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RECENTLY
FUNDED

icipe BY NUMBERS

89

Peer reviewed journal articles published
between 1 July and 15 December 2022

1,262

mentions of *icipe* in social and traditional
media between
1 July and 15 December 2022

10

new partners of
BioInnovate Africa Programme

80,224

bee colonies being reared by
MOYESH project partners

9

African governments
investing in RSIF



Prof. Kym Anderson
Chair, *icipe* Governing Council

Dear Friends and Colleagues,

Welcome to this bountiful *icipe* newsletter, which covers the period from July to December 2022, a prolific time for our Centre.

In particular, we are pleased to welcome the Australian Centre for International Agricultural Research (ACIAR), as a new core funder of *icipe*. This support builds on ACIAR's long-standing project-based investments in *icipe*, especially in the promotion of edible insects as a way of enhancing food and nutrition security, employment and income for smallholder farmers and entrepreneurs. For research and development institutions like *icipe*, core funds are critical. They safeguard resilience and capacity for innovation, for example, by enabling long-term, visionary planning; infrastructural upgrades; staff capacity strengthening; operations in the communication, finance and research management docket; and exploratory research. Indeed, without core funds it would be difficult for research and development institutions to effectively undertake their main business.

In addition, as detailed in the Recently Funded section, over the past six months, numerous partners have committed project funding to *icipe*. See the Research Highlights section, which spotlights some of our projects and programmes accomplishments; and the Selected Recently Published section, which illustrates our world-class scientific knowledge. Both demonstrate why *icipe*, and indeed insect science, are worthwhile investments.

icipe continues to evolve as a crucial scientific institution. Against the rising global importance of data, the Director General's Thought Leadership column reflects on how the Centre has emerged as a data science hub in Africa. *icipe* has aligned its scientific data infrastructure and practice to universal standards, strengthened the capacity of its teams and partners, and developed a research niche in next-generation decision making tools, models, analytics and approaches.

Meanwhile, the BioInnovate Africa Programme (<https://bioinnovate-africa.org>), supported by the Swedish International Development Cooperation Agency (Sida), and managed by *icipe* since 2016, has announced ten new grants for bio-based innovations. They will improve food production and food safety, boost human and animal health, reduce postharvest losses, and create biodegradable packaging materials.

Our efforts to nurture African scientific talent for research and innovation are summed up in the sections on Capacity Building and Institutional Development and on the Regional Scholarship and Innovation Fund (<https://www.rsif-paset.org/>).

It is our hope that you will find these, and many other stories presented in this newsletter, interesting, informative and inspiring.

We thank you for your partnership in 2022, and wish you happy holidays and a prosperous 2023.



Dr Segenet Kelemu
Director General, *icipe*

icipe EMERGING AS A DATA SCIENCE HUB



Just like oil, raw data is only valuable when properly refined; it must be synthesised into information to make discoveries and to enable decisions that have real-world applications for the benefit of society.

Data is the new oil. So goes the new global refrain. The rationale is that just like crude oil fuelled previous industrial revolutions, data is powering the fourth industrial revolution, which fuses advances in artificial intelligence, machine learning, robotics, the internet of things, genetic engineering and quantum computing, among others.

Defined as figures, text, numbers, images or audio content, data is generated through experiments or surveys. There are two main types of data. The first is structured data that typically comprises quantitative data, which is highly organised and easily decipherable by machine learning algorithms. The second category is unstructured

(or noisy) data, which consists of datasets (mostly large collections of files) that do not have pre-defined models and cannot be understood and interpreted correctly by machines.

Over the past two or so decades, data has become one of the world's most valuable resources. This is due to digitisation of many mechanisms of day-to-day life; the vision to automate processes, environments and activities, and thus the central role of machines and the need to train them; as well as improved communication channels. In tandem to the accelerated need for data are advancements in tools to assemble data, increased data sources and diversification of data collection processes.

THE RISE OF DATA SCIENCE

The emergence of big data, that is large volumes that have a variety of data types and are streamed with high velocity; the increasing cost of gathering data; the need to gather data rapidly, comprehensively, affordably and accurately, and to make connections among various data, has spiralled the field of data science. This discipline uses scientific methods, processes, algorithms and systems to extract or extrapolate knowledge

and insights from structured and unstructured data, to uncover insights for decision making and strategic planning. Data science employs techniques and theories from the fields of statistics, analytics, informatics, mathematics, computer science, and domain knowledge to understand and analyse the actual phenomena within data.

DATA SCIENCE AT *icipe*

Overview of the *icipe* DMMG Unit

- 53 team members including: 9 scientists; 12 research officers; 12 PhD students; 5 MSc students; one consultant and 14 interns.
- The team represents 13 countries from Africa and beyond.
- 53 percent of the team members are women.
- Between 2020 and 2022, the Unit has published 102 peer-reviewed journal papers.

Data is one of the main pillars of research. Therefore, it is imperative for research institutions to have a plan on how data are collected, analysed, organised, standardised, stored, published and shared, while adhering to ethics to uphold the FAIR (findable, accessible, interoperable and reusable) principles. The connections among these entities and their workflow are termed as data management.

In 2019, *icipe* established the Data Management, Modelling and Geo-Information (DMMG) Unit, which has a four-fold mandate. First, the Unit is responsible for the establishment and enhancement of the Centre's data management and data sharing workflow. This includes setting up the relevant policies, rules and governance

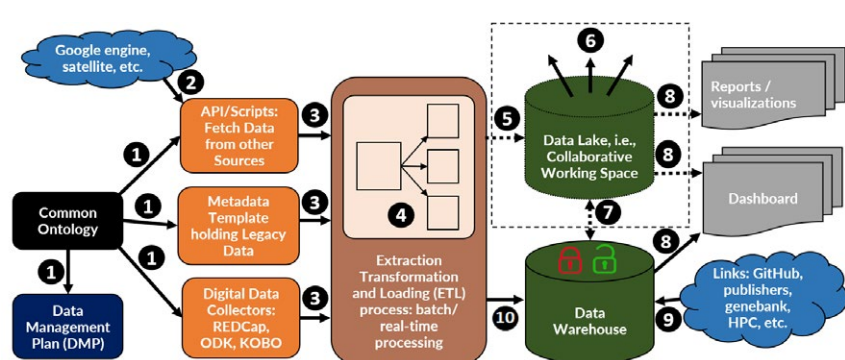
mechanisms in compliance with international standards. Second, the DMMG Unit strengthens the analytical skills of *icipe* teams and partners. Third, the Unit is mandated to develop a research niche to conceptualise and establish next generation decision-making tools, models, analytics and approaches for the management of crop pests and disease vectors, and the sustainable use and conservation of beneficial insects. Four, the DMMG Unit supports *icipe*'s 'One Health' vision and resource mobilisation goals. This is by reinforcing the alignment of the institution's scientific data infrastructure and practice to universal standards such as the FAIR principles of data management, while also showcasing elements of open data, open science and reproducible science.

DATA MANAGEMENT

A key achievement of the DMMG Unit is the establishment of the *icipe* Data Research Management and Archiving Policy. Aligned to the policy is the Centre's data infrastructure, which has several interconnected components, namely, common ontology, legacy data, data

management plan, digital data collection tools, the data warehouse, and a software version data management tool (GitHub). Google analytics accessibility metrics of the *icipe* information systems show that the Centre's data is accessed globally, at a fast rising rate. [Paper link](#)

The *icipe* data management workflow



Key:

1. Common ontology annotated to variables in the DMP, new data from collectors, legacy data, and data from cloud systems
2. Fetch readily available data from other sources e.g. Google engine, satellite, etc.
3. Load raw data to memory for further cleaning
4. Extraction transformation and loading (ETL) processes: cleaning, profiling, and annotation; batch/real-time
5. Load clean and annotated raw data to the data lake for analysis and visualisation [work in progress]
6. Build data analysis pipelines e.g. modeling and machine learning etc. [work in progress]
7. Execute APIs to archive meta-data, dictionary, protocols, experiment plan, raw data, and clean data [work in progress]
8. Execute APIs to summarise data and provide reports/visualisation/dashboards [work in progress]
9. Data resources in the data warehouse updated with links to external data sources
10. Load clean and annotated raw data to the data warehouse for visualisation and archiving

EXAMPLES OF *icipe* DATA SCIENCE RESEARCH

Locust surveillance and monitoring

From late 2019, several eastern African countries were devastated by catastrophic desert locust swarms. *icipe* and partners including the Food and Agriculture Organization of the United Nations (FAO) and the Desert Locust Control Organization for Eastern Africa (DLCO-EA), analysed 40 years of long-term monitoring data and applied machine learning algorithms to identify locust swarms breeding sites in the region using key bioclimatic and edaphic factors. The Centre also developed a model to predict desert locust breeding grounds in the Sahel-Maghreb region, and one to assess the damage caused by the insects in Kenya.

Upon request and support from the FAO Commission for Controlling the Desert Locust in the Central and Western, *icipe* is rolling out decision support tools to assess site-specific risk of desert locusts breeding and to predict their migratory patterns and intensity. The Centre is also helping to improve monitoring systems, determine the socio-economic impact of desert locust invasions, and build the capacity of national partners to apply the decision support tools.

Bees, pollinators and pests

icipe researchers have used long-term climate data and time-series remote sensing and vegetation variables to explain the role of landscape structure and

fragmentation on the integrity of honey bee colonies. Further, we have developed the first ever predictive ecological niche model for stingless bees in Kenya. By testing and applying cross-cutting geospatial tools and techniques, we have created innovative methodologies to understand cropping patterns, farming systems and their impact on avocado pests; as well as pollinators and their pests.

Coupling climate change and insect pest induced impacts

Often, research on insect-mediated crop losses is disconnected from models predicting changes in crop yield due to climate change. And yet, as climate changes, it is important to establish the relationships among insect metabolism, physiology, life history traits, demography; and environmental variables like temperature and carbon dioxide concentration in the atmosphere. *icipe* has developed a novel methodological framework to couple crop and insect pest models. Using the model, we have produced worldwide maps of the temperature- and carbon dioxide-dependent damage in maize, combined with yield losses due to insect pests, under several climate change scenarios.

Crop pests and natural enemies

icipe has applied geospatial and remote sensing models at global, regional and local scales, under diverse climate

scenarios, to explain the distribution and dynamics of various insect pests such as the fall armyworm, maize stemborers, invasive fruit flies and mealybugs and their natural enemies; as well as the parasitic *Striga* weed.

Push-pull technology resilience

In collaboration with Cornell University, USA, *icipe* has established the resilience of ecological agriculture against pest adaptation. Using the *icipe* push-pull technology as a model, we collected long term data from push-pull and non-push-pull fields in western Kenya, covering 34 cropping seasons (2005 – 2016). Our analysis shows that more than 20 years since the technology was first introduced, stemborers and the parasitic *Striga* weed have not adapted to overcome its effectiveness. In fact, the robustness of the push-pull technology has improved due to emerging properties within it.

Plants-nematodes interaction

We used bioinformatics analytical algorithms to analyse next-generation sequence data of root-knot nematodes. The study established the essential genes responsible for the growth and development of the nematodes and their ability to evade the immunity of their host crops. Our findings open up opportunities to incorporate artificial intelligence and computational biology in nematological research.

Malaria transmission blocking symbiont

In 2020, *icipe* and partners made the groundbreaking discovery of a microbe (*Microsporidia MB*), in malaria-transmitting mosquitoes, which is capable of blocking transmission of the disease's parasites from the insects to people. As part of our studies to enable the use *Microsporidia MB* as a malaria control tool, we aim to investigate, model and predict the factors that can influence its levels under field conditions; and to provide foresight for malaria disease incidence. We are using an integrated system dynamics simulation model to explain the interactions among people, the malaria vectors and parasites, the environment; and implications for malaria transmission; and an individual based modelling system to predict the changes in malaria characteristics after interventions using *Microsporidia MB*.

Disease modelling

Kenya is one of the several African countries that continue to experience outbreaks of dengue fever, a neglected tropical disease whose virus is mainly transmitted by *Aedes aegypti* mosquitoes. To support the country's goal of targeted preventive and control measures, we have modelled areas that are at dengue risk in Kenya. We predict that the coastline of Kenya will dominate in dengue fever outbreaks. Thus, our recommendation is to intensify efforts on vector control in the region. These findings require ground truthing through longitudinal data to monitor parameters like climate and vector distribution patterns.

Tsetse control

Through studies conducted in Shimba Hills National Reserve, Kenya, between 2017 and 2019, we used a species distribution model linked with satellite-derived data to predict potential breeding and foraging grounds of the *Glossina pallidipes* tsetse fly species, the vector of African animal trypanosomosis. This knowledge will guide the design and deployment of cost-effective, large-scale tsetse control tools.

Insects genomics

icipe is using machine learning and infrastructure to manage and derive value from the massive amounts of molecular data generated at the Centre. Our infrastructure includes a High-Performance Computing (HPC) cluster, cloud computing solutions and support analysis pipelines. Moreover, *icipe* has contributed substantial FAIR-compliant genomic data globally, for example by depositing nucleotide sequences and associated metadata to the US National Library of Medicine, National Center for Biotechnology.

Insect identification

Alongside DNA barcoding, landmark-based morphometric measurements of insects are a useful taxonomic approach in insect identification. We have established the superiority of two machine learning classifiers: support vector machine and artificial neural network models, and their potential as an integrated and smart application software for insect discrimination and identification.

Insect diversity

icipe has established a pioneering, well curated and long-term collection of insects in East Africa. The physical collection is supported by a comprehensive database of over 60,000 records with complete geographic and temporal data and images for each specimen. This resource has resulted in over 200 newly described species. The knowledge will support biodiversity conservation efforts.

Capacity building

icipe is unique in Africa in terms of advancement in data science. We are receiving an increasing number of requests from across Africa and the globe, to support capacity building and share experience in data science. We are nurturing young African capacity, and we are also in the frontline in creating awareness for data science and its application. This strength is being recognised by partners, including research organisations, government institutions, international organisations and development agencies.

RSIF

The Regional Scholarship and Innovation Fund (www.rsif-paset.org), managed by *icipe* since 2018, is well positioned to enable Africa to embrace the fourth industrial revolution (4IR). Indeed, RSIF has a thematic area dedicated to information and communications technology, including artificial intelligence and big data. In addition, we have established a digital repository to collect, preserve and distribute the knowledge being generated through RSIF. With the support of the DMMG Unit, data management and data science training is continuously provided to RSIF scholars and researchers.

Bioeconomy and bioinnovations

The BioInnovate Africa Programme (bioinnovate-africa.org), supported by Swedish International Development Cooperation Agency (Sida), and managed by *icipe* since 2016, has assisted the East African Community to develop a Regional Bioeconomy Portal, which provides one-stop access to data, knowledge and intelligence on bioeconomy in the region. Moreover, the Programme is working with partners to incorporate data science in biosciences-based innovations, for example by testing the use of artificial intelligence and mobile applications that can collect big data.

MOYESH project

The More Young Entrepreneurs in Silk and Honey (MOYESH) project, a partnership between *icipe* and the Mastercard Foundation, aims to see 100,000 young people, in Ethiopia, secure dignified and fulfilling work along honey and silk value chains. We are using an interactive digital monitoring and evaluation system that includes the KOBO data collection tool integrated with a web-based data management system and Power BI, a collection of software services, applications and connectors. This system enables us to: establish the baseline; technologies to be tested and readiness by communities to uptake them; create models for dissemination; and conduct macrolevel analysis on socio-economic transformation at regional and national levels. It also supports the possibility of replicating the MOYESH project model on a continental level.

STAFF

icipe Director General, **Segenet Kelemu**, has been awarded the title of *Officier de L'Ordre national du Mérite* (Officer in the National Order of Merit), by the President of the French Republic. Dr Kelemu becomes the first Ethiopian, and one of a handful of Africans that have received this honour.

Tadele Tefera, Head, *icipe* Ethiopia Office, has been elected Fellow of the African Academy of Sciences (AAS).

Menale Kassie, Social Science and Impact Assessment (SSIA) Unit, has been awarded the 2022 TWAS Siwei Cheng Award in Economic Sciences; for advancing understanding of the process and impacts of multiple-technology adoption in complex social and agricultural environments in sub-Saharan Africa.

Beatrice Muriithi, Scientist, SSIA Unit, has been selected as an African Women in Agricultural Research and Development (AWARD) Policy Fellow, in the first cohort of the Gender Responsive Agriculture Systems Policy (GRASP) Fellowship Scheme.

Sheila Agha, former *icipe* African Regional Postgraduate Programme in Insect Sciences (ARPPIS) scholar and currently Postdoctoral Fellow, Behavioural and Chemical Ecology Unit (BCEU), has been awarded the Wellcome Early Career Award, to undertake a project titled: 'An investigation of drivers of dengue virus transmission and the potential for Wolbachia-based transmission blocking in Kenya', over five years, commencing in December 2022. The research will be supported by David Tchouassi and Baldwyn Torto (BCEU); and Jeremy Herren (Human Health Theme).

SCHOLARS

Gladys Mosomtai (PhD, Kenya) has joined ESRIN (known as the ESA Centre for Earth Observation) on a research fellowship. She is one of the first two African researchers to join the ESRIN's activities. Her research will aim to understand the role of livestock migration patterns in the transmission of Rift Valley fever.

Ayaovi Agbessenou (Togo), PhD scholar, Plant Health Theme, received the Fungi Division Travel Award, to attend the 54th Annual Meeting of the Society for Invertebrate Pathology (SIP 2022), held in Eastern Cape, South Africa, in August 2022.

Bashiru Adams (Ghana), PhD scholar, Plant Health Theme, received a student travel award to the 36th annual joint meeting of the International Society of Chemical Ecology (ISCE) and the Asia-Pacific Association of Chemical Ecologists (APACE), held in Kuala Lumpur, Malaysia, in August 2022.

Juliet Akoth Ochola (Kenya), former MSc scholar, BCEU, was awarded first place in the student poster competition for her research in using banana paper to disrupt chemical signalling between the potato and potato cyst nematodes, during the American Chemical Society Agro Division Hybrid Meeting and Expo held in Chicago, USA, in August 2022.

JOURNAL APPOINTMENTS

Baldwyn Torto, Head, BCEU, has been appointed Jury Member (2022 and 2023) of Falling Walls Science Breakthrough, Life Sciences. He has also been appointed as a member of the Selection Committee Advisory Board, as a reviewer for the 2023 OWSD-Elsevier Foundation Awards for Early-Career Women Scientists in the Developing World, focused on 'Food security, agricultural productivity and sustainable food production'. In addition, he is an invited guest editor, *Annual Review of Entomology* journal.

Amanuel Tamiru, Scientist, BCEU, has been appointed as an Editor, *Arthropod-Plant Interactions* journal (Springer-Nature), especially on topics relating to the chemical ecology of insect-plant interactions.

Merid Getahun, Scientist, Animal Health Theme, has been appointed as an Editor, *Arthropod-Plant Interactions* (Springer-Nature).

icipe GOVERNING COUNCIL STUDENT AWARDS WINNERS

BEST PUBLISHED SCIENCE PAPER



Winner

Rehemah Gwokyalya (PhD, Uganda)

Paper: Gwokyalya R., Herren J.K., Weldon C.W., Khamis F.M., Ndlela S. and Mohamed S.A. (2022) Differential immune responses in new and old fruit fly-parasitoid associations: Implications for their management. *Frontiers in Physiology*, 13:945370. <https://doi.org/10.3389/fphys.2022.945370>



Winner

Miano Raphael Njurai (PhD, Kenya)

Paper: Miano R. N., Ayelo P. M., Musau R., Hassanali A. and Mohamed S. A. (2022). Electroantennogram and machine learning reveal a volatile blend mediating avoidance behavior by *Tuta absoluta* females to a wild tomato plant. *Scientific Reports*, 12 (1), 1–16. <https://doi.org/10.1038/s41598-022-13125-0>



Second Runner Up

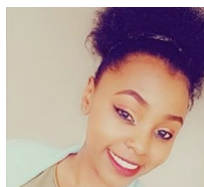
Maiyo N.C., Khamis F.M., Okoth M.W., Abong G.O., Subramanian S., Egonyu J.P., Xavier C., Ekesi S., Omuse E.R., Nakimbugwe D., Ssepuuya G., Ghemoh C.J. and Tanga C.M. Nutritional quality of four novel porridge products blended with edible cricket (*Scapsipedus icipe*) meal for food. *Foods*, 11(7):1047. <https://doi.org/10.3390/foods11071047>



Second Runner Up

Mwando N.L., Ndlela S., Meyhöfer R., Subramanian S. and Mohamed S.A. (2022) Immersion in hot water as a phytosanitary treatment for *Thaumetotibia leucotreta* (Lepidoptera: Tortricidae) in bell pepper (*Capsicum annuum* L.), *Postharvest Biology and Technology*, 192. <https://doi.org/10.1016/j.postharvbio.2022.112026>

BEST SCIENCE POSTER



Winner

Evalyne Wambui Ndotono (MSc, Kenya)

Poster title: Gut microbial shift in broiler and layer chicken fed with black soldier fly larvae-based meal as a dietary protein source

Supervisors: Fathiya Khamis and Chrysantus Tanga (*icipe*); and Joel Bargul (Jomo Kenyatta University of Agriculture and Technology, Kenya)



First Runner Up

Jacqueline Wahura Waweru (PhD, Kenya)

Poster title: Investigating symbiont-based immunity in *Anopheles* mosquitoes against *Plasmodium falciparum* infection

Supervisors: Jeremy Herren and Daniel Masiga (*icipe*); and Prof Lizette Koekemoer, University of the Witwatersrand, South Africa



Second Runner Up

Sahadatou Mama Sambo (PhD, Benin)

Poster title: Combating the tomato pest *Tuta absoluta* using an assembly of native and exotic parasitoids

Supervisors: Samira Abuelgasim Mohamed and Shepard Ndlela (*icipe*); and Hannalene du Plessis (North-West University, South Africa)



The *icipe* Governing Council (GC) held its 38th Annual General Meeting from 14 to 18 November 2022 in Kenya. Pictured: (Front row, l-r): Dr Michel Eddi (France); Dr Barbara Frei Haller (Switzerland); Prof. Kym Anderson (Australia), Chair; Dr Segenet Kelemu (Ethiopia), Director General & CEO, and Ex-Officio Member; Dr Ylva Hillbur (Sweden); Dr Ignace Gatere (Rwanda). (Back row, l-r): Prof. Rickard Ignell (Sweden); Prof. Ingrid Öborn (Sweden); Prof. Ted Turlings (The Netherlands); Prof. Hirut Woldemariam (Ethiopia); Mr Jim Park (USA); Amb. Dr Amina C. Mohamed (Kenya); Dr Morven A. McLean (USA); and Prof. Daniel Chamovitz (Israel).

The IKEA Foundation has provided a USD 5 million grant to *icipe*, for an initiative that will contribute to a resilient, circular and regenerative food system in eastern Africa. Two of the Centre's innovations: the vegetable integrated push-pull technology and black soldier fly farming, will be harnessed into a One Health package that will increase production of cereals, the main staples for most households; as well as high-value vegetables, poultry and fish, which will augment the region's largely starch-based diets, thus countering malnutrition and hidden hunger while protecting the environment.

[Read More](#)



The Australian Centre for International Agricultural Research (www.aciar.gov.au), has signed a Partnership Agreement with *icipe*, to provide the Centre annual core funding. The support builds on ACIAR's longstanding project-based investments in *icipe*, especially in the promotion of edible insects as a way of enhancing food and nutrition security, employment and income for smallholder farmers and entrepreneurs.

[Read More](#)

L-r: Dr Segenet Kelemu, *icipe* Director General & CEO, and Prof. Andrew Campbell, Chief Executive, ACIAR, during the official signing of the core funding Partnership Agreement between ACIAR and *icipe*.

icipe has received funds from the estate of Mr Andreas Landshoff, a Dutch publisher, producer and literary agent, who passed away on 9 December 2021, aged 91 years. This is the first investment of its kind ever made to *icipe*.

Having started his career in various publishing houses in Germany, in the 1960s Mr Landshoff was the European Editor of Harry N. Abrams, at the time the most important American art publisher. Based in Amsterdam, he oversaw major global co-productions without which – and given the technical printing conditions at the time – the large holdings of European paintings would not have been published.

In 1972, he founded Andreas Landshoff Productions, becoming an independent publisher, theatre producer, authors' agent and publishing consultant. He was reputed for his fabulous memory, immense knowledge of history and, of course, art.

Described as humility personified, Mr Landshoff decided to bequeath *icipe* after watching an interview conducted with the Centre's Director General, Dr Segenet Kelemu, on [The Mind of the Universe](#), an international documentary series that explores the human destiny and the world of tomorrow through the eyes of the greatest thinkers and scientists of our time. The series is produced by VPRO, a Dutch public broadcaster.



Mr Andreas Landshoff (1930 – 2021)

Information source and more on his fascinating legacy

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Her Excellency Caroline Vicini (left), Ambassador and Head of Mission, Embassy of Sweden, Kenya, visited *icipe* to launch the new scientific equipment. Dr Fathiya Khamis (right), Senior Scientist, Plant Health Theme, makes a presentation on a quantitative and qualitative real time polymerase chain reaction (PCR) machine, which will enable rapid identification of pest and diseases; studies on population genetics; and quantification of resistant genes in pest populations. Also in the picture: *icipe* Director General & CEO, Dr Segenet Kelemu (second left); and Prof. Baldwin Torto (second right), Head, Behavioural and Chemical Ecology Unit (BCEU).

The Swedish International Development Cooperation Agency (Sida), has provided a grant amounting to USD 2.6 million to *icipe* for the purchase of state-of-the art scientific equipment.

This support is an addition to the core contribution provided by Sida to *icipe*. In 2014, Sida contributed USD 1.54 million, until then the largest single grant of support for instrumentation at *icipe*. The upgrade of the analytical infrastructure pivots *icipe*'s centre of excellence in insect science status.



RESEARCH HIGHLIGHTS

Nature-based solutions

In October 2022, *icipe* and partners organised a webinar on 'Nature-based solutions for biodiversity, food security and health', as a side event of the Food and Agriculture Organization of the United Nations (FAO) Science and Innovation Forum 2022. The webinar attracted 355 participants from 55 countries. The discussions concluded that nature-based solutions require research and scaling strategies; incentives and innovation capacity building for farmers and private sector actors; collaboration between researchers and private sector partners; regulatory frameworks; and cross cutting support of development partners.

SIPFEED Ethiopia

icipe and partners, with the support of the Swiss Agency for Development and Cooperation (SDC), Ethiopia office, have launched the 'Scaling-Up Insect-Based Protein Feed Technologies and Practices for Enhanced Poultry Production in Ethiopia (SIPFEED)' project. The initiative will build on *icipe*'s success in East Africa in championing the role of insects in transforming the food system into a more sustainable and vibrant circular economy. Through SIPFEED, the partners will pilot and demonstrate the numerous benefits of insect-based feeds and insect-composted organic fertiliser.

Farmer-friendly digital support systems

icipe is a partner in a newly launched initiative supported by the Norwegian Agency for Development Cooperation (NORAD) and led by the Norwegian Institute of Bioeconomy Research (NIBIO), which will develop early-warning systems for key pests and diseases of major crops in Malawi. *icipe* scientists will establish the backbone for farmer-friendly digital support systems, by harnessing available data and collecting new data, to devise predictive models.

Tungiasis management

icipe in partnership with the Kenya Medical Research Institute (KEMRI); the Ministry of Health (MoH), Division of Vector Borne and Neglected Tropical Diseases, Kenya; University of Nagasaki, Japan; and Japan International Cooperation Agency (JICA); recently conducted a training of master trainers on tungiasis, a painful, debilitating, parasitic skin disease caused by penetration of female sand fleas, *Tunga penetrans*, into the skin. The partners have recommended the addition of tungiasis to the mass drug administration activities conducted annually by MoH.

Approved biopesticides

icipe and Real IPM-Biobest Ltd have received approval permits for the full registration of two biopesticides in Tanzania and Uganda. Derived from the insect-infecting *Metarhizium anisopliae*, a fungus that grows naturally in the soil,

the two biopesticides: ICIPE 7 (Mazao Detain®) and ICIPE 78 (Mazao Achieve®), are both effective against the fall armyworm.

Toolbox to manage *Tuta absoluta*

In 2008, the invasive and highly destructive *Tuta absoluta*, a tomato leafminer, was detected for first time in Africa and has since spread rapidly across the continent. Between 2018 and 2022, *icipe*, with the support of the African Union Research Grants, in collaboration with the International Potato Center (CIP); the Institute of Biological Control, Julius Kühn-Institut, Germany; the World Vegetable Center; and national institutions in Kenya, Republic of South Sudan, Sudan, Tunisia and Uganda; assembled, validated and implemented an eco-friendly management toolbox for *T. absoluta*. Additionally, evidence of the socio-economic impacts of the technologies was generated, alongside capacity building and awareness creation among stakeholders in the tomato value chain.

Mapping malaria vectors

The Vector Atlas Project, an initiative that brings together a new collaboration of partners to build an online, open access repository to hold and share analyses-ready malaria vector occurrence, bionomics, abundance and insecticide resistance data, has been launched. The project is led by *icipe*; University of Oxford, UK; and the Malaria Atlas Project

initiative, Australia; with funding from the Bill & Melinda Gates Foundation. Collaborators include the Pan-African Mosquito Control Association (PAMCA); Global Biodiversity Information Facility; VectorBase; IRMapper; Amplicon Project; MalariaGen; Target Malaria and Global Vector Hub.

Read More

One Health project

Biovision Foundation for Ecological Development, Switzerland, has selected the *icipe* One Health project targeting cattle for the control of disease vectors as the cover story of their current quarterly magazine.

Read More

From hunters to keepers

In 2017, *icipe* commenced meliponiculture, the domestication of stingless bees, in Ethiopia. The Centre is bringing together the indigenous expertise of tradition stingless bee honey hunters, and scientific knowledge, to create income generation opportunities for communities while conserving and regenerating this mighty resource.

Read More

PROTeinAfrica

ACIAR has expanded its investments in *icipe*'s edible insects activities with a grant for a project on 'Upscaling the benefits of insect animal feed technologies for sustainable agriculture intensification in Africa' ([PROTeinAfrica](#)), to be implemented from March 2022 – June 2025, in Kenya, Uganda and Rwanda.



Mr Luke Williams, Australian High Commissioner to Kenya, addresses participants during the launch of PROTeinAfrica, held on 28 September 2022.

MORE YOUNG ENTREPRENEURS IN SILK AND HONEY (MOYESH) PROJECT

THREE YEARS OF THE MOYESH PROJECT

The MOYESH project ([moyesh.icipe.org](#)) was launched in October 2019 by *icipe* in partnership with the Mastercard Foundation and Ethiopia Jobs Creation Commission (JCC). The five-year initiative aims to see 100,000 young people (60 percent of them women), in Ethiopia, secure dignified and fulfilling jobs along honey and silk value chains. Three years into its implementation, the MOYESH project has exceeded its targets on many levels. The initiative has also provided a model for unlocking the full potential of beekeeping, which has a long tradition in Ethiopia but is constrained by several challenges. It has also started a renaissance for sericulture farming in the country. Significantly, the MOYESH project has demonstrated the viability of beekeeping and sericulture as entry points for holistic and inclusive development, as well as the creation of circular economies.

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NEW NICHES AND NOVEL ENTERPRISES

The MOYESH project has opened up new opportunities for entrepreneurs in the beekeeping value chain in Ethiopia. We tell the stories of two enterprises in Gore town, Oromia Region, which have found niches in producing protective beekeeping clothing and modern frame hives.

Read More



Pictured during a training session organised by *icipe* and partners, MOYESH project technical assistants from Oromia Region, Ethiopia, all kitted out in beekeeping protective clothing tailored by Gemechis, Tigist and Friends Enterprise, a selected supplier of the MOYESH project.

WOMEN-LED BEEKEEPING ENTERPRISES

Historically, in Ethiopia, beekeeping has not been considered a female occupation. Moreover, cultural perceptions create difficulties for women to engage in gainful employment, relegating them to traditional domestic roles and duties. This segregation leads to income inequalities and reduced decision making for women in the households. The MOYESH project aims to reverse this trend through several strategies. First, the initiative has set itself an explicit target of having 60 percent of the partnering youth as women. Second, the project is employing engendered pathways, including the formation of women-led beekeeping enterprises. These enterprises are enabling women to gain legitimacy as entrepreneurs. They also stand as a testament of women as an integral part of sustainable development.

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TEA CAPACITY

In 2019, BioInnovate Africa programme and the Thayer School of Engineering at Dartmouth College, USA, commenced collaboration to build technoeconomic analysis (TEA) capacity for innovation projects in eastern Africa. This goal is achieved through a six-month fully funded, tailor-made online course, which assesses the economic feasibilities, bottlenecks and further research and development requirements during early stages of biobased technologies. The training also addresses the application of TEA to evaluate the profitability and broader social and environmental impact of potential business ventures in developing countries. Eligible participants are students enrolled for a Master's or a PhD programme at a university in eastern African countries: Burundi, Democratic Republic of Congo, Ethiopia, Kenya, Rwanda, South Sudan, Tanzania and Uganda. Read testimonials of eight students who have completed the course.

[Read More](#)



DOCUMENTARY

BioInnovate Africa has launched a video documentary on 'Innovation in the development context of eastern Africa', which focuses on the Programme's model of innovation ecosystem building that emphasises academia, government, and industry collaboration. It features science and innovation leaders in eastern Africa, as well as academics and innovators, who discuss the opportunities that investing in science and innovation brings to the region.



NEW GRANTS

BioInnovate Africa Programme has announced 10 new grants amounting to approximately USD 10 million for regional innovation collaboration projects in eastern Africa as outlined below:

Improving food production and food safety:

- Rhizobia-mycorrhizae-based biofertiliser for smallholders farmers, led by the Evangelical University in Africa, Democratic Republic of the Congo (DR Congo). Partners: Hope Africa University, Burundi; University of Nairobi, Kenya; and ITRACOM/ FOMI fertiliser company, Burundi.
- Plant based insecticides for controlling maize storage insect pests and other insect pests of economic relevance to smallholder farmers, led by the Egerton University, Kenya. Partners: The Open University of Tanzania; University of Rwanda; *icipe* and Farm Track Consulting Ltd, Kenya.
- Biofungicides for the management of coffee wilt disease in East Africa, led by Kaffabio Control Agro-Industry PLC, Ethiopia. Partners: Kenya Agricultural and Livestock Research Organization (KALRO) Coffee Research Institute in Kenya and Tanzania.
- Novel biodegradable carrier (from banana fibre) for efficient crop protection, led by the International Institute of Tropical Agriculture (IITA), Tanzania. Partners: International Fertilizer Development Corporation (IFDC) in Uganda; *icipe* and Bio-Corn Products EPZ, Kenya.
- Using *Lactobacillus* for aflatoxin decontamination value-added peanut products, led by the Centre for Agriculture and Bioscience International (CABI). Partners: Makerere University, Uganda; Burundi Institute for Agricultural Sciences; and Uganda National Farmers' Federation.

Providing alternative biodegradable packaging materials

- Eco-friendly packaging products from cassava and other agricultural wastes, led by Kyambogo University, Uganda. Partners: Institute of Policy Analysis and Research, Rwanda; Ardhi University, Tanzania; and Oribags Innovations Ltd, Uganda.

Improving human and animal health

- Supplements to artemisinin-based combination therapy for malaria treatment, led by the Pharmaceutical Society of Uganda. Partners: University of Bahr El Ghazal, South Sudan; Université Officielle de Bukavu, DR Congo; and Jena Herbals Ltd, Uganda.
- Nanoencapsulated-bromelain from pineapple and seafood waste for control of helminths and other livestock diseases, led by Jomo Kenyatta University of Agriculture and Technology, Kenya. Partners: Université Evangélique en Afrique, Bukavu, DR Congo; Sokoine University of Agriculture, Tanzania; and Vetcare® Africa, Kenya.
- Novel bio-rational products for controlling *Tungiasis* in East Africa, led by Masinde Muliro University of Science and Technology (Centre for African Medicinal and Nutritional Flora and Fauna), Kenya. Partners: KALRO – Biotechnology Research Institute, Gulu University in Uganda, and AtoZ Group of Companies (Vector Health International, Africa Technical Research Centre), Tanzania.

Reducing postharvest losses

- Smart-hybrid solar dryers for fruits and vegetables, led by the African Centre for Technology Studies, Kenya. Partners: Kenya Industrial Research and Development Institute; Tanzania Industrial Research and Development Organization; National Agricultural Research Organization of Uganda (NARO); and GREKKON Ltd, Kenya.

Nigeria invests in RSIF

The Federal government of Nigeria has announced a contribution of USD 4 million, through the World Bank-funded Africa Higher Education Centers of Excellence for Development Impact Project (ACE-Impact), to RSIF.

The amount will support training of 32 PhD students from Nigeria, and an additional eight students from sub-Saharan African countries.

Nigeria joins eight other African countries that are investing in PASET and RSIF. They are: Benin, Burkina Faso, Côte d'Ivoire, Ghana, Senegal, Rwanda, Kenya and Mozambique.

PASET members, together with the World Bank, the Government of Korea and the European Union, have now invested a total of USD 54.7 million in RSIF.

RSIF-Mozambique partnership progress

Through an agreement signed in 2021, the government of Mozambique, through its World Bank-funded project on 'Improvement for Skills Development in Mozambique (MozSkills)', is investing USD 6 million in RSIF. Of the amount, USD 4.2 million will fund RSIF PhD scholarships, while USD 1.8 million will be dedicated to research and innovation.

In November 2022, a results sharing seminar was held in Maputo, Mozambique, bringing together stakeholders from the government and academia in Mozambique, representatives of the World Bank, Mozambican RSIF scholars and the RSIF team, to deliberate progress.

The discussions demonstrated how the RSIF component compliments broader initiatives being undertaken through the MozSkills project. Specifically, RSIF in collaboration with the Ministry of Higher Education, Science and Technology, Mozambique, has awarded 32 PhD scholarships to Mozambican students, and 12 research and innovation grants to faculty and researchers in universities and research institutions in the country. Overall, the seminar received evidence of how the partnership is enabling Mozambican scientists and innovators to tap into the RSIF network; its pan-African vision for scientific research and innovation capacity building; and *icipe's* extensive research and innovation expertise.

IN FOCUS: RWANDA AND RSIF

Overview

- After an initial contribution of USD 2 million to RSIF in 2018, in August 2022, the Government of Rwanda announced an additional contribution of an equal amount to PASET through RSIF.
- The government of Rwanda, alongside the governments of Ethiopia and Senegal, was one of the founding members of PASET.
- Rwanda has hosted two PASET forums, which are the key avenue for knowledge-sharing and deliberations on building high quality technical and scientific capacity in the sub-Saharan Africa.
- Hon. Dr Valentine Uwamariya, Minister of Education, Rwanda, is the current chair of the PASET Governing Council.
- Rwanda participates in the PASET Executive Board, represented by Mr Mike Hughes, Advisor, Science, Technology and Innovation, Ministry of Education.
- University of Rwanda is an RSIF African Host University (AHU), through the African Center of Excellence in Internet of Things (ACEIoT).

Research and innovation grants

- 6 research and innovation grants have been awarded to the University of Rwanda.
- 4 research grants have been awarded to faculty at the University of Rwanda. Projects include: real time assessment of the indoor air pollution in urban and rural households; agricultural data from acoustic monitoring; electromagnetic compatibility monitoring and prediction models for biomedical devices; tools for evaluating African lakes.
- Research innovation commercialisation grants have awarded to faculty at the University of Rwanda. Projects include: smart bee-hiving technology; infectious diseases outbreak; and prediction using geolocation data with machine learning.

PhD scholarships

- 22 Rwandan nationals have been awarded RSIF PhD scholarships (27 percent of them women).
- 19 RSIF PhD scholars (42 percent of them women) from 11 African countries are conducting their studies at ACEIoT.

Support to early career scientists

- 2 Rwandan RSIF PhD graduates have been selected for the RSIF Junior Investigator Research Award.

University-industry cooperation, networks and partnerships building

- 2 national and 9 international industrial partners are collaborating in the RSIF research and innovation projects.
- 10 PhD students are involved in RSIF research and innovation projects.

Recently postgraduate completions

A total of 15 *icipe* postgraduate scholars from Kenya, Nigeria, Rwanda, Togo and Zimbabwe, graduated or defended their theses between July and December 2022. Registered in various universities in Africa, their studies advance knowledge on: a new repell-and-trap intervention against tsetse in the wildlife-livestock interface; epidemiology of trypanosomosis, and potential vectors and vertebrate reservoirs of zoonoses in the human-wildlife-livestock interface and; development of a tool to apply *Metarhizium anisopliae* on *Glossina fuscipes fuscipes* tsetse species. Other findings are on effective biopesticides for pesticide resistant whiteflies; integrated pest management for climate resilient crop production; and effective potato varieties and processing methods on starch digestibility and nutritional quality.

Additional outcomes are on the relationship among *Varroa* destructor, pollen diet and the immunity of honeybees; use of hyperspectral and multispectral remote sensing to map flowering plants in Africa; potential impact of climate change and variability on *Striga hermonthica*; implication of landscape structure and bioclimatic variables on pollinators in avocado production systems; modelling the impact of agroecological factors for coffee pest and disease dynamic prediction; use of cricket in cassava and millet flours to address child malnutrition; farmers perceptions, preferences and cost-effectiveness of insect-based chicken feed; and the effect of inclusion of insect meals in diets on performance of improved indigenous chickens.

[Read More](#)

Personal narrative: Laurah Ondari, EANBiT Fellow

Through the Eastern Africa Network for Bioinformatics Training (EANBiT; eanbit.icipe.org), *icipe* is coordinating a network of three universities: Pwani University, Kenya; Makerere University, Uganda; and Muhimbili University of Health and Allied Sciences, Tanzania; and four research institutes: *icipe*; Kenya Medical Research Institute – Wellcome Trust Research Programme; Biosciences eastern and central Africa – International Livestock Research Institute (BecA-ILRI Hub); and Uganda Virus Research Institute (UVRI). The goal is to create a critical mass of practitioners who can develop and use bioinformatics approaches to biosciences. Between 2018 and 2021, 44 MSc in Bioinformatics fellowships have been awarded. Laurah Ondari, (Kenya) an EANBiT fellow undertaking studies at Pwani University, currently on attachment at *icipe*, narrates her journey from rolling and meandering tea plantations in Kenya's Rift Valley, to studying the mechanisms of action of selected drugs used to treat animal sleeping sickness and leishmaniasis.

[Read More](#)


Laurah pictured in the *icipe* Bioinformatics Lab

Nematology capacity building

icipe, International Institute of Tropical Agriculture (IITA) and Ghent University (Ugent), Belgium, have renewed their partnership for international training of nematology students in Kenya. The five-year agreement (2022 – 2027) strengthens the role of *icipe* jointly with IITA, as a leading nematology training hub in Africa. *icipe* will serve as an African Satellite Hub for Ugent's Master of Science in Agro- and Environmental Nematology Programme. Students enrolled on the programme will continue to participate in the Kenya Track Option coordinated by *icipe* and IITA, which includes a one-month

industrial training in Kenya and a 10-day Tropical Pest and Disease Course. They will also serve as trainers of the Basic Crash Course in Nematology (BCCN), through which 12-15 technical participants gain knowledge in nematology techniques. In the first phase of the *icipe*-IITA-Ugent partnership (2017 – 2021), over 50 students from Cambodia, Ethiopia, Indonesia, Kenya, Malaysia, Nigeria, Rwanda, Tanzania and Uganda, took part in the Kenya Track. About 70 technicians and national research and extension officers from Benin, Burundi, Cameroon, Ethiopia, Madagascar, Nigeria, Rwanda, South Africa, Tanzania and Uganda participated in the BCCN.

Superiority of insect-based animal feeds

In a recent study, *icipe* researchers show that the incorporation of black soldier fly larvae in poultry feeds increases the wealth of beneficial bacteria in the gut of poultry, thus promoting the overall health and growth of the birds. Also known as friendly bacteria, this community of microorganisms is vital in strengthening the immunity, physical fitness and nutritional development of poultry. These findings add on to the benefits of black soldier fly based poultry feeds, which include improving growth performance and the quality and quantity of meat and eggs. Moreover, black soldier flies are remarkable in organic waste recycling to produce high quality, nutrient rich fertilisers that improve soil health and crop yield, and in the development of pest control products.

[Paper link](#)

Mosquito repellent fabric

Our studies have established that fabric strips treated with transfluthrin, a fast-acting pyrethroid insecticide, can be used as substitutes to full screening of open eave gaps in houses to protect people from being bitten by malaria mosquitoes in the peri-domestic area. Further studies are required to establish the climatic conditions for optimum performance of the tool, its range and longevity. [Paper link](#)

White mango scale spread

We used four ecological niche models to predict the habitat suitability of the invasive white mango scale (*Aulacaspis tubercularis*) pest, under current and future climatic conditions. Our findings show that countries in East, South and West Africa; alongside Mexico, Brazil, India, Myanmar, Bangladesh, Thailand, Laos, Vietnam, and Cambodia; are highly suitable for the establishment of *A. tubercularis* under current climatic conditions. Under future conditions, the suitable areas of *A. tubercularis* might slightly decrease in sub-Saharan Africa, and expand in Australia, Brazil, Spain, Italy and Portugal. [Paper link](#)

Review of Aedes-borne viral disease dynamics

The toll of yellow fever, dengue fever, Chikungunya and Zika diseases, which are caused by viruses transmitted by

Aedes mosquitoes, continues in Africa. Integrating vector surveillance and knowledge on disease ecology with rationalised vaccination in high-risk areas is important in their control. *icipe* researchers have published a review of the evolving dynamics of these diseases, highlighting gaps in their detection and management and the prospects for prevention and control. [Paper link](#)

Dinapsis diversity

icipe and partners have revised the endemic African genus *Dinapsis* (Dinapsini, Megalyridae, Hymenoptera) and described seven new species. An illustrated identification key to all described species of *Dinapsis* is available [Here](#)

Achieving workplace equity

Upon invitation by *Nature* journal, *icipe* Director General, Dr Segenet Kelemu, has written an article on “Achieving workplace equity”, which describes how she used her role as the Centre’s CEO to create a more equitable workplace for all. The article has been published online in *Nature Human Behaviour*, World View section. [Paper link](#)

IPM in Africa

The *Current Opinion in Insect Science* journal has published a special section on integrated pest management (IPM) in Africa, edited by Thomas Dubois (Head, *icipe* Plant Health Theme) and Manuele Tamò (Insect Ecologist, IITA). The section features articles co-authored by 11 *icipe* scientists. [Paper link](#)

Tomato, whitefly and powdery mildew disease fungus

Recent studies by *icipe*, aimed at providing a model for plant-pathogen and non-vector herbivore interactions, show that tomato plants infected with the powdery mildew disease fungus are more attractive to, and fed on by the greenhouse whitefly (*Trialeurodes vaporariorum*). However, this scenario does not increase the fitness of the whiteflies. In fact, their development and fitness is reduced. Further studies will explore the major chemical compounds involved in the interactions between the pest and disease, as a lead for the management of the pest. [Paper link](#)

Urbanisation of Aedes mosquito

Arthropod-borne (arboviral) viral diseases like chikungunya, dengue fever and yellow fever are re-merging in Africa, with the potential for major outbreaks in urban areas. Although the primary vector, the *Aedes aegypti* mosquito species, thrives in urban environments, the risk for arboviral diseases is geographically heterogeneous. *icipe* researchers have recently published a study on the possible interactions among the vector species or subpopulations, and the associated serotypes, genotypes and lineages of arboviral diseases viruses. The findings predict the impact of such relationships with disease transmission risk in urban landscapes, with implications for surveillance and control. [Paper link](#)

Biopesticide for Tuta absoluta

icipe has published the first report of the field efficacy and economic viability of Mazao Campaign®, an *icipe* biopesticide derived from strains of *Metarhizium anisopliae* (ICIPE 20), against the tomato leafminer, *Tuta absoluta*. The results show significantly lower fruit yield loss, improved fruit yield and marketability, and a high cost-benefit ratio. Ongoing research will establish the most optimum formulations of the biopesticide, delivery and application approaches and effectiveness in diverse agroecological zones and compatibility with commonly used pesticides in tomato production systems. [Paper link](#)

Sustainable entomocomposting

icipe and partners have published comprehensive information on the potential of entomocomposting – the degradation of organic materials using insects – to control soil pathogens and improve soil fertility and crop productivity in an environmentally sound, socially just, climate-resilient and cost-effective manner. In a chapter in a book titled: *Fate of biological contaminants during recycling of organic wastes*, the researchers also make key recommendations to guide investors, entrepreneurs and farmers in sustainable entomocomposting.

[Chapter link](#)



Pictured following the meeting of the Council of the National Council of Science and Technology (NCST), of the Government of Rwanda, held in October 2022:

First row (l-r): Prof. Eliane Ubaliro (McGill University, Canada), Council member, NCST; Prof. Keun Lee (Seoul National University, Korea), Council member, NCST; His Excellency Paul Kagame, President of the Republic of Rwanda; Prof. Hakizumwami Biralir Runesha (University of Chicago, USA), Council member, NCST; Her Excellency Dr Valentine Uwamariya, Minister of Education and Co-Chair of the NCST Council.

Second row (l-r): Dr Eugène Mutimura, Executive Secretary, NCST; Dr Segenet Kelemu (Director General, *icipe*), Council member, NCST; Dr Ivan Twagirashema (Deputy CEO, Rwanda Mines, Petroleum and Gas Board), Council member NCST; Her Excellency Mrs Clare Akamanzi, Executive CEO, Rwanda Development Board.

icipe Director General & CEO, Dr Segenet Kelemu, pictured with Mr Murray Watt, Minister for Agriculture, Fisheries and Forestry, Australia, during a trip to the country in November 2022. Dr Kelemu participated in the Australian Centre for International Agricultural Research (ACIAR) Policy Advisory Council meeting, as a member. She also took part in the TropAg International Agriculture Conference, as a panelist in the ACIAR and One CGIAR plenary session on 'Food security and food systems transformation in the Indo-Pacific – the role for science'.



In October 2022, a team from the END Fund visited *icipe* for discussions regarding the Centre's research and development activities on leishmaniasis. They included: Mr William Campbell (4th right), International Board Chair; Ms Carol Karutu (5th right), Vice President, Programs; and Duncan Ochol (2nd left), Program Manager. They are pictured with *icipe* Director General, Dr Kelemu (6th right), and several scientists from the Centre.

On 25 November 2022, a delegation from the European Commission visited *icipe* to familiarise themselves with initiatives funded by European Union at the Centre. Pictured listening to a presentation by *icipe* Director General, Dr Kelemu (l-r): Ms Simona Mari-Sabatini, European Commission Directorate General for International Cooperation and Development Offices (DEVCO); Mr Peter Koren, Programme Manager, Innovation and Connectivity, European Commission; Dr Bernard Rey, Immediate Former Head of Cooperation Delegation of the European Union in South Africa; and Ms Anna Hakami, Policy Analyst, European Commission. Also in the picture, Dr Amanuel Tamiru (extreme right), Scientist, *icipe* Plant Health Theme; and Dr Saliou Niassy (extreme left), Head, *icipe* Technology Transfer Unit.



Between 2020 and 2022 *icipe* and Biovision Foundation for Ecological Development, Switzerland, implemented the Advocacy for Agroecology (A4A) project, with a two-fold mandate: to generate knowledge on the climate resilience of the *icipe* push-pull technology; and to increase adoption of the technology by ensuring availability of the seeds of its intercropped, *Brachiaria* and *Desmodium*. In October 2022, the two partners organised a stakeholders visit to A4A field sites in Gurage Zone, Southern Nations, Nationalities, and Peoples' Region (SNNPR), Ethiopia. In the picture: Dr Adrian Bolliger (left) Programme Officer, Biovision Foundation for Ecological Development, discussing with Mr Ganamo Ganore, an A4A project model farmer, about the impact of the push-pull technology.

Participants of the launch of the Vector Atlas project (see Research Highlights, page 9), pictured in a discussion session, during the launch of the project, at the *icipe* Thomas Odhiambo Campus, Mbita, on the shores of Lake Victoria.



In August 2022, six *icipe* researchers transitioned into new positions. They are: David Tchouassi (Cameroon), from Research Scientist to Senior Scientist, Behavioural and Chemical Ecology Unit (BCEU); Fathiya Mbarak Khamis (Kenya), from Scientist to Senior Scientist, Plant Health Theme; Komivi Senyo Akutse (Togo), from Scientist to Senior Scientist, Plant Health Theme; Saliou Niassy (Senegal), from Scientist to Senior Scientist, Technology Transfer Unit; Beatrice Muriithi (Kenya), from Postdoctoral Fellow to Scientist, Social Science and Impact Assessment Unit; Kiatoko Nkoba (Democratic Republic of Congo), from Postdoctoral Fellow to Scientist, Environmental Health Theme.

Several appointments have been made in the Data Management, Modelling and Geo-Information (DMMG) Unit. They include: Bester Tawona Mudereri (Zimbabwe), Postdoctoral Fellow (geospatial and remote sensing modelling for monitoring of coffee pests and diseases); Bonoukpoè Mawuko Sokame (Togo), Postdoctoral Fellow (crop losses due to pests modelling); Antoinette Wiebe (Canada), Project Manager (Vector Atlas project); Peter Gitu Karanja (Kenya), Business Support Officer 1 (Cloud Solution Architect); Sheila Nangila Wafula (Kenya), Business Support Officer I (Software Engineer – GIS); Chelsea Mbeke Kilonzo (Kenya), Research Officer I (Geospatial Data Clerk); Dorcus Nabucha Namikelwa (Kenya), Research Officer I (Geospatial Data Clerk).

New appointments in the MOYESH project (Ethiopia) include (Oromia Region), Wondimu Gezahegn, Research Assistant II; Terefe Etana, Research Assistant II; and Tadesse Berhanu, Research Assistant II, (Amhara Region), Tadele Getahun, Research Assistant II and Genanew Atinkut Mengist, Research Assistant II; (Southern Nations, Nationalities, and Peoples' Region), Lisanu Abakaru, Research Assistant II; Meron Shawel Legese, Business Support Officer I (Assistant Accountant) and Girma Deseno, Business Support Officer II (Accountant), in Jimma, Oromia Region.

Other appointments include: Margaret Mendi Njoroge (Kenya), Postdoctoral Research Fellow, Human Health Theme, to coordinate research activities within the Disease Ecology Group; Joseph Gichuhi, Postdoctoral Fellow, SymbioVector project; Tonoude Romuald Thierry Hounkpatin (Benin), Senior Business Support Officer (Project and Finance Officer), Accelerating Inclusive Green Growth through Agri-based Digital Innovation in West Africa (AGriDI); Austine Tunya Oyier, Senior Business Support Officer I (Supply Chain), RSIF; and Abyalew Moges (Ethiopia), Research Assistant II, Black Soldier Fly project, Ethiopia.

For complete details on recent staff appointments visit: [LINK](#)

RECENTLY FUNDED

Donor: Australian Centre for International Agricultural Research (ACIAR)

Title: Core support to *icipe*

icipe staff: Segenet Kelemu (Director General)

Donor: IKEA Foundation

Project title: Scaling regenerative black soldier fly farming innovations with vegetable push-pull cropping systems for One-Health in rural Kenya, Rwanda and Uganda

***icipe* staff:** Sevgan Subramanian, Chrysantus Tanga and Daniel Mutyambai (Insects for Food and Feed Programme); Jimmy Pittchar, Zeyaur Khan (Push-pull IPM technology), Saliou Niassy (Technology Transfer Unit, TTU)

Collaborators: National Environment Management Authority (in Kenya and Uganda); and Rwanda Environment Management Authority (REMA); private waste management companies: Takataka Solutions Ltd, Bins Service Waste Management Company Ltd, Colnet Waste Management Company Ltd (Kenya); ASANTE Waste Management and De Waste (U) Ltd, Uganda; and GreenCare and Rwanda Ltd and COPED Ltd (Rwanda). Sanergy Ltd and InsectiPro Ltd, Kenya; Marula Proteen Ltd, Uganda; and Safe for Health Ltd, Rwanda; Kenya Agriculture and Livestock Research Organisation (KALRO); Kenya Marine and Fisheries Research Institute (KMFRI); Rwanda Agriculture and Animal Resources and Development Board (RAB); Food for the Hungry, Rwanda; National Agriculture

Research Organisation (NARO); National Fisheries Resources Research Institute (NaFIRRI), Uganda; national agricultural research services, non-governmental organisations, self-help groups, farmers, feed producers and seed producers. Makerere University, Uganda; Jomo Kenyatta University of Agriculture and Technology (JKUAT), Kenya and University of Rwanda; Rwanda Food and Drugs Authority (FDA); Improving Market Systems for Agriculture in Rwanda (IMSAR); Kenya Bureau of Standards (KeBS); and Uganda National Bureau of Standards (UNBS); and O-farm, BopInc, and village capital

Donor: United States National Institutes of Health (NIH) through University of Cape Town, South Africa

Project: H3ABioNet Network – Pan African Bioinformatics Network for H3Africa

icipe staff: Daniel Masiga (Human Health Theme).

Collaborators: University of Cape Town, South Africa

Donor: NIH

Project title: Eastern Africa Network for Bioinformatics Training (EANBiT) – administrative supplement

icipe staff: Daniel Masiga (Human Health Theme)

Collaborators: Pwani University, Kenya; Kenya Medical Research Institute – Wellcome Trust Research Programme; Biosciences eastern and central Africa–International Livestock Research Institute (BecA-ILRI) Hub; Makerere University, Uganda and Uganda Virus Research Institute; and Muhimbili University of Health and Allied Sciences (MUHAS), Tanzania

Donor: Government of Nigeria

Programme: Regional Scholarship and Innovation Fund (RSIF) of the Partnership for Skills in Applied Sciences, Engineering and Technology (PASET)

icipe staff: Moses Osiru, RSIF Regional Coordinating Unit (RCU)

Donor: Norwegian Agency for Development Cooperation (Norad) through WorldFish

Project title: Development and Scaling of Sustainable Feeds for Resilient Aquatic Food Systems in Sub-Saharan Africa (FASA)

icipe staff: Chrysantus Tanga and Subramanian Sevgan (Insects for Food and Feed Programme)

Collaborators: Swedish University of Agricultural Sciences (SLU); Aller Aqua Africa; and West and Central African Council for Agricultural Research (CORAF)

Donor: Centre de Suivi Ecologique (CSE), Senegal.

Project title: Promoting sustainable development in Africa through agroforestry.

icipe staff: Elfatih Abdel-Rahman and Henri Tonnang (DMMG Unit)

Collaborators: CSE

Donor: Swiss Agency for Development and Cooperation (SDC), Ethiopia

Project title: Scaling-up insect-based protein feed technologies and practices for enhanced poultry production in Ethiopia (SIPFEED-ETH).

icipe staff: Chrysantus Tanga, and Subramanian Sevgan (Insects for Food and Feed Programme); and Tadele Tefera (*icipe* Ethiopia Office).

Collaborators: Hawassa University; Yirgalem Agro-processing Industrial Park; and Sidama Region Poultry Sector; all in Ethiopia.

Donor: Novo Nordisk Foundation, Denmark led by Impact Designs

Project title: Refugee Insect Production for Food and Feed (RefIPro)

icipe staff: Chrysantus Tanga and Dennis Beesigamukama (Insects for Food and Feed Programme)

Collaborators: Impact Designs (lead organisation and grant holder); Makerere University, Uganda; Copenhagen University, Denmark; Mothers against Malnutrition and Hunger (MAMAH), Uganda; and Bobo Eco Farm, Uganda.

Donor: Kenya Education Network (KENET) – Research and Innovation Grant in Computer Science and Information Systems 2022/2023

Project title: Using machine learning approaches to infer relationships of insect songs, behaviour and weather variables for improved productivity of cricket farms for food and income generating in Kenya

icipe staff: Kennedy Senagi (Data Management, Modeling and Geo-Information Unit), and James Egonyu (Insects for Food and Feed Programme)

Collaborators: Strathmore University, Kenya

Donor: One CGIAR Secretariat led by the Alliance of Bioversity and International Center for Tropical Agriculture (CIAT)

Project title: Transforming AgriFood Systems in West and Central Africa (TAFS-WCA) – Work Package 2: Informed Digital Agriculture for Climate Resilience – Managing Climate Risks and Accessing Services

icipe staff: Tobias Landmann and Elfatih Abdel-Rahman (DMMG Unit); and Thomas Dubois (Plant Health Theme)

Collaborators: Rwanda Agriculture and Animal Resources Development Board (RAB) and One Acre Fund, Rwanda

Donor: Bill & Melinda Gates Foundation through Chancellor Masters & Scholars of the University of Oxford, UK

Project title: The Vector Atlas

icipe staff: Henri Tonnang (DMMG Unit); and Daniel Masiga (Human Health Theme)

Collaborators: Led by *icipe*; University of Oxford, UK; and the Malaria Atlas Project initiative, Australia. Collaborators include the Pan-African Mosquito Control Association (PAMCA); Global Biodiversity Information Facility; VectorBase; IRMapper; Amplicon Project; MalariaGen; Target Malaria and Global Vector Hub

Donor: Ghent University, Belgium

Project: *icipe* as an African Satellite Institute for courses for International Masters Programme students and Basic Nematology Crash Course

icipe staff: Solveig Haukeland

Collaborators: International Institute of Tropical Agriculture (IITA); Moi University, Kenya; and CABI

Donor: University of Zurich, Switzerland

Project title: Capacity Building Fellowships on EU-UPSCALE Project

icipe staff: Frank Chidawanyika (Push-pull IPM Programme)

Donor: CGIAR Plant Health Initiative Subgrant Proposal 2022 for non-CGIAR Partners led by CIMMYT

Project title: Plant Health Initiative – Development, testing and scaling of maize and vegetable IPM in Eastern Africa

icipe staff: Thomas Dubois, Samira Mohamed, Fathiya Khamis and Komivi Akutse, (Plant Health Theme); Subramanian Sevgan (Environmental Health Theme); Saliou Niassy (TTU); Menale Kassie (SSIA Unit) and Frank Chidawanyika (Push-pull IPM Programme)

Collaborators: CIMMYT, IITA, IFPRI

Donor: United States Department of Agriculture -Agricultural Research Service

Project title: Identification of semiochemicals for regulation of potentially invasive pests or beneficial organisms for the control of invasive pests to the US

icipe staff: Baldwyn Torto (Behavioural and Chemical Ecology Unit)

Collaborators: Chemistry Research Unit, USDA

Donor: Norad

Project title: Malawi Digital Plant Health Service (MaDiPHS)

icipe staff: Thomas Dubois (Plant Health Theme); Henri Tonnang and Elfatih Abdel-Rahman (DMMG Unit); Saliou Niassy (TTU); Sunday Ekesi (Capacity Building and Integrated Sciences)

Collaborators: Norwegian Institute of Bioeconomy Research (NIBIO) (Lead); Norwegian Meteorological Institute; Centre for Agriculture and Bioscience International (CABI); Food and Agriculture Organisation of the United Nations – Malawi; International Institute of Tropical Agriculture (IITA); Lilongwe University of

Agriculture and Natural Resources; Malawi Ministry of Agriculture; Malawi Ministry of Natural Resources and Climate Change; Penn State University, USA; Total Land Care (TLC), Malawi; and Viamo.

Donor: Wellcome Early-Career Award – 2022

Project title: An investigation of drivers of dengue virus transmission and the potential for Wolbachia-based transmission blocking in Kenya

icipe staff: Sheila Agha, Baldwyn Torto, David Tchouassi (BCEU); and Jeremy Herren (Human Health Theme)

Collaborators: Liverpool School of Tropical Medicine, UK; Ministry of Health, Division of Vector-borne and Neglected Tropical Diseases, Kenya

Donor: Biovision Foundation for Ecological Development, Switzerland

Project title: Piloting novel, biorational, cattle-targeted interventions for sustainable control of arthropod vectors of malaria and other diseases of humans and livestock through multi-sectoral stakeholder engagement and community partnership

icipe staff: Ulrike Fillinger, Margaret Njoroge (Human Health Theme)

Collaborators: County-level health management teams in Busia County, western Kenya; and Kwale County, coastal Kenya

Donor: GIZ - Fund for the Promotion of Innovations in Agriculture (i4Ag)

Project title: AgEco IPM: Agro-ecological management of the fall armyworm in Eastern and Southern Africa

icipe staff: Thomas Dubois, Samira Mohamed, Komivi Akutse, Fathiya

Khamis and Frank Chidawanyika (Head, Plant Health Theme); Sunday Ekesi (Head, Capacity Building and Integrated Sciences); Sevgan Subramanian (Head, Environmental Health Theme); Saliou Niassy (Technology Transfer Unit); Menale Kassie, Holger Kirscht and Michael Kidoido (SSIA Unit); and Elfatih Abdel-Rahman and Bester Mudereri (DMMG Unit)

Collaborators: National Agricultural Research Organisation (NARO), Uganda; Total Land Care, Malawi; Zambia Agriculture Research Institute (ZARI)

Donor: The Research Institute of Organic Agriculture (FiBL)

Project title: Long-term Farming Systems Comparison in the Tropics (SysCom) – What is the contribution of organic farming to sustainable development?

icipe staff: Edward Karanja

Collaborators: University of Nairobi; International Livestock Research Institute (ILRI); Kenya Agriculture and Livestock Research Organization (KALRO); Kenya Organic Agriculture Network (KOAN); Kenyatta University, Kenya; JKUAT and Biofarms Ltd

Donor: Netherlands Postcode Lottery led by Stichting Cordaid

Project title: B(Eat) The Locust

icipe staff: Chrysantus Tanga

Collaborators: Catholic Organization for Relief and Development Aid (Cordaid); and Indigenous Movement for Peace Advancement and Conflict Transformation (IMPACT)

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