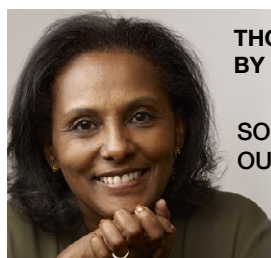




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icipe BY NUMBERS

99

peer reviewed journal articles published
between 1 January and 30 June 2023

3.5K

mentions of *icipe* in social and traditional
media between
1 January and 30 June 2023

41

students trained through the Norad-
supported CAP-Africa project (July
2018 – June 2023)

1 Million

farmers to benefit from i4Ag-funded
fall armyworm initiative

9

African governments
investing in Rsif



Prof. Kym Anderson
Chair, *icipe* Governing Council

Dear Friends and Colleagues,

Greetings from the *icipe* family. We are pleased to present this latest newsletter, which covers the period from January to June 2023.

The activities summarised here underline *icipe*'s uniqueness as the world's only research institution working primarily on insects and other arthropods. They also emphasize the Centre's conscious and deliberate alignment to local, national, regional and global aspirations and agendas, and its strong commitment to partnerships and collaborations.

The Thought Leadership Column by the *icipe* Director General (DG) is a fitting centrepiece of this newsletter. It focuses on soil's indispensability which, along with sunlight and water, provides the basis for all life. Globally, calls are rising for measures to protect soil and to restore and rehabilitate degraded ecosystems. As the DG observes, *icipe* takes a nature-positive, One Health, systems approach to soil health, thereby contributing to soil's restoration and rehabilitation, to more-sustainable crop production and food security, and to better health and well-being of the natural environment, people and animals.

The sections of this newsletter on Selected Recent Publications; Research Highlights; and Institutional Capacity Building and Institutional Development

illustrate *icipe*'s virtuous cycle, from generating world-class scientific knowledge and translating it into innovative, inclusive and transformative solutions while nurturing scientific talent and leadership.

In the sections on Institutional News; Newsmakers; and Recently Funded we present news of events and visitors, collaborations and partnerships, awards and recognitions, and new investments in our Centre.

We also report in some detail on progress in two programmes managed by *icipe*. One is the BioInnovate Africa Programme (<https://bioinnovate-africa.org>), which is supported by the Swedish International Development Cooperation Agency (Sida). Implementation of its Phase III (2022 – 2027), which has commenced in earnest, will continue to support scientists in universities, research institutes and firms to translate innovative biologically based research outputs into practical uses that address development challenges in the region. The other programme highlighted is the PASET Regional Scholarship and Innovation Fund ([https:// www.rsif-paset.org/](https://www.rsif-paset.org/)). In five years, this programme has become one of the largest academic and research networks in applied sciences, engineering and technology in Africa.

We thank you for your continued partnership and support, and trust you will enjoy reading this newsletter.



Dr Segenet Kelemu
Director General, *icipe*

SOIL HEALTH: OUR HEALTH, OUR WEALTH



icipe takes a nature-positive, One Health, systems-approach to soil health, thus contributing to its restoration and rehabilitation; sustainable crop production and food security; and good health and well-being of the environment, people and animals.

“To forget how to dig the earth and to tend the soil is to forget ourselves.” – Mahatma Gandhi.

SOIL HEALTH IN AFRICA

“The nation that destroys its soil, destroys itself,” thus lamented Franklin D. Roosevelt, President of the United States of America (1933 – 1945), when reflecting on the Dust Bowl era¹.

Soil, the loose surface material that covers most land, is intuitively embedded in our minds. Although we may not always consciously consider its role in our day-to-day lives, we have an intrinsic awareness of the importance of soil – it is the poetic connection to country, to home.

More functionally, soil is a living, life-giving resource; a fundamental terrestrial asset, which, along with sunlight and water, provides the basis for all life. It is the Earth’s skin, providing a protective covering; an environmental buffer that resists erosion, prevents floods and regulates temperature. It is the “switching yard” for the global cycles of carbon, water and nutrients like nitrogen, phosphorus and many others, which

Soil health is its capacity to sustain biological productivity, maintain environmental quality and promote plant and animal health. Indicators of soil health are a set of chemical, physical and biological characteristics. They encompass levels of nutrient cycling; soil fertility including availability of minerals such as nitrogen, phosphorus and potassium among others; organic matter quantity and quality including carbon-nitrogen ratio, microbial biomass carbon, enzymes and decomposition. Other measures are the soil’s physical stability; the ability to resist disintegration due to tillage, or erosive forces such as water or wind; soil loss and soil depth; water holding capacity and infiltration. Soil health is also indicated by mineral toxicity levels such as salinity, sodicity and aluminium toxicity, as well as the presence of heavy metals and pesticides.

A 2022 report by the Food and Agriculture Organization of the United Nations (FAO), notes that 40 percent of the soils in Africa have

are stocked, transformed and cycled through it. Soil is key to the survival of people and animals, a foundation for human structures and habitats for various fauna such as ants, mites, beetles, termites, nematodes and earthworms.

Soil is the physical anchor for most plants; the support system for crop production. It is a treasure trove of beneficial microorganisms like bacteria, fungi and archaea, collectively known as the soil microbiome. The rich tapestry of soil biodiversity has highly complex and elegant interactions that facilitate biological equilibrium. For example, they help plants to tolerate unfavourable conditions and toxic contaminants, and to suppress pests, pathogens and diseases.

naturally low soil fertility, compounded by further degradation through processes such as nutrient mining. An earlier study by the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA, 2020), found that in sub-Saharan Africa, 65 percent of arable land has deteriorated due to erosion-induced losses of topsoil and soil nutrients, chemical intensive agriculture and poor soil management.

Globally, there are calls for measures for soil protection, as well as the restoration and rehabilitation of degraded ecosystems, for sustainable crop production and food security. This plea is key to the United Nations Food Systems Summit, held in 2021. Also, the Sustainable Development Goal (SDG) 3, emphasises the interconnection between soils, good health and well-being. And in 2020, the African Union commenced an ambitious continental effort to stimulate the reversal of soil degradation in the continent.

1. “The Nation that Destroys its Soil...” a Letter from the President (link: <https://soilcarboncoalition.org/learning/FDR-INVESTIGATION.pdf>)

The Dust Bowl was a period of severe dust storms during a drought in the 1930s in regions of the United States. High winds and choking dust swept across the regions, killing people and livestock and causing crop failure (Source: <https://soilcarboncoalition.org/learning/FDR-INVESTIGATION.pdf>)

ONE HEALTH FOR SOIL HEALTH

icipe takes a nature-positive, One Health, systems-approach to soil health, by promoting regenerative agricultural practices that protect soils from harmful chemicals and synthetic products. Our strategies also help to rejuvenate and recover soil organic matter and to boost soil fertility under changing climate and habitats. These actions contribute to the production of safe, nutrient rich foods for people and fodder for animals.

In addition, we harness beneficial organisms in the soil for the biological control of crop pests and disease vectors of people and animals. We also generate knowledge on soil ecosystems in relation to insect-transmitted pathogens, as well as tools to measure soil health. By supporting sustainable livestock production, *icipe* helps to reduce the impact of greenhouse emissions while exploiting the potential of livestock in soil rejuvenation.

EXAMPLES OF *icipe* SOIL HEALTH RESEARCH

Integrated pest management

icipe harnesses the synergies in plant-insect-soil interactions to develop environmentally friendly, sustainable, affordable and accessible integrated pest management (IPM) options for pests of vegetables, fruits and staples such as cereals, tubers and banana. Our portfolio includes biological control of pests using other organisms such as predators and parasitoids; biopesticides and botanicals; naturally derived attractants and repellents; and cultural practices like intercropping. These strategies reduce misuse and overuse of chemical and synthetic products. They demonstrate that it is possible to control crop pests and to increase yield without harming the Earth.

Push-pull technology

The push-pull technology involves intercropping cereals with legumes, for instance *Desmodium* species, and planting fodder grass, such as *Brachiaria*, around the intercrop to control stemborers, the parasitic *Striga* weed and the fall armyworm. Our studies show that the technology's companion crops, both perennial plants, restore soil function and fertility, and increase soil organic carbon and nitrogen, while also improving availability of phosphorus to plants and reversing soil degradation. The push-pull technology provides about 70 percent soil surface cover. Through its biomass, the technology recycles five times more nitrogen, phosphorus and potassium than maize monocrops. In addition, the technology enriches the diversity of soil microbiome community that is associated with important ecological services, while reducing those related to plant diseases, mycotoxin production and removal of nitrogen from the soil.

Biopesticides

Over the years, *icipe* has identified a range of strains from the soil-borne, insect-infecting *Metarhizium anisopliae* fungus. We have used these strains to develop a variety of powerful biopesticides, which have been commercialised by our private sector partners. They include: ICIPE 69 (Campaign), for fruit fly, thrips and mealybugs; and ICIPE 62 (Supreme), for aphids. Several soil-derived, *icipe* biopesticides, which are effective against the tomato leafminer, *Phthorimaea absoluta*, and the fall armyworm, are in the process of registration.

Nematode control

Plant parasitic nematodes, soil dwelling worms, are a major, yet neglected challenge, for crop production in Africa. *icipe*'s groundbreaking chemical ecology research has opened up avenues for their control. In addition, together with IITA, we have generated new knowledge on the distribution and damage of various nematodes in Africa; developed diagnostic capabilities to identify and quantify them; and boosted capacity and awareness for their management. We are also testing control tools including dead-end trap crops, resistant crop varieties, and biological control products such as the soil-dwelling trichoderma fungi and garlic extract formulations. Further, we are exploring the use of beneficial nematodes, especially the entomopathogenic species, in the control of insect pests.

Banana fibre paper technology

Based on previous research by *icipe* and IITA, we are working with private sector partners to commercialise an evolutionary banana fibre paper technology to manage nematodes and other soil-dwelling pests.

While we know that the technology improves the delivery and effectiveness of nematicides, we aim to establish its safety to soil health and the microbial environment. In partnership with James Hutton Institute, UK, we are conducting a series of tests including evaluations on the use of microBIOMETER, a low cost test that enables quick soil health assessments; and molecular barcoding of the soil microbial environment. This research creates a basis for microbiome soil health assessments.

Insects for food, feed and other uses

icipe's pioneering research has demonstrated the potential of various farmed insects such as black soldier flies, as effective recyclers of organic wastes into green frass fertilisers that contain good concentrations of nitrogen, phosphorus, potassium and soil micronutrients. We have illustrated that these products improve soil fertility, contribute to soil carbon sequestration, and enhance the soil water retention capacity and organic matter. In addition, we have established that chitin and chitosan, which naturally occur in the skeletons of insects, control various plant pests including soil dwelling pests.

Moreover, insect farming takes pressure off scant land resources, thus circumventing a range of challenges associated with traditional agricultural activities including soil degradation. Further, insect-based feeds boost poultry farming, thus increasing availability of manure.

"To be a successful farmer one must first know the nature of the soil." - Xenophon, Ancient greek philosopher and historian, student of Socrates, Circa 430 - 354 BC

Soil ecosystems and disease mapping

A fraction of the soil diversity is composed of disease-causing organisms and pathogen-transmitting vectors that live in or spend part of their life cycle in soil. To control these agents, it is vital to understand the soil ecosystems and ecological factors influencing their distribution. For example, soils are a preferred breeding site for sand flies, which spread pathogens of various diseases including leishmaniasis, a devastating, neglected tropical disease. *icipe*'s knowledge on specific sand fly breeding sites, for example termite mounds and soil cracks, is enabling a comprehensive approach to the surveillance of the vectors, as well as risk mapping and predictions of disease hotspots. These insights are especially useful in view of climate and land use changes, and the extensive movement of people and livestock. The information helps to create community awareness, and to design targeted interventions and mitigation strategies.

Reducing tungiasis burden

icipe is contributing to the reduction of the burden of tungiasis, a highly neglected, debilitating soil-related disease, and a major public health challenge in many parts of Africa. The disease is caused by *Tunga penetrans*, a parasitic sand flea, whose eggs, larvae and pupae develop in soils, including on unsealed earthen house floors. The adult fleas survive on their hosts, with the females penetrating the skin to breed, causing inflammation, pain and itching, and difficulty in undertaking routine functions such as walking, sleeping and working. To tackle tungiasis, it is important to identify the presence of the fleas during their off-host development stages, through soil analysis. We have developed an efficient and economical PCR-based kit to identify *T. penetrans* larvae. This is a major feat, as soil organic material is known to be rich in PCR inhibitors. We have also designed and started to implement a healthy home concept; structures that feature simple improvements using locally available materials to prevent tungiasis among other diseases.

Malaria IVM

Since July 2010, *icipe* has served as a regional centre under the Stockholm Convention on Persistent Organic Pollutants (POPs). As the regional centre, *icipe* works with partners to build capacity and transfer technologies to Africa member states, in alternatives to the use of POPs, to manage disease vectors and pests, and biodiversity and environmental conservation.

Further, *icipe* is a proponent of integrated vector management (IVM) for malaria, which reduces the misuse and overuse of insecticides. For example, between 2017 and 2022, *icipe* implemented an initiative in southern Africa, to minimise the use of DDT, a POPs that is commonly used for mosquito control in the region. If not properly managed, DDT, can contaminate soil for decades. Together with partners, we demonstrated the effectiveness of alternatives such as house screening and bio-larviciding of mosquitoes using *Bacillus thuringiensis israelensis (Bti)*, a naturally occurring, soil-borne bacteria. The initiative was supported WHO-AFRO; and the Global Environment Facility (GEF) through the United Nations Environment Programme (UNEP).

Sustainable livestock farming

The impact of livestock on the ecosystem is polarised due to their role in greenhouse gases emissions. However, sustainable livestock farming systems provide vital ecosystem services, including soil enrichment. For example, livestock contain a rich and diverse rumen microbial community, which is excreted via dung. The microbes contribute to better soil health by supporting nutrient cycling and decomposition. They also help to remedy soil pollutants like heavy metals, pesticides and hydrocarbons. *icipe* is conducting unique research on the livestock rumen, to understand the microbial community; generate insights for more effective management of vector-borne pathogens; and create strategies to sink greenhouse gases in the animals. Moreover, we are developing inclusive innovations, such as simple disease diagnostic tools, and arsenals to fight major livestock vectors like tsetse flies and

ticks. Also, *icipe* is contributing to high quality and adequate fodder, for example through the push-pull technology. These aspects contribute to more sustainable livestock farming.

Beekeeping initiatives

icipe's science-led, modern beekeeping initiatives are an excellent example of circular, resilient and regeneration of unproductive, degraded lands. Beekeeping helps to promote soil cover and reforestation through cultivated forages, and the pollination of wild plants and crops. Using a vast knowledge of bees, climate and land use changes, we have tailored strategic and impactful beekeeping initiatives for various agroecologies across Africa. We are also boosting the conservation of ground-nesting pollinators, such as stingless bees, through domestication efforts and awareness creation to reduce destruction, as well as unsustainable harvesting. These efforts protect soil habitats and safeguard the indirect role of the pollinators in soil quality and function.

Sericulture farming

In various parts of Africa, *icipe* is promoting sericulture farming, the rearing of silkworms to produce raw silk. The activities contribute to soil preservation through foliages like mulberry and castor plants, which are cultivated to feed the silkworms. They provide soil cover, while their biomass is composted into manure. Moreover, silkworm excrement makes good organic fertiliser, while its cocoons can be used in the biological control of insect pests.

BioInnovate Africa Programme

Over the past five years, more than 20 regional, bioscience innovation projects supported by BioInnovate Africa Programme have reached commercialisation stages. Of these, several support soil health. They include: an internationally certified, nitrogen biofortified organic fertiliser developed from biodegradable municipal waste; a vermicomposting, cyclic system to convert coffee waste into nutrient rich fertilisers; and agro-industrial wastewater treatment to produce biogas and bio-fertiliser.

"The soil is the great connector of lives, the source and destination of all. It is the healer and restorer and resurrector, by which disease passes into health, age into youth, death into life. Without proper care for it we can have no community, because without proper care for it we can have no life." –Wendell Berry, [The Unsettling of America: Culture and Agriculture](#).

STAFF

icipe Director General, Segenet Kelemu has received an honorary doctorate degree of Doctor of Philosophy Honoris Causa from [Ben-Gurion University of the Negev](#), Israel, for her outstanding scientific leadership in helping build a food secure Africa.



She has also been decorated with the second highest award of France; the title of Officier de L'Ordre national du Mérite (Officer in the National Order of Merit). The honour is awarded by the President of France to French citizens as well as foreign nationals, to recognise and reward distinguished merits in diverse fields such as science, economics and politics among others.

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His Excellency Mr Arnaud Suquet (left), the Ambassador of France to Kenya and to Somalia, presents a certificate to Dr Segenet Kelemu, after the pinning of the medal of the Officier de L'Ordre national du Mérite.



In addition, Dr Kelemu has been appointed by the Government of Sweden as a Board member of Stockholm Environment Institute (SEI).

Sunday Ekesi, Head Capacity Building and Integrated Sciences, will receive the 2024 TWAS Award in Agricultural Sciences, conferred by The World Academy of Sciences, for his impactful contributions to fruit fly management, thus facilitating the growth of the horticulture industry in Africa. He has also been elected to Sigma Xi – the world's largest interdisciplinary scientific society.

Baldwyn Torto, Head Behavioural and Chemical Ecology Unit (BCEU), has been elected International Member of the United States National Academy of Sciences (NAS).

Robert Jackson, Visiting Scientist, Research Predatory Arthropods, has been appointed Honorary Member of the International Society of Arachnology.

Menale Kassie, Head, Social Sciences and Impact Assessment Unit, received the 2022 TWAS Siwei Cheng Award in Economic Sciences.

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SCHOLARS

Stella Gachoki (Kenya), PhD scholar, Animal Health Theme, was awarded the 2023 – 2024 Schlumberger Foundation Faculty for the Future Fellowship, in line with the programme's long-term goal to accelerate gender equality in STEM.

Rehemah Gwoklyalya (Uganda), PhD scholar, Plant Health Theme, was awarded a Mawazo Fellowship, which supports African women PhD students working on emerging development issues.

Rodrigue Kokou Fiaboe (Togo), PhD scholar, Plant Health Theme, was awarded a travel grant to attend the 38th Annual Meeting of the International Society of Chemical Ecology in Bengaluru, India, to be held on 3-27 July 2023. He will make an oral presentation titled: Can intraguild interactions on tomato influence responses of the ectoparasitoid *Bracon nigricans*?

Joseph Oundo (Kenya), PhD scholar, Animal Health Theme, was awarded a travel grant to attend the 29th Conference of the World Association for the Advancement of Veterinary Parasitology in Chennai, India, to be held on 20 – 24 August 2023.

Steeven Belvinos Affognon (Benin), PhD student, Data Management, Modelling and Geo-Information (DMMG) Unit, received the Best Modelling Team award at the ICMS and MAC-MIGS Modelling Camp 2023, held in Edinburgh, UK from 17 – 20 April 2023.

JOURNAL APPOINTMENTS

Baldwyn Torto, Head, BCEU, has been appointed Member, Editorial Committee, *Annual Review of Entomology* journal (Impact Factor: 22.7).



icipe Director General, Segenet Kelemu, receiving an honorary doctorate degree of Doctor of Philosophy Honoris Causa from Ben-Gurion University of the Negev, pictured with the University's President, Prof. Daniel Chamovitz (left), and Rector, Prof. Chaim J. Hames (right).



In January 2023, the *icipe* DG made an official visit to Ethiopia, where she toured selected projects being implemented by the Centre, and held meetings with partners and senior government officials. She is pictured (centre) during a courtesy call to Dr Yilkal Kefale Asres (right), President, Amhara Regional State, accompanied by Meklit Asefa (left), Manager, *icipe* office in Amhara Region.

Selected events by the Director

General: Participation in a roundtable on 'Embracing Equity in Research and Development', at the World University Services of Canada in Nairobi, in line with the International Women's Day campaign of the International Development Research Centre (IDRC); the European Initiative for Agricultural Research for Development (EIARD) dialogue meeting; and the second meeting of the Scientific Advisory Committee of the UN Food Systems Coordination Hub. In addition, the DG was a speaker at the 'Visions for a Sustainable Agriculture' workshop at the University of Neuchâtel, Switzerland. She also participated in the launch of the Developing Excellence in Leadership Training and Science in Africa (DELTAS Africa II) programme, hosted by the Science for Africa Foundation; and in the meeting of Association of International Research and Development Centre's for Agriculture (AIRCA).

Selected visits to *icipe* to discuss partnerships and collaborations by:

Dr Sarah M. Schmidt, Advisor, Fund International Agricultural Research, GIZ; Dr Claes Kjellstrom, Senior Policy Specialist, Swedish International Development Cooperation Agency (Sida) and Dr Anna-Karin Norling, Senior Research Advisor, Sida; Dr Frank Eyhorn, CEO, and Loredana Sorg, Co-Head of Development Projects, Biovision Foundation; and Dr Nathalie Gabala, Executive Director, Mastercard Foundation. We also welcomed: Dr Patrice Grimaud, Regional Director, Eastern Africa, CIRAD; a delegation from the IGAD Center for Pastoral Areas and Livestock Development led by Dr Ameha Sebsibe, Head, Livestock and Fisheries; Dr Susan Kaaria, Director of African Women in Agricultural Research and Development (AWARD); Dr Eliane Ubalijoro, Chief Executive Officer CIFOR-ICRAF and Prof. Appolinaire Djikeng, Director General, International Livestock Research Institute (ILRI).

More events and visits under 'Scenes', page 13

The *icipe* DG and Chrysantus Tanga, Head, Insects for Food and Feed and Other Uses, participated in the Curt Bergfors Food Planet Prize Award ceremony, held in Stockholm, Sweden.

The event celebrated winners of the Award in 2023, alongside those of 2020, 2021 and 2022, whose presentation had been disrupted by the COVID-19 pandemic. *icipe* won the Prize in 2020, in recognition of the Centre's pioneering research and development activities on insects for food, feed and other uses.

As the Regional Coordination Unit for the PASET Regional Scholarship and Innovation Fund (Rsif), *icipe* has endorsed the Call for Action 'Towards an Africa-EU Science, Technology and Innovation Programme'.

"Science is crucial for all continents to sustain or meet their growth aspirations, especially by creating job prospects for the youth, ensuring food security, conserving biodiversity, building resilience to climate change, and delivering global health. The Africa-EU science, technology and innovation programme recognises this central role of science in global development. *icipe* sees the initiative as a partnership that will promote science and research for development that is mutually beneficial for Africa and Europe." - Dr Segenet Kelemu, *icipe* Director General and CEO.

icipe participated in the PASET Governing Council, hosted by the Government of Rwanda, through the Ministry of Education, on 1 – 2 February 2023.

The event was attended by high-level government officials; representatives from the World Bank and Korea; researchers, academics and private sector partners, who are members of the PASET Consultative Advisory Group. The Centre also took part in the launch of [Grand Challenges Rwanda](#), held from 18 – 19 May 2023, led by the Rwanda National Council for Science and Technology (NCST).

icipe Annual Report 2022

icipe Annual Report 2022

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WATCH VIDEO

Google Research collaboration

In March 2023, a team from Google Research visited *icipe* for discussions on areas of possible collaboration. The development of desert locust and fall armyworm control strategies were identified as immediate collaborative initiatives. The activities will harness *icipe*'s data management, modelling and geo-information capacity, and Google Research's platforms, technology and expertise, for example in internet of things, high resolution imagery and weather prediction. Using Sudan as a pilot study, the partners will undertake remote sensing of desert locust bands and deep learning to identify breeding grounds. The fall armyworm modelling will facilitate understanding of the pests and their parasitoids; optimise models of suitable ecologies; develop nature-based, environment and culture specific interventions; and support effective technology dissemination and advisory services. National partnerships, capacity building, university collaboration and student mentorship, will be cross-cutting areas of focus.

CAP-Africa for One Health

The Combatting Arthropod Pests for better Health, Food and Climate Resilience (CAP-Africa), an initiative supported by the Norwegian Agency for Development Cooperation (Norad), was implemented by *icipe* from July 2018 – June 2023 in Ethiopia, Kenya and Uganda. Executed through a One health lens, the thrusts of the CAP-Africa project were: Global health – to reduce the burden of malaria and emerging infectious diseases; Climate change, pollinators and insects for food and feed; Plant health, focusing on invasive species; Animal health, aiming to generate novel knowledge on livestock vectors and diseases, as well as tools and strategies to manage them; and Education and socio-economics as intersecting components.

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How do trypanosomes cause anaemia in cows?



Hackathon for fly knowledge

icipe held a Genome Annotation Hackathon, a thrilling and knowledge-packed event, that focussed on understanding the gene family composition of two fascinating species: *Hippobosca* and *Stomoxys* fly species, which are implicated in the transmission of various disease pathogens, especially in animals. Through the Hackathon, which involves collaborative computer programming, using bioinformatics tools and databases, 20 early career researchers gained hands-on experience in: genome annotation of the two species; unravelling the mysteries of their gene family composition including the evolutionary relationships and functional implications; and sequence alignment and phylogenetic analysis.

BRAINS project

The Government of Canada has announced a CAD \$20 million grant to the Alliance of Bioversity International and the International Center for Tropical Agriculture (Alliance); and *icipe*, to develop low carbon, climate resilient systems, that are favourable to women and the youth, using bean, fruit trees and beneficial insects farming and business enterprises. Titled: 'Building Equitable Climate-Resilient African Bean & INsect Sectors (BRAINS)', the initiative will be implemented across 15 sub-Saharan African countries, directly benefitting 5 million smallholder farmers, 2.5 million consumers and school-age children, and a range of value chain actors. Indirectly, BRAINS will profit 50 million consumers, businesses and households.



Dennis Beesigamukama, a postdoctoral researcher at *icipe* demonstrating the use of insect frass fertiliser to participants of the inception meeting of a novel IKEA Foundation-supported initiative, that will harness two of the Centre's innovations: the vegetable integrated push-pull technology and black soldier fly farming, into a One Health package.

Better mango production and youth opportunities

Since 2020, *icipe* in partnership with Biovision Foundation for Ecological Development, have been implementing an integrated project to tackle pests and other challenges constraining mango production in the Southern Nations, Nationalities and Peoples' Region (SNNPR), Ethiopia. The partners have introduced components of the *icipe* fruit fly IPM package, for example traps and cultural practices such as orchard sanitation. Also, they have provided training on a range of mango production management options, including pruning, mulching, composting and mother tree grafting. In addition, complementary activities, such as beekeeping, have been introduced. A key goal of the initiative is to enable young people to benefit from the mango value chain.

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Upscaling fall armyworm IPM

icipe has received a grant through the Fund for the Promotion of Innovation in Agriculture (i4Ag), to upscale the Centre's highly successful, integrated pest management package for the fall armyworm. Through a project known as Agroecological Innovations for Smallholder Pest Management (EcoPM), *icipe* and partners will reach one million farmers in Malawi, Uganda and Zambia.

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Global Biocontrol Forum

An extensive menu of biological control options to manage destructive invasive pests, including the fall armyworm, and rich insights on the challenges and potential solutions for a worldwide scale up of the strategies were key outcomes of a two-day 'Global Forum on Biological Control' held on 26 and 27 June 2023 in Nairobi. Such measures offer a method of tackling pests and diseases using other living organisms and naturally-sourced compounds, such as insect predators and parasitoids. The forum was co-organised by Food and Agriculture Organization of the United Nations (FAO) and *icipe*.

[Press release](#) and [pictorial of natural enemies](#)

MORE YOUNG ENTREPRENEURS IN SILK AND HONEY (MOYESH) PROJECT

The More Young Entrepreneurs in Silk and Honey (MOYESH) project was launched in 2019 by the Mastercard Foundation and *icipe*, in partnership with the 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. The MOYESH project is complemented by two other *icipe*-led initiatives: the first is aimed at quality production and fair trade of honey in Ethiopia; and the second focuses on beekeeping enterprises to improve livelihoods and resilience, especially for women, in degraded natural habitats, in Wag Himra Zone, Amhara Region, Ethiopia.



ONE HEALTH SITES

The three images above illustrate how *icipe*'s science led, modern beekeeping initiatives in Ethiopia are serving as entry points for holistic and inclusive development, as well as the creation of circular economies. The picture on the left shows previously degraded piece of land; a disused quarry where only stray grazing animals used to roam to glean meagre forage. The area's authorities allocated it to a MOYESH beekeeping enterprise composed of jobless young people who had returned to their villages after unsuccessfully trying to eke a living in urban areas. The centre photo shows the youth group members at work, restoring the land through reforestation, multipurpose bee forages, and rehabilitation of a nearby small stream to support irrigation. On the right is a recent image of the land, which has now been transformed into a thriving, productive area. The group generates income from beekeeping and the sale of tree seedlings. Similar stories abound across the MOYESH sites. Moreover, integration of components of the *icipe* 4Hs activities has begun. For example, the push-pull technology is being piloted; and insects for feed technologies are being demonstrated while protocols for their incorporation are being developed.

IN NUMBERS

- 102,565 **young people recruited**, trained and provided with business starter kits for beekeeping and sericulture.
- 25,066 **direct jobs created** for input and service provider small enterprises.
- 648,014 direct and indirect **jobs created for young people**.
- 1,457 **tonnes of honey** and 222 **tonnes of silk** produced and sold, generating ETB 414 million.
- 2,000 **honey villages** established through the Government of Ethiopia's Yelemat Tirufat development campaign, which focuses on nutritional opulence, inspired by the MOYESH project.
- 60,000 frame hives to be produced for beekeeping farmers by the Government of the Oromia Region, based on the **MOYESH project business model**.

BIOINNOVATE AFRICA PROGRAMME

Backed by close to 25 years of history; sustained support by the Swedish International Development Cooperation Agency (Sida); a variety of bioscience innovations; contributions to capacity building and policy development; and remarkable convening and participation power; BioInnovate Africa remains one of the largest regional bioscience research and innovation-driven initiatives in eastern Africa.

Over the past six months, the Programme has commenced in earnest implementation of phase III (2022 – 2027), through a five-year cooperation agreement between Sida and *icipe*. BioInnovate will continue to support scientists in universities, research institutes and firms to translate innovative biologically based research outputs into practical uses that address development challenges in the region. The participating countries are Burundi, Ethiopia, Kenya, Rwanda, Tanzania and Uganda; with the Democratic Republic of the Congo

(DRC), and South Sudan as new entrants. The four broad project categories aim to: improve food production and food safety; reduce postharvest losses; provide biodegradable alternative packaging materials; and improve human and animal health.

The initiatives are aligned to national, regional and global agenda including the recently adopted East African Regional Bioeconomy Strategy. The activities support the United Nations Decade of Action (2020 – 2030), to accelerate the

achievement of the Sustainable Development Goals (SDGs); the African Union Agenda 2063; and the targets of the East African Community vision 2050 to boost value addition and agro-processing as the biggest direct employer of all manufacturing industries in the region.

“By its very existence, BiInnovate Africa Programme plays as an extremely important role in the African and global bioscience innovation space. The Programme has truly evolved as a boundary organisation that provides valuable lessons and a model for the development of a sustainable bioeconomy in Africa. Capitalising on this success, we are taking strong steps towards the future, exploring new partnerships, investments and collaborations; while also contributing to global deliberations on sustainable development.” - Julius Ecuru, Manager, BiInnovate Africa Programme.

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

NEW PARTNERSHIP

The Carnegie Corporation of New York (CCNY), and *icipe*, have entered into a partnership to strengthen doctoral training and postdoctoral research in applied science, engineering and technology in Africa (DOCTAS), through Rsif. Within DOCTAS, CCNY will provide a total of USD 950,000 over the next two years. Through DOCTAS, CCNY will provide a total of USD 950,000 to *icipe* over the next two years. Part of the support will go into the Rsif Junior Investigator Research Award. It will enable up to five Rsif PhD graduates who hold positions in institutions in Africa to

establish research, managerial and other complementary skills, as well as regional and international networks that will allow them to become independent researchers.

An additional 20 grants will be given to ongoing Rsif PhD scholars, thus boosting resources for research, and outcomes. The DOCTAS initiative will also strengthen the ability of researchers to engage with policymakers, to link research to policy and practice.

IN FOCUS: BENIN AND Rsif

- In 2021, the Government of Benin contributed USD 2 million to Rsif.
- There are 20 Rsif doctoral scholars (8 of them women) from Benin registered in nine Rsif African host universities (AHUs).
- 1 Benin Rsif PhD scholar has completed studies on the genetic diversity and optimisation of cowpea. He was registered at Université Félix Houphouët-Boigny, Côte d'Ivoire, with sandwich placement at Korea Institution of Science and Technology (KIST).
- 7 peer-reviewed journal articles have been published by scholars from Benin.
- University of Abomey-Calavi, Benin, is an Rsif AHU in the 'ICT, including artificial intelligence and data science' thematic area.
- In 2022, 8 Rsif funded students from three countries (Benin, Burkina Faso and Nigeria) joined the PhD programme in Information technologies and communication at the Institute of Mathematics and Physical Sciences, University of Abomey-Calavi.

- Three projects in agri-based digital innovation are being implemented in Benin, supported by the European Union through the ACP Innovation Fund of the Organization of African, Caribbean and Pacific States (OACPS). They include: (i) a digital solution for more effective and efficient agro-ecological management of the fall armyworm in northern Benin, led by the Université de Parakou (ii) boosting rice and maize supply chains through innovative e-market and financial services to smallholder farmers in Benin, led by African Green Corporation SA (iii) strengthening the political and regulatory environment for the development and scaling up of digital innovations in the agricultural sector in Benin, led by ACED-BENIN.

[Read More](#)



IN FOCUS: KENYA AND Rsif

- In 2018, Kenya became the first country to contribute USD 2 million to Rsif. Kenya is a former chair of PASET.
- So far, 25 Kenyan scholars (17 of them women) have been awarded Rsif doctoral scholarships. They are registered in eight Rsif AHUs: Bayero University Kano (BUK), Nigeria; University of Nairobi (UoN), Kenya; Institut 2iE, Burkina Faso; Sokoine University of Agriculture (SUA), Tanzania; Makerere University, Uganda; African University of Science and Technology (AUST), Nigeria; Kenyatta University, Kenya; and Nelson Mandela African Institution of Science and Technology (NM-AIST), Tanzania.
- 3 Kenyan Rsif PhD scholars have completed their studies, contributing knowledge to: enhancing performance of perovskite solar cell technology (scholar registered at AUST, Nigeria; with sandwich placement at Worcester Polytechnic Institute, USA); promotion of useful neglected crops nutritionally and pharmacologically (scholar registered at SUA, Tanzania; with research placement at Korea Institute of Science and Technology (KIST), Korea); microbiology and the synthetic gut microbial ecosystem (scholar registered at SUA, Tanzania, with sandwich

placement at KIST, Korea).

- 32 peer reviewed journal publications have been published by Kenyan Rsif PhD scholars.
- Seven Rsif funded research and innovation projects are under implementation in Kenya.

4 research and innovation grants have been awarded to University of Nairobi; and 2 to Kenyatta University; and 1 research grant to an Rsif alumni, at Moi University. Research projects include: (i) research and development of photovoltaics based on lead-free perovskite solar cell technology; (ii) self-cleaning solar module for enhanced electrical output; (iii) deep learning approaches to mineral prospect modelling of rare Earths in carbonatites; (iv) enhancing biodegradable sanitary towel production using seaweed; and a value addition strategy for banana pseudo stem residues.

Institutional innovation grant: Capacity building for university-industry business technology transfer.

Research innovation commercialisation grants awarded to faculty: an integrated near infra-red and magnetic field system for non-invasive monitoring of body glucose and Na⁺/K⁺ concentration anomalies: for diabetes/cancer diagnosis.

There are two Rsif AHUS in Kenya: University of Nairobi (Energy, including renewables – PhD in Physics); and Kenyatta University (Minerals, Mining and Material Science area – PhD in Material Science). The AHUs are hosting a total of 37 Rsif funded PhD students from 14 countries. [Read more](#)

CAPACITY BUILDING AND INSTITUTIONAL DEVELOPMENT

NEW SCHOLARS

Four PhD and three MSc students have recently joined *icipe* to conduct research within the recently launched, IKEA Foundation supported project titled: “Scaling regenerative black soldier fly farming innovations with vegetable push-pull cropping systems for One Health in Rural Kenya, Rwanda and Uganda”.

PhD scholars

Richard Malingumu (Uganda)

Research title: Optimization of black soldier fly growth and quality of frass fertilizers using locally available organic substrates

Supervisors: Dennis Beesigamukama and Chrysantus M. Tanga

Agnes Waringa Kiriga (Kenya)

Research title: Identification and validation of vegetable-integrated push-pull systems in diverse ecologies of East Africa

Supervisors: Daniel Mutyambai; Frank Chidawanyika; Saliou Niassy and Samira Mohamed

Marc Marin Agbodjan (Togo)

Research title: Systemic modelling of pest, disease, and soil fertility management strategies in vegetable integrated push-pull systems

Supervisors: Bonoukpoè Mawuko Sokame; Daniel Mutyambai; Frank Chidawanyika and Henri Tonnang

Evanson Rigan Omuse (Kenya)

Research title: Assessing the factors influencing One health impacts of VIPP and black soldier fly innovations in East Africa

Supervisors: Frank Chidawanyika; Daniel Mutyambai; Dennis Beesigamukama; Tanga Mbi and Saliou Niassy

Msc scholars

Burume Akpoko (Democratic Republic of Congo)

Research title: Develop and validate post-harvest processing and shelf-life of black soldier fly products

Supervisors: Xavier Cheseto and Chrysantus Tanga

Roseline Nandi Okoma (Kenya)

Research title: Participatory selection of target sites and crops/cultivars in different agroecologies

Supervisors: Frank Chidawanyika and Daniel Mutyambai

Priscilla Mwikali Kimuli (Kenya)

Research title: Crop response to frass fertilizer across agroecological zones

Supervisors: Daniel Mutyambai; Dennis Beesigamukama and Chrysantus Tanga

Within the CAP-Africa project (July 2018 – June 2023), Education has been a crosscutting thrust. The aim was to strengthen ongoing postgraduate training, in scientific research, development, policy and technology dissemination, through fellowships and improved access to scientific resources. Further, together with partners, we boosted the capacity of stakeholders to produce and use science, for example through training workshops and field days. We also strengthened soft skills, for example research management and proposal development.

41 students trained (7 PhD and 34 MSc – 22 female); 41 peer reviewed articles published; 116 young and mid-level scientists (98 female) acquired science skills and knowledge through workshops and training courses; 15 research managers (5 female) from national and regional partnering organisations trained in managing intellectual assets in research and innovation projects; 19 training events conducted comprising trainers of trainees workshops, on-farm trainings and field days.

1756 farmers (884 female) trained on *icipe* technologies directly and about 3 million indirectly via the media; 5 new institutions introduced to, and trained on *icipe* technologies; 28 technology learning sites established; 1069 (375 female) partners gained skills development and improved knowledge on the three research thrusts; 214 learning sites established; 36 field days organised in participating countries; extension materials (leaflets, factsheets, brochures, booklets, manuals) on new technologies developed by *icipe* and disseminated.

Desmodium root-pruning

The *icipe* push-pull technology involves intercropping cereal crops with plants, for example legumes of the *Desmodium* genus, and a fodder grass, for instance *Brachiaria*, to control stemborers, the parasitic *Striga* weed and the fall armyworm. Our recent studies have shown that pruning the roots of *Desmodium*, a perennial, fast-growing plant, enhances the legume's performance and reduces below-ground competition within the push-pull farming system. Also, once decomposed, the pruned roots provide additional soil nutrients. Combined, these factors enhance cereal production. [Paper link](#)

Stingless bees homing ability

icipe continues to build knowledge on stingless bees, a fascinating, important and largely unexplored resource in Africa. Our latest research unravels the foraging range and homing ability of stingless bees, that is, the potential to return to colonies after each foraging trip. In a natural landscape, the bees performed exemplary well on both aspects, in comparison to urban settings. We suppose that artificial structures in urban areas pose landmark and navigation difficulties for the bees. This knowledge will guide our strategies for stingless bee farmers in urban areas, especially in developing forages around their colonies. [Paper link](#)

Outdoor mosquito control

In Zambia, the current malaria interventions primarily target mosquito species that prefer to feed and rest indoors. Our research confirms previous reports that the *Anopheles funestus* mosquito species is the main malaria vector. We provide new knowledge that the species also transmits malaria outdoors. The findings also note that *A. rufipes*, for long considered a secondary vector, is gaining prominence in malaria transmission. Our findings lay the foundation for intercropping either wild tomato, marigold or blackjack with cultivated tomato, to manage *P. absoluta*, without negative impact on the mirid predator. [Paper link](#)

Trypanosomiasis burden in Ethiopia

icipe has generated, new and compelling information on the impact of animal trypanosomiasis on crop-livestock production, economy and poverty in Ethiopia. The disease increases the value of livestock deaths by 33 percent; production costs by 63 percent; and it decreases crop production by 14 percent due to loss of oxens. We estimate the annual direct economic loss to be about USD 58,300 per annum in the study areas; and USD 94 million countrywide. Preventive measures and social protection programmes against animal trypanosomiasis could have lifted about 9000 people in the study areas and about 200,000 people in Ethiopia, above the national poverty line, annually. [Paper link](#)

Asteraceae plants: triple effect

Previous *icipe* research has shown the below-ground crop protection properties of certain *Asteraceae* plants, like blackjack (*Bidens pilosa*) and marigold (*Tagetes minuta*), which suppress the root-knot nematode, *Meloidogyne incognita*, a pest of tomato and other *Solanaceae* plants. The *Asteraceae* plants also have above-ground pest control capacity, as they prevent the greenhouse whitefly (*Trialeurodes vaporariorum*), and green peach aphid (*Myzus persicae*), from feeding on *Solanaceae* plants. Our recent research shows that compounds of some *Asteraceae* plants can influence the host finding behaviour of the above-ground pest, invasive tomato leafminer, *Phthorimaea absoluta*, and its associated mirid predator *Nesidiocoris tenuis*. Our findings lay the foundation for intercropping either wild tomato, marigold or blackjack with cultivated tomato plants, to manage *P. absoluta*, without negative impact on the mirid predator.

Model for monitoring bees

Monitoring key pollinator taxa such as the genus *Ceratina*, small carpenter bees, requires precise, near real-time predictions. We evaluated three machine learning techniques, together with their ensemble model, on their suitability to predict current and future distribution of the bees. We found that integrating multi-source data in predicting suitable habitats improves prediction capacity of the model. [Paper link](#)

Antimalaria compounds

A study by *icipe* has identified a compound known as isoliensinine in *Cissampelos pareira*, a climber plant commonly known as velvet leaf, which can prevent transmission of malaria infection in mosquitoes, while also inhibiting asexual replications of the malaria parasites. These findings provide the first detailed characterisation of the anti-malarial profile of isoliensinine. They boost efforts to investigate malaria transmission-blocking compounds in plants, and also recommend better scientific methodologies towards this goal. [Paper link](#)

IoT for microclimate variables

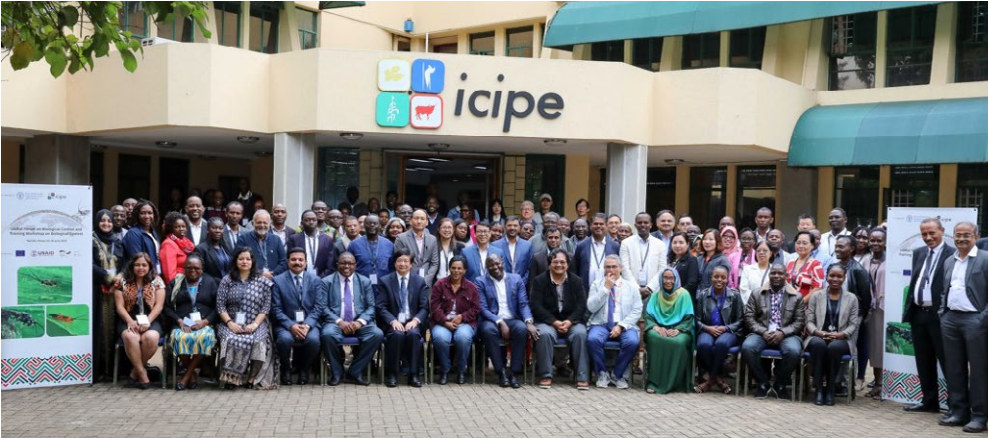
Together with partners, *icipe* researchers have designed a low-cost Internet of Things (IoT) network to monitor microclimate variables and evaluated its use in the context of agroecosystems in temperate and inter-tropical zones. Our system has successfully acquired data for more than two years at high temporal frequency, with temperature measurements every minute in three contrasting environmental conditions. Using the [WorldClim](#) data as a reference, our system highlights and quantifies the discrepancy between macro and microclimate. [Paper link](#)

Women empowerment evidence

Through a case study in Zambia, *icipe* has contributed to global discussions on the impact of integrating women's empowerment into project implementation, on the uptake of agricultural interventions. Our study applied the pro-WEAI tool, to monitor and assess the implication of women's empowerment on the willingness to pay for the *icipe* fruit fly IPM package. The study provides clear evidence that empowering women through intentional inclusion in training, encouragement to join groups and awareness creation on negative gender norms, will increase agricultural technology uptake. [Paper link](#)



Representatives of the collaborating institutions of the *icipe*-coordinated Tropical Medicine Research Centers Network (TMRC) project met on 13 and 14 March 2023 at the *icipe* Duduville Campus; with a field visit to the *icipe* Nguruman Station, from 15–17 March 2023. The TMRC project aims for a multidisciplinary approach to study drivers of visceral leishmaniasis and post kala-azar dermal leishmaniasis in eastern Africa. Collaborators include: *icipe*; Kenya Medical Research Institute (KEMRI); Ohio State University, USA; University of Khartoum, Sudan; National Institutes of Health/National Institute of Allergy and Infectious Diseases (NIH/NIAID); Gondar University, Ethiopia; University of California, USA; Ohio State-Global One Health Office of International Affairs; U.S. Food and Drug Administration; Institute of Tropical Medicine in Antwerp, Belgium.



A section of the participants of the Global Forum on Biological Control, co-organised by FAO and *icipe*, supported by the European Union, United States Agency for International Development (USAID), and the Federal Ministry for Economic Cooperation and Development (BMZ). The Forum brought together about 80 participants from over 30 countries including researchers, government, extension agents and private-sector partners.



Dr Daniel Valenghi, Regional Program Officer, Thematic Cooperation Division, Food Systems Section, the Swiss Agency for Development and Cooperation (SDC), Addis Ababa, Ethiopia, during a visit to *icipe* on 20 March 2023. He was accompanied by delegates from SDC and LED – Liechtenstein Development Service.



In January 2023, *icipe* welcomed Members of Parliament of Canada, and partners from the International Development Research Centre (IDRC), Canada; and Canadian Foodgrains. They were especially updated on IDRC-supported initiatives, which include insects for food and feed and other uses, and IPM for fruit fly management.



Dr Mirjam Macchi Howell, Policy Advisor 2030 Agenda and Research, Analysis and Research Division, Swiss Agency for Development and Cooperation (SDC), Berne, Switzerland, listening to *icipe* scientist, Beatrice Nganso, as she explains aspects of the Centre's research on commercial and beneficial insects.

Dr Leah Ndung'u (left), Regional Manager for Eastern and Southern Africa, ACIAR; Dr Julianne Biddle (second left), Director, Multilateral Engagement, ACIAR; and Ms Eleanor Dean (right), General Manager, Outreach and Capacity Building, ACIAR; pictured with *icipe* Director General, Dr Segenet Kelemu (second right), during a visit to the Centre.



PROMOTIONS

Julius Ecuru (Uganda)

Principal Scientist /Manager, Research Innovation Coordination Units, to manage the BioInnovate Africa Programme and the Regional Coordination Unit of the Rsif at *icipe*.

Merid Negash Getahun (Ethiopia)

Senior Scientist, Animal Health Theme, to continue his chemical ecology research and development activities primarily under the Animal Health Theme.

Amanuel Tamiru (Ethiopia)

Senior Scientist, Plant Health Theme, to lead the Push-Pull Integrated Pest Management Programme, under the Plant Health Theme.

Jeremy Herren (Switzerland)

Senior Scientist, Animal Health Theme, to continue his research on insect symbionts to block the transmission of vector borne diseases.

NEW APPOINTMENTS

Sheila Biloh Agha (Cameroon),

Postdoctoral Fellow (Wellcome Early-Career Award), Behavioural and Chemical Ecology Unit (BCEU)

Antoine Barreaux (France), Visiting

Scientist, CIRAD (French Agricultural Research Centre for International Development), Animal Health Theme

Hilaire Kpongbe (Benin) Postdoctoral

Fellow, BCEU

Charles Okech Amara (Kenya),

Research Assistant I, Symbiovector project (Human Health Theme)

Kalabe Mulugeta (Ethiopia), Business

Support Officer II (Information Management), MOYESH project

Dereje Kussa (Ethiopia), Business

Support Officer II (Enterprise and Business Development), MOYESH project

Mesfin Gizachew (Ethiopia), Business

Support Officer II (Enterprise and Business Development), MOYESH project

Tenaw Melese (Ethiopia), Business

Support Officer II (Enterprise and Business Development), MOYESH project

Eddie Kipkosgei Business (Kenya),

Business Support Officer II (Software Developer), ICT Unit

Lydia Wambui Mwangi (Kenya), Business

Support Officer I (ICT User Support), ICT Unit

Kioko Munyoki (Kenya), Support Officer

II (Senior Electrician), Facilities and Assets Unit

Evangeline Koli Shinali (Kenya),

Business Support Officer I (Library Assistant), Information Resource Centre

Irene Wangari Kuria (Kenya), Business

Support Assistant II, Human Resource Unit

For complete details on recent staff appointments visit:

Read More



icipe STAFF AWARDS

Outstanding Employee of the Year

Josephine Mueni Mayale, Senior Accountant, General Accounting Unit
Karen Wambui, Programme Support Officer, Human Health Theme

Outstanding Support Staff Contribution of the Year

James Kabii, Senior Research Officer II Molecular Biology and Bioinformatics Unit (MBBU)

Outstanding Professional Staff of the Year

Dr Chrysantus Tanga, Senior Scientist and Leader, Insects for Food, Feed and Other Uses Programme

Outstanding Team of the Year

Data Management, Modelling, and Geo-Information (DMMG) Unit

Outstanding Publication of the Year

Ochola J ... Coyne D; Opperman C and Torto B et al. (2022). Wrap-and-plant technology to manage sustainably potato cyst nematodes in East Africa. *Nature Sustainability*. [Paper link](#)

Getahun M N et al. (2022) Metabolites from trypanosome-infected cattle as sensitive biomarkers for animal trypanosomosis. *Frontiers in Microbiology*. [Paper link](#)

Outstanding Partner of the Year

Australian Centre for International Agricultural Research (ACIAR)

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Donor: International Atomic Energy Agency (IAEA)

Title: Regional (AFRA) Training Course on Population Genetic Studies to Support Field Projects

icipe staff: Daniel Masiga and Jandouwe Villinger (Human Health Theme)

Collaborators: IAEA; French Research Institute for Development (IRD); Centre for Research in Infectious Diseases (CRID), Cameroon

Donor: Schlumberger Foundation - Faculty for the Future program

Title: Spatial-temporal dynamics of the biological transmission cycle of bovine trypanosomiasis - PhD Fellowship

icipe staff: Stella Gachoki and Daniel Masiga (Animal Health Theme)

Collaborators: University of Twente, The Netherlands

Donor: Carnegie Corporation of New York

Title: Strengthening doctoral training in applied science, engineering, and technology in Africa (DOCTAS), through the PASET Regional Scholarship and Innovation Fund (Rsif)

icipe staff: Evelyn Nguku

Collaborators: Rsif African Host Universities and international partner institutions

Donor: One CGIAR Secretariat led by the Alliance of Bioversity and 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 (Data Management, Modelling and Geo-Information Unit); and Thomas Dubois (Plant Health Theme)

Collaborators: Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT); Council for Scientific and Industrial Research, Ghana; Esoko (Ghana); International Institute of Tropical Agriculture (IITA); Rwanda Agriculture Board, Rwanda; One Acre Fund, Rwanda

Donor: GI Support Fund for the Development of Geographical Indications in the Africa-Caribbean-Pacific Region, a program coordinated by CIRAD

Project title: HonOgiek: GI for traditional honey of Mau Forest

icipe staff: Subramanian Sevgan and Kiatoko Nkoba (Environmental Health Theme); and Beatrice Muriithi (Social Science and Impact Assessment Unit)

Collaborators: CIRAD; Macodev (Mariashoni Community Development) cooperative, a community-based organization

Donor: Service contract from Leibniz Centre for Agricultural Landscape Research (ZALF) with funding from European Space Agency

Project title: Data fusion for enhanced crop system mapping for a local site in Kenya, and integrating drought risk information (abiotic) into the existing pest and diseases data portals (biotic) at *icipe*

icipe staff: Tobias Landmann (Data Management, Modelling, and Geo-Information, DMMG Unit)

Collaborators: Leibniz Centre for Agricultural Landscape Research e.V. (ZALF); Remote Sensing Solutions GmbH; Regional Centre for Mapping of Resources for Development; Ministry of Agriculture, Kenya

Donor: Research Institute of Organic Agriculture (FiBL)

Project title: Long-term farming system comparison in the Tropics (SYSCOM) - What is the Contribution of organic agriculture to sustainable development?

icipe staff: Edward Karanja (Plant Health Theme)

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); Ministry of Agriculture, Tharaka Nithi and Murang'a counties, Kenya

Donor: FAO

Title: Strengthening the National Capacity of the Directorate of Plant Protection – National Ministry of Agriculture and Food Security (MAFS), South Sudan

icipe staff: Saliou Niassy (Technology Transfer Unit)

Collaborators: FAO and the Ministry of Agriculture, South Sudan

Donor: German Development Cooperation, GIZ Office in Kenya

Title: Training of trainers, a national workshop and support of the ‘Support for Agricultural Production’ (SPQA) and ‘Improvement of disaster risk management and food security to strengthen resilience’ (RDRM) projects: push-pull technology and mealybug training program

icipe staff: Saliou Niassy (Technology Transfer Unit), Samira Mohamed (Plant Health Theme)

Collaborators: GIZ Somaliland and the Ministry of Agriculture

Donor: Global Action for Fall Armyworm Control

Project title: Enhancing the capacities of national stakeholders to scale up the use of biological control in invasive pest management in the Global Action for Fall Armyworm Control in Africa, Asia and the Near East

icipe staff: Subramanian Sevgan (Environmental Health Theme); Sunday Ekesi (Head of Capacity Building and Integrated Sciences, Capacity Building and Institutional Development); Thomas Dubois (Plant Health Theme)

Collaborators: FAO

Donor: IRD

Project title: To conduct the necessary research and development for assessing the feasibility of a future use of *Cotesia typhae* in France as a new biocontrol agent against the corn stem borer *Sesamia nonagrioides* (Lepidoptera: Noctuidae), an important pest of maize in France and other Mediterranean countries.

icipe staff: Thomas Dubois (Plant Health Theme), Paul Calatayud (IRD)

Collaborators: EGCE-CNRS, Arvalis and Bioline, France

Donor: BioInnovate Africa Programme - Regional Innovation Collaboration Projects in eastern Africa, 2022

Project title: Deployment of a novel biodegradable carrier for efficient crop protection (DEFENCE)

icipe staff: Solveig Haukeland

Collaborators: Led by International Institute of Tropical Agriculture (IITA). Partners: icipe; International Fertilizer Development Corporation (IFDC); Bio-Corn Products EPZ Ltd, Jomo Kenyatta University of Agriculture and Technology (JKUAT), Kenya Agricultural Livestock Research Organisation (KALRO), Meru University of Science and Technology, Moi University, Dream Team Consultancy Services, PlantVillage, in Kenya; Antananarivo University, Madagascar; Makerere University, National Agricultural Research Organization (NARO) in Uganda; Real IPM-Biobest; Tanzania Agricultural Research Institute; North Carolina State University and AgBiome in USA; Agricultural Research Institute; International Potato Center (CIP); Papyrus Ltd., Australia

Donor: USDA – Department of Agriculture

Project title: Pesticide- and attractant-based control of Oriental fruit flies and related pests of small and large fruit crops
icipe staff: Baldwin Torto

Donor: CIAT

Project: Supporting and PhD co-supervision

icipe staff: Frank Chidawanyika

Collaborators: CIAT

Donor: Biovision Foundation for Ecological Development, Switzerland

Project title: Increasing diffusion and impact of the vegetable integrated push-pull technology (VIPPT) in eastern Africa from a 'One Health' perspective.

icipe staff: Amanuel Tamiru, Jimmy Pittchar, Frank Chidawanyika and Zeyaur Khan (Push-Pull IPM programme); Ulrike Fillinger (Human Health Theme); and Saliou Niassy (Technology Transfer Unit)

Collaborators: CIFOR-ICRAF; Sustainable Agriculture Tanzania (SAT)

Donor: Biovision Foundation for Ecological Development, Switzerland

Project title: Integrated Sustainable Production of Tomatoes (ISPOT) in Kenya
icipe staff: Samira Mohamed and Shepard Ndlela (Plant Health Theme); and Menale Kassie (SSIA Unit)

Collaborators: County governments of Kirinyaga and Narok; Kenya Organic Agriculture Network (KOAN); Safi Organics Ltd; Farmtrack Consulting Ltd; Real IPM-Biobest Ltd; Kenya National Farmers Federation (KENAFF); Green World; Sinoway Kenya Ltd

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Core donors

- Swiss Agency for Development and Cooperation (SDC), Switzerland
- Swedish International Development Cooperation Agency (Sida), Sweden
- Australian Centre for International Agricultural Research (ACIAR), Australia
- 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
- Biovision Foundation for Ecological Development, Switzerland
- British Council- Newton Fund Institutional Links
- Chalmers University of Technology
- Cambridge Africa ALBORADA Research Fund
- Canadian Executive Service Organization, CESO-SACO
- Carnegie Corporation of New York
- 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)
- Danish International Development Agency (DANIDA)
- Desert Locust Control Organization of Eastern Africa (DLCO-EA)
- Deutsches Zentrum für Luft- und Raumfahrt - German Aerospace Center (DLR)
- ETH Zürich
- Ethiopian Catholic Church Social Development Commission (ECC-SDCBOM)
- European Union
- Food and Agriculture Organization of the United Nations (FAO)
- French Agricultural Research Centre for International Development (CIRAD)
- Future Leaders – African Independent Research (FLAIR)
- German Academic Exchange Service (DAAD)
- Federal Ministry for Economic Cooperation and Development (BMZ)
- German Aerospace Centre
- German Research Foundation (DFG)
- Government of Nigeria (Under investors of Rsif)
- Global Challenges Research Fund (GCRF)
- IKEA Foundation
- 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 Areas (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
- Kenya Education Network (KENET)
- LEAP-Agri (A long-term EU-Africa research and innovation partnership on food and nutrition security and sustainable agriculture)
- Leibniz Centre for Agricultural Landscape Research, ("ZALF") with funding from European Space Agency
- 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
- Novo Nordisk Foundation, Denmark Through Impact Designs
- One CGIAR Secretariat through CIMMYT and ILRI
- 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)
- United States National Science Foundation (NSF)
- University of Bern, Switzerland
- University of Cambridge, UK
- University of Eastern Finland
- University of Glasgow, Scotland
- University of Leeds, UK
- USAID – United States Agency for International Development
- Wageningen University, The Netherlands
- Wellcome Trust, UK
- World Federation of Scientists
- WorldFish
- World Health Organization (WHO)
- World Trade Organization (WTO) – Enhanced Integrated Framework (EIF)

Investors in the Regional Scholarship and Innovation Fund

- Government of Benin
- Government of Burkina Faso
- Government of Côte d'Ivoire
- Government of Ghana
- Government of Kenya
- Government of Mozambique
- Government of Rwanda
- 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)

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