs).
- Enhancing business planning and market analysis.
- Strengthening engagement with end-users

Weevil Wasps, Cerceris sp. (Carbronidae: Hymenoptera) and interesting predator of adult weevils.

Location: Makindu, Kenya

06

ENABLERS FOR IMPACT DELIVERY

6.1 Strategic Partnerships

Realising *icipe*'s vision of impactful insect science requires strategic, multi-faceted partnerships across the research-to-impact continuum. *icipe* will foster collaborative relationships with a diverse range of stakeholders, including academia, research institutions, donors, private sector, non-governmental and civil society organisations, development partners, farmer organisations, governments, and regional economic bodies. These partnerships will be built on mutual trust and accountability, and using the following key partnership strategies:

a. Innovation Co-Creation and Contextualisation

Recognising that technology dissemination is not a linear process, *icipe* will prioritise participatory approaches to innovation development and adaptation. This involves engaging with communities to understand their needs, constraints, and indigenous knowledge systems, especially by:

- Jointly identifying production constraints and co-developing solutions with communities.
- Adapting innovations to local biophysical and socio-economic conditions.
- Collaborating with national agricultural research systems actors, community-based organisations, and farmer cooperatives to ensure effective dissemination and uptake of technologies.
- Partnering with humanitarian organisations to provide insect based technological solutions in conflict-affected and disaster-prone areas.

b. Skills for Insect Businesses

icipe will capitalise on the burgeoning opportunities in the insect-based economy by fostering entrepreneurship, particularly among youth. This involves building capacity in insect-related business skills and providing access to resources and networks by:

- Developing training programs tailored to the needs of aspiring insect entrepreneurs.
- Focusing on empowering youth to unlock their potential and drive innovation in the sector.
- Collaborating with business incubators and accelerators, financial institutions, and other organisations to support insect-based enterprises.

c. Strategic Alignment with Vision 2030

icipe's partnership strategy will be aligned with the goals of its Vision and Strategy 2026 - 2030. This alignment will include:

- Forging partnerships that support *icipe*'s research themes and impact pathways.
- Building strong relationships with donors and aligning partnership expectations.
- Strengthening links with government ministries, departments and agencies to facilitate use of *icipe's* scientific outputs in decision making.

- Leveraging partnerships to mobilise resources for research and development.

d. Royalty to Loyalty

icipe's successful pipeline of nature-based solutions, such as biopesticides, IPM tools, and insect-derived products, necessitates strong private sector engagement for large-scale production and distribution. *icipe* will build a "loyalty" partnership framework, which fosters deeper, mutually beneficial relationships to complement the traditional model where private companies pay royalties on licensed products. This loyalty framework will involve:

- Building win-win partnerships based on trust and shared value.
- Providing private sector partners with access to *icipe*'s technologies, technical backstopping, and know-how.
- Leveraging private sector expertise in market intelligence and co-developing commercially viable technologies.
- Offering time-based or geography-based exclusivity on a case-by-case basis to incentivise investment and ensure sustained impact.
- Ensuring uninterrupted research and a continuous supply of market-responsive technological solutions.

e. Monitoring and Evaluation of Partnerships

icipe will establish a robust monitoring and evaluation framework to track the progress and impact of its partnerships. This will ensure that partnerships are effective and contribute to the achievement of *icipe*'s goals by:

- Developing clear performance indicators to measure partnership outcomes.
- Conducting regular reviews of partnership activities and making necessary adjustments.
- Sharing lessons learned and best practices with partners.

6.2 Human Capital Development

Human capital development remains a cornerstone of global scientific and technological progress, particularly in emerging economies with rapidly evolving innovation ecosystems. Capacity development acts as a transformative catalyst, addressing systemic challenges, bridging knowledge gaps, fostering institutional resilience and providing incentives that attract and retain a scientifically skilled and innovative workforce. *icipe* will continue to develop capacity of and mentor students, staff, and partners with scientific and leadership skills that enables them to conduct cutting edge research as well as scale innovative insect-based solutions. Some of the critical areas will include:

- Developing the next generation of science leaders through targeted training, mentorship, and career development programs.
- Developing capacity of African research institutions to conduct high-quality research and innovation.
- Providing training in interdisciplinary fields such as insect science, climate change, and sustainable agriculture.
- Facilitating technology transfer, knowledge exchange and mutual learning and cooperation.
- Establishing structured mentorship programs to support the development of young scientists.
- Equipping researchers with the skills to effectively use digital tools and data analysis, including AI.
- Training researchers to communicate their findings effectively and engage with policymakers.
- Fostering an entrepreneurial mindset and supporting the development of innovative solutions.

Box 6: ARPPIS and DRIP

icipe has two postgraduate training programmes namely, the African Regional Postgraduate Programme in Insect Science (ARPPIS) and the Dissertation Research Internship Programme (DRIP). These programmes nurture young, talented scientists for regional leadership roles and internationally competitive research careers in insect and related sciences, who can establish themselves in academia, research, government or industry in Africa and globally. It also upgrades the qualifications of staff members and curricula of universities and research organisations to meet Africa and global demand for doctoral-level researchers in insect sciences and related arthropods. The ARPPIS provides fully funded doctoral fellowships to outstanding scientists from sub-Saharan Africa and helps improve access to scientific information and publications. DRIP, on the other hand, accepts PhD and master's students from all over the world for placement or internship at *icipe* to undertake part or all their research studies. Postgraduate training at *icipe* provides not only technical skills in specific research areas, but also broader development of academic and professional skills, including research ethics and compliance, science paper writing, grant proposal writing, communications, and research leadership. *icipe* encourages scientists to build networks through collaborative research and participation in international scientific conferences. *icipe*'s partners in postgraduate training are global, and since 1983, they have included, but not limited to, 69 universities in 20 African countries, and 58 universities from 17 other countries around the world. *icipe* will continue with its ARPPIS and DRIP training programmes and aim to maintain optimal numbers of up to 200 postgraduate students on campus at any given time, in tandem with the capacity available at the Centre. *icipe* will also maintain modern research infrastructure in insect sciences, including well-equipped laboratories, highly qualified supervisors and mentors, and state of the art library facilities. Students will be exposed to newer techniques including digital tools like AI and its use in food systems, global health, environment and biodiversity, policy, and climate research. At the core of *icipe*'s training will be a commitment to promote women's participation and leadership in science and strive to achieve a 50:50 gender parity in its postgraduate programmes. Further, *icipe* will continue its effort to ensure that more than 75% of all *icipe* alumni remain in research, development, and higher education in Africa.

Box 7: PASET RSIF

The Regional Scholarship and Innovation Fund (RSIF) is a flagship initiative of the Partnership for Skills in Applied Sciences, Engineering and Technology (PASET). PASET was launched in 2013, with support from the World Bank, and by 2025, it comprised of 11 countries namely, Benin, Burkina Faso, Cote d'Ivoire, Ethiopia, Ghana, Kenya, Nigeria, Mozambique, Rwanda, Senegal and Tanzania. These countries, except Ethiopia and Tanzania, contributed between US$2 and US$6 million towards PhD training of scholars. RSIF is managed by *icipe*, serving as the Regional Coordination Unit on behalf of PASET since August 2018. RSIF's development objective is to strengthen the institutional capacity for quality doctoral training, research, and innovation in transformative technologies in Sub-Saharan Africa. Fifteen (15) African Host Universities (AHUs) host RSIF-sponsored PhD scholars in designated PhD programmes in the thematic areas of (a) data science and artificial intelligence, (b) food security and agribusiness, (c) energy including renewables, (d) mining, minerals and materials science and (e) climate change. There are also 32 international partner institutes (IPIs) with formal agreements with PASET, where RSIF scholars go for their sandwich placements. A total 302 PhD scholars were enrolled into the RSIF PhD programmes in 6 cohorts between 2018 and 2025. *icipe* will, with the mandate from PASET, continue managing the RSIF. In partnership with PASET, *icipe* will support the realisation of PASET's goal of awarding 640 PhD scholarships by 2033 in applied sciences, engineering and technology.

Box 8: BioInnovate Africa

BioInnovate Africa is a regional science and innovation collaboration initiative that has supported more than 200 universities, research organisations and private sector companies in East Africa since it was established in 2010 with support from the Swedish International Development Cooperation Agency (Sida). BioInnovate Africa was first hosted at the International Livestock Research Institute in Nairobi, Kenya. Sida transferred management of BioInnovate Africa to *icipe* in October 2016. Through innovation grants and technical assistance, BioInnovate Africa builds innovation capacity of scientists and organisations (predominantly in the East African countries of Burundi, DR Congo, Ethiopia, Kenya, Rwanda, South Sudan, Tanzania and Uganda). It translates biologically based ideas, technologies and inventions into practical uses in society using appropriate business models, thereby fostering a sustainable bioeconomy in the region. BioInnovate Africa's thematic focus areas are (a) value addition to agro-produce and other biological materials, which includes developing new food/feed production and processing methods (promoting circular food systems), biorefineries and industrial green chemicals, bio packaging materials and biological fuels, other consumer goods including fashion and textiles, beauty and care; (b) biological waste conversion involving turning agro/biowaste and other feedstock into useful renewable products including product recovery from solid waste, using insects as biowaste converters, watershed preservation, and wastewater treatment and reuse and bioenergy production; and (c) biologically based healthcare product development including bioprospecting, use of indigenous knowledge and manufacture of biopharmaceuticals and diagnostics for key diseases affecting the region. *icipe*, in cooperation with Sida, will continue managing BioInnovate Africa initiative, with the goal of deepening its presence in East Africa, while extending its experiences to a similar or new initiative in other regions of Africa.

6.3 Strategic Communication

Effective communication will be key to positioning *icipe* as a leader in insect science and achieving the objectives of the Vision and Strategy 2026-2030. *icipe* will use communication to articulate regional and global policy issues, foster insect science and innovation, empower women, and drive societal transformation through evidence-based solutions. A key focus will be ensuring that *icipe* staff, students, partners, and collaborators fully understand and appreciate the Centre's value proposition, core values, vision, mission, context, objectives, and implementation processes. This internal alignment is crucial for effective external communication and impact. *icipe's* communication will promote science diplomacy through advocacy and thought leadership, positioning insect science as a critical component of sustainable development. *icipe* will also leverage communication to rally action for using science in addressing development challenges, resource mobilise, enhance credibility and legitimacy, expand reach, and engage new stakeholders and audiences. Ultimately, *icipe* aims to enhance visibility, raise awareness, and foster a deeper understanding of its role in development.

The main communication thrusts, grounded in a comprehensive communications strategy, will include:

a. Strategic Brand Repositioning and Reputation Management

icipe will be strategically reposition its brand as an innovative leader in insect science for sustainable development, building upon the trust and connection established with stakeholders. This repositioning will involve clearly articulating *icipe*'s unique value proposition and its role in the "marketplace" of development solutions. The improved brand identity will resonate with the evolving needs and expectations of stakeholders and will be reflected in key visual elements, messaging, and digital platforms, including the website. Proactive reputation management will be essential to ensure *icipe*'s continued credibility and influence.

b. Building a Collaborative Communication Ecosystem

icipe will foster a cohesive internal communication environment, empowering researchers and staff to effectively communicate their work. *icipe* will establish strategic partnerships with media outlets, communication consultants, and communicators from donor and like-minded institutions to facilitate co-creation and co-communication, optimising resources and reach. *icipe* will establish a Science Communication Community of Practice to share best practices, build capacity, and ensure consistent messaging.

c. Evidence-Based Engagement and Strategic Outreach

icipe will utilise evidence-based communication strategies to increase awareness, stimulate discourse and dialogue, influence decision-making, and engage stakeholders. Tactics will include targeted events, media campaigns, policy briefs, and digital engagement strategies, all informed by data and stakeholder insights.

d. Innovative and Impactful Communication Approaches

icipe will adopt innovative storytelling tools and digital platforms to share, translate, and communicate information in compelling and cost-effective ways. *icipe* will strengthen its capacity to synthesise, translate, and package information into strategic narratives, leveraging inclusive storytelling tools such as graphics, audio and video podcasts, blogs, in-depth interviews, and human-interest stories. Digital platforms will be used to enhance reach and engagement, including social media, interactive websites, and virtual events.

e. Integrating Gender-Sensitive and Inclusive Communication

icipe will develop communication strategies that are gender-sensitive and inclusive, ensuring that messages and platforms are accessible and relevant to diverse audiences. *icipe* will utilise gender-disaggregated data to inform communication strategies and evaluate their impact on different groups. Inclusive language and imagery will be prioritised to promote gender equity and representation.

f. Crisis Communication Preparedness

icipe will develop a robust crisis communication plan to address potential risks and challenges, ensuring timely and effective communication during critical situations.

6.4 Gender Integration

Gender equity is fundamental to achieving sustainable development and inclusive growth. *icipe* recognises that women, youth, and marginalised groups often face systemic barriers, including limited access to resources, technologies, and decision-making opportunities. Addressing these barriers is essential to ensuring equitable participation and leaving no one behind in all aspects of *icipe*'s work. Gender integration will be done through the following actions:

a. Intersectional Approaches

Aligned with global frameworks such as the Sustainable Development Goals (SDG 5: Gender Equality), *icipe* will integrate gender-responsive and intersectional approaches into its research, innovation, and scaling efforts. Recognising overlapping disadvantages based on gender, age, socio-economic status, disability, and location, *icipe* will ensure its strategies promote equity across diverse groups.

b. Data-Driven Context-Specific Solutions

icipe will prioritise the collection and analysis of gender-disaggregated data to design tailored, localised solutions for women, youth, and men. Practical approaches, such as providing childcare during training, will ensure equal opportunities for women with caregiving responsibilities. By making insect-based solutions affordable, accessible, and trusted, *icipe* will empower communities to adopt inclusive and resilient practices.

c. Collaborative Initiatives

In partnership with governments, NGOs, and private sector actors, *icipe* will foster gender-responsive and intersectional collaborations to ensure all stakeholders—particularly those from intersecting marginalised identities—are equitably engaged and benefit from its insect-based solutions. Capacity development programs for staff and partners will focus on gender and the application of gender tools with an intersectional lens, with a specific emphasis on empowering women, youth, and marginalised groups. These programs will aim to enhance their technical skills, leadership capacities, and decision-making roles.

d. Monitoring, Evaluation, and Learning for Gender Equity

To capture results, the Monitoring, Evaluation, and Learning Framework will integrate gender-specific indicators. These indicators will monitor gender-related outcomes, such as increased adoption of innovations, improved job creation, enhanced livelihoods for women, and equitable access to resources. Insights from the data collected will inform policies and programme adjustments, ensuring continuous improvement.

6.5 Strategic Human Resources

Recognising human resources (HR) as a strategic asset that underpins economic growth, resilience, and organisational agility, *icipe* will leverage a progressive approach to human capital and organisational development. By fostering a culture of learning, inclusivity, resilience, and technology integration, *icipe* will manage change as a natural extension of its strategic growth. This approach will ensure that change is embraced as an opportunity for improvement and alignment with *icipe*'s vision, mission, and core values.

a. Restructuring for Impact

Through forward-looking HR practices, *icipe* will attract top talent, respond effectively to emerging environmental challenges, and secure critical funding and partnerships. Ultimately, these HR advances will amplify *icipe*'s research impact, strengthen its leadership position, and ensure it continues to fulfil its mission in a sustainable, inclusive, and resilient way. *icipe* will handle change management and organizational development in a manner that enhances organisational resilience, agility, and innovation at the workplace. The HR functions will include protocol services, talent management and development, employee compensation, benefits, relations and fostering an organisational culture that enhances trust and promotes proactive change management.

For this reason, *icipe* has adopted a new re-structured organogram (Figure 2) to enhance delivery and effectiveness in the implementation of its vision and strategy for the period 2026-2030.

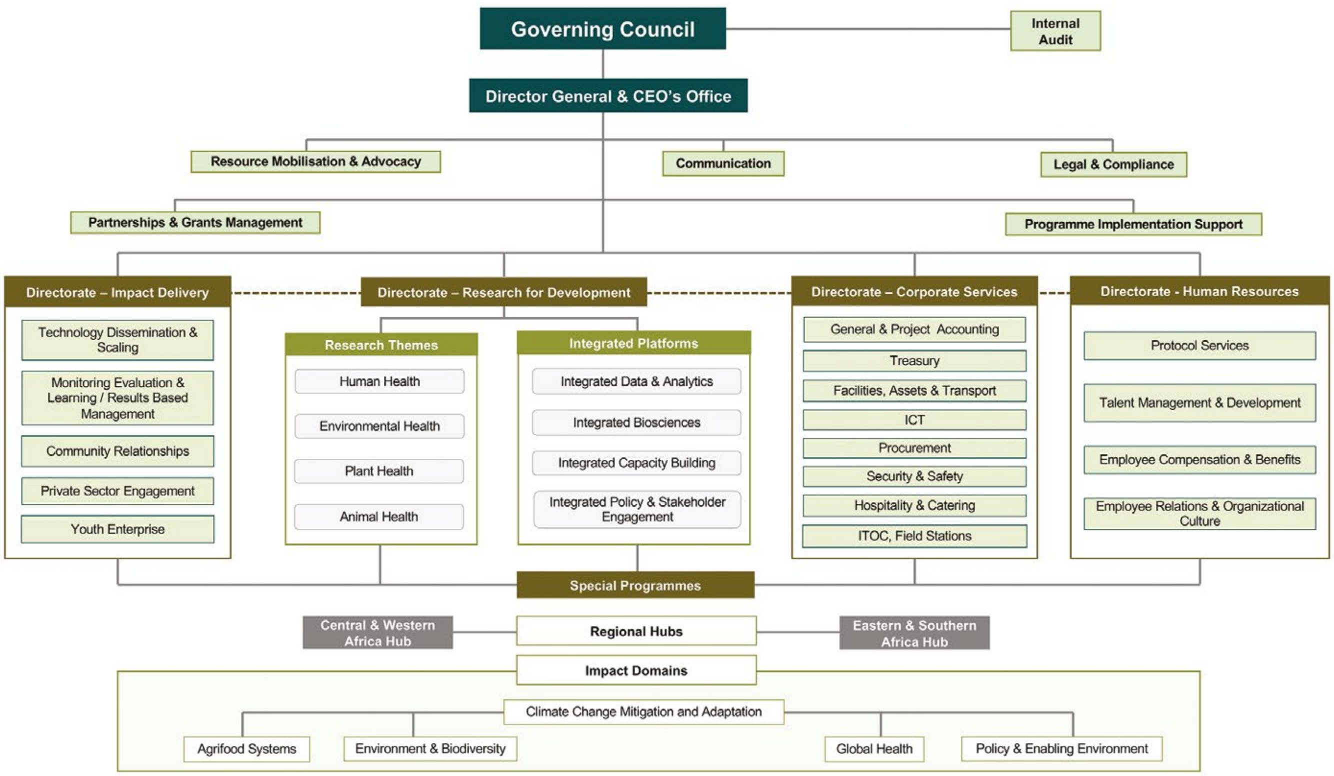


Figure 2. icipe Organogram

The rationale for the new organogram is explained below:

i. **Enhanced Focus on Impact Delivery:** The creation of a dedicated "Directorate of Impact Delivery" is *icipe*'s commitment to respond to global challenges by generating global public goods, while delivering local solutions for impact, hence balancing basic research and applied and development aspects that advance food systems transformation, global health, environment and biodiversity conservation. Thus, the Directorate shall oversee outreach and partnerships, ensuring that *icipe*'s innovative solutions reach their intended beneficiaries effectively. The Directorate shall be responsible for technology dissemination and scaling, with focus on youth engagement and enterprise development for job creation, community relationships and private sector engagement for societal impact.

ii. **Strengthened Research for Development:** This falls within the "Directorate of Research for Development", which encompasses the research for development themes and integrated platforms. The R4D themes are Plant, Human, Animal, and Environment Health. They are the structural mechanism for delivering on the impact domains. The integrated platforms, on the other hand include Data and Analytics, Biosciences, Capacity Building and Stakeholder and Policy Engagement, which provide cross cutting support for research and related services.

iii. **Integrated Support Functions:** The "Directorate of Corporate Services" consolidates essential support functions like finance, information technology and facilities. This streamlines operations and allows research and impact delivery teams to focus on their core mandates. Human Resources will be managed under the "Directorate of Human Resources" working closely with the Directorate of Corporate Services.

iv. **Resource Mobilization and Advocacy:** This component highlights the importance of securing funding and advocating for policies that support *icipe*'s mission.

v. **Geographical Hubs:** *icipe* decentralisation through "Central and Western Africa Hub" and "Eastern and Southern Africa Hub" will enable the Centre to tailor its interventions to the specific needs of different regions.

b. Restructuring to Enhance Impact Delivery and Efficiency

i. The new structure facilitates better coordination between research, impact delivery, and support functions.

ii. Dedicated directorates and thematic programs allow for a sharper focus on core activities.

iii. Consolidation of support functions improves efficiency and reduces administrative burden.

iv. The emphasis on data and analytics enables evidence-based decision-making and improved programme design.

v. The decentralised hub structure allows *icipe* to be more responsive to the specific needs of different regions.

vi. The emphasis on partnerships within the Directorate of Impact Delivery helps to ensure that *icipe's* work is relevant and impactful.

6.6 Resource Mobilisation and Accountability

With a proven record of accomplishment in managing large, multi-year grants and fostering strong relationships with international funding institutions and philanthropic foundations, *icipe* effectively delivers innovative research and solutions. Additionally, revenue from prudent asset management and strategic partnerships have further contributed to *icipe's* ability to deliver on its mission. Resource mobilisation and accountability (RMA) efforts will be enhanced, guided by:

- Maximising impact through targeted investments in human capital, institutional capacity, knowledge sharing, and infrastructure modernisation.
- Securing and diversifying funding sources, ensuring effective financial and human resource management, cost-effective operations, and long-term financial planning.
- Establishing a dedicated RMA office and function as a core activity at *icipe*.
- Developing a strategy to guide RMA initiatives, aiming to raise revenue and ensure sustainable resource availability, detailing how, where, and when to mobilise resources.

6.7 Monitoring, Evaluation, and Learning

icipe's approach to Monitoring, Evaluation, and Learning (MEL) is fundamental to ensuring *icipe's* scientific endeavours not only achieve excellence but also translate into tangible impacts. *icipe* will embed a robust MEL framework within *icipe*'s working environment and culture, ensuring accountability, fostering a culture of continuous improvement, and driving transformative progress in alignment with the Vision and Strategy 2026-2030. The MEL Framework will serve as a results-oriented tool to track progress toward strategic targets. It promotes accountability, transparency, and adaptive learning, ensuring effective resource utilisation and programme delivery across agrifood systems, global health, environment and biodiversity, and policy and enabling environment domains. Specific aspects of the MEL framework will include:

a. Driving Policy and Stakeholder Engagement with Advanced Technologies

icipe will use MEL to drive policy engagement by producing actionable, evidence-based insights that shape policies in agrifood systems, health, and biodiversity. It will also strengthen stakeholder engagement by presenting measurable progress to donors, partners, and beneficiaries. Leveraging advanced technologies such as integrated big data management systems and AI-driven real-time dashboards, the framework will enable real-time tracking of programme implementation, resource allocation, performance metrics, and achievement of key milestones.

b. Inclusivity, Gender Responsiveness, and Complexity Acceptance

icipe will ensure that inclusivity remains a core pillar of MEL framework, incorporating gender-responsive and equity-focused metrices to ensure that benefits reach diverse stakeholders, including women, youth, and vulnerable groups. By collecting gender-disaggregated qualitative and quantitative data, *icipe* will evaluate the gendered impacts of its interventions and derive valuable lessons to inform future strategies. While performance measurement of progress toward achievement of expected results remains the core of MEL frameworks, complexity acceptance and systems thinking are of greater value than ever. Therefore, the MEL principles embraced by *icipe* are consistent with established good-practice and will help to support project and programme effectiveness.

c. MEL in *icipe*'s Working Environment and Culture

icipe recognises that effective MEL is more than just tracking outputs; but about fostering a culture of learning and adaptation. To this end, *icipe* will implement a participatory MEL approach, engaging staff, partners, and beneficiaries in the process to ensure that diverse perspectives are captured in evaluations. The MEL framework will be designed to not only measure outcomes but also understand the processes that led to those outcomes. This will involve utilising a mix of quantitative and qualitative methods to capture the complexity of *icipe*'s work and the contexts in which *icipe* operate. *icipe* will build capacity of its staff and partners in MEL, ensuring that these practices are embedded across all levels of the organisation.

d. Utilisation of Evaluation Findings and Innovation in MEL

To ensure that evaluation is not an end, *icipe* will establish mechanisms for the active use of evaluation findings. This includes feedback loops at the project and programme levels, as well as organisational learning processes that inform strategic decision-making. *icipe* will also invest in knowledge management systems to capture and disseminate lessons learned, ensuring that our evaluations contribute to the broader knowledge base. Furthermore, recognising the evolving landscape of international development, *icipe* will remain agile and adaptive in its MEL practices.

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Falls Acraea, Telchinia acerata (Nymphalidae: Lepidoptera) - a pest of sweet potato.

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