

2

**FROM THE OUTGOING CHAIR,
icipe GOVERNING COUNCIL**



Prof. Dr. Bill Hanson

3

**THOUGHT LEADERSHIP COLUMN
BY THE DIRECTOR GENERAL**



UN Food Systems Summit Action Tracks
icipe's Track Record

Dr Segenet Kelemu

5

FROM OUR PARTNERS

7

INSTITUTIONAL NEWS

7

NEWSMAKERS

9

RESEARCH HIGHLIGHTS

10

**MORE YOUNG
ENTREPRENEURS IN SILK AND
HONEY (MOYESH) PROJECT**

11

**BIOINNOVATE AFRICA
PROGRAMME**

11

**REGIONAL SCHOLARSHIP AND
INNOVATION FUND**

12

**CAPACITY BUILDING
AND INSTITUTIONAL
DEVELOPMENT**

13

**SELECTED ARTICLES OF
RECENTLY PUBLISHED**

14

STAFF NEWS

16

RECENTLY FUNDED

icipe BY NUMBERS

11,000

people trained and 302 enterprises developed via the Insects for Food and Feed and other uses programme, as of 2021

253,082

farmers reached directly, and 52.5 million others connected with through secondary pathways in 2021

100

agreements signed by BioInnovate Africa Programme and partners in Eastern Africa, as of 2021

16

research grants funded through the Regional Scholarship and Innovation Fund (RSIF) as of 2021

234

Peer reviewed journal articles published between 1 January and 15 December 2021

4213

mentions in social and traditional media between 1 July and 15 December 2021



Prof. Dr. Bill Hanson
Outgoing Chair, *icipe* Governing Council

Dear Friends and Colleagues,

In November 2021, I concluded my tenure as Chair of the *icipe* Governing Council (GC), having assumed the position in November 2019.

It has been extremely gratifying to serve this unique and outstanding institution. Significantly, over the past two years, I have witnessed the dramatic proliferation in *icipe*'s scientific output, signified by a rise in peer reviewed publications – from 135 in 2019 to 234 in 2021. Indeed, with a 136 journal articles published between January and June 2021, the Centre recorded its highest ever publication output in a six-month duration.

This growth corresponds with an improvement in the quality of journals in which *icipe* researchers are publishing their work; increase in top cited publications; and inclusion of five current scientists and one former *icipe* researcher in the “World Ranking of Top 2% Scientists”. In addition, there has been a massive expansion in the awards and recognitions received by the Centre and its various teams, as well as the depth and breadth of *icipe*'s media visibility.

As illustrated in this bumper edition of the *icipe* newsletter, the upsurge in knowledge generation is matched by the Centre's impact on developmental issues. Indeed, as detailed in the Director General's [Thought Leadership column](#), *icipe* is distinct in its comprehensive alignment to the United Nations Food Systems Action Tracks and by extension, cross-cutting bearing on the Sustainable Development Goals (SDGs).

Further examples are presented in the [Research Highlights](#) section; through a special focus on the immense advancement

of the Centre's activities in Ethiopia; and in capacity building accomplishments. Also, remarkable progress has been made in the *icipe* managed programmes: the [Regional Scholarship and Innovation Fund](#) (RSIF), recently marked a major milestone with the completion of its first ever PhD, while [BioInnovate Africa Programme](#) and partners have launched several bioscience-based products into markets across eastern Africa.

These outcomes continue to inspire donor confidence, as is evident in the [Recently Funded section](#). This fact is underscored in [From our Partners column](#), by the Swedish International Development Cooperation Agency (Sida), one of *icipe*'s core donors. The article has three key messages: high appreciation of *icipe* as a partner; increasing importance accorded by the Swedish government and Sida to biodiversity and thus *icipe*'s work; and the importance of unrestricted core funding, with a kind invitation by Sida to more donors to provide such support to *icipe*.

As I thank you all for your support and collegiality over the past two years, I am delighted to pass on the baton to Emeritus Professor Kym Anderson, the incoming Chair of the *icipe* GC. An Australian economist, Prof. Anderson has held numerous research leadership roles including at the World Bank and World Trade Organization. He has also served on various boards among them, Australia's Grape and Wine Research and Development Corporation, the CGIAR's International Food Policy Research Institute, and the Australian Centre for International Agricultural Research. He joined the *icipe* GC as a member in April 2020, before becoming Vice Chair in November 2020 and Chair in November 2021. ([Read bio](#))



The *icipe* family wishes you a happy holiday season, as we look forward to our continued partnership in 2022.



Dr Segenet Kelemu
Director General, *icipe*

UN FOOD SYSTEMS SUMMIT ACTION TRACKS

icipe's Track Record



The success of the UN Food Systems Summit Action Tracks depends on the availability of a well trained and empowered human resource, as well as effective institutions of research, implementation and governance. Towards this goal, adequate global, regional and national financial investments are an imperative.

On 23 September 2021, the United Nations Food Systems Summit was held as part of the Decade of Action to achieve the Sustainable Development Goals (SDGs) by 2030. Guided by five [Action Tracks](#) developed through dialogues between governments and stakeholders, the Summit launched “bold new actions to deliver progress on all 17 SDGs, each of which relies on healthier, more sustainable and more equitable food systems”. The Action Tracks establish a space to share and learn, coordinate action, commitments and new partnerships. They also explore how cross-cutting levers of change like human rights, finance, innovation

and the empowerment of women and young people can be mobilised to create solutions at local, national, regional and global levels to scale up and accelerate existing initiatives aligned to the Summit’s vision and principles.

icipe's track record, discussed below through selected examples, demonstrates the alignment of our activities to the Action Tracks. As is evident, the Centre’s 4H themes: Human Health, Animal Health, Plant Health and Environmental Health, form a unique framework to create One Health hubs that are vital for global food systems transformation.

At the heart of *icipe's* activities is the well-being of smallholder farmers who contribute about 70 – 80 percent of the food supply in Africa. We believe that their health is key for food and nutritional security. We are contributing to this goal by controlling vector-borne diseases like malaria, which, among other negative effects, reduce ability and energy for agricultural activity and output.

The *icipe* integrated pest management (IPM) strategies and tools, as well as vector control approaches for animal diseases, are environmentally safe, as well as accessible, economically and technically feasible for smallholder farmers. In 2021, we reached 253,082 farmers directly, and 52.5 million others through secondary pathways.

We are enabling farmers to increase yield of Africa’s main staples like cereals, potatoes and bananas; as well high

Action Track 1: Ensure access to safe and nutritious food for all

nutrient foods such as fruits, legumes and vegetables, including indigenous, nutritionally superior, varieties; and cash crops. Also, *icipe* is tackling tsetse flies, ticks and biting flies and the diseases they transmit to animals, thus enhancing livestock productivity and availability of dairy products. In addition, we are championing insects as an alternative, affordable and nutritious source of food for people and livestock. The latter is unlocking pig, poultry and fish farming, doubly increasing nutrition access – directly from the animals and by freeing-up conventional feed options like fishmeal and soybean as food for people. Overall, more and diverse agricultural production boosts household incomes and food purchasing power.

Our approaches enable communities to produce and store food safely. Socio-economic studies show that the *icipe* fruit fly IPM packages lower insecticide use and its adverse impact on environmental and human health by 68 – 89 percent, and 35 – 40 percent, respectively.

The push-pull technology reduces stemborer and fall armyworm damage on maize cobs and thus ear rot fungi that cause pre-harvest mycotoxin contamination of the crop. In livestock, reduced disease infections lead to decreased use of drugs and contamination of products like milk and meat. Also, we have generated guidelines for safe production and use of insects for food and feed products. And our research has contributed to mitigating postharvest losses through improved storage strategies that do not require the use of chemical pesticides.

Action Track 2: Shift to sustainable consumption patterns

The globally acclaimed *icipe* insects for food and feed initiatives encompass most ambitions of this Action Track. Insects can transform food systems because they reproduce quickly, have high growth and feed conversion rates, better ecological footprint, lower greenhouse gas emissions, as well as water and land requirements.

Our efforts have led to the establishment of 302 insect-based enterprises in the eastern Africa region. And 4 percent of the annual animal feed protein in Kenya is currently being met through insect proteins, with projections that in the next five years, such integration could go up to 25 percent. Using our mass rearing and sustainable harvesting technologies, many communities are integrating insect-based proteins into their diets.

Broadly speaking, *icipe* contributes to consumption of sustainable food products by providing better understanding of food value chains, including constraints and opportunities faced by smallholder farmers; key players and their interests; and consumer perceptions.

Our innovative technology transfer pathways facilitate knowledge flow; stronger capacities of farmers, agricultural agencies and stakeholders; impact on food systems governance by collaborating with policy and decision making institutions to design policies, legislation and regulations; partnerships with private sector to develop and market high-quality sustainable products; and intensive awareness raising to promote demand.

Action Track 3: Boost nature-positive production

The *icipe* IPM approach affirms the reciprocal relationship between nature and food systems, and that it is possible to control crop pests and to increase yield without harming the Earth.

Our packages include control of pests using other organisms like predators and parasitoids; biopesticides and botanicals; naturally derived attractants and repellents; and cultural practices like intercropping. All these IPM components support the sustaining and regenerative capacity of our environment.

Also, we contribute to the conservation and sustainable use of biodiversity by broadening knowledge on arthropods, their diversity and role in ecosystems, as well as habitat management to ensure their survival. In particular, we are building a wealth of knowledge on pollinators, especially African honeybees and stingless bees, to complete gaps on their threats and develop mitigation strategies; understand their efficiency on a variety of crop plants; their genetic diversity; as well as interaction with IPM strategies and other organisms in agricultural and natural habitats.

icipe is ingenious in the development of holistic and inclusive livelihood alternatives for communities, especially those living in fragile or natural resource-rich ecosystems in Africa. This innovativeness has led to community-based enterprises based on sustainable, modern beekeeping and silk farming; and on-farm cultivation of medicinal plants and commercial production of biopesticides and botanicals. Also, the Centre is partnering with Mastercard Foundation to enable young men and women in Ethiopia secure dignified and fulfilling work along honey and silk value chains.

Action Track 4: Advance equitable livelihoods

Further, studies show that in Kenya alone, insect-based enterprises, like those being promoted by *icipe*, could create employment opportunities for 3,000 – 33,000 people per year in Kenya and improve the country's economy by USD 16–159 million, while potentially lifting 0.07–0.74 million people out of poverty, annually.

icipe's research activities promote equality of opportunity and outcomes for women, men and the youth, through engendered pathways of technology development and adoption; capacity development; and policy influence. In 2021, 53 percent of all the farmers we reached were women. Over 70% of our insect for food and feed initiatives, and 30 percent of push-pull farmers are aged below 35 years. And studies show that the push–pull technology increases investments in children education and shifts household expenditures to female consumption preferred goods, and enhances women and household dietary diversity scores.

Action Track 5: Build resilience to vulnerabilities, shocks and stress

icipe is dedicated to combating one of the major disruptions to the functionality of sustainable food systems: invasive species. Recent examples of the Centre's interventions include contribution to the control of catastrophic locust swarms that swept across the horn of Africa –

Ethiopia, Kenya and Somalia from early 2019; the fall armyworm, a caterpillar that is endemic to the Americas that arrived in Africa in 2016, severely threatening production of cereals and other crops; and Tuta absoluta, a devastating leafminer originating from Peru that can cause 100 percent tomato yield loss. Other species, include fruit flies like *Bactrocera dorsalis*, a native of Asia; potato cyst nematodes (PCN); and invasive weeds particularly the *Parthenium hysterophorus*, aptly known as famine weed. Importantly, in collaboration, with partners, we have developed

a strategy to manage invasive species in Africa. We are also addressing two other food systems stressors in Africa: drought and climate change. For example, a climate-smart version of the push-pull technology is enabling farmers in increasingly dry and hot regions to stabilise their cereal–livestock mixed production systems. And our research on camel disease vectors is improving the health and productivity of these animals, the most important resource for communities in arid and semi-arid lands of Africa.

icipe's resilient and determined response to the COVID-19 pandemic provides a range of best practices, like adjustments in institutional operations, field and laboratory-based activities, African-led solutions and post-crisis recovery ideas, that may be applicable under other “business as unusual” scenarios, to ensure minimum disruptions in sustainable food systems.



Susanne Johansson
Senior Research Advisor and
responsible officer for *icip*e at Sida

50 YEARS OF SWEDISH CORE SUPPORT TO *icip*e

*icip*e's work on maintaining biodiversity and ecosystem services
is more relevant than ever



Sida has been a proud supporter of *icip*e for about 50 years and the Centre has always been a highly appreciated and relevant partner in Sida's development cooperation.

Insects are decreasing in number in an unprecedented way, mainly due to environmental and climate change and the expansion of food production to meet a growing global population. And yet, insects are also part of the solution when it comes to building resilient agricultural production systems and maintaining healthy ecosystems and sustainable livelihoods. The Swedish government has identified biodiversity loss as one of the largest global challenges. Maintaining biodiversity is the basis for

social and economic development in all parts of the world. Consequently, Sida has received a new assignment from the Swedish government to “strengthen the work with biodiversity in its entire operations by 2023”. Therefore, we will focus on integrating and strengthening biodiversity in, and with existing initiatives and partners; have a normative dialogue with our partners; mobilise funding and increase synergies between initiatives and partners where relevant.

*icip*e – A HIGHLY APPRECIATED SIDA PARTNER



Miwaleni Spring in Moshi, Tanzania, one of the biodiversity hotspots where *icip*e has previously conducted R&D activities.

With Sida's new assignment on biodiversity, the work of *icip*e will be even more relevant. Many of the initiatives at *icip*e are directly or indirectly contributing to maintaining biodiversity and to developing sustainable ways to use ecosystem services to increase livelihoods, health and food security across Africa.

Developing insect-based products such as dietary oils, honey and silk, and using insects for food and feed, may be the most obvious and direct examples of using insects. Monitoring and increasing the understanding of insects, their biology and habitats, has also led to developing new tools and strategies to manage pests of crops, such as the invasive fall armyworm. And a ground-breaking understanding of microbes in mosquitoes may result in developing and implementing new approaches to prevent transmission and spread of malaria. These are just a few examples of important outcomes that have resulted from *icip*e's research and knowledge on ecosystem services and biodiversity.

Practically since its start 50 years ago, *icip*e has received core support from Sweden, a fact that demonstrates our special relationship. *icip*e has grown into a centre that delivers highly relevant research and innovation of high quality, expanding its work and relevance across the African continent, while still keeping its unique focus on the problems and benefits of insects and other arthropods. This focus led *icip*e to win *Curt Bergfors Foundation Food Planet Prize* in 2020, for “transitioning to more circular, resilient, and efficient insect-based production systems in Africa and worldwide, tapping one of the world's most underutilised protein sources and expanding the very concept of livestock farming.” *icip*e was chosen from among 650 nominations, recognising the centre's pioneering research and development activities on insects for food, feed and other uses.

That several of *icip*e's researchers were listed among the top 2% scientists in a global list recently released by Stanford University/Elsevier is another good example that proves that *icip*e is in the forefront of its field.

UNRESTRICTED CORE FUNDING

The guiding principles of Sida's research cooperation are local ownership, long-term engagement and a systems approach. We strongly believe in the strength of core support, allowing the priorities and needs of our highly trusted partners to be in the front seat. It also increases predictability and flexibility for our partners.

Director General, Dr Segenet Kelemu states in her column on "Decolonising knowledge: *icipe* takes a stand" (Vol.11, issue No.1, 2021) that "*icipe* occupies a unique practical and epistemic space as an African yet global institution; one that thrives on the ethos of equal, respective partnerships; and one that ascribes

to the principles of the international scientific community while remaining committed to transformation of livelihoods across Africa." As core donors, leaving the visionary and strategic work to the leadership of *icipe*, Sida hopes that we are and continue to be part of the solution.

Sweden is one of the world's most research intensive countries. We believe in research as a foundation for development, wellbeing and sustainable and democratic societies. This is why research cooperation is an important part of Swedish development cooperation. However, funding for research and innovation, especially unrestricted funding,

continues to be a major challenge in low-income countries. In a world of increasing climate change and biodiversity loss, *icipe*'s work will remain to be of high relevance for the African continent and beyond for many more years to come.

Sida believes that long-term unrestricted core funding is an important ingredient when building resilient and independent capacity for research and innovation for sustainable development such as at *icipe*. Therefore, Sida warmly invites other core donors to join us in the Sponsoring Group of *icipe*.

Sida's mission

Sida – the Swedish International Development Cooperation Agency – is Sweden's government agency for development cooperation. Our mission is part of the national policy for global development. We strive to reduce poverty and oppression around the world. In cooperation with organisations, government agencies and the private sector we invest in sustainable development for all people.

We continuously learn from experiences with our cooperation partners and evaluate our partner portfolio to deliver the best possible assistance in each context. Sida has bilateral development cooperation with some 35 countries in Africa, Asia, Latin America and Europe. [Read more](#)



Dr Jan Wärnbäck (green cap), Coordinator, Sida Regional Hub for Environment and Climate Change in Africa, and Dr Katrin Aidnell (blue cap), Sida Regional Program Manager, Environment and Climate Change, pictured during a visit to *icipe*, sampling organic fertiliser, bio-composted by black soldier flies.



Mr Alan AtKisson, Director of Department for Partnership and Innovation, delivering a special message, virtually, during the *icipe*@50 celebrations.



DG VISIT TO ETHIOPIA



In September 2021, *icipe* Director General, Dr Segenet Kelemu, made an official visit to Ethiopia. She toured selected project sites of the More Young Entrepreneurs in Silk and Honey (MOYESH) project, a partnership between the Centre and the Mastercard Foundation, and initiatives supported by the *icipe*-managed BioInnovate Africa programme. In the highly interactive sessions, Dr Kelemu used her own journey, from growing up in rural Ethiopia to becoming a renowned scientist and an acclaimed international leader, to inspire MOYESH youth partners to seize opportunities provided to them, and to dare to have grand visions. The forums also led to insights for the evolution of ongoing projects into One Health hubs that amalgamate knowledge and technologies from the *icipe* 4H themes while also embracing novel, transformative elements. Further, the Director General held meetings with the *icipe* Ethiopia office staff and restated the Centre's vision and mission, as well as commitment to nurturing a highly motivated, energetic and well skilled staff.

5 QUESTIONS

With Dr Tadele Tefera, Head, *icipe* Ethiopia Office, on the tremendous growth of the Centre's presence in the country over the past eight years, evidenced by the number of staff; expansion of geographical coverage; management of the MOYESH project, the largest single restricted grant in the history of *icipe*; developmental impacts; and recognition by partners, including the Ethiopian government.

[Read More](#)



FOOD PLANET PRIZE

icipe, alongside all the 2020 finalists and prize winners of the Food Planet Prize, is featured in a [video](#) to raise awareness on how the food system is interconnected to planet Earth, and to give hope by showing initiatives that are improving the food system.

COVID-19 PERSPECTIVE

Dr Kelemu and two leading South African researchers have authored a [Perspective](#) in *PLOS Medicine* journal, titled "COVID-19 in Africa: Catalyzing change for sustainable development", which provides a positive outlook on how the continent handled the pandemic. [Paper link.](#)

WHERE ART MEETS SCIENCE

We continue to enhance our Duduville Campus as a beautiful, pleasant and environmentally friendly home of creativity and innovation. In collaboration with Kitengela Glass, a Kenyan company that applies the *dalle de verre tableau* technique on recycled glass, we have installed brilliant, insect-inspired artwork at our dining terrace.

In addition, five gazebos that are ideal for small meetings, tea and lunch breaks, recreational activities or as think spaces, have been built and furnished using locally available renewable materials. These additions perfectly blend into our thriving landscape that consists of numerous flora, insects and bird species.



NEWSMAKERS

Five current scientists and one former *icipe* researcher are in the "World Ranking of Top 2% Scientists" list. Created by Stanford University, the list identifies the top scholars in their own areas of specialty and the frequency with which their publications are cited by other authors around the globe. The scientists are: Sunday Ekesi, Director of Research and Partnerships (entomology – plant biology); Baldwyn Torto, Head, Behavioural and Chemical Ecology Unit (entomology – mycology and parasitology); Zeyaur Khan, Leader, Push-Pull Integrated Pest Management Programme (entomology – plant biology); Menale Kassie, Head, Social Sciences and Impact Assessment Unit (agricultural economics and policy – agronomy and agriculture); Tadele Tefera, Head, *icipe* Ethiopia Office (entomology – plant biology) and Jean Maniania, former Head, *icipe* Arthropod Pathology Unit (entomology – microbiology).

As Ohio State University Global One Health initiative (GOHi) celebrated its 10-year anniversary, *icipe* was selected as one of its key partners in helping to achieve the mission of addressing the causes and effects of diseases more efficiently and effectively at the interface of humans, animals, plants and the environment.

STAFF

Dr Segenet Kelemu has been nominated as a member of the Scientific Board of the International Basic Science Programme (IBSP). Operational since 2005, IBSP is the only international forum in the United Nations that makes recommendations to the Director-General of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and its Member States on the global situation of the basic sciences through consensual deliberation involving all regions of the world. Dr Kelemu will also be featured in the World Exposition 2020 to be held in Dubai, United Arab Emirates, from 1 October 2021 – 31 March 2022, under the theme ‘*Connecting Minds, Creating the Future*’.

Dr Sunday Ekesi has been selected as a Fellow of the Entomological Society of America (ESA), the largest organisation in the world serving the professional and scientific needs of entomologists and individuals in related disciplines. He has also received the Distinguished Scientist Award, one of four awards given annually by the ESA International Branches.

Dr Menale Kassie has been ranked among the top 5 percent authors in the field of Economics in IDEAS, the largest bibliographic database dedicated to the discipline.

Dr Henri Tonnang, Head Data Management, Modelling and Geo-information Unit, has been nominated by the Director General of UNESCO as a member of the Advisory Committee in Open Science.

Dr David Tchouassi, Scientist, Behavioural and Chemical Ecology Unit (BCEU), has been awarded a five-year Wellcome Trust International Intermediate Fellowship for a project titled ‘Ecological and genetic drivers of persistent *Plasmodium* transmission by *Anopheles funestus*, a major malaria vector in Kenya’.

Dr Jeremy Herren, Scientist and leader of the *icipe* SymbioVector Project, has been selected as one of 10 winners of the Falling Walls 2021, in the Life Sciences category ([Link](#)). Since joining *icipe* in 2014, Dr Herren has spearheaded research leading to a discovery of a microbe in malaria-transmitting mosquitoes, which is capable of blocking transmission of the disease’s parasites from the insects to people.

Mary Ngure, Information Resource Centre Coordinator, has been elected as a member of International Federation of Library Associations and Institutions (IFLA) Academic and Research Libraries Section (2021 – 2025).

Prof. Ahmed Hassanali, former Head, *icipe* BCEU, has received a Life time Achievement award from the International Society of Chemical Ecology (ISCE), in recognition of his outstanding contributions to the establishment of chemical ecology research in Africa, and distinguished scholarly contributions and mentorship.

SCHOLARS

Bester Mudereri (Zimbabwe), a PhD scholar within the Push-Pull for sub Saharan Africa project, funded by Biovision Foundation for Ecological Development, Switzerland, received the best PhD award in the University of the Western Cape for the 2020–2021 academic year.

On 20 August, World Mosquito Day, **Trizah Koyi Milugo** (PhD scholar, BCEU), was featured in a blog on *Frontiers Science News*, on her research that aims to contribute to the development of novel tool for controlling malaria transmission.

Mukundi Mukundamago (South Africa), ARPPIS PhD scholar, has been nominated as an Africademics Scholarships Ambassador.

Three members of the **Nematology Research Group** won awards during the Horticultural Association of Kenya workshop (29 November – 3 December 2021): James Kisaakye, Best Oral presentation (*Endophytic non-pathogenic Fusarium Oxysporum* improves banana); Calvince Orange, Best Poster presentation (Assessment of cv. Shangi-like potato lines with potato cyst nematode resistance – PCN); and Ivy Nyambura, First-runner up, poster presentation (Biological control of PCN using banana fibre paper).

JOURNAL APPOINTMENTS

Dr Saliou Niassy, Head, Technology Transfer Unit, and James Egonyu, Scientist, Insects for Food and Feed and other uses programme, are Guest Editors of a Special Issue on Advances in Insects for Food and Feed, in the *International Journal of Tropical Insect Science*.

Dr Beatrice Muriithi, Postdoctoral Fellow, Social Sciences and Impact Assessment Unit, has been appointed member of the Editorial Board at the *African Journal of Agricultural and Resource Economics (AfJARE)/Journal Africain d’Economie Agricole et des Ressources (JAEAR)*.

Dr Komivi Akutse, Scientist, Plant Health Theme, has been appointed to the Scientific Advisory Board of the *Journal of Applied Entomology*.

A paper co-authored by **Dr Robert Copeland**, Biosystematics Unit, has won the Science Achievement Award of the United States National Museum of Natural History (NMNH), Smithsonian Institution’s 2020 committee. [Paper link](#)

Push-pull and fall armyworm

Ongoing studies suggest that greenleaf *Desmodium* provides the most effective control of fall armyworm within the push-pull technology and it also has the capacity to recruit the pest's parasitoid, *Telenomus remus*. Also, push-pull improves soil conditions, leading to higher maize growth rate, and it induces defence semiochemicals that reduce fall armyworm infestation and damage.

Push-pull and vegetables

Based on studies that showed that *Desmodium* repels vegetable pests and attracts beneficial arthropods (predators and parasitoids), *icipe* and partners have commenced integration of farmer-preferred vegetables like kale, black nightshade, tomato and onion, cabbage and cowpea into push-pull systems. The vegetables will supplement household nutrition, and provide off-season food and income. These initiatives have been featured in 'Shamba Shape Up', a popular TV show in East Africa: [Link 1 \(from 16.20\)](#), [Link 2 \(from 15.40\)](#). [Comic book](#) and [manual](#).

Push-pull app

A mobile phone application has been developed by Agape Innovations Ltd, in collaboration with scientists from University of Leeds, Keele University and *icipe*, to communicate the push-pull technology across Africa has been established. Available on [Google Play store website](#)

Masterclass

With Saliou Niassy, Head, Technology Transfer Unit, demystifying technology transfer, its vital role in research and development, *icipe*'s approach and accomplishments.



Mango export unlocked

A protocol developed by *icipe* to disinfest fruit flies specifically from apple mangoes, a popular variety in Africa, has been recognised by the European Union as an effective post-harvest treatment. This outcome has facilitated much-anticipated re-access of mangoes from the region into the European market. In July 2021, *icipe*, Kenya Plant Health Inspectorate Service (KEPHIS), and Fresco Freshpro Limited, Kenya, sent a pilot shipment of treated mango to Italy. The consignment passed and satisfied all phytosanitary requirements.

Potato rescue

With the continued threat of the potato cyst nematode (PCN), first reported in Kenya in 2015, *icipe* and partners have developed a proof-of-concept for a diagnostic tool to identify and quantify the pest. Alongside, in collaboration with the International Institute of Tropical Agriculture (IITA), PCN resistant potato varieties, as well as cropping practices that could mitigate PCN damage, are being tested in potato growing hubs across Kenya. Distribution and characterisation of PCN in the country is ongoing, flanked by awareness creation, with about 20 training days, reaching approximately 1,000 farmers held over the past several months.

Integrated pest and pollinator management (IPPM)

Integrated pest management (IPM) and pollination services are two ecosystem services that have largely been studied in isolation. *icipe* has investigated the combined effects of these two sets of approaches on avocado and cucurbits in Kenya and Tanzania. The results show that an IPPM strategy that brings together IPM and pollination services could create positive interactions and synergies for pest control, pollination and ultimately, crop yield. [Read more](#)

Mangoes and spices

In 2020, *icipe* and partners launched an integrated agroecological project to comprehensively address the challenges of mango production in Ethiopia. In addition to the Centre's IPM approaches, a key component of the initiative is top working (pruning and grafting), to replace indigenous mango trees with hybrid/ grafted varieties. Early income generating crops that are compatible with the mango farming systems are also being introduced.

[Read More](#)



Black soldier fly farming in Ethiopia

Through *icipe*'s capacity building efforts, progress has been made in commencing research and development activities on black soldier flies, and by extension insects for feed, in Ethiopia. Between 28 June – 10 July, 2021, Eyob Kefeni (below, extreme right), an Ethiopian PhD student at Hawassa University, undertook training at *icipe*. The skills he gained enabled him to set up experiments at the University on the use of black soldier flies in aquaculture farming in Ethiopia.

Further input was provided by *icipe* Director General, Dr Kelemu (below, centre), during a visit to the University in September, and a follow-up seminar presented in October at the University by Dr Menale Kassie (below, third right), Head, *icipe* Social Sciences and Impact Assessment Unit.

[Read More](#)



MOYESH – A TRANSFORMATIVE FORCE

In 2019, *icipe* in partnership with the Mastercard Foundation launched the MOYESH project, a five-year initiative that aims to see 100,000 young men and women in Ethiopia secure dignified and fulfilling work along honey and silk value chains. Listen to this [audio podcast](#) on how MOYESH is endowing social and knowledge capital to youth partners, value chain actors and communities.



FAREWELL

Gratitude, appreciation, reflection and inspiration marked the occasion as we bid farewell to Mr Alemayehu Konde Koira, upon his retirement as Country Head, Ethiopia, at the Mastercard Foundation, in August. From 2016 – 2021, he was pivotal in the formation and evolution of a highly successful partnership between Mastercard Foundation and *icipe*. Achievements by the two institutions and their partners during this period include implementation of the Young Entrepreneurs in Silk and Honey (YESH) project (2016-2021), which laid the basis for the MOYESH project.

SILK MOVEMENT

Across the world, silk, a natural protein fibre produced by silkworms, is a highly coveted premium product, due to its soft, lustrous, smooth, strong and durable texture. Since 2016, *icipe* and Mastercard Foundation have advanced silkworm farming in Ethiopia, leading to a sericulture farming movement that is bringing together mothers and daughters; sons and fathers; friends and neighbours; with thriving enterprises along the silk value chain. Read [Instagram Stories](#).

WELCOME

In September 2021, the Mastercard Foundation and *icipe* reiterated their commitment to partner in the creation of dignified and fulfilling jobs for youth in Ethiopia. During a courtesy meeting, Mr Samuel Yalew Adela, incoming Country Head, Ethiopia, at the Mastercard Foundation, and *icipe* Director General & CEO, Dr Segenet Kelemu, acknowledged tremendous progress made through the YESH and MOYESH projects. However, they observed that across Ethiopia and indeed Africa, youth unemployment remains a massive challenge, one that requires innovative approaches backed by strong, effective partnerships.

FOCUS: SELECTED MOYESH PROJECT TEAM MEMBERS



Dr Workneh Ayalew, Programme Coordinator

Previously, he was the Coordinator of the YESH project; and Director of the Livestock Value Chains, Ethiopian Agricultural Transformation Agency (ATA), on secondment from the International Livestock Research Institute (ILRI);

He has also held positions in the National Agricultural Research Institute, Papua New Guinea; at FARM-Africa and Alemaya University, Ethiopia. He holds a PhD in animal production and breeding from the Georg-August University of Goettingen, Germany; MSc in animal breeding from Alemaya University in Ethiopia and BSc (Honours) in animal sciences from Addis Ababa University in Ethiopia.



Esayas Mulatu Morka

Senior Deputy Programme Coordinator

Previously, he was Business Development Manager, YESH project at *icipe*. He holds an MBA from Sikkim Manipal University, India; Postgraduate

Diploma in Rural Development from Weitz Centre for Sustainable Development, Israel; and BSc in Industrial Engineering from Bahir Dar University, Ethiopia.



Freweini Assefa, Deputy Programme Coordinator



Her previous appointments include various capacities in Illu Ababore and Tigray Bureau of Agriculture and Rural Development. She holds a PhD in Animal Nutrition from Haramaya University, Ethiopia; and MSc in Animal Science from the University of

New England, New South Wales, Australia; BSc in Agriculture (Animal Science) from Alemaya University of Agriculture, Ethiopia.



Meklit Assefa

Programme Manager, Amhara Region

Previously, she was Senior Forest Management Expert, Ministry of Environment Forest and Climate Change

Commission; Graduate Assistant, Kotebe College of Teacher Education. She holds an MSc in Plant Biology and Biodiversity Management from Addis Ababa University; BSc in Biology from Bahir Dar University.



Teshome Kumela

Programme Manager, Oromia Region

Prior to this appointment, he was a Project Coordinator and Scientist (Push-Pull IPM) at *icipe*; Technical Assistant and Researcher,

Ethiopian Institute of Agricultural Research (EIAR). He holds an MSc and a BA, both in Economics, from Jimma University, Ethiopia; and a Diploma in General Agriculture from Jimma Agricultural College.



Henok Mechal, Programme Manager, Southern Nations, Nationalities, and Peoples' Region

He previously served as a Senior Livestock Value Chain Development Specialist,

ATA. He holds an MSc in Agricultural Economics from Haramaya University; BSc in Agricultural Resource Economics and Management from Hawassa University, both in Ethiopia.



WHAT GOES ROUND

Coffee residues, the husks and pulps left over in the processing of the crop, contain phenolic toxic poisonous substances. Often, this affluent is pumped directly into the environment with great impact on the health of people, animals and ecosystems. The Burqitu (Bio-chain) Bio-waste Processing and Integrated Agriculture Enterprise, an initiative in southern Ethiopia supported by BioInnovate Africa Programme, has made commendable progress in vermicomposting – using earthworms to convert coffee affluent into nutrient-rich fertilisers that are then applied to coffee and other crops.

[Read More](#)

SURE BET FOR AVOCADOS

An internationally certified, nitrogen biofortified organic fertiliser developed from biodegradable municipal waste, has been launched in Tanzania. Supported by BioInnovate Africa Programme, the fertiliser has been produced by Guavay Company Limited, Tanzania, in collaboration with partners from Tanzania and Uganda. Aptly branded Hakika, Kiswahili for ‘for sure’, the fertiliser contains natural growth promoters, beneficial micro-organisms that help to preserve soil moisture, and superior qualities like rapid bio-composting and fermentation. Although useful to other crops, Hakika is specifically targeted towards avocado growing.

ELEVATING AFRICA'S ORPHAN CEREALS

With the support of BioInnovate Africa Programme, Hawassa University, Ethiopia, has developed a range of protein enhanced sorghum and millet products that are more appealing to the tastes, preferences and demands of customers. The project is contributing to sorghum and millet value chains, unlocking the commercial potential of two of Africa's orphan crops. During a visit to the University in September 2021, *icipe* Director General, Dr Segenet Kelemu, observed the enormous potential of the project, especially through further integration of technological innovations for extrusion, an energy efficient and versatile process.

HEALTHY SWEETNESS

Sweet toothed, yet health conscious consumers, can now indulge themselves in the healthy sweetness of honey toffees. The candy brand, which contain 75 percent honey and 25 percent dairy products, groundnut, coconut, spices, and no processed sugar, has been developed by Aroma Honey Toffee Limited, Uganda, supported by BioInnovate Africa. The venture, which currently involves two bee farmer groups in Rwanda and Kenya, will help to improve farm gate prices and income for beekeepers, and value chain actors.

EASTERN AFRICA BIOECONOMY ADVANCES

The eastern Africa region is arguably the most advanced in the development of a bioeconomy in Africa, with a bioeconomy strategy, and an annual bioeconomy conference that is the largest such convening on the continent. The second conference, held on 10 and 11 November 2021, co-organised by *icipe*/ BioInnovate Africa programme, in partnership with the East African Science and Technology Commission, Stockholm Environment Institute Africa Centre, and Biosciences eastern and central Africa-International Livestock Research Institute Hub, provided insights for the region to capitalise on advances, address challenges and serve as a model for bioeconomy development.

[Read more](#)

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

FIRST RSIF PhD

In October 2021, RSIF marked a major milestone with the completion of the initiative's first ever PhD. Jean Nepomuscene Hakizimana, a Rwandese national registered at Sokoine University of Agriculture (SUA), Tanzania, defended his doctoral thesis on the genetic variation and epidemiology of the African swine fever virus (ASFV), in eastern and southern Africa. His research, conducted within the SACIDS Foundation for One Health headquartered at SUA, contributes towards the global race to develop effective management strategies of African swine fever, a haemorrhagic viral and transboundary animal disease of domestic and wild pigs.

[Read More](#)

“MY FLOOD, MY MUSIC”

The ‘Do-It-For-Common’, a project led by the Centre of Excellence on Dryland Agriculture, Bayero University, Kano State, Northern Nigeria, with the support of RSIF, is aiming to break the cycle of destruction caused by recurrent and devastating floods in the region. The initiative will create: an innovative science communication system to simplify flooding related climatic information and make it accessible to communities in a timely manner; a flood risk hazards toolkit; awareness among community members on possible human activities that exacerbate flood incidents through a music campaign under the slogan “My Flood, My Music”; and preventive measures to tackle disease outbreaks and other flooding risks.

CONFERENCE

From 15 – 17 November 2021, *icipe* in its role as the Regional Coordination Unit (RCU) of RSIF, in partnership with University Mohammed VI Polytechnic (UM6P), a PASET international partner institution, convened a virtual conference themed: “African-led science, technology and innovation for contributing to the sustainable development goals (SDGs) and stimulating global development”. With increasing appreciation of RSIF as a high return-on-investment initiative, participants deliberated evolution of the programme for optimum impact on Africa's socio-economic transformation. Also, the forum discussed strategies for RSIF's sustainability through more investments by African governments and the creation of a permanent fund.

CLASS OF 2021

A total of 13 students from Benin, Cameroon, Ethiopia, Ghana, Kenya, Liberia, Nigeria, Sudan and Zambia have commenced PhD studies at *icipe*. Of these, five are scholars of the African Regional Postgraduate Programme in Insect Science (ARPPIS), with support from German Academic Exchange Service (DAAD). The rest are Dissertation Research Internship Programme (DRIP) scholars. The students will be hosted within various projects being implemented by the Centre, while registered at various universities across Africa.

RECENTLY GRADUATED

Between July – December 2021, 18 *icipe* postgraduate scholars from Benin, Cameroon, Ethiopia, Kenya, Uganda and Sudan graduated, contributing knowledge on: management of *Tuta absoluta*, potato cyst nematode and fall armyworm; avocado pests and pollinators; eastern Africa finger millet and the rice blasts; surveillance of Afrotropical disease vectors, sand flies and viral hemorrhagic fevers outbreaks; human metapneumovirus and respiratory syncytial virus; epizootic and zoonotic pathogens in camel; black soldier fly frass fertiliser; microbe-based strategies for bee health; and cricket-based fish rearing.

[Read More](#)


2021 *icipe* GOVERNING COUNCIL STUDENTS AWARDS

BEST PUBLISHED SCIENCE PAPER

Winner

Ayaovi Agbessenou (PhD, Togo)



Registered in: University of Pretoria, South Africa
Paper: Agbessenou A., Akutse K.S., Yusuf A.A., Ekesi S., Subramanian

S. and Khamis F. (2020) Endophytic fungi protect tomato and nightshade plants against *Tuta absoluta* (Lepidoptera: Gelechiidae) through a hidden friendship and cryptic battle. *Scientific Reports* 10, 22195. [Paper link](#)

First runner up

Trizah Koyi Milugo (PhD, Kenya)



Registered in Tumaini University, Tanzania
Paper: Milugo T.K., Tchouassi D.P., Kavishe R. A., Dinglasan R. R. and

Torto B. (2021) Root exudate chemical cues of an invasive plant modulate oviposition behavior and survivorship of a malaria mosquito vector. *Scientific Reports* 11, 14785. [Paper link](#)

Second Runner Up

Rose Nyakemiso Sagwe (PhD, Kenya)



University of Würzburg, Germany
Paper: Sagwe R.N., Peters M., Dubois T., Steffan-Dewenter I. and Lattorff

H.M.G (2021) Pollinator supplementation mitigates pollination deficits in smallholder avocado (*Persea americana* Mill.) production systems in Kenya. *Basic and Applied Ecology*. [Paper link](#)

BEST SCIENCE POSTER

Winner

Dorcus Omoga (PhD, Kenya)



Registered in: University of Pretoria, South Africa
Poster title: One Health surveillance: Evidence of known and new zoonotic arboviruses circulation

in multiple hosts with potential impact to Human

Supervisors: Dr Rosemary Sang and Dr David P. Tchouassi (*icipe*); Dr Marietjie Venter (University of Pretoria); Prof. Sandra Junglen, Institute of Virology, Charité – Universitätsmedizin, Berlin, Germany

First runner up

Ayaovi Agbessenou (PhD, Togo)



Registered in: University of Pretoria, South Africa
Poster title: Temperature-dependent modelling approach and spatial

prediction reveal suitable areas for deployment of two *Metarhizium anisopliae* isolates for sustainable management of *Tuta absoluta*

Supervisors: Dr Komivi S. Akutse and Dr Fathiya M. Khamis (*icipe*); Dr Abdullahi A. Yusuf (University of Pretoria)

First runner up

Rose Nyakemiso Sagwe (PhD, Kenya)



Registered in: University of Würzburg, Germany
Poster title: Pollination efficiency and visitation frequency of avocado

(*Persea americana*) flower insect visitors
Supervisors: Dr Michael Lattorff and Dr Thomas Dubois (*icipe*); Dr Ingolf Steffan-Dewenter and Dr Marcell K. Peters, (University of Würzburg)

First runner up

Evanon Omuse (MSc, Kenya)

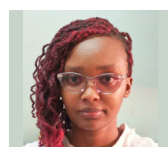


Registered in: University of Nairobi, Kenya
Poster title: Safety of Biopesticides on the Honeybee *Apis mellifera* and African stingless bee *Meliponula ferruginea*

Supervisors: Dr Thomas Dubois and Dr Saliou Niassy (*icipe*); Dr John Maina Wagacha and Dr George Otieno Ong'amo (University of Nairobi)

First runner up

Tracy Maina (MSc, Kenya)



Registered in: Jomo Kenyatta University of Agriculture and Technology, Kenya
Poster title: Horizontal transmission of *Plasmodium*-blocking symbiont *Microsporidia* MB in *Anopheles Arabiensis*.

Supervisors: Dr Jeremy K. Herren and Dr Tullu Bukhari (*icipe*)

Malaria transmission blocking

The possibility of controlling malaria using a newly discovered microbe that blocks transmission of the disease from mosquitoes to people has moved closer to reality with advanced findings by *icipe* researchers. In a study published on 28 July 2021 in *Frontiers in Microbiology* ([paper link](#)), *icipe* researchers show that the microbe, *Microsporidia MB*, can be transmitted sexually between mosquitoes, in addition to being passed from mother mosquitoes to their offspring, as reported in the Centre's previous study. This breakthrough will allow the efficient spread of the microbe through mosquito populations, thus limiting their ability to infect people with the parasite that causes malaria. [Read more](#)

Devastating weed that favours mosquitoes

icipe has generated new evidence of the immense threat posed by a highly destructive invasive plant, known scientifically as *Parthenium hysterophorus*, towards probable escalation of malaria incidents in East Africa. In a study published in *Scientific Reports* ([Paper link](#)), the Centre demonstrates that the weed, which has aptly earned the alias of 'famine weed' due to its phenomenal adverse impact on people's health, agriculture, livestock and the environment, has contrastingly favourable effects on *Anopheles* mosquitoes, which transmit the malaria parasite. Also, the researchers note the possibility of exploiting the *Parthenium*-mosquito relationship to control the insects. [Read more](#)

Waterbuck repellent blend benefits

Our recent socio-economic assessments, conducted in 18 African countries, show that adoption of the *icipe* waterbuck repellent blend in 5 to 50 percent of livestock populations would generate an economic surplus of US\$ 78–869 million per annum. These findings indicate an estimated benefit:cost ratio of 9:1, although this is likely to be higher if indirect benefits of the technology, like the increase in quantity and quality of animal draught power and human and environmental health effects, are incorporated. The technology consists of a collar dispenser containing distinct chemical odours initially identified from waterbuck, a large antelope found in several parts of Africa, that repel tsetse flies away from livestock. [Paper link](#)

Cereal pests and parasitoids

In partnership with the French Research Institute for Development (IRD), we have enhanced knowledge on inter-specific competitions between the fall armyworm and the maize Lepidoptera stemborers on maize (<https://doi.org/10.1007/s12600-021-00952-6>). Further, we have increased understanding of the physiological process of larval parasitoids like *Cotesia* species used in biological control of stemborers and fall armyworm. In collaboration with Laboratoire Evolution, Génomes Comportement, Ecologie (EGCE), France, we have recently described the genome-wide patterns of bracovirus chromosomal integration into multiple host tissues during parasitism. [Paper link](#)

Thrips pheromones

We tested the field efficacy two male-produced aggregation pheromones of the bean flower thrips *Megalurothrips sjostedti*, characterised through our previous studies. We also determined the compatibility of these pheromones with two thrips attractants and the entomopathogenic fungus, *Metarhizium anisopliae* ICIPe 69. Our findings pave way for designing a lure-and-kill thrips management strategy to control bean flower thrips using autoinoculation devices or spot spray application. [Paper link](#)

Pollinator decline drivers

icipe researchers were part of a team of pollination experts that reviewed the data and evidence for drivers of pollinator decline across the world. In Africa, the factors are land cover and configuration, pesticide use and climate change. The risks of pollinator decline for people, which include pollination deficits, wild pollinator diversity, yield instability, food system resilience, are higher in the Global South. Despite extensive research on pollinator decline, the analysis reveals considerable scientific uncertainty about the implications for human society. [Paper link](#)

Rectifying pollination deficit

icipe studies indicate a high reliance of avocado on insect pollinators. We also noted significant pollination deficits in smallholder avocado production in Kenya, which is affecting fruit set – the process in which flowers become fruit – in the crop. Our findings show that the pollination deficit can be resolved by establishing two honeybee colonies on a smallholder farm. Increased pollination will also reduce fruit abscission, the loss of fruits after fruit set and before ripening. [Paper link](#)

Harnessing locusts

icipe has published a review that assesses the potential of harnessing locust swarms for beneficial uses, as a more sustainable management strategy than widespread use of insecticides. The report highlights the global distribution of locust-species, their nutritional value, historical practices of their use as food, feed and other applications, harvesting technologies and regulatory frameworks. It also points out safety and socio-cultural concerns that should be addressed to promote beneficial uses of locusts. [Paper link](#)

Insights for insect farming roadmap

Our second review focuses on research trends on key substrates and commonly farmed insect species, map of commercial enterprises, insect nutritional values, processing techniques, marketing, regulatory framework and lessons learnt on insect farming. These insights facilitate a roadmap for scaling insect farming technologies in a phased approach through effective public-private partnerships, towards a circular food economy in Africa. [Paper link](#)

Push-pull soil function and fertility

Results from long-term experiments in smallholder fields in western Kenya demonstrate the superiority of the push-pull technology compared to the predominant maize culture systems. The perennial legumes in the push-pull system restore soil function and fertility. Also, intercropping perennial legumes could contribute to reversing the trajectory of soil degradation in smallholder farming systems. [Paper link](#)

TOP CITED

Two papers by *icipe* researchers are among the top 10% most cited PLOS ONE papers published in 2018. The publications are on 'Women's empowerment in agriculture and agricultural productivity: Evidence from rural maize farmer households in western Kenya' ([paper link](#)) and 'Threshold temperatures and thermal requirements of black soldier fly *Hermetia illucens*: Implications for mass production' ([paper link](#)).


Chrysantus Mbi Tanga (Cameroon) Senior Scientist and Head, INSEFF

Since 2019, Chrysantus has served as a Research Scientist in INSEFF, with previous positions as Consultant and Postdoctoral Fellow, *icipe* African Fruit Fly Programme (AFFP). He obtained a PhD in Agricultural Entomology from University of Pretoria, South Africa in 2012 as an *icipe* ARPPIS scholar; and a BSc in Zoology and an MSc in Medical Entomology from the University of Buea, Cameroon.


Elfatih Abdel-Rahman (Sudan) Research Scientist, DMMG Unit

Prior to this appointment, Elfatih was a Postdoctoral Fellow in the DMMG Unit. His previous positions include: Postdoctoral Fellow, University of KwaZulu-Natal, South Africa; and Associate Professor, Faculty of Agriculture, University of Khartoum, Sudan. He holds a PhD in Environmental Sciences (geographic information systems and remote sensing), from University of KwaZulu-Natal; and an MSc in Crop Production from University of Khartoum.


Everlyn Nguku (Kenya), Capacity Building Specialist, RSIF

A former Interim Head, Environmental Health Theme, and Programme Head, Commercial Insects Programme at *icipe*, Everlyn's most recent appointment was as Scientist, National Agriculture and Food Organization (NARO), Japan and the Japan International Cooperation Agency (JICA). She holds a PhD in Textile Science and an MA both from Kenyatta University, Kenya.


Rosalynn Murithi (Kenya), Resource Mobilisation Manager

Having joined *icipe* in 2014 as Resource Mobilisation Officer, Rosalynn holds a BA in Sociology from Egerton University; an MA in Rural Sociology and Community Development from University of Nairobi, both in Kenya; and a Project Management Professional (PMP) certification from the Project Management Institute, USA.


Natacha Motisi (France), Visiting Scientist, Centre International en Recherche Agronomique pour le Développement, CIRAD

Focusing on plant epidemiology within DMMG Unit, Natacha will work on a Development Smart Innovation through Research in Agriculture (DeSIRA) project: "Transforming Robusta coffee agroforestry to improve resilience of smallholders to adapt and mitigate climate change in Uganda". She holds a PhD in Epidemiology from Agrocampus Rennes, France.


Pierre Marraccini (France) Visiting Scientist (CIRAD)

Specialising in coffee molecular physiology, he will work under the DeSIRA III project on Robusta coffee agroforestry to adapt and mitigate climate change in Uganda. He holds a PhD in Plant Cellular and Molecular Biology from Paris-Orsay University. Most recently, Pierre was hosted at the Agricultural Genetics Institute (AGI, Hanoi – Vietnam) in the framework of the BREEDCAFS (BREEDing Coffee for AgroForestry Systems project supported by EU (H2020 SFS-2016-2).


Edward Nderitu Karanja (Kenya), Postdoctoral Fellow, Farming Systems Comparison in the Tropics (SysCom) Project

Previously, he was a Lecturer at University of Embu, and Jomo Kenyatta University of Agriculture and Technology, both in Kenya. He holds a PhD in Applied Microbiology from University of Embu.


Miressa Tuli (Ethiopia), Gender Expert, MOYESH Programme

His previous positions include Lecturer, Haramaya University, Ethiopia; Gender and Rural Development Expert, and Seed Sector Transformation Advisor, BENEFIT-ISSD; Gender and Child Safeguarding Specialist, Save the Children. He holds a BA in Gender and Development and MSc in Rural Development and Agricultural Extension, both from Haramaya University.


Jonas Musabwa Mugabe (Rwanda), Project Manager, Accelerating Inclusive Green Growth through Agri-based Digital Innovation in West Africa (AGriDI) project, RSIF

His previous positions include Lead Specialist Research, Policy and Investment and Project Manager of the Platform for African-European Partnership in Agricultural Research for Development (PAEPARD) at the Forum for Agricultural Research in Africa (FARA); Deputy Director General for Research at the Institut des Sciences Agronomiques du Rwanda (ISAR, currently RAB), and Senior Lecturer at the National University of Rwanda. He holds a PhD in Agriculture Economics from University of Gembloux, Belgium.


Naomi Zani (Kenya), Executive Assistant, Director General's Office

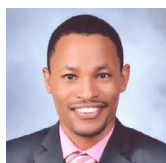
Previously, Naomi served as the Regional Human Resource Manager at International Potato Center (CIP); Office Manager, Executive Assistant and Administrative Assistant at CIP, Kenya Anti-Corruption Authority (KACA), CABI and *icipe*. She holds an MBA in Global Business Management from United States International University – Africa, and Bachelor of Business Administration and Management (Human Resources Management) from St. Paul's University, Kenya.


Caroline Adala Oremo (Kenya), Capacity Building – Doctoral Scholarships, RSIF

Caroline was previously an Associate Program Officer for capacity building at the Alliance for a Green Revolution in Africa (AGRA). She holds a Masters degree in Educational Technology from The University of British Columbia, Canada, and a Bachelor of Education degree from Kenyatta University, Kenya.


Belachew Kindu (Ethiopia), MOYESH Programme, Oromia Region, Ethiopia

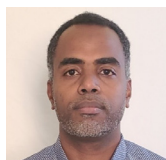
His previous positions include: Animal Health Assistant, Agricultural Extension Communication Expert; and Agricultural Extension and Agricultural Business Team Leader at Dabo Hana Woreda Agriculture and Natural Resource Office, Ethiopia. He holds a BA from Jimma University in Agricultural Extension.


Desalegne Tadesse (Ethiopia), Senior Business Support Officer, Communications

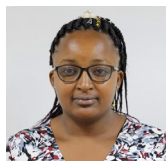
Since 2017, Desalegne has served as Communication Officer, *icipe* Ethiopia Office. His previous positions include: Communications and Outreach Officer, International Water Management Institute (IWMI) – East Africa and Nile Basins Office; and Senior Communication Officer, International Committee of the Red Cross (ICRC), Delegation to the African Union. He holds an MA in Journalism and Communication and a BA in Information Systems, both from Addis Ababa University, Ethiopia.


Tibebe Dejene Biasazin (Ethiopia), Visiting Scientist, Fruit Fly IPM

He holds a PhD in Chemical Ecology from the Swedish University of Agricultural Sciences and MSc in Applied Entomology from Addis Ababa University, Ethiopia.


Nuredin Abdella (Ethiopia) Business Support Officer II (Information Management) under the MOYESH Programme

He holds a BA in Software Engineering from Microlink Information Technology College and an MSc in Computer Science from Hilcoe School of Computer Science and Technology (both in Ethiopia). Previously, he held positions as an Information Management Officer at iMAP; various positions Agricultural Transformation Agency (ATA); and Database Manager for Columbia University ICAP Ethiopia programme.


Sophia Kariuki Komeiyan (Kenya) Research Officer II, Environmental Health Theme

Since 2014, she has been working on stingless bees at *icipe*, most recently as a laboratory technician. She holds a Bachelor's degree in Technology Environmental Resource Management from Technical University of Kenya.


Joseck Esikuri (Kenya) Research Assistant II

He joined *icipe* in 2013 and has held positions within the Arthropods Pathology Unit and the Animal Rearing and Quarantine Unit (ARQU). Previously, he worked at the Kenya Wildlife Service and Kenya Agricultural Research Institute (KARI). He holds a Diploma in Applied Biology from Nairobi Technical Training Institute.


Eric Mwanzi Chadamba (Kenya), Research Assistant I, Environmental Health Theme

He joined *icipe* in 2018 as a Field Assistant under Bee Pollinators and Pollination Ecology project.


Ruth Muchiri (Kenya) Business Support Officer I, Procurement Unit

Previously, she held the position on an interim level. She joined *icipe* in September 2015 and holds a Degree in Procurement and Contract Management from Jomo Kenyatta University of Agriculture and Technology (JKUAT) and a Diploma in Purchasing and Supplies Management. Previously, she was a Procurement Assistant at the International Livestock Research Institute (ILRI).

Donor: Swiss Agency for Development and Cooperation (SDC)

Project title: Core programme support: 2021–2024

icipe staff: Segenet Kelemu (Director General)

Donor: Swedish International Development Cooperation Agency (Sida)

Project title: Strengthening *icipe*'s research instrumentation portfolio for improved delivery on climate-smart technologies and biodiversity conservation (SIRCAB)

icipe researchers: Segenet Kelemu (DG); Sunday Ekesi (DRP); Baldwyn Torto and Merid Getahun (BCEU); Thomas Dubois and Fathiya Khamis (Plant Health Theme); Sevgan Subramanian (Environmental Health Theme); Daniel Masiga (Animal Health Theme); Jandouwe Villinger (Molecular Biology and Bioinformatics Unit – MBBU) and Moses Ndotono (Laboratory Manager)

Donor: Children's Investment Fund Foundation (CIFF)

Project title: Symbiont-based malaria transmission blocking (SYMBIOVECTOR): establishing a foundation for *Microsporidia* MB field trials (SMBV-FFT)

icipe researchers: Jeremy Herren, Ulrike Fillinger, Tullu Bukhari, David Tchouassi and Dan Masiga (Human Health Theme)

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

Project title: H3ABioNet: informatics solutions for H3Africa

icipe researcher: Dan Masiga (Animal Health Theme)

Hub: University of Cape Town, led by Professor Nicky Mulder, with about 25 nodes: <https://www.h3abionet.org/about/consortium>

Donor: Food and Agriculture Organization of the United Nations (FAO)

Project title: Capacity building services for youth in Kiambu county, Kenya, on black soldier fly farming

icipe researcher: Chrysantus Tanga (Head, Insects for Food and Feed programme)

Collaborators: FAO Kenya

Donor: Biovision Foundation for Ecological Development, Switzerland

Project title: Scaling up successful beekeeping enterprises for improving livelihoods and resilience, especially for women, in degraded natural habitats in Wag Himra Zone, Amhara Region, Ethiopia

icipe researchers: Workneh Ayalew (Programme Coordinator)

Collaborators: Amhara Region Livestock and Fisheries Development and Promotion Agency; Wag Himra Zone administration office; Dehana Woreda administration office; Zequala Woreda administration office; and Includovate Ethiopia, Addis Ababa

Donor: German Federal Foreign Office, sub-grant through International Center for Agriculture Research in the Dry Areas (ICARDA)

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

icipe researcher: Workneh Ayalew (Programme Coordinator)

Collaborators: Amhara Region Livestock and Fisheries Development and Promotion Agency

Donor: Wellcome Trust International Intermediate Fellowships

Project title: Ecological and genetic drivers of persistent Plasmodium transmission by *Anopheles funestus*, a major malaria vector in Kenya

icipe researchers: David Tchouassi and Baldwyn Torto (Behavioural and Chemical Ecology Unit)

Collaborators: Kenya Medical Research Institute (KEMRI); Centre for Research in Infectious Diseases (CRID), Yaoundé, Cameroon; Institute for Molecular Biology and Biotechnology (IMBB-FORTH), Greece

Donor: Research Institute of Organic Agriculture FiBL through Biovision Foundation for Ecological Development, Swiss Agency for Development and Cooperation, The Liechtenstein Development Service (LED) and COOP Sustainability

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

icipe researcher: Edward Karanja (Postdoctoral Fellow)

Collaborators: Research Institute of Organic Agriculture (FiBL), Switzerland; Kenya Agricultural and Livestock Research Organisation (KALRO); Kenyatta University, Kenya; Kenya Organic Agriculture Network (KOAN); Jomo Kenyatta University of Agriculture and Technology (JKUAT); Biofarms Limited; Ministry of Agriculture (Tharaka Nithi and Murang'a counties), all in Kenya.

Donor: United States Department for Agriculture (USDA) Agriculture – Research, Education and Economics. Agriculture Research Service

Project title: Proactive classical biological control of *Tuta absoluta*

icipe researchers: Samira Mohamed and Shepard Ndlela (Plant Health Theme)

Collaborator: USDA

Donor: FAO – Subregional office for Eastern Africa

Project title: Capacity building on the use of biological control agents and biopesticides for control of Fall Armyworm in Eastern Africa

icipe researchers: Subramanian Sevgan, Samira Mohamed and Saliou Niassy

Donor: Keele University

Project title: Development of a phone app to communicate with farmers

icipe researcher: Zeyaur Khan (Push-pull IPM)

Donor: Biovision Foundation for Ecological Development, Switzerland

Project title: Push-pull technology training

icipe researcher: Saliou Niassy (Technology Transfer Unit)

Collaborators: Agriculture & Food Systems Institute Community – Technology Development Organization (AFSI-CTDO); Institute for Culture and Ecology (ICE); Kushereketa Rural Development Organization (KURDO); LEAD Foundation; Mukushi Seeds, Zimbabwe; Organization of Collective Co-operatives in Zimbabwe (OCCZIM); Participatory Ecological Land Use Management (PELUM), Uganda; Regional Research Centre for Integrated Development (RCID); Sustainable Agriculture Tanzania (SAT); Tanzania Agricultural Research Institute (TARI); Tanzania Organic Agriculture Movement (TOAM); Women and Land in Zimbabwe (WLZ) and Zimbabwe Organic Producers and Promoters Association (ZOPPA).

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

Project title: Technical assistance from PCPB accredited service providers to implement efficacy and residue field trials of plant protection products in Kenyan horticulture to support compliance with SPS requirements of domestic and international markets

icipe researchers: Shephard Ndlela, Xavier Cheseto and Komivi Akutse (Plant Health Theme)

Donor: Biovision Foundation for Ecological Development, Switzerland

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

icipe researcher: Zeyaur Khan (Leader, Push-pull Integrated Pest Management programme)

Collaborator: Ministry of Agriculture, Kenya

Donor: Engineering and Physical Sciences Research Council (EPSRC), UK Research and Innovation, Global Challenges Research Fund (UKRI GCRF) GCRF Challenge Clusters/University of Leeds

Project title: Scaling up biocontrol innovations in Africa

icipe researcher: Zeyaur Khan (Push-pull IPM)

Collaborator: Ministry of Agriculture, Kenya

Donor: GCRF Agri-Tech Catalyst Seeding Award round 10 through University of Edinburgh

Project title: Seeding quantitative genetics analysis of phenotypic variation in the *icipe* cricket

icipe researcher: Chrysantus Tanga (Head, Insects for Food and Feed programme)

Collaborator: Roslin Institute, Edinburgh University, Scotland, UK

Donor: Swedish International Development Cooperation Agency (Sida)

Project title: Amendment to the Agreement on BIO-INNOVATE Phase II 2016-2021

icipe researcher: Julius Ecuru (Manager, BioInnovate Africa Programme)

Donor: Deutsches Zentrum für Luft- und Raumfahrt - German Aerospace Center (DLR)

Project title: Sub-contract to develop a model to predict breeding time of desert locusts using data in Sudan or Morocco or Niger and Kenya

icipe researchers: Tobias Landmann, Elfatih Abdel Rahman and Emily Kimathi (Data Management, Modelling and Geo-Information (DMMG) Unit)

Donor: Norwegian Refugee Council (NRC)

Project title: Undertaking a market assessment to determine suitability of insect farming as a viable livelihood opportunity for employment and self-employment in Dadaab

icipe researcher: Chrysantus Tanga (Head, Insects for Food and Feed programme)

Collaborator: NRC

Donor: InsectiPro Ltd (with funding from Bill & Melinda Gates Foundation)

Project title: Insects for food and feed

icipe researcher: Chrysantus Tanga (Head, Insects for Food and Feed programme)

Collaborators: InsectiPro Ltd, Kenya; Farms for Orphans, Inc., Kinshasa, Democratic Republic of Congo

Donor: DFG - German Research Foundation/CHARITÉ – Universitätsmedizin Berlin

Project title: Identification of virus transmission networks to control key arboviral diseases in Kenya

icipe researchers: Rosemary Sang and David Tchouassi (Human Health Theme) and Menale Kassie (Social Sciences and Economic Assessments Unit)

Collaborator: Prof. Sandra Junglen, Institute of Virology, CHARITÉ – Universitätsmedizin Berlin, Germany

Donor: French National Research Agency through IRD

Project title: Towards sustainable biological control of the Mediterranean corn borer: from the adaptive mechanisms to the mass release of a new *Cotesia* species

icipe researchers: Thomas Dubois and Julius Obonyo (Plant Health Theme)

Donor: Swedish Research Council for Sustainable Development

Project title: Joint action to develop biological control methods against the invasive crop pest the Fall Armyworm (*Spodoptera frugiperda* L.) in Africa

icipe researchers: Amanuel Tamiru, Samira Mohamed and Paul-André Calatayud (Plant Health Theme) and Subramanian Sevgan (Environmental Health Theme)

icipe gratefully acknowledges the financial support of the following organisations and agencies

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
- 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
- Cambridge Africa ALBORADA Research Fund
- 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)
- ETH Zurich
- 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)
- Global Challenges Research Fund (GCRF)
- 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
- 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)
- United States National Science Foundation (NSF)
- University of Bern, Switzerland
- University of Cambridge, UK
- University of Glasgow, Scotland
- University of Leeds, UK
- USAID – United States Agency for International Development's
- Wageningen University, The Netherlands
- Wellcome Trust, UK
- World Federation of Scientists
- 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)

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

Email address: icipe@icipe.org

Support *icipe*: www.icipe.org/support-icipe

