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RECENTLY
FUNDED

icipe BY NUMBERS

128

Peer reviewed journal articles published
between 1 January and 30 June 2022

2,570

mentions of *icipe* in social and traditional
media between 1 January and 30 June
2022

10

biobased products launched into the
eastern Africa market through initiatives
supported by BioInnovate Africa
Programme

72,000

jobs created so far through the
MOYESH project

50

partners currently investing in RSIF
either in funds or in kind



Prof. Kym Anderson
Chair, *icipe* Governing Council

Dear Friends and Colleagues,

We are pleased to present this newsletter that sums up *icipe*'s activities between January and June 2022.

The centrepiece of this publication is the Director General's Thought Leadership column, which provides valuable insights for inclusive innovation based on the Centre's experience. Innovation is a concept that is central to popular imagination, and one that is given prominence in developmental aspirations like the African Union Agenda 2063, and the United Nations 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs). However, achieving inclusive innovation remains a global challenge, due to the ever-evolving nature, definition and dynamics of the concept. Thus, evidence is needed for a holistic and balanced approach that will enable policies and partnerships; involvement of all segments of society; cost-effective pathways; sufficient human, technical and financial resources; and supportive national, regional and global systems.

The rest of this newsletter consists of our regular sections: Research Highlights, spotlighting some projects and programmes accomplishments; Selected Recently Published, illustrating continued generation of world-class scientific knowledge; Newsmakers, showing national, regional and global recognition and visibility of our teams;

Staff News, presenting recently appointed colleagues; and Recently Funded, capturing new investments in our Centre.

Our efforts to nurture African scientific talent for research and development, as well as innovation, are summed up in the sections on Capacity Building and Institutional Development; and the Regional Scholarship and Innovation Fund (<https://www.rsif-paset.org/>) and BioInnovate Africa Programme (<https://bioinnovate-africa.org>), both managed by *icipe*.

These stories are presented in a mixed media format, aimed to bring you the stories, the voices and faces behind the statistics and data. Some highlights include several videos featuring topics of which are: 20 years of *icipe*'s fruit fly research; testimonials of farmers in Kenya on the impact of parasitoids in controlling the fall armyworm; and potential benefits of integrating readily available but not-widely used malaria vector control tools, in southern Africa. We also have a Masterclass podcast with Caleb Kibet, Postdoctoral Fellow, Eastern Africa Network for Bioinformatics Training (EANBiT), on bioinformatics and *icipe*'s leading role in advancing the field in Africa. These products are located on the *icipe* website and social media platforms, where you may access them at your convenience.

We wish you a happy reading, and look forward to your continued partnership.



Dr Segenet Kelemu
Director General, *icipe*

TOWARDS INCLUSIVE INNOVATION

icipe offers evidence for a holistic, balanced and effective approach



To achieve inclusive innovation, a strong evidence base is needed for a holistic and balanced approach that will enable policies and partnerships; involvement of all segments of society; cost-effective pathways; sufficient human, technical and financial resources; and supportive national, regional and global systems.

The concept of innovation is central to popular imagination. It conjures up imageries of radical, brilliant ideas that transform organisations and our world. Companies are fixated with it. It is the mantra of leaders; the emblem of modern society; a panacea for developmental problems; a phenomenon to be studied. Indeed, the ideology of innovation is central to the African Union Agenda 2063, and the United Nations and its 17 Sustainable Development Goals (SDGs).

Simply put, innovations are new or improved products and processes that have specific advantages for markets, industries and consumers. At their best, innovations should enhance the competitive advantage of nations, regions and corporations, while also contributing to social change and overall human progress.

However, innovation is not a unifying concept. Many innovations are large in scale, capital intensive and destructive to the environment. While some innovations refine and improve, others disrupt, destroy and make established competences obsolete. Innovations do not follow well-orchestrated pathways. In fact the linear model of innovation of the 1960s and 1970s, which suggests progression from basic to applied research, product development and commercialisation, has long been disputed. Diverse innovations demand specific organisational environments and managerial skills. To be widely and effectively adopted, they require new market channels for distribution, diffusion and support. These two sets of factors are not always available.

Perhaps the most troublesome aspect of innovation is the decoupling of economic growth and economic development, leading to the exclusion of certain segments of society. Older models, also referred to as ‘mainstream innovation’, were aimed at middle- and high-income consumers, and formal producers. This focus excluded informal producers and low-income consumers, especially those in marginalised areas, or those with limited resources.

INCLUSIVE INNOVATION

From the 1990s, the global quest for alternative models led to concepts like “pro-poor innovation,” “grassroots innovation,” “below-the-radar innovation,” among others. Over the past two decades, these concepts have been framed as “inclusive innovation”. But, policymakers, economists, developmentalists, theorists, among others, continue to struggle to make meaning of the ever-evolving nature, definition and dynamics of inclusive innovation. Challenges prevail in synergistic policies and partnerships; the involvement of consumers especially the most vulnerable; appropriate and supportive national, regional and global systems; cost-effective pathways; and sufficient human, technical and financial resources.

Geopolitical innovation inequality abounds. The *Global Innovation Index 2021* shows that high-income economies, notably from Northern America and Europe, followed by Asian economies, continue to dominate the top 25 list of most innovative economies. The top five research and development spending economies since 2011 are the United States, China, Japan, Germany and the Republic of Korea. In sub-Saharan Africa, only Mauritius and South Africa rank in the top 65; and only Kenya and Tanzania have remained firmly in the top 100. Rwanda has regained its lead position among low-income economies. There is good news in that sub-Saharan Africa (SSA) is the region with the largest number of overperforming economies; those accomplishing innovations above expectation, relative to their level of economic development.

THE FACTS

INSIGHTS FROM *icipe***BiInnovate Africa Programme**

Supported by Swedish International Development Cooperation Agency (Sida) and managed by *icipe* since 2016, BiInnovate Africa Programme is one of the largest regional bioscience research and innovation-driven initiatives in the continent. The Programme enables scientists in eastern Africa to collaborate in a regional context, with interdisciplinary teams from academia, industry and government, to develop and commercialise biosciences based innovations for developmental priorities. In phase II (2018 – 2021), BiInnovate Africa Programme supported 20 projects under three themes: policy, value added products and value added agro/biowaste. The Programme offers valuable lessons in tackling key constraints in innovation systems, from regulatory approvals, procurement, institutional policy, intellectual property management, market analysis and scaling-up. **BiInnovate Africa Programme is highly regarded across Africa, and indeed the world, as a leader in mainstreaming biosciences as a sustainable pathway for development. Moreover, the Programme has been a main partner in the development of a bioeconomy in Africa.**

Beekeeping

While beekeeping is a longstanding tradition in many African countries, *icipe*'s vision is of a sustainable, profitable, holistic and inclusive industry. Our starting point is generating new knowledge to conserve and safeguard bees. We support beekeepers to establish robust and healthier bee colonies; and to produce better quality and quantity, and more diverse bee products; by boosting traditional beekeeping methods, and introducing modern and improved technologies and processes. We facilitate inclusion of women and youth in beekeeping, which has traditionally been a male-dominated occupation. This is through tailored-made initiatives like the More Young Entrepreneurs in Silk and Honey (MOYESH) project, funded by the Mastercard Foundation. We are building effective networks with value chain actors, to enhance entrepreneurship, investments and markets. We are augmenting the role of bees as pollinators, and premiering knowledge and standards to harness the premium value of stingless bees.

Biopesticides

Our innovative approach includes identification of the most effective strains from the most ideal microorganisms for particular pests. We create effective formulations that target specific stages in a pest's life cycle. We design application strategies that ensure that the biopesticides are easy-to-use, and that they do not require labourious, expensive and time-consuming application methods. Private sector partners are commercialising the products to ensure that they are widely available. The *icipe* biopesticides are compatible with other environmentally friendly control measures like attractants and natural enemies, and with useful arthropods like pollinators. We are collaborating with policymakers to streamline registration and regulations processes, and to harmonise and domesticate policies across African regions. **To increase awareness and adoption, we are elevating knowledge on the 'slow yet sure' mode of action of biopesticides. Also, we are supporting farmers to produce biopesticides on small scales using simple methods and affordable equipment, while also facilitating business opportunities for entrepreneurs.**

Silk farming

Worldwide, silk is one of the most notable textiles, with a rising demand and a global market valued at around USD 16.94 billion in 2021. This presents opportunities for Africa, especially for women and the youth. *icipe*'s goal is to help African entrepreneurs to find a niche locally, and in the global market, which has traditionally been dominated by Asian countries. We aim to introduce novel and unique silk products, for example by blending wild and cultivated silk; or textiles that have authentic, yet internationally appealing, African designs using traditional or organic dyes. Thus, we are identifying the best silkworm species for various African regions.

For example, in Ethiopia, we have selected the Eri silkworm due to its suitability to the country's weather conditions, its hardiness, disease tolerance and year-round production cycles, among other factors. Our basic science research enables the establishment of the high quality silkworm egg grainages and rearing methods. **Our results so far show the potential of vibrant, inclusive value chains across all silk farming stages, benefiting entrepreneurs, private sector actors, designers and models.** Moreover, there is potential for value-added products such as oil from the castor plant used to rear Eri silkworms, and the use of silkworm pupae as food.

Capacity building

Broadly, *icipe* supports innovation progress in Africa by nurturing gifted and talented young scientists into motivated researchers. This is through the Centre's dedicated capacity building programme, and the Regional Scholarship and Innovation Fund (RSIF) of the Partnership for skills in Applied Sciences, Engineering and Technology (PASET), an Africa led initiative. In addition, RSIF is providing research and innovation grants to partnering African Host Universities, while also enabling research on thematic areas selected by PASET as priority for Africa's socio-economic transformation. The grantees will benefit from RSIF's pan-African vision for scientific research and innovation capacity; and from *icipe*'s extensive research and innovation capacity.

INSIGHTS FROM *icipe*

Mosquito and malaria control

icipe's process has been distinguished by a focus on understanding the behaviour and the ecology of mosquitoes, the malaria vectors. Our basic research has enabled us to develop a range of environmentally friendly tools and strategies including nature-derived attractants, repellents and larvicidal and, potentially, a novel way to block transmission of the malaria parasite, using a naturally-occurring microbe found in mosquitoes. We implement our activities through an integrated vector management (IVM) approach, with an intersectoral network of local, national, regional and international partners. These efforts are guided by continuous surveillance of mosquitoes, the shifting malaria trends and specific local situations. This leads to scientific evidence-based decision making in the choice, sequence and optimum execution of the tools and strategies. **Overall, *icipe's* initiatives on malaria, and on other neglected tropical diseases, are contributing to stronger health innovation ecosystems in Africa.**

Insects for food, feed and other uses

The *icipe* insects for food, feed and other uses programme is globally reputed for advancing knowledge on the nutritional and socio-economic value of insects; contribution to the transformation of the current food system into a more sustainable and vibrant circular economy; and the establishment of a thriving, inclusive insect-based sector in Africa and beyond. Our range of high-quality, insect-based products includes: biofortified foods and feeds; organic fertilisers; pest and disease vector control products; and insect oils; to mention just a few. We have introduced protocols to improve harvesting and mass rearing of insects; and tools and processes to produce novel, safe and affordable insect-based products. These activities have been supported by massive capacity and awareness building, and support for the development of policies and national standards. **As a result, over 1000 large scale and micro-enterprises have been established; and close to 40 percent of those involved are women.**

Continuous improvements

We continue to generate new knowledge to improve our flagship and well reputed innovations. For example, we now have a climate smart push-pull technology, that maintains the benefits of the original, with additional advantages that prove the distinction of this technology as a platform to improve cereal-livestock mixed farming systems. We are now integrated into the push-pull system, high value vegetables, which are often produced by women. This will boost household nutrition and general well-being through new income avenues for women. In tsetse control, we have identified a blend of compounds from zebra, which will increase the effectiveness, affordability and sustainability of the *icipe* tsetse repellent technology and NGU traps. We have also developed a novel technology based on sticky small panels made of materials that enhances tsetse fly trapping. We are currently testing these two sets of innovations.

NEWSMAKERS

Enat Bank, Ethiopia, has named its 94th branch, located in Addis Ababa, after *icipe* Director General & CEO, **Dr Segenet Kelemu**, in honour of her excellence in the world of science. Initiated by 11 distinguished Ethiopian women, Enat Bank was founded in 2011 and became operational in 2013. The Bank's vision of serving all people specially aims to bring a new dynamism to supporting women in Ethiopia, to maximise their economic capabilities, especially in business. <https://www.enatbanksc.com/>

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STAFF

Dr Kelemu is the 2022 International Recipient of the prestigious Ellis Island Medal of Honor. The medals, which were established in 1986 by the Ellis Island Honors Society (EHS), are among the United States most renowned awards.

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On 7 June, [Doha Debates](#) announced that the latest individual honoured in their SolvingIt series is [Dr Segenet Kelemu](#), one of Africa's leading scientists and a role model for women in science and research around the world.

[Doha Debates](#), a media organisation based in Qatar and Washington DC, USA, engages people in conversations about global challenges through debates, town halls, podcasts, films and more. The group's SolvingIt series has reached millions around the world, and honours top scientists, activists, and climate change leaders from Africa and other regions of the world. ([Top Ethiopian Scientist Being Honored By International News Organization - Daily Post Gallery](#))

Dr Kelemu is one of the scientists featured in a publication titled, *Earth, Oceans and Skies: Insights from selected, outstanding African women scientists*; published by the United Nations Economic Commission for Africa (ECA). The book is one of the Commission's main activities to champion the UN Decade of Action. [Download a copy](#)

Prof. Baldwin Torto, Head, Behavioural and Chemical Ecology Unit (BCEU), has been appointed member of the Jury, Life Sciences, 2022 Falling Walls Breakthroughs; and member, 2022 Selection Committee, UNESCO-Organization for Women in Science for the Developing World-Elsevier Foundation Awards.

Dr Menale Kassie, Head, Social Science and Impact Assessment Unit, has been elected Fellow of the African Academy of Sciences.

Dr Tadele Tefera, Head, *icipe* Ethiopia Office, has been elected Fellow of the Ethiopian Academy of Sciences.

Dr Julius Ecuru, Manager, BioInnovate Africa Programme, has been appointed to serve on the JRS Biodiversity Foundation Board of Trustees for three years, starting in January 2022.

SCHOLARS

Naomi Nyambura Riithi (MSc, Kenya), was featured in the Royal Society of Tropical Medicine and Hygiene (RSTMH) blog, during the International Women's Day (March 8 2022) titled: Gender bias is a galling word in a world where women seek to be heard and their ideas appreciated.

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Andrew Abiya (MSc, Kenya), won the best presentation award in the UU-A student summit on 'Bridging young researchers with the Sustainable Development Goals (SDGs)', aimed at supporting the formation of collaborative programmes by merging African potential and Japanese scientific technology. Andrew presented the results of his study on the productivity of the wonder multistorey garden technology.

Gladys Mosomtai (PhD, Kenya) was awarded the United Nations Economic Commission for Africa (UNECA) Fellowship for Young African Professionals. She was also awarded the African Research Fellowship within the European Space Agency EO AFRICA Initiative. In addition, Gladys was selected as one of the leading women in machine learning for Earth observation (ML4EO) – having been nominated by the Radiant Earth Foundation, during International Women's Day.

JOURNAL APPOINTMENTS

Dr Henri Tonnang, Head, Data Management, Modelling, and Geo-Information (DMMG) Unit has been appointed as Associate Editor, *Frontiers in Tropical Diseases* (Vector Biology section); and Associate Editor, *International Journal of Tropical Insect Science*.

Dr Elfatih M. Abdel-Rahman, Research Scientist, DMMG Unit, is a Guest Editor of the special issue on Improving the Remote Sensing of Phytochemicals, of the *Frontiers in Remote Sensing* journal.

Dr Tobias Landmann, CIM/GIZ Integrated Expert in Geospatial Science, DMMG Unit, is a Guest Editor of the special issue on Remote Sensing for Land Degradation and Drought Monitoring, of the *Remote Sensing* journal published by MDPI.

Desert locust genome

Scientists from the United States Department of Agriculture – Agricultural Research Service (USDA-ARS) have produced the first high-quality genome of the desert locust. This is one of the largest insect genomes ever completed and it was all done from a single locust. That one locust was provided by Prof. Baldwyn Torto, Head, Behavioural and Chemical Ecology Unit (BCEU), *icipe*. Through an intense search across Kenya, he and his team located two locust parents, which they bred to produce an offspring of known pedigree.

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Mosquitoes and *Parthenium*



A male of *Aedes aegypti* mosquito captured feeding on the invasive and highly destructive *Parthenium* weed, in the compound of the *icipe* Duduville Campus, in Nairobi. This is our first observation of male *Aedes aegypti* feeding on the weed, which confirms our findings that mosquito plant

feeding is selective and not random. *icipe* scientists intend to use *Parthenium* odours in traps to control both sexes of malaria and dengue vectors.

Rwanda edible insects standards

Against a grand vision of mainstreaming edible insects as a way of achieving food security and economic growth, Rwanda has marked two major milestones: the launch of national standards to guide the emergence of the edible insects sector; and the establishment of the country's first commercial insect-based animal feed plant. *icipe* provided the scientific and technical guidance. These landmarks have been achieved through a process facilitated by the Improving Market Systems in Rwanda for Agriculture (IMSAR) project, an initiative funded by UK Aid through the Foreign Commonwealth and Development Office (FCDO); in partnership with the Rwanda Agricultural Board (RAB), and the Rwanda Standards Board (RSB).



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EIT-Hub

AgriFutures, Australia; the Australian Centre for International Agricultural Research (ACIAR); and *icipe*, have created the Emerging Insect Technology Hub (EIT-Hub). The platform will enable collaboration and knowledge-sharing among research and industry partners, scientists and investors in Africa and Australia. The EIT-Hub will capitalise on the goal of promoting insect farming as an emerging industry in Australia, by AgriFutures Australia. It will also build on the investments by various development partners in the insects for food and feed sector in Africa, through *icipe*. It will also benefit from the Centre's globally reputed leadership in advancing knowledge, and a thriving insect-based sector in Africa and beyond.

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Agroveg project

Funded by Biovision Foundation for Ecological Development, Agroveg project, a three-year initiative, has been launched to address production constraints in traditional African vegetables (TAVs) and crucifers (kales and cabbage). To be implemented in Kenya and Tanzania, Agroveg will scale-up *icipe* strategies for the control of arthropod and nematode pests of vegetables. These approaches include biopesticides, parasitoids, predators and resistant vegetable varieties. Significantly, a novel agroecological-based vegetable push-pull (food-food) cropping system will be developed. Partnerships, linkages and capacity will be strengthened among vegetable value chain stakeholders.

One Health initiative

icipe is implementing a One Health initiative, as a model for the simultaneous control of insect vectors of diseases that affect people and animals. For example, previous *icipe* studies have shown that, while affected directly by vectors like ticks and tsetse flies, cattle also act as a reservoir of mosquitoes, which cause various ailments in people. We are testing novel products and strategies, including the development of an environmentally friendly biopesticide for a range of vectors. Cattle will be used as decoys and treated with the biopesticide, thus protecting the animals as well as people.

Nematology awareness

The *icipe* nematology research group in partnership with colleagues from the International Institute of Tropical Agriculture (IITA), have intensified efforts to address the dearth of knowledge, awareness and capacity on nematodes and nematology in Africa. Recent activities include the establishment of a Pan African Nematology Network (PANEMA); participation in the International Congress of Nematology (ICN), with 13 presentations; establishment of new collaborative links with Pwani University, Kenya; and training of flower growers in Kenya, in partnership with Bayer East Africa.

From 2017 – 2021, *icipe* led research to evaluate the potential benefits of integrating readily available but not-widely used malaria vector control tools, such as dry season (winter) larviciding and house screening for **malaria elimination, in southern Africa**. We have prepared a brief documentary on these activities, which were funded by the Global Environment Facility (GEF) through support from and through the United Nations Environment Programme (UNEP) and World Health Organization Regional Office for Africa (WHO-AFRO II).



20 years of *icipe's* research on fruit flies in Africa.



Testimonials of farmers in Eastern Kenya on the **impact of parasitoids introduced by *icipe*, in controlling the fall armyworm**.



icipe Annual Report, 2021

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YOUNG ENTREPRENEURS IN SILK AND HONEY (YESH) PROJECT

Two beekeeping initiatives implemented by *icipe* under the YESH project, funded by the Mastercard Foundation, and the European Investment Fund Honey Trade project, have secured the East African Organic Products Standard certification, for the production and handling of honey and beeswax. They are: Guangua Honey Production, Processing and Marketing Share Company; and Acheyeta Honey Production and Marketing Cooperative, both in Amhara Region.



MORE YOUNG ENTREPRENEURS IN SILK AND HONEY (MOYESH) PROJECT

PROGRESS

To date, the MOYESH project has created jobs for a total of 72,000 people (60 percent of them young women); and close to 7000 youth enterprises have been registered; and 157 private small and medium enterprises (SMEs), each generating about 10 direct jobs, have been created, to supply beekeeping and silk farming inputs.

INSPIRATION

Inspired by the success of the MOYESH project, policymakers, governments and various organisations in Ethiopia are designing and supporting novel youth-centred development schemes. For example, the Oromia Regional government has launched a Honey Development Initiative, while honeybee colony multiplication and queen bee rearing centres are being established in the region, and in Amhara Region as well.

RE-IMAGINING MOYESH

To expand the outreach and upscale its business models, a concept note has been developed on “Re-imagining MOYESH through disruptive and systems approach”. The document outlines activities under seven alternative and complementary thrusts, which could generate over 43,000 direct, and 203,000 indirect jobs.



Ms Gete Wari, a member of the Lami, Aga, Martu and Friends Enterprise, Oromia Region, Ethiopia, established through the MOYESH project, displaying silk cocoons and yarn during the Conference of the African Association of Insect Scientists held in Addis Ababa in March 2022.

IN FOCUS

NEW PHOTOGRAPHIC SYSTEM

Thanks to a grant from Sida, *icipe* has acquired a MacroSolutions Macropod photographic system. This technologically advanced equipment, with its capacity to produce high-resolution images presents exciting opportunities, especially for our taxonomy research. For example, until recently, taxonomy and identification of microhymenoptera (very small wasps; mostly 1-3 mm in length), were hindered by the difficulty of visualising diagnostic morphological characters on such tiny specimens. Many wasps are significantly beneficial to humankind, because of their ability

to naturally control agricultural pests. Most of them are parasitic: they usually lay their eggs in or on the eggs or larvae of other insect species, and as the wasp larva develops, it leads to the death of the host insect. Images, like the ones below, are key in descriptive taxonomy and the system will enable us to catalogue and enhance understanding on the diversity of life. Furthermore, striking insect images are valuable in science communication.

[\(See pictorial\)](#)



SIDA AND *icipe* RENEW COOPERATION

On 21 March 2022, *icipe* and the Swedish International Development Cooperation Agency (Sida), signed a five-year agreement to implement BioInnovate Africa Programme phase III. With up to 160 million SEK (approximately USD 17 million) committed for BioInnovate Africa phase III, and previous Sida support to BioInnovate Africa phase I (2010 – 2015) and phase II (2016 – 2021), this is the largest single investment in a regional bioscience research and innovation-driven initiative to date in eastern Africa. BioInnovate Africa phase III is opportune; it coincides with the UN Decade of Action (2020 – 2030), to accelerate attainment of the Sustainable Development Goals (SDGs). This phase is also aligned with the aspirations of the African Union Agenda 2063, and the East African Community Vision 2050 of boosting value addition and agro-processing as the biggest direct employer of all manufacturing industries in the region.



L-R. Dr Segenet Kelemu, Director General of *icipe* and Dr Claes Kjellstrom, Senior Policy Specialist/Research, Sida signing the BioInnovate Africa phase III Agreement on 21 March 2022.

NEW PRODUCTS

A total of 10 new biobased products have been launched through initiatives supported by BioInnovate Africa Programme. They include foods enriched with insect-based proteins; nutritionally enhanced sorghum and millet foods; orange-fleshed sweet potato puree; clean sweet potato vines; mushroom blocks; refractance window drying technology; waste-water treatment technology; and a tsetse fly control technology.



EAC BIOECONOMY MILESTONE

In April 2022, the East African Community (EAC) council of ministers approved a 10-year regional bioeconomy strategy for the region; the first of its kind in Africa and the second in the world after the European Union. The strategy was developed through a national and regional consultative process spearheaded by the East African Science and Technology Commission (EASTECO), in partnership with the region's councils and commissions of science and technology; African Technology Policy Studies Network (ATPS); Stockholm Environment Institute (SEI) – Africa Centre; Scinnovent Centre Limited; and Bio-innovations Company Limited; with support from BioInnovate Africa Programme.

CALL OPEN

BioInnovate Africa Programme has announced a call for concept notes for Regional Innovation Collaboration Projects in eastern Africa. The opportunity is intended for scientists from universities, research institutes, and government agencies to work jointly with counterparts in the private sector to co-develop innovative biological based goods and services or product delivery systems, and pilot new technologies with good prospects for business and the market. The application deadline is 19 July 2022.



REGIONAL SCHOLARSHIP AND INNOVATION FUND (RSIF – www.rsif-paset.org)

AGriDI PROGRESS

In 2021, *icipe* was awarded a grant of Euro 4.2 million by the Organisation of African, Caribbean and Pacific States (OACPS), through the European Union financed ACP Innovation Fund, for the 'Accelerating inclusive green growth through agri-based digital innovation in Western Africa' (AGriDI) project. The initiative is being implemented by *icipe* (through RSIF), in partnership with

Agropolis Foundation, Gearbox Pan African Network and University Abomey-Calavi, Benin. In March 2022, AGriDI awarded the first batch of 10 third-party grants, to support co-development and adaptation of digital technologies with end users, especially the private sector, women and youth, and to develop policies to stimulate digital innovation.

RSIF – MOZAMBIQUE PARTNERSHIP

RSIF in collaboration with the Ministry of Higher Education, Science and Technology, Mozambique, has provided research and innovation grants totaling USD 570,000 to Mozambican scientists and researchers. This is the first set of grants of a USD 6 million investment in

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

DESIGN THINKING

With support from RSIF, the University of Ghana in partnership with the Alliance for a Green Revolution (AGRA), and RMG Ghana Limited, have initiated a process to create a conducive environment for agri-business development in Ghana. The partners intend to inculcate, among students and practitioners, design thinking – a methodology that provides a solution-based approach to solving problems – in the food value chain. A Design Thinking Development Centre has been established at the University, where randomised control trials on the impact of design thinking will be conducted.

PAN-AFRICAN CONFERENCE

Between 28 and 29 June 2022 RSIF in collaboration with one of the Fund's international partner institutions; University Mohammed VI Polytechnic (UM6P), Morocco, convened a pan-African conference. The theme was 'African-led science, technology and innovation for contributing to the Sustainable Development Goals (SDGs) and stimulating global development'. The forum reflected on the need and ways to fortify Africa's ability and capacity, through science, technology and innovation, to respond to a fast-changing global environment, in alignment to the aspirations of African Agenda 2063. [Communique.](#)

RECENTLY GRADUATED SCHOLARS

Richard Koech (Kenya), was registered at the African University of Science and Technology (AUST), Nigeria, with sandwich placement at Worcester Polytechnic Institute, Massachusetts, USA. His research established novel routes to improve the performance of lead halide perovskite solar cells.

"Of my findings, the possibility of incorporating thermally evaporated cesium bromide and polyethylene oxide into the active layer perovskite solar cell excites me the most. The technique improves the power conversion efficiency and long-term stability of the cells. It will enable development of a low-cost solar energy, with transformative potential benefits for individuals and institutions who are off the national electricity grid."

Emmanuel Effah was registered at the University Gaston Berger, Senegal, with sandwich placement at the Worcester Polytechnic Institute. His goal was to build a robust and affordable Agriculture Internet-of Things (Agri-IoT) technology to address impacts of climate change-induced drought on food security.

"I am most excited about having developed an Agri-IoT Tech prototype, whose performance and global significance has been proven. It has a realistic routing protocol founded on: a custom-built prototype of a robust; low-cost, simple to deploy and operate anywhere, location-independent; and smart Agri-IoT Tech."

CAPACITY BUILDING AND INSTITUTIONAL DEVELOPMENT

GRADUATIONS AND DEFENCES

A total of 14 scholars from Ethiopia, Kenya, Rwanda and Tanzania, have graduated or defended their theses over the past six months. They have contributed knowledge on: the role of grasses and associated fungal species in the egg-laying behaviour of mosquitoes; plant derived semiochemicals that attract the stable fly, *Stomoxys calcitrans*; and the development of a tool for the application of *Metarhizium anisopliae* on tsetse flies. Further insights have been generated to improve rearing and harvesting techniques of edible grasshoppers; and for the development of insect-based products. Understanding has been enhanced on the possibility of mitigating climate change through improved soil health; and on how the push-pull technology contributes to carbon sequestration and nitrogen fixation; community composition,

pollinator diversity and pollination efficiency in avocado and cucurbit production across diverse landscapes in Kenya and Tanzania. Socio-economic studies have revealed the connection between storage hygiene and storage pests; and the willingness to pay for larvae spy acoustic technology in Kenya.

Under the EANBiT consortium, scholars have conducted research to establish the genetic basis for important agronomic traits in finger millet; whole genome sequencing and phylogenetic analysis of norovirus GI and GII strains circulating in coastal Kenya between 2013 – 2019; whole genome sequence analysis of rotavirus genotype G1P[8] strains circulating in coastal Kenya, before and after the introduction of vaccines; transmission dynamics of

recent outbreaks of viral hemorrhagic fevers in Uganda; parallelizing long-read de novo genome assemblers on mixed architectures (CPU/GPU) with OpenACC and CUDA; and on the accuracy of genotype imputation.

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MASTERCLASS

With Caleb Kibet, Postdoctoral Fellow, Eastern Africa Network for Bioinformatics Training (EANBiT) on bioinformatics; its utility in scientific research and *icipe's* leading role in advancing the field in Africa.



Cricket fortified porridge

In a game-changer for nutritional security in Africa, *icipe* researchers have used nutrients from a recently discovered edible African cricket known as *Scapsipedus icipe*, to transform African porridge from a basic, often low-nutrient meal, into a super-food that meets and exceeds micronutrient requirements for people. In the process, the Centre has created a novel model for food-to-food biofortification. [Paper link](#)

Banana waste, potato's gain

With potato production in East Africa under increasing threat from the invasive and highly destructive potato cyst nematode (PCN) pest, an organic technology developed from banana plant waste material may well be the ultimate rescue. Known as 'wrap and plant', the solution involves enclosing potato seed before planting, in a thick absorbent paper that is made from the fibre of banana plants. This strategy provides a protective barrier for the plants against damage by PCN. These findings of research led by *icipe*, International Institute of Tropical Agriculture (IITA) and North Carolina State University, USA, have been published recently in [Nature Sustainability](#).

Fall armyworm monitoring framework

A recent study by *icipe* that employed data science and rule-based modeling approach has developed an innovative framework to monitor the fall armyworm in Africa. More broadly, the tool will be a basis for decision support systems, on the tri-trophic interactions between plants, pests and beneficial organisms. [Paper link](#)

Malaria burden

Our evaluations have confirmed the continued, heavy burden of malaria in Africa, and specifically, the disease's impact on agricultural labour, yields and productivity. The household toll is greatest when women and children below 14 years old fall sick. Thus, it is vital to intensify their access to malaria control and prevention services, and to integrate interventions on the disease with efforts to boost agriculture. [Paper link](#)

Push-pull climate resilience

Using the Food and Agriculture Organization of the United Nations (FAO) Self-Evaluation and Holistic Assessment of Climate Resilience of Farmers and Pastoralists (SHARP), we assessed the push-pull technology against 13 agroecosystem indicators of climate resilience, in comparison to other farming systems. The results indicate that the push-pull farming system is more climate-resilient, with significant impact on eight out of the 13 indicators. [Paper link](#)

EYE on yellow fever

icipe is mainstreaming the potential of using mosquito-based surveillance, within the context of the global 'Eliminate Yellow Fever Epidemics (EYE)' strategy. Our recent studies reveal the distribution and contribution of mosquito sub-species and sub-populations, in relation to yellow fever transmission dynamics. Overall, we highlight the importance of genotype-based analyses for precise surveillance of disease vectors to predict disease risk and guide cost-effective interventions. [Paper link](#)

3-G push-pull

Farmers have shown preference for the third generation push-pull technology, developed recently by *icipe* and partners, because of certain superior traits of its companion plants. This adapted version of the technology uses companion crops that are more resilient to the increasingly hot and dry conditions, due to climate change, in various parts of Africa. The *Brachiaria* cultivar, Xaraes, was rated as 'very good' for drought tolerance, biomass yield, and resistance to spider mites. *Desmodium incanum* was rated 'very good' for seed production and drought tolerance. [Paper link](#)

Climate change and bees

Despite the more stable and favourable climatic conditions in the tropics, in comparison to temperate regions, seasonality still plays a major role in maintaining bee species diversity, as it influences plant species distribution. This means that the diversity of bee species in the tropics will be at risk, in view of global climate change.

Push-pull controls fall armyworm

A study by *icipe* and Keele University, UK, published in *Frontiers in Ecology and Evolution* ([paper link](#)), has established the scientific mechanisms through which the push-pull technology conquers the fall armyworm. The findings also reveal intriguing new properties that reaffirm push-pull as a rare agricultural innovation success; its superiority as an agroecological technology that exploits natural insect-plant and insect-insect interactions; and its distinction as a platform to improve cereal-livestock mixed farming systems.

[Short video](#); [press release](#)

TOP CITED ARTICLES

Chia et. al (2020) [Nutritional composition of black soldier fly larvae feeding on agro industrial by-products](#). *Entomologia Experimentalis et Applicata*

*Among work published between 1 January 2019 – 31 December 2020.

Heya et. al (2020) [Characterization and risk assessment of the invasive papaya mealybug, *Paracoccus marginatus*, in Kenya under changing climate](#). *Journal of Applied Entomology*

Akutse et. al (2020) [Entomopathogenic fungus isolates for adult *Tuta absoluta* \(Lepidoptera: Gelechiidae\) management and their compatibility with *Tuta* pheromone](#) (2020). *Journal of Applied Entomology*.



Dr Kjersti Thorkildsen (left), Senior Adviser, Department for Human Development, Section for Higher Education and Research, Norwegian Agency for Development (Norad); and Dr Susanne Johansson (right), Senior Research Advisor, Swedish International Development Cooperation Agency (Sida); pictured with *icipe* Director General & CEO, Dr Segenet Kelemu (centre), during a visit to the Centre in April 2022.



Dr Thorkildsen was accompanied by Mrs Helga Torsknæs, Senior Adviser, Department for Human Development, Section for Higher Education and Research, Norad; and Mr Erlend Arnesen Haugen and Mr Øystein Rune Størkersen from the Norwegian Embassy, Kenya. Their discussions focussed on the Norad-funded Combating Arthropod Pest for Better Health Food and Resilience to Climate Change (CAP-Africa) initiative, being implemented by *icipe*, and broader activities of the Centre. Dr Johansson held discussion with the *icipe* Senior Management and researchers and the team of the Sida-funded BiolInnovate Africa Programme.



Delegates from the Swiss Agency for Development and Cooperation (SDC): Dr Daniel Valenghi (Programme Officer, Global Programme Food Security, Swiss Cooperation Office, Ethiopia); Dr Amsalu Abate (GPFS, Ethiopia); and Dr Corinne Corradi (International Cooperation Team, Nairobi, Kenya); visited *icipe* in February 2022. Dr Corradi (left) and Dr Valenghi (centre) are pictured with Dr Chrysantus Tanga (right), Senior Scientist and Head, *icipe* Insects for Food and Feed and Other Uses Programme (INSEFF), touring the black soldier fly rearing facilities.

Delegates from the Swedish International Development Cooperation Agency (Sida), led by Dr Jan Wärnbäck, Regional Coordinator/Specialist Environment and Climate Change, Swedish Development Cooperation hub for Environment and Climate Change in Africa (SwECCA), visited *icipe* in May 2022. The visitors, who were drawn from 12 Swedish embassies in Africa, aimed to familiarise themselves with *icipe* as an example of success in moving research for development to commercialisation.



A high-level delegation from the Canadian Embassy in Kenya, visited *icipe* in May 2022. They included the Honourable Harjit S. Sajjan (centre), Minister of International Development and Minister responsible for the Pacific Economic Development Agency of Canada, who was on a tour of Kenya and Rwanda. He is pictured with *icipe* Director General, Dr Segenet Kelemu (left), and Dr Chrysantus Tanga (right), Senior Scientist and Head, *icipe* Insects for Food and Feed and Other Uses Programme (INSEFF), observing black soldier fly rearing.

Dr Sarah Schmidt, Fund International Agricultural Research (FIA) Advisor, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Germany, who visited *icipe* on 17 May 2022, captures silkworms being reared as part of the Centre's Commercial and Beneficial Insects Programme.



(l-r): Dr Pierre Grard, representative in East Africa of the French agricultural research and cooperation organization (CIRAD); and Dr Hervé Pennec, researcher and Director of the African Studies Network, the French National Centre for Scientific Research (CNRS); and Ms Amel Feredj, deputy director for international cooperation, CNRS, in discussions with *icipe* researchers during a visit to the Centre in June 2022.

Board Members of the Association of the International Agricultural Research Centers (AIARC), made a familiarisation visit to *icipe* in June 2022. They are pictured touring the Insects for Food and Feed and Other Uses facilities (l-r): Mr David Stinson, Director of Finance, AIARC; Mr Michael Gerba, Chief Operating Officer, International Livestock Research Institute (ILRI) and Board member, AIARC; Ms Judy Vukovich, Board member, AIARC; and Mr Jeffrey T. Hungate, President & CEO, AIARC; with Dr Peter Egonu, Scientist, *icipe*.





Beatrice T. Nganso (Cameroon) Research Scientist, Environmental Health Theme

A former *icipe* scholar, Beatrice holds a PhD in Entomology from the University of Pretoria, South Africa. From 2019 – 2022, she was a Postdoctoral Fellow at the Agricultural Research Organization (ARO), Israel. She specialises in molecular biology, physiology and behavioural ecology of honey bees, with special interest in their interactions with associated biotic stressors.



Dennis Beesigamukama (Uganda) Postdoctoral Fellow

Since January 2021, Dennis has been a soil fertility consultant at *icipe*, focusing on insect frass fertilisers and soil health. He holds a PhD in Soil Science from Kenyatta University, Kenya. Previously, he was a lecturer of Soil Science and Agronomy at Busitema University, Uganda; and a lecturer and consultant at Makerere University, Uganda.



Inusa Jacob Ajene (Nigeria) Postdoctoral Fellow

Jacob will conduct research on integrated pest management (IPM) in vegetables. His research interests include: molecular basis for plant pathogen interactions, arthropod population genetics, species distribution modelling, vegetable pathology and IPM. He holds a PhD in Plant Biotechnology from Stellenbosch University, South Africa. Previously, he was a senior lecturer at Ahmadu Bello University Zaria, Nigeria.



Caleb Kipkurui Kibet (Kenya), Postdoctoral Fellow

Previously, Caleb was a Bioinformatics Consultant at *icipe*. He also held positions as adjunct lecturer at Pwani University, Kenya, and a research fellow at Mozilla. He holds an MSc and PhD in Bioinformatics from Rhodes University, South Africa, and a BSc in Biotechnology from Kenyatta University, Kenya. He has been a recipient of several awards, including the Mozilla Science Fellowship, and is a board member of the Open Bioinformatics Foundation and Dryad Digital Repository.



Ayako Hyuga (Japan), Visiting Scientist, Human Health Theme

She has joined *icipe* under a postdoctoral training fellowship awarded by the Uehara Memorial Foundation and the Nakatomi Foundation, both in Japan. Her research focus is on the ecology and host-seeking behaviour of *Tunga penetrans*. Ayako holds a PhD in medical science, infection research, from Nagasaki University, Japan, and a Bachelor of Veterinary Medicine from Nihon University, Japan. Previously, she was a researcher at the Tokyo Metropolitan Institute of Public Health, Japan.



Abdi Etafa (Ethiopia), Gender Expert, MOYESH project

He holds BSc and MSc degrees in Rural Development from Haramaya University, Ethiopia. His previous positions held in various organisations include: researcher and lecturer, capacity development associate, rural development expert and social inclusion expert, gender and extension advisor.



Nelson Christopher Suchi (Kenya), Facilities and Assets Manager

Having joined *icipe* in 2014 as a Clerk of Works, Nelson served as the interim Facilities and Assets Manager between 2018 – 2021. He holds a Bachelor of Technology degree in Building Construction from the Technical University of Kenya; Diploma in Building and Civil Engineering from the Technical University of Mombasa; and Diploma in Project Management from the Kenya Institute of Management. His previous positions include: Engineering Manager at the British Army Training Unit Kenya, and Project Manager at the Kenya Builders and Concrete Company Limited.



Victoria Akoth Ochwal (Kenya), Senior Research Officer, Human Health Theme

She holds a Masters Degree in Developmental Studies from St Pauls University, Limuru and a Bachelor Degree in Public Health from Kenyatta University, Nairobi. Previously, she was a Research Officer at Busara Center for Behavioural Economics, Kenya; social behaviour change research assistant at The Mannoff Group and country programme officer, Fred Hollows Foundation.

**Beritah Mutune (Kenya) Research Officer I, Technology Transfer Unit**

A former scholar in the Arthropod Pathology Unit, Beritah has previously held various positions at *icipe* including: intern in the Molecular Biology and Biochemistry Unit and the Animal Rearing and Quarantine Unit (ARQU); and as a consultant in the Technology Transfer Unit. She holds a BSc in Biomedical Sciences from Maseno University and a Master's degree in Public Health from Jomo Kenyatta University of Agriculture and Technology, both in Kenya.

**Gilbert Rotich (Kenya), Research Officer I**

He will support field activities of the arboviral and malaria research programmes, including field surveys of disease vectors, their morphological and molecular identification, and screening of diverse pathogens. Previously, he was a Research Assistant in the *icipe* Bee Health Programme.

**Valerian Aloo (Kenya), Executive Assistant to the Director General**

She holds a Bachelor's degree in Business Studies from the Open University, UK. She is a certified professional trainer and auditor. Previously, she served as Capacity Building Officer at the Biosciences eastern and central Africa-International Livestock Research Institute (BecA-ILRI) Hub and as a senior recruitment consultant and trainer at the Superior Service Compaby Limited, UK.

**Winfred Kinya (Kenya), Senior Business Support Officer I**

She holds a Bachelor of Business Administration from the Kenya Methodist University (KEMU). She is also a certified accountant of the Institute of Certified Public Accountants of Kenya (ICPAK). Previously, she has worked at the Alliance for a Green Revolution in Africa (AGRA); Worldwide Fund for Nature International (WWF); and Save the Children International (SCI).

**Maryann Wanjiru Mwangi (Kenya), Senior Business Support Officer I**

She holds a Bachelor of Commerce from the Catholic University of Eastern Africa. Her previous positions include: project finance and compliance specialist at the International Potato Centre (CIP); and finance officer at The Palladium Group; and grants associate projects, PACT Kenya.

**Maureen Agena (Uganda) Senior Communications Specialist, RSIF**

She holds an MSc in Information Systems awarded jointly by Uganda Martyrs University, Uganda and St Mary's University, Nova Scotia, Canada; an MA in Development Communication from Daystar University, Kenya, and a BSc in Information Technology from Uganda Martyrs University, Uganda. Her previous positions include an online communications and ICT4Ag consultant, World Bank Group in Kenya and Uganda; communications consultant, Technical Centre for Agriculture and rural Cooperation (CTA), The Netherlands; communications and advocacy specialist, Regional Universities Forum for Capacity Building in Agriculture (RUFORUM); and lecturer, Daystar University, Kenya.

Donor: Swedish International Development Cooperation Agency (Sida)

Project title: Phase III of the Bioresources Innovations Network for Eastern Africa Development Programme (BioInnovate Africa Programme) 2022 – 2026

icipe staff: Julius Ecuru

Donor: Australian Centre for International Agricultural Research (ACIAR)

Project title: Upscaling the benefits of insect-based animal feed technologies for sustainable agricultural intensification in Africa (PROTeinAfrica) (LS/2020/154)

icipe staff: Chrysantus Tanga, James Egonyu, Dennis Beesigamukama, Menale Kassie, Michael Kidoido, Sevgan Subramanian, Thomas Dubois

Collaborators: AgriFutures Australia; Makerere University; University of Rwanda; USIU-Africa; InsectiPro Ltd, Kenya; Kenya Bureau of Standards (KEBS); Uganda National Bureau of Standards (UNBS); Rwanda Standards Board (RBS); Farm Concern International, Kenya; Unga Farm Care (EA) Limited, Kenya; Kenya Agriculture and Livestock Research Organization (KALRO); and Kenya Marine and Fisheries Research Institute (KMFRI).

Donor: Biovision Foundation for Ecological Development, Switzerland

Project title: Intensification of push-pull technology for improved food security, nutrition and incomes

icipe staff: Zeyaur Khan

Collaborators: Ministry of Agriculture, Kenya; One Acre Fund; Magos Farm Enterprises Agrovet; Send a Cow; Advantage Seed Company; and community based organisations including Uasin Gishu Vibrant Umbrella, Pamoja and Sigomre Organic Agriculture Project (SAOP)

Donor: Biovision Foundation for Ecological Development, Switzerland

Project title: Upscaling and institutionalization of fruit fly IPM technology among smallholder fruit growers in East Africa (Phase V)

icipe staff: Fathiya Khamis

Collaborators: Ministry of Agriculture, Kibwezi County, Kenya; National Biological Control Program, Ministry of Agriculture, Natural Resources, Livestock and Fisheries, Tanzania; Ministry of Agriculture, Natural Resources, Livestock and Fisheries, Zanzibar

Donor: Biovision Foundation for Ecological Development, Switzerland

Project title: Intensified agroecological-based cropping systems to enhance food security, environmental safety and income of smallholder producers of crucifers and traditional African vegetables in East Africa (AGROVEG)

icipe staff: Komivi Akutse, Daniel Mutyambai, Fathiya Khamis, Thomas Dubois, Solveig Haukeland

Collaborators: World Vegetable Center; Research Institute of Organic Agriculture (FiBL)

Donor: Canadian Executive Service Organization (CESO-SACO)

Project title: Strengthen entrepreneurship skills and knowledge of students and grantees of the Regional Scholarship and Innovation Fund (RSIF)

icipe staff: Moses Osiru

Collaborator: CESO expert, Dr Bryan Marshman

Donor: CESO-SACO

Project title: Assistance in resource mobilisation for the RSIF Permanent Fund

icipe staff: Moses Osiru

Collaborator: CESO expert, Dr Karen Jensen

Donor: CESO-SACO

Project title: Update and implement the gender strategy of RSIF

icipe staff: Moses Osiru

Collaborator: CESO expert, Dr Lynne Brennan

Donor: CESO-SACO

Project title: Improve understanding about business incubators models in Africa

icipe staff: Moses Osiru

Collaborator: CESO expert, Dr Aarij Bashir

Donor: CESO-SACO

Project title: Support the development of a gender-sensitive value chain for mangoes

icipe staff: Samira Mohamed, Beatrice Muriithi, Menale Kassie

Collaborators: CESO-SACO expert, Beth Timmers

Donor: HORIZON-CL6-2021-FARM2FORK-01-18 – One Health approach for Food Nutrition Security and Sustainable Agriculture (FNSSA), led by Synelxis

Project title: oNe hEalth SusTainabiLity partnership between EU-AFRICA for food sEcuRity (NESTLER)

icipe staff: Chrysantus Tanga

Collaborators: Synelxis, South Africa; CloudEO AG, RiniGARD, Mana Biosystems, EBOS Technologies Limited, Stichting IDH Sustainable Trade Initiative, Zanasi Alessandro SRL, University College London

Donor: International Center for Agricultural Research in the Dry Areas (ICARDA), with funding from the German Federal Foreign Office

Project title: AI-driven climate-smart beekeeping for women

icipe staff: Workneh Ayalew

Collaborators: Livestock Resources Development Office, Amhara Region Bureau of Agriculture, Bahir Dar, Ethiopia

Donor: Université Libre de Bruxelles, Belgium

Project title: Study on foraging plants of African stingless bees jointly conducted with ULB Belgium

icipe researchers: Kiatoko Nkoba

Collaborators: Agroecology laboratory, Université Libre de Bruxelles

Donor: United States Department of Agriculture – Agricultural Research Service (USDA-ARS), through University of Florida, USA

Project title: Pesticide- and attractant-based control of oriental fruit flies and related pests of small and large fruit crops

icipe researchers: Xavier Cheseto, Baldwin Torto

Donor: European Union Uganda Delegation – Global Climate Change Alliance Plus (GCCA+) and Development Smart Innovation through Research in Agriculture (DeSIRA)/ led by CIRAD

Project title: Robusta coffee agroforestry to adapt and mitigate climate change in Uganda (ROBUST) (FOOD/2021/427-759)

icipe staff: Girma Hailu, Fabrice Pinard, Thomas Dubois, Henri Tonnang

Collaborators: National Coffee Research Institution (NACORI); National Firestry Research Institution (NAFORI); Uganda Coffee Farmers Alliance (UCFA); Makarere University; International Women Coffee Association (IWCA); and Eco-Charcoal Limited; all in Uganda

Donor: Kenya Agriculture and Livestock Research Organization – Upscaling agricultural technologies to enhance productivity and incomes for smallholder farmers in Kenya (KALRO/CS APP/SGS2/2021)

Project title: Production to Markets: Scaling-up the adoption and implementation of environmentally benign pest management technologies in Makueni County, Kenya

icipe staff: Shepard Ndlela, Samira Mohamed

Donor: 2021 – 2022 Fulbright U.S. Student Program: Open Study/ Research Award

Project title: Investigating migratory honeybees in Kenya

Donor: Swiss Agency for Development and Cooperation (SDC); Liechtenstein Development Service (LED); Coop Sustainability Fund and Biovision Foundation for Ecological Development, Switzerland; (through the Research Institute of Organic Agriculture – FiBL, Switzerland)

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

icipe staff: Edward Karanja

Collaborators: Kenya Agricultural Livestock Research Organization (KALRO); Kenyatta University (KU); Jomo Kenyatta University of Agriculture and Technology (JKUAT); Kenya Organic Agriculture Network (KOAN); Kenya Institute of Organic Farming (KIOF); Tropical Soil Biology and Fertility (TSBF); ministries of agriculture of Tharaka Nithi and Murang'a counties in Kenya

Donor: Participatory Ecological Land Use Management – Kenya (PELUM-KENYA)

Project title: Facilitation and capacity building on desert locust management on 5 March 2022 during a sensitization forum at RIDEP, Tharaka Nithi County, Kenya

icipe staff: Saliou Niassy

Donor: University of Eastern Finland – Service Contract

Project title: Field study for the project pest free fruit

icipe staff: Thomas Dubois

Donor: Ministry for Primary Industries (MPI), New Zealand

Project title: Fruit Fly Project 17 – combining current fruit fly lures

icipe staff: Shepard Ndlela, Samira A. Mohamed

Collaborators: Lead Institution: New Zealand Institute for Plant and Food Research Limited; Plant & Food Research, New Zealand; USDA-ARS Hawaii, USA; Department of Primary Industries and Regional Development, Western Australia; University of Pretoria South Africa; ENEA C. R. Casaccia, Italy

Donor: COLEACP (Pacific Liaison Committee Europe-Africa-Caribbean-Pacific for the promotion of ACP horticultural exports)

Project title: Support to strengthen the competitiveness and compliance of the ACP horticultural industry to regulatory and/or private requirements of domestic, regional, and international markets through training and technical assistance in the areas of food safety and plant health

icipe staff: Shepard Ndlela, Xavier Cheseto, Komivi Akutse, Levi Ombura, Thomas Dubois

Donor: German Federal Ministry for Economic Cooperation and Development / The Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (BMZ/GIZ) through International Institute of Tropical Agriculture (IITA)

Project staff: Piloting and upscaling biorational and biological control strategies for sustainable Fall Armyworm Management in Africa (BIOFAWMA) AG-4589

icipe staff: Sevgan Subramanian

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Core donors

- Swiss Agency for Development and Cooperation (SDC), Switzerland
- Swedish International Development Cooperation Agency (Sida), Sweden
- Ministry of Education, State Department of University Education and Research, Kenya
- Government of the Federal Democratic Republic of Ethiopia

Restricted project donors

- African Academy of Sciences
- African Technology Policies Studies Network
- African Union
- Australian Center for international Agricultural Research (ACIAR)
- Bayer: Science for a Better Life
- Bertha Foundation
- Bill & Melinda Gates Foundation
- BioInnovate Africa Programme
- Biotechnology and Biological Sciences Research Council (BBSRC)
- Biotechnology and Biological Sciences Research Council, UK, through Rothamsted Research, UK
- Biovision Africa Trust
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- Children's Investment Fund Foundation (CIFF)
- Code for Science & Society (CS&S)
- Cultivate Africa's Future (CultiAF) through International Development Research Centre (IDRC)/Australian Centre for International Agricultural Research (ACIAR)
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- ETH Zurich
- Ethiopian Catholic Church Social Development Commission (ECC-SDCBOM)
- European Union
- Food and Agriculture Organization of the United Nations (FAO)
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- German Academic Exchange Service (DAAD)
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- iMC Worldwide
- Impaxio GMBH
- Innovate UK
- InsectiPro Ltd
- Institute of Research for Development (IRD)
- International Atomic Energy Agency (IAEA)
- International Centre for Agricultural Research in The Dry Area (ICARDA)
- International Development Research Centre (IDRC)
- International Fund for Agricultural Development (IFAD)
- IPM Innovation Lab (Feed The Future Innovation Lab for Integrated Pest Management) of Virginia Tech, USA
- JRS Biodiversity Foundation
- Keele University, UK
- LEAP-Agri (A long-term EU-Africa research and innovation partnership on food and nutrition security and sustainable agriculture)
- Mastercard Foundation
- Max Planck Institutes, Germany
- Medical Research Council
- Ministry for Primary Industries (MPI), New Zealand
- Mozilla Foundation, USA
- National Geographic Society
- National Research Fund (NRF), Kenya
- Netherlands Organisation for Scientific Research (NWO)
- Norwegian Agency for Development Cooperation (Norad)
- Norwegian Refugee Council
- Open Philanthropy
- Participatory Ecological Land Use Management (PELUM), Kenya
- Penn State University, USA
- Remote Sensing Solutions (RSS) GmbH, Germany
- Research Institute of Organic Agriculture (FiBL)
- Rockefeller Foundation
- Scottish Funding Council
- Swedish International Development Cooperation Agency (Sida)
- Swedish University of Agricultural Sciences (SLU)
- Swiss Agency for Development and Cooperation (SDC)
- Swiss National Science Foundation (SNSF)
- The Curt Bergfors Foundation Food Planet Prize
- The Royal Society, UK
- The Stichting IKEA Foundation through Biovision Foundation for Ecological Development
- TWAS, The World Academy of Sciences through Organization for Women in Science for the Developing World (OWSD)
- United Nations Environment Programme (UNEP)
- United Nations Office for Project Services (UNOPS)
- United States Agency for International Development (USAID)
- United States Agency for International Development-Partnerships for Enhanced Engagement in Research (USAID-PEER) Science
- United States Department of Agriculture (USDA)
- United States National Academy of Sciences (NAS)
- United States National Institutes of Health (NIH)
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- University of Bern, Switzerland
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- USAID – United States Agency for International Development's
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- Wellcome Trust, UK
- World Federation of Scientists
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- World Trade Organization (WTO) – Enhanced Integrated Framework (EIF)

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- Government of Senegal
- World Bank Group
- Government of South Korea
- ACP Innovation Fund of the European Union through the Organisation of African, Caribbean and Pacific States (OACPS)

In realising its mission, *icipe* also benefits from extensive partnerships with research partners (including universities and research institutes in Africa and beyond), private sector partners, and communities across Africa.

For more information on these and other topics, please visit our

Website: <http://www.icipe.org> or contact us through our

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