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

**Dr Lukas Bertschinger,**  
Chair, *icipe* Governing Council

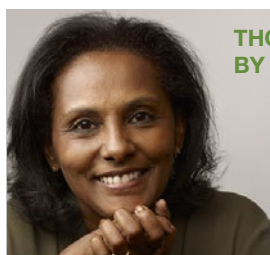


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## *icipe* BY NUMBERS

**40**

Countries  
*icipe* is working in

**34**

Peer reviewed  
journal papers

**217,048**

farmers using the  
Push-Pull technology



**ANNUAL  
REPORT  
2018**

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Dr Lukas Bertschinger,  
Chair, *icipe* Governing Council

Dear Colleagues and Friends,

We are pleased to present the *icipe* e-bulletin for January – May 2019, which opens with a strong call to action on agriculture in Africa by the Centre's Director General (DG), Dr Segenet Kelemu. In her Thought Leadership column, the DG urges for a determined and bold decision to strategically invest in agricultural research and development, to resolve the challenges facing the sector once and for all.

The merit of such strategic investments is aptly illustrated in From Our Partners, column where Stephen Wathome, Programme Manager, Agriculture, Job Creation and Resilience, Delegation of the European Union (EU) to Kenya, discusses the solid partnership between the EU and *icipe* towards strengthening agriculture as a core and effective component in Africa's development.

Overall, *icipe* continues to expand its investment partnerships, with a range of new grants signed across the Centre's programmes during the past five months.

Meanwhile, our ongoing initiatives are progressing steadily, and continue to impact global knowledge production and livelihoods, as evidenced in the selected Recently Published journal articles and Research Highlights sections.

In this publication, we also highlight *icipe*'s evolving role in strengthening science, technology and innovation for socio-economic transformation in Africa. The Centre is contributing towards this goal through BioInnovate Africa Programme, one of Africa's largest regional innovation-

driven science initiative, and as the Regional Coordination Unit (RCU) of the PASET Regional Scholarship and Innovation Fund (RSIF).

In response to the expanding range of *icipe*'s initiatives, the Centre continues to strengthen its team with no less than 15 new colleagues joining us since the beginning of the year, as highlighted under the New Appointments section.

One of *icipe*'s goals is to support the Centre's staff to maintain balance in their personal and professional lives. In line with this vision, on March 8, International Women's Day, *icipe* launched a crèche, a facility where staff members will be able to care for their young children during work hours, as the need arises.

We hope that the facility will enable the Centre to respond to one of the major challenges faced by women staff and graduate students; the ability to care for their young children while maintaining their productivity at work. *icipe* also recognises that child care is increasingly becoming gender neutral, and the crèche is also open to male staff members, thus allowing them to contribute to better balanced families.

We wish you happy reading of these and other sections of this e-bulletin.

We also invite you to download a copy of our 2018 Annual Report, available at <http://www.icipe.org/publications/annual-reports>

Dr Lukas Bertschinger,  
Chair, *icipe* Governing Council

*icipe* continues to expand its partnerships, with a range of new grants signed across the Centre's programmes during the past five months.





**Dr Segenet Kelemu**  
Director General, *icipe*

## Agriculture in Africa: Time to be brave

As a young student in Ethiopia, I recall vividly learning about African agricultural constraints with a list that included: poor soil fertility, diseases and pests, lack of access to improved seeds, shortage of skilled manpower, inadequate infrastructure and market access, over-reliance on rainfed agriculture, and poor compensation for scientists, among other factors.

Several decades later, this list – this litany of woes – is still being taught in classrooms across the continent. The question then begs: since we know what is wrong; since we have ideas about what needs to be done to improve agriculture, why have we not been able to crack the code? And, how can we resolve these challenges once and for all?

In my view, the answer lies in the bold and determined decision to invest in research for development in a sustained, strategic and long-term along with the creation and implementation of enabling policies. I make this recommendation aware of the fact that, indeed, the solutions for agricultural challenges in Africa extend beyond scientific innovations, especially when we consider broader issues like those associated with land tenure and access to agricultural financing.

And this is just the point: to succeed, we must steer clear off the same beaten track and commit to a strategy that encompasses issues beyond the traditional research and development architecture

Towards such a vision, I propose the following seven points.



**‘Risky’ choices** will be necessary to put an end to perennial problems of agricultural research, including intermittent funding, knee jerk approach (for example, in response to funding calls), and incomplete agricultural innovation value chains that confine research to pilot stages or laboratory shelves. On the one hand, institutions and their researchers must become defiant: they must develop initiatives based on clearly identified agricultural priorities and Africa-led models, and fight for their place in development agendas.

On the other hand, governments and development partners should invest in the research and innovation continuum: from basic science, technology design and trials, to commercialisation and scaling up. Consideration should also be given to aspects like research infrastructure and equipment, overhead costs, training and capacity building, and incentives for researchers.

**How can we resolve agricultural challenges once and for all? We must make bold and determined decisions for research and development.**



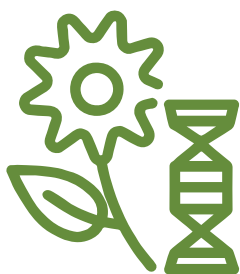
**Move beyond the rhetoric** that variously touts agriculture as the backbone of the African economy, engine for growth and so on, as well as promise laden terms like agribusiness, agripreneurs – fads that disappear as soon as they appear. The role of agriculture in food security, growth and prosperity in rural areas is undebatable and must continue to be supported. In tandem, proper linkage between agriculture and social economic transformation – the sectors centrality to the ideal of holistic and inclusive development – needs to be embraced and mainstreamed into development agendas more effectively.



**Unpack the agricultural value chain**, a vogue idea that remains poorly understood. Ideally, a value chain should facilitate flow of products, knowledge and information, finance and payments, and synergistic organisation of participants. Ultimately, the result should be high-quality agricultural products and more income for all participants. To get to this point, we need to re-examine the basics; to conceptualise ideal value chain models for different crops and regions, and expose key players and address their vested interests.



The **politics and policies of agriculture** will have to change drastically. For example, agriculture is often confined to line ministries and their institutions. And yet, the determinants of agricultural productivity and growth, like land, inputs such as seeds and fertilisers, machinery, energy and water; access to information and technologies; technical support; price and trade policies; and public and private investments, often fall outside the jurisdiction of agricultural ministries.



**Diversify agricultural research** to become holistic. First, such an approach will allow comprehensive investigation of target problems. For example, *icipe*'s solutions are grounded in interdisciplinary research underpinned by a multitude of natural science disciplines from chemical ecology, molecular biology and biotechnology, insect pathology, taxonomy and systematics, ecology, biostatistics and bioinformatics, geo information system and social sciences. Second, projects should move beyond seeking solutions for specific challenges in isolation. It is time to bring into stock broader aspects that have historically not been seen as integral to core agricultural research. Towards this goal, researchers should incorporate social sciences disciplines of economics, anthropology, sociology, human geography, history, demography, and political science, and their myriad sub-fields. Third, it is important to enhance knowledge co-production with farmers and other value chain participants.



## Stem external and internal brain drain:

Every year, thousands of young African researchers graduate from local and international institutions. Unfortunately, many of them are not able to fulfil the dreams that first inspired them into a career in agricultural research. Researchers trained overseas often have to make the difficult decision between risks and rewards – that is, either to remain abroad, or to return home and face challenges of lack of infrastructure, being under-utilised, limited opportunities for professional success, and low pay (some times even lower than the stipends they received as students abroad). Local graduates are not spared either. Due to lack of opportunities, many end up accepting any available opportunities, typically outside their fields of training. Others opt for more promising opportunities, for example within international agencies and non governmental organisations. This scenario leads to external and internal brain drain that African governments must address.

## Seven action points for Africa's agricultural R&D

1. Make 'risky' choices
2. Move beyond the rhetoric
3. Unpack the agricultural value chain
4. Politics and policies of agriculture must change
5. Diversify agricultural research
6. Stem external and internal brain drain
7. Lessons from Brazil, China and Russia.



## Lessons from Brazil, China and Russia:

A net importer of agricultural products in the 1970s, **Brazil** now ranks among the world's five largest agricultural producers and exporters. The Brazilian "miracle" is the result of a dynamic and comprehensive policy to support agriculture, from upstream to downstream, with numerous intervention channels, as well as ambition to become a global agricultural power.

Meanwhile, **China** is feeding one fifth of the world's population with less than 10 percent of world's arable land, and ranks first globally in production of cereals, cotton, fruit, vegetables, meat, poultry, eggs and fishery products. Since 1978, China has implemented a step by step reform policy, making agriculture, rural areas and farmers a priority, while also opening up the country's sector to the world through exchange and cooperation partnerships with more than 140 countries.

Russia stands today as the world's leading exporter of wheat, while other grains and key agriproducts are also surging up. The rise of **Russia's** agriculture production is the result of geopolitics and government investment.

In response to the food bans and counter-bans imposed between Russia and western countries, the government has turned towards domestic agriculture to achieve self-sufficiency, boosting production through strategies that include use of top quality machinery and agricultural equipment, and state subsidies for agricultural producers.

# Newsmakers



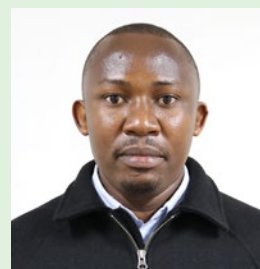
**Segenet Kelemu**, *icipe* Director General, has been selected a 2019 College of Agriculture Alumni Fellow of Kansas State University, USA. Dr Kelemu earned a PhD in molecular biology and plant pathology from Kansas State University in 1989, after attaining an MSc at Montana State, USA, in 1985, and a Bachelors degree from Addis Ababa University, Ethiopia, in 1979. Press release: <http://www.icipe.org/news/icipe-director-general-honoured-alma-mater>



**Baldwyn Torto**, Principal Scientist and Head, Behavioural and Chemical Ecology (BCEU), has been awarded the 2019 Agropolis Louis Malassis International Prize for Food and Agriculture, under the Outstanding Career in Agricultural Development category. Press release: <http://www.icipe.org/news/global-honour-icipe-scientist-%E2%80%93-prof-baldwyn-torto-awarded-agropolis-louis-malassis>



**Arnold Mwanzu**, Coordinator, *icipe* Information Resources Centre, was recently appointed the Country Coordinator Kenya of the Electronic Information for Libraries (EIFL). EIFL works with libraries to enable access to e-resources in developing countries in Africa, Asia Pacific, Europe and Latin America.



**Joel Ouma Odero**, a THRIVE PhD fellow conducting research within the *icipe* Animal Health Theme has been appointed a student ambassador of the Royal Society of Tropical Medicine and Hygiene (RSTMH). Appointed yearly through a competitive selection process, student ambassadors are involved in a range of activities to raise RSTMH's profile.

## RECENTLY FUNDED

### Donor: Biovision Foundation

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

**icipe researchers:** Ulrike Fillinger and Mike Okal

**Collaborators:** Departments of Health, and Agriculture, Livestock and Fisheries, in the county governments of Busia (western Kenya) and Kwale (coastal Kenya).

Directorate of Veterinary Services, in Nairobi, Busia and Kwale counties.

### Donor: Biovision Foundation

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

**icipe researchers:** Fathiya Khamis and Chrysantus Tanga

**Collaborators:** Ministry of Agriculture, Kenya; National Biological Control Programme of the Ministry of Agriculture, Natural Resources, Livestock and Fisheries, Tanzania; Ministry of Agriculture, Natural Resources, Livestock and Fisheries, Zanzibar; Plant Health Clinic, Ethiopia; Farmtrack Consulting; Kenya Biologics Ltd.

### Donor: Biological Sciences Research Council (BBSRC)/ University of Durham, UK

**Project title:** Designing low-cost house floors to control tungiasis

**icipe researchers:** Ulrike Fillinger.

**Collaborators:** Dr Lynne Elson, Kenya Medical Research Institute (KEMRI) Wellcome Trust Programme, Kilifi  
Kenya Industrial Research and Development Institute (KIRDI)  
Prof Steve Lindsay, Durham University, UK

### Donor: Biovision Foundation

**Project title:** Combating the invasive tomato leafminer, *Tuta absoluta* through the Implementation of eco-friendly IPM approach on tomato in East Africa

**icipe researchers:** Samira Mohamed and Shepard Ndlela

**Collaborators:** National Crops Resources Research Institute (NACRRI), National Agricultural Research Organization (NARO), Uganda; Ministry of Agriculture, Livestock & Fisheries (Kenya);

## RECENTLY FUNDED

### Donor: Biovision Foundation

**Project title:** Improving ecological and economic performance of push-pull technology through comprehensive management of Napier stunt disease, mycotoxins and fodder commercialisation

**icipe researchers:** Charles Midega and Jimmy Pittchar

**Collaborators:** Kenya Agriculture and Livestock Research Organization (KALRO); Send-a-cow (Kenya)

### Donor: ANTI-VeC Network (Application of Novel Transgenic technology & Inherited symbionts to Vector Control), GCRF Network in Vector Borne Disease/University of Liverpool.

**Project title:** Determining heritable microbe incidence, prevalence and impact in sandfly vector species

**icipe researchers:** Villinger and Damaris Matoke

**Collaborators:** Prof. Greg Hurst, University of Liverpool, UK  
Prof. Claudia Ximena Moreno Herrera; Dr Rafael Vivero and Dr Gloria Cadavid, Universidad Nacional de Colombia, Medellín.

### Donor: ANTI-VeC Network (Application of Novel Transgenic technology & Inherited symbionts to Vector Control), GCRF Network in Vector Borne Disease/University of Glasgow

**Project title:** A novel malaria transmission blocking strategy: microsporidian symbionts of *Anopheles* mosquitoes.

**icipe researcher:** Jeremy Herren

**Collaborators:** Prof. Steve Sinkins, University of Glasgow, Scotland, UK., Dr Mara Lawniczak, Wellcome Sanger Institute, UK.

### Donor: ANTI-VeC Network (Application of Novel Transgenic technology & Inherited symbionts to Vector Control), GCRF Network in Vector Borne Disease

**Project title:** Roles of insect-specific flaviviruses and immune priming in arbovirus transmission blocking in mosquitoes

**icipe researchers:** Jandouwe Villinger and David Tchouassi

**Collaborators:** Dr Seth Barribeau, University of Liverpool, UK

### Donor: Department for International Development (DFID)

**Project title:** Developing, commercializing and scaling of biopesticides for integrated fall armyworm management to improve the livelihoods of smallholder farmers.

**icipe researchers:** Sunday Ekesi, Komivi Akutse and Subramanian Sevgan

**Regulatory organisations:** Pest Control Product Board, Kenya; Tropical Pesticide Research Institute, Tanzania; Agricultural Chemicals Board, Uganda; Plant Health Regulatory Directorate, Ethiopia.

**National partners:** Kenya Agriculture and Livestock Research Organisation; Tanzania Agricultural Research Institute; Uganda National Agricultural Research Organization; Ethiopian Institute of Agricultural Research).

**Private sector partners:** Real IPM – Biobest, Koppert, Dudutech, Kenya Biologics Ltd., AgBiTech BCRL – Pest Control India Ltd, HortiServe, Andermatt Ltd., Russell IPM.

### Donor: Cultivate Africa's Future Phase 2 (IDRC & ACIAR) –

Concept note: Alien invasive fruit flies in Southern Africa; Implementation of a sustainable IPM programme to combat their menaces

**icipe researchers:** Samira Abuelgasim Mohamed (Principal Investigator)

**Collaborators:** Zambia Agriculture Research Institute  
Ministry of Agriculture, Plant Quarantine Services Institute, Zimbabwe  
Department of Agricultural Research Services, Bvumbwe Research Station, Malawi, Eduardo Mondlane University, Mozambique

### Donor: Tools and Technologies for Broad-Scale Disease Surveillance of Crop Plants in Low-Income Countries (Round 21) of the Bill & Melinda Gates Foundation Global Grand Challenges/Rothamsted Research

Project: Smart Army Worm Surveillance (SAS) GCE Phase I R21

**icipe researcher:** Subramanian Sevgan

**Collaborators:** Cosmonio Imaging B.V  
Efes Informacijske Resitve D.O.O  
Kenya Agriculture and Livestock Research Organization (KALRO)

### Donor: International Atomic Energy Agency (IAEA) through FAO/IAEA

**Project title:** Coordinated Research Project (CRP): Call on Assessment of Simultaneous Application of SIT and MAT to Enhance Bactrocera Fruit Fly Management  
Semiochemicals for pre-release treatment of Bactrocera dorsalis and relative response to male lures in semi field conditions

**icipe researchers:** Shepard Ndlela, Samira Mohamed, Fathiya Khamis, Brian Isabirye, Sunday Ekesi

**Collaborators:** Kenya Agricultural and Livestock Research Organization-Biotechnology Research Institute, Kenya

### Donor: BMZ/GIZ 2018 Project funding

**Project title:** Improving food and nutritional security through integrated control of tsetse and tick-borne livestock diseases (ICTLD)

**icipe researchers:** Daniel Masiga, Mike Okal, Merid Getahun, Menale Kassie, Beatrice Muriithi, Komivi Akutse, Subramanian Sevgan, Saliou Niassy

Kenya Tsetse and Trypanosomiasis Eradication Campaign (KENTTEC)  
Director of Veterinary Services (DVS) Kenya  
Ministries of livestock and agriculture, and national agricultural research and extension systems in Kenya and Ethiopia.  
National Institute for Control and Elimination of Tsetse and Trypanosomosis (NICETT), Ethiopia  
mHealth Kenya  
Innova Biologicals Ltd  
Real-IPM-Biobest



## RECENTLY FUNDED

### Donor: National Academy of Sciences, USA

Supplementary funding for the project “End of the road for illegal bushmeat trade in East Africa: Establishing transboundary surveillance by high-resolution melting analysis of vertebrate molecular barcodes”

**icipe researcher:** Jandouwe Villinger (Principal Investigator)

Continuing project partners:

Kenya: Dr Lillian Wambua (co-PI), International Livestock Research Institute (ILRI)

Dr Moses Otiende (co-PI), Kenya Wildlife Service (KWS);

Dr Maamun Jeneby (co-PI), National Museums of Kenya (NMK);

Tanzania:

Prof. Benezech Mutayoba, Sokoine University of Agriculture, Tanzania

Dr Scott Miller and Dr David Schindel Smithsonian Institution, USA.

New project partners

Dr Robert Aruho, Uganda Wildlife Authority.

Dr Ernest Eblate Mjingo, Tanzania Wildlife Research Institute (TAWIRI) laboratories.

### Donor: ANTI-VeC Network (Application of Novel Transgenic technology & Inherited symbionts to Vector Control), GCRF Network in Vector Borne Disease/Liverpool School of Tropical Medicine

Project: Should the tsetse symbiont, *S. glossinidius*, be engineered to control African Trypanosomiasis?

### Donor: Research England GCRF QR Funding 2018-19/ University of Cambridge

Project: The burden of livestock trypanosomiasis on the marginalised pastoralist communities in arid regions of northern Kenya.

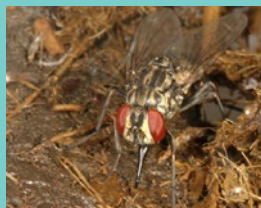
**icipe researcher:** Joel Bargul

**Collaborators:**

KEMRI Wellcome Trust Research Programme/initiative to Develop African Research Leaders (IDeAL)

Joint funding for East African Network for Bioinformatics Training (EANBIT) Bioinformatics Masters Programme

## RECENTLY PUBLISHED: SELECTED PAPERS



### Trapping stable flies

*icipe* researchers in collaboration with colleagues at the University of Pretoria, South Africa, have identified chemical odours in specific animal dungs that guide pregnant female stable flies to lay their eggs on the most suitable droppings. This optimum selection facilitates survival of the eggs and the emergence of stronger offsprings, thus ensuring thriving generations of the flies. These findings could lead to the development of odour baited traps for these highly destructive, extremely adaptive, yet little studied insects.

Paper link: [Scientific Reports, https://www.nature.com/articles/s41598-019-40479-9#auth-2](https://www.nature.com/articles/s41598-019-40479-9#auth-2); Press release: <http://www.icipe.org/news/new-knowledge-offers-possible-leads-trap-stable-flies>



### Trapping bean flower thrips

Researchers from *icipe*, Keele University, UK, and Wageningen University & Research, the Netherlands, have discovered chemical odours that could be exploited to develop technologies for trapping bean flower thrips (*Megalurothrips sjostedti*) in Africa. The *icipe*-led research identified aggregation pheromones released by male bean flower thrips, that attract male as well as female thrips. The pheromones cause bean flower thrips to assemble in a focal point on the plant and can therefore be used to lure insects. This study provides the first information regarding the aggregation pheromone among the thrips belonging to the *Megalurothrips* group in Africa. Paper link (published as an open access article) <https://link.springer.com/article/10.1007/s10886-019-01054-8>



### Ntepes virus

*icipe* research has described a novel virus, designated Ntepes virus, through risk assessment study to examine the role of sandflies mainly known for their role in the transmission of leishmaniasis in the circulation of viruses in Kenya. The researchers identified a novel virus in sandflies belonging to the group known as *Phlebovirus*. The virus appears to have a wide host range including sand flies, people, livestock and wildlife (primates and rodents). However, the authors did not find any evidence of disease in people as a result of infection by the virus. The findings of the study were published in the high impact journal Emerging Infectious Diseases. Paper link <https://wwwnc.cdc.gov/eid/article/25/4/pdfs/18-0750.pdf>



### Beetle and biopesticide

The small hive beetle, *Aethina tumida* is an invasive pest of the honey bee, with no known methods for its successful management. However, yeast inoculated pollen baited-traps have shown promise as quick monitoring tools. An *icipe* study has found that Apicure®, an *icipe* developed, essential oil-based biopesticide has potential to manage the beetle. Paper link: <https://aasopenresearch.org/articles/2-9>



## **Tuta absoluta management**

In April 2019, *icipe* launched a new project, supported by the African Union Research Grants programme, to promote sustainable management in East Africa of *Tuta absoluta*, an invasive pest of Solanaceous vegetables. The initiative will build on the Centre's previous activities to assemble, validate and implement proven integrated pest management strategies for *T. absoluta*. The project will be implemented in collaboration with the Kenya Plant Health Inspectorate Service (KEPHIS); Tanzania Agricultural Research Institute (TARI) and National Crops Resources Research Institute (NaCCRI).



## **Fall armyworm management in Ethiopia**

*icipe* in collaboration with the Ethiopian Agricultural Research Council, Ethiopian Institute of Agricultural Research and the Ministry of Agriculture, through support provided by the Feed the Future Collaborative Research on Integrated Pest Management Innovation Lab of the US Agency for International Development (USAID), organised a training workshop on integrated management of fall armyworm in Ethiopia. The event enabled over 70 experts from national and regional agricultural research, plant protection, agricultural extension and resource persons from international and national research and development institutions to exchange insights and information on the fall armyworm, its distribution status, damage and sustainable management options.



## **FAW-IPM launch**

*icipe* and partners have launched a new project to develop a science-led, African-context specific sustainable integrated pest management package for the fall armyworm. Known as FAW-IPM, the initiative is funded by the European Commission Directorate for International Cooperation and Development (DEVCO), with addition funds from *icipe* core donors. The project will be implemented in Kenya, Ethiopia, Rwanda, Tanzania and Uganda, in partnership with various stakeholders, and it will focus on a range of activities including capacity for early warning, rapid response and regional preparedness, and damage assessment of the pest across various ecologies.



## **Malaria control events**

In April, through a Research Enrichment – Public Engagement grant from the Wellcome Trust, UK, *icipe* held two major malaria control related events at the Centre's Thomas Odhiambo Campus, on the shores of Lake Victoria: a Malaria Exploration Course (MEC), and commemoration of the World Malaria Day (marked globally 25 April). Through the MEC, school pupils were invited to learn in a fun and interactive manner, through games, demonstrations, introduction to scientific research, and deliberation on 'big picture' issues surrounding malaria control. Over 700 participants, including members of the public and local government and ministries of Health and Education officials, attended *icipe*'s World Malaria Day activities, which included a 'science fair', performances, posters and 'show and tell', by the pupils, a "mosquito walk", exhibitions of *icipe* research activities, and other Human Health interventions, and the Push-Pull technology.



## **YESH!**

The Young Entrepreneurs in Silk and Honey (YESH), has met its target of recruiting 12,500 direct beneficiary youth, with the addition of 3,800 youth this year. An initiative of *icipe*, and Mastercard Foundation, YESH aims to create employment opportunities for young people through beekeeping and silkworm farming in Ethiopia. Now, efforts will focus on consolidation and planning towards realising the projects goal of ensuring that the beneficiaries become successful entrepreneurs and contribute to Ethiopia's continued economic growth. YESH also aims to support broader developmental agendas, such as food security and environmental protection.



## **Insects rearing**

Over the past several months, the Insects for Food and Feed programme has trained 40 extension workers and farmers from Kenya and Uganda on commercial rearing of longhorned grasshopper, cricket and black soldier fly. Topics covered include theoretical basis and practicals, and field visits to emerging commercial insect enterprises supported by *icipe*. Other aspects were gender mainstreaming into insect agribusinesses, and food safety considerations.



## **Neonicotinoids in Africa**

A Working Group meeting on "Neonicotinoids and their Impact on Ecosystem Services for Agriculture and Biodiversity in Africa" took place at the *icipe* Duduville campus from 13 – 15 May 2019. Co-organised by *icipe*, the German Academy of Sciences Leopoldina and the Academy of Sciences of South Africa (ASSAf), and facilitated by the Network of African Science Academies (NASAC), the European Academies Science Advisory Council (EASAC), and the Interacademy Partnership (IAP), the event was a follow up meeting to advance the Working Group's report, including policy recommendations, future research areas, and a communication strategy. The report is envisioned to be released later this year.



## Recent graduates

Three *icipe* postgraduate scholars recently graduated from the University of Pretoria, South Africa:



### Nelly Ndungu

Research topic:  
Investigation of phenotypic plasticity and molecular mechanisms underlying developmental

and differentiation in stingless bees in Mwingi and Kakamega forests, Kenya.

Mentors: Dr Kiatoko Nkoba and Dr Dan Masiga (*icipe*); and Dr Abdullahi Yusuf, Prof Christian Pirk, University of Pretoria.

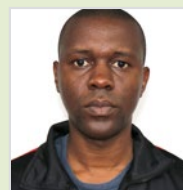


### Beatrice Nganso

Research topic:  
Investigating the mechanisms of African honey bee tolerance to the invasive pest *Varroa*

destructor

Mentors: Prof. Baldwin Torto (*icipe*); Dr Abdullahi Yusuf and Prof. Christian Pirk, University of Pretoria.



### Joshua Mbewe Njelembo

Research topic:  
Assessment of the efficacy of a repellent mixture isolated from

waterbuck to protect cattle and enclosures (kraals) from a vector of human sleeping sickness *Glossina fuscipes fuscipes*

Mentors: Prof. Baldwin Torto (*icipe*) and Prof. Christian Pirk and Dr Abdullahi Yusuf, University of Pretoria.

## PhD proposals presentations

The 2018 PhD scholars presented their proposals to the *icipe* research community, an important first step in their research journey, in **April 2019**.

### Vongai Marjorie Paradza (Zimbabwe)

ARPPIS PhD

Development of effective biopesticides against pesticide resistant strains of whiteflies infesting vegetables in East Africa

Supervisors: Dr Fathiya Khamis, Dr Sevgan Subramanian, Dr Komivi Akutse, Dr Sunday Ekesi (*icipe*)

### Nadia Karelle Toukem (Cameroon) ARPPIS PhD

Optimization of management of key Avocado pests for its effective integration with pollinators conservation efforts in East Africa

Supervisors: Dr Samira Mohamed, Dr Sevgan Subramanian (*icipe*)

Prof Mark Laing (University of KwaZulu-Natal)

### Trizah Milugo Koyi (Kenya) DRIP PhD

Improving malaria transmission-blocking potency through structural modification of compounds from the Star weed (*Parthenium hysterophorus*)

Supervisors: Dr David Tchouassi, Prof Baldwin Torto (*icipe*)

Prof Reginald Kavishe (Kilimanjaro Christian Medical University College)

### Rose Nyakemiso Sagwe (Kenya) DRIP PhD

Community composition, pollinator diversity and pollination efficiency in avocado and cucurbit production across different landscapes in Kenya and Tanzania.

Supervisor: Prof Michael Lattorff (*icipe*)

### Mukundi Mukundamago (South Africa)

ARPPIS PhD

Predicting the spatio-temporal distribution of common plant-pollinator interactions in two contrasted and changing landscapes of the Eastern Afromontane biodiversity hotspots in Kenya: the Aberdare range and the Taita Hills.

Supervisors: Dr Régis Babin (*icipe*); Dr Rosina Kyerematen; Dr Samuel Adu-Acheampong (University of Ghana)

Fairo Foruy Dzekashu (Cameroon) ARPPIS PhD

Diversity of plants, Bee pollinators, and their networks in natural and agricultural habitats of the Eastern Afromontane biodiversity hotspots in Kenya.

Supervisors: Prof Michael Lattorff, Dr Régis Babin (*icipe*); Prof. Christian Pirk, Dr Yusuf Abdullahi Ahmed (University of Pretoria)

### Edwin Ochieng Ogola (Kenya) ARPPIS PhD

Evaluating the ecology of relevant arboviruses in blood-feeding arthropods in selected ecologies of Kenya

Supervisors: Dr David Tchouassi, Prof Rosemary Sang, Prof. Baldwin Torto (*icipe*); Prof. Armanda Bastos (University of Pretoria)

### Joel Ouma Otero (Kenya) DRIP PhD

Zoonotic tick-borne pathogens within nomadic pastoral systems in selected counties of northern Kenya

Supervisors: Prof Rosemary Sang, Dr David Tchouassi (*icipe*); Dr Jaffu Chiongola (Kilimanjaro Christian Medical University College), Dr Barbara Blacklaws (University of Cambridge)

Faith Isikhumen Ebhodaghe (Nigeria) ARPPIS PhD

Community-based control of tsetse vectors of animal African trypanosomiasis in Shimba Hills, Kenya.

Supervisors: Dr Michael Okal, Dr Beatrice Muriithi (*icipe*); Prof. Armanda Bastos (University of Pretoria)

## Nematodes, science, agriculture and Africa

A CONVERSATION with students from the International MSc in Agro- & Environmental Nematology, Ghent University, Belgium, who were among the first cohort to undertake industrial training in Kenya in 2018, through a newly established partnership between the University, *icipe* and International Institute of Tropical Agriculture (IITA). Read: <http://www.icipe.org/news/nematodes-science-agriculture-and-africa>





**By Stephen Wathome**  
Programme Manager, Agriculture,  
Job Creation and Resilience

# Delegation of the European Union to Kenya

Over the past 10 years, the European Union (EU) and *icipe* have formed a solid partnership towards strengthening agriculture as a core and effective component in Africa's development. Within this period, the EU has provided grants totaling approximately Euro 45 million to support a range of *icipe* initiatives including: bee research; Push-Pull technology; management of fruit flies, tsetse flies, and insect transmitted camel diseases; and more recently, control of the fall armyworm.

The EU-*icipe* collaboration on bee research is embodied in the establishment of the Africa Reference Laboratory for Bee Health, which was launched in 2014. With its central reference laboratory in Kenya, satellite stations in Ethiopia, Burkina Faso, Cameroon, Liberia and a diagnostic laboratory in Madagascar, the facility is a partnership between *icipe* and the African Union Inter-African Bureau for Animal Resources (AU-IBAR). The only one of its kind in Africa, this state-of-the-art facility provides a focal point for cutting edge research to improve bee health and pollination services, with the ultimate aim of enhancing the livelihoods of beekeepers and farmers across Africa, through better honey products and crop productivity.

Beyond that, most of the EU's support to *icipe* has largely been through the Integrated Biological Control Applied Research Program (IBCARP). Having commenced in 2015 and due to be concluded in 2019, IBCARP aims to support the adoption of *icipe* technologies by an estimated 350,000 additional farmers and pastoralists in Kenya, Ethiopia and Tanzania.

### IBCARP has four components

**First**, the programme is enabling *icipe* and partners to conduct research to modify the Push-Pull technology; in other words to develop a climate-smart version that will enable the expansion of this innovative and highly successful intercropping strategy that controls pests and weeds in cereal, to drier agricultural areas, while ensuring its resilience in the longer term. In addition, the Centre and partners are accelerating, through diverse, creative pathways, the adoption of Push-Pull, so that the technology benefits more farmers across the continent.

**Second**, through IBCARP, *icipe* is optimizing and scaling-up the mass production and roll-out of the Centre's tsetse repellent collar technology by creating a viable business plan for commercialisation, packaging and dissemination has been developed. These elements have steadily come together over the past five years. One of the highlights is the registration of the blend used in the collars, by the Kenya Pest Control Products Board (PCPB) in 2018. This milestone will enable *icipe* to speed up

“

I can say that the tsetse control programme has been a guiding light to a better situation. The accrued benefits, our lives have changed.

**Josephine Wayua Lovi,**  
Kwale County, coastal,  
Kenya



commercialisation of the technology. It is also gratifying to see the tangible benefits that the integrated use of the collars, in combination with other *icipe* tsetse management technologies, have on people's lives. For example, in Shimba Hills, a potentially productive agricultural area in coastal Kenya, it had become almost impossible to rear cows, and to grow crops, due to heavy tsetse infestation. Today, the story has changed completely. Now, farmers have healthier, larger livestock herds; more land is being ploughed and as a result, more crops are being grown; households have more protein sources – including milk and meat – and their incomes have improved greatly.

**The third** IBCARP component is the expansion of the integrated pest management packages for fruit flies to new regions in Kenya, Ethiopia and Tanzania, specifically targeting mango growers. The mango is a special fruit in Africa. It is a crop that requires little labour or inputs, and one that can transform the income and nutrition of a household. But many farmers across Africa have been unable to reap the full benefits

“

Due to Push-Pull, my husband and I now see clear chances to escape the poverty that has previously marked our lives.

**Bakelech Tesfaye,**  
Jimma Zone, Ethiopia



“

I was among the first batch of 23 famers who decided to take a chance with the fruit fly IPM technologies. The results were amazing.

**Lena Kaari Kinyua,**  
Embu County, Kenya



of mango cultivation primarily due to fruit flies. The EU support is enabling *icipe*, in collaboration with private sector partners, to implement a mango value chain approach that is increasing yields while also helping African growers recapture markets that had become inaccessible due to quarantine issues related to fruit flies.

**Fourth**, IBCARP has enabled *icipe* to start novel research on camel diseases and the insects that transmit them. The camel is a highly valuable domestic animal, especially for communities living in arid and semi arid parts of Africa. However, for long, the health of camels has been a major challenge, with a range of unknown diseases. Unlike other animals, such as cattle, camel health has not received



The initiative on camel health has enabled us to understand diseases prevalent in the animals, such as surra, its symptoms, different types and appropriate treatment.

**Gujo Huqo, Community Chief, Marsabit County, Kenya**



much attention. *icipe* researchers have conducted groundbreaking studies that identify the actual vectors involved in transmission of camel trypanosomiasis, or surra, and in improving disease diagnosis, and in developing its management technologies.

Based on the success through the initiatives above, in 2018 the EU approved a Euro 7 million grant to *icipe* for a project that aims to rapidly develop research-led solutions that are specific to Africa, in the management of the invasive fall armyworm. From the moment the pest was first reported in Africa, in January 2016, *icipe* immediately embarked on the development of a science-led, African-context specific sustainable integrated pest management package for the fall armyworm. In partnership with various stakeholders, the Centre has initiated a range of activities including capacity for early warning, rapid response and regional preparedness, and damage assessment across various ecologies. The EU support will enable *icipe* to build on the Centre's early results to create a comprehensive package on the management of the pest, and to work with a range of partners to ensure that the solutions are delivered to communities, to avert the very real threat posed by the pest.

The EU is grateful for its decade long journey with *icipe*, and the opportunity to partner in the development of science-led, environmentally safe, accessible and affordable solutions to improve livelihoods, resilience and food and nutritional security of smallholder farmers in Africa.

## BIOINNOVATE AFRICA PROGRAMME

In January 2019, the total number of projects being supported through the Programme rose to 20, with the additional of nine new successful initiatives selected for funding based on a call made in 2018.

With the support of the Swedish International Development Cooperation Agency (Sida),

BioInnovate Africa provides grants to scientists, researchers, innovators and entrepreneurs from the six eastern Africa countries to transform bioscience based ideas into commercially viable enterprises.

In addition, BioInnovate Africa has been identified as a key platform to spearhead

the Africa region pre-conferences and workshops in preparation of the 2020 Global Bioeconomy Summit. Moreover, the Programme's Manager, Julius Ecuru, will serve on the International Advisory Council of the Summit.

## RCU-RSIF

In 2018, *icipe* was selected the Regional Coordinating Unit (RCU) of the Regional Scholarship and Innovation Fund (RSIF), which is aimed at strengthening doctoral training, as well as research and innovation in applied sciences, engineering and technology (ASET), in Africa.

The RSIF is one of the flagship programmes of the Partnership for skills in Applied Sciences, Engineering and Technology (PASET), an initiative by African governments to address fundamental gaps in skills and knowledge necessary for long-term, sustained economic growth in sub-Saharan

Africa (SSA). Over the past several months, RCU has commenced operation in earnest, with activities that include:

**Institution of a highly skilled team** to implement various aspects of *icipe*'s mandate.

**Initiation of a rigorous and competitive process** to select a total of 11 African host universities.

**Expansion of international networks** to enhance the quality of PhD training at the African host universities.

**Strengthening of relationships with partner institutions in Korea** that will receive RSIF scholars for sandwich programme, through a visit by RCU to the country.

**Call for applications for 45 RSIF PhD scholarships** (to open in mid-June 2019 and close in mid-July 2019) in five priority thematic areas: information communication technology (ICT), including big data and artificial intelligence; food security and agribusiness; minerals, mining and materials engineering; energy including renewables; and climate change.



**icipe as the Regional Coordination Unit (RCU) of RSIF:**



Supported in the organisation of the Forum, and participated in high level panel discussions, represented (right) by Moses Osiru (Manager, RCU).



Organised side events including the signing of memorandums of understanding (MoUs) between RSIF and partner institutions from Africa and Korea, and held discussions with African Host Universities (AHU).



Presented a gallery walk showcasing *icipe* and RSIF.



Conducted training in research and communication skills and organised publicity and visibility opportunities for RSIF scholars.





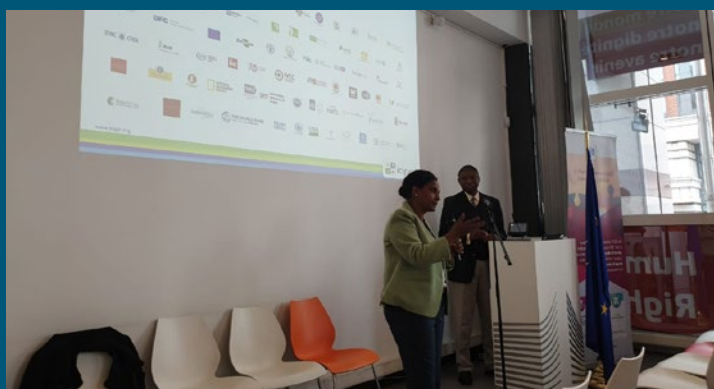
## The Director General:



Participated in the Sida Science Days (20-22 May 2019) as a speaker in a session entitled: Research support – a luxury when people are starving?.



Attended the 2019 Alumni Fellows week between 10–12 April, with an impactful schedule of ceremonies, presentations and addresses.



Gave a presentation at the European Union headquarters in Brussels on *icipe*'s R&D activities.



Attended a Food Initiative Strategic review conference at the Rockefeller Bellagio Centre, with other experts and funders to review the Rockefeller Foundation's proposed food strategy.



Delegation from Institut de recherche pour le développement (IRD) and the French Agricultural Research Centre for International Development (CIRAD), visited *icipe* to discuss ongoing collaborations.



Prof. Baldwyn Torto at the Award ceremony of the 2019 Agropolis Louis Malassis International Scientific Prize for Agriculture, presenting a seminar title: Towards the sustainable management of plant parasitic nematodes in smallholder cropping systems: is wrap and plant the answer?



Svein Bæra, Research Director; Norwegian Ministry of Foreign Affairs, Solbjørg Sjøveian - The Leader; section for Research, Innovation and Higher Education at Norad. Kjersti Thorkildsen - The Research Coordinator; section for Research, Innovation and Higher Education at Norad, visited *icipe*.



Delegation from the Australian Centre for International Agricultural Research (ACIAR) during their visit to *icipe*.





Visit by team led by Dr Rocio A. Diaz-Chavez, Deputy Centre Director, Research Energy and Climate Change Programme Leader, Stockholm Environment Institute Head Office in Nairobi.



His Excellency Dr Gebregziabher Gebreyohannes, State Minister of Ministry of Agriculture (second Right-to-left) and Dr. Kefena Efa, Oromia Livestock Development Agency Head, visiting the *icipe* stand at the World Bee Day in Addis Ababa, Ethiopia.

*icipe* has launched a crèche, a facility where staff members may have young children aged five years and below cared for during work hours. The facility has been constructed through a partnership between *icipe* and Zamara, the Centre's insurance services brokers. While the facility is in compliance with the Kenya Breastfeeding Mothers Bill, 2017, it is also aligned to the Centre's vision of enhancing gender equality, diversity and inclusiveness, as well as the ideal of a conducive and fruitful workplace.



*icipe* DG, Dr Segenet Kelemu, cuts the ribbon with, Ms Rosalyn Mugoh, Managing Director, Zamara insurance and risk business; and unveils the plaque with Mr Gatigwa Kimana, Director of Finance and Administration, *icipe*.



Some *icipe* staff with their young children during the launch of the crèche.





## New appointments



**Thomas Dubois (Head, Plant Health Theme).** Previously, Thomas was the regional Director for eastern and southern Africa at the World Vegetable Centre. He has also held positions at the International Institute of Tropical Agriculture (IITA), and at Africa Rice. Thomas holds a PhD in Entomology from Cornell University, USA, and an MSc in Bioengineering from University of Ghent, Belgium. He has been an invited expert for the Food and Agriculture Organization of the United Nations (FAO) commission on genetic resources; the United Nations Conference on Trade and Development (UNCTAD), on sanitary and phytosanitary issues; United States Department of Agriculture on regional biopesticide regulations, and for the Common Market for Eastern and Southern Africa (COMESA) on biotechnology policies.



**Tino Johansson (Head, Environmental Health Theme),** holds a PhD (Geography) and an MSc (Geography) from University of Helsinki, Finland. His areas of specialisation include natural resources management, climate change adaptation, sustainability science, development geography, human-wildlife conflicts and food security. Prior to joining *icipe*, Johansson worked as a Research Coordinator at the University of Helsinki's Department of Geosciences and Geography, and Coordinator, Taita Research Station of the University of Helsinki in Wundanyi, Kenya. He also previously held various positions at *icipe*, including: Visiting Scientist and Project Coordinator under the Adaptation for Ecosystem Resilience in Africa (AFERIA) project, Coordinator under the Climate Change Impacts on Ecosystems Services and Food Security in Eastern Africa (CHIESA) project, and the Sustainable Peri-Urban Milk Value Chain Development project in Somaliland.



**Xavier Chiriboga Morales (Postdoctoral Research Fellow, Biological Control of the Fall Armyworm project, Plant Health Theme).** He holds a PhD in Chemical Ecology from the University of Neuchâtel, Switzerland; MSc in Plant Sciences, Entomology and Pathology from Wageningen University, the Netherlands; and an engineering degree in Agricultural Sciences. Prior to joining *icipe*, Xavier was a Research Assistant at the University of Neuchâtel. He also held positions at the Agency for Security of Food and Agricultural Products (AGROCALIDAD) in the Laboratory of Entomology and at Instituto Nacional de Investigaciones Agropecuarias (INIAP), Ecuador.



**Valine Moraa (Communications Officer, BioInnovate Africa Programme)** holds a Bachelor's degree in Mass Communication from Africa Nazarene University, Kenya. Prior to joining *icipe*, Valine was a Communications and Media Officer at Kakenya Dream's Organization. Previously, she has held positions as a Research and Documentation Consultant at Uraia Trust; Program Officer, Communications, International Rescue Committee (IRC); Media for Peace Initiative Kenya; and as a Public Relations and Communications Assistant at Sustainable Development for All-Kenya (SDFA-Kenya).



**James Peter Egonyu (Scientist, Insect for Food and Feed (INSEFF) programme),** holds a PhD (Agricultural Entomology) from University of Nairobi, Kenya; an MSc (Crop Science); and a BSc (Agriculture) from Makerere University, Uganda. Prior to joining *icipe*, he was a lecturer of Entomology and Research Methods at Makerere university; a Research Officer (Crop Entomology) and founding Head of the Coffee and Cocoa Value Addition and Agribusiness Program at the National Coffee Research Institute, Uganda; an *Iso Lomso* Fellowship under The Stellenbosch Institute for Advanced Study; and an Agricultural Inspector at the Ministry of Agriculture, Animal Industry & Fisheries, Uganda. He has also served as a member of the Technical Working Committee of the Consortium for enhancing Universities' Responsiveness to Agribusiness Development (CURAD); Associate Editor of the International Journal of Tropical Insect Science; and as the Chairperson of the Research and Development Committee of the Entomological Association of Uganda.



**Esther Mokeira Nyauma (Senior Project Accountant)** holds an MBA from the United States International University, Kenya, and a Bachelor of Commerce degree from the University of Nairobi, Kenya. She is also a member of the Institute of Certified Public Accountants of Kenya (ICPAK). Most recently, Esther held positions as a Project Accountant at JHPIEGO and Intrahealth International, and as a Finance Officer the University of Maryland, Kenya.

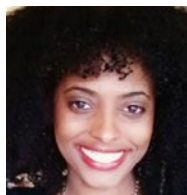
### Regional Coordination Unit (RCU) of the Regional Scholarship and Innovation Fund (RSIF)



**Moses Osiru (Manager),** holds a PhD in Agriculture (Plant Pathology) and an MSc (Plant Breeding/Pathology) from Makerere University, Uganda. Previously, he has held positions with the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM), Consultative Group on International Agricultural Research (CGIAR), World Bank, African Union Commission, various governments, international agencies and non-governmental organisations. He also sits on editorial boards of various journals and was a member of the Founding Steering Group of the African Forum on Agricultural Advisory Services (AFAAS).



**Kristin Seljeftot (Resource Mobilization Specialist)**, is an Economist specialised in inclusive partnerships and resource mobilisation for sustainable development. Previously, she worked with the Pan African Organization Agency for Cooperation and Research in Development (ACORD), and as a Facilitator for harmonization for the Ethiopian Government based in the United Nations Development Programme (UNDP). She also held positions with the French Research Association (CIDR) in South-West Madagascar and at the Center for Applied Research (SNF) at NHH in Bergen, Norway. She holds an MBA from the Norwegian School of Economics, NHH, Bergen, and a Master of International Management degree from HEC Paris, and an undergraduate degree in Development Studies from UiA, Kristiansand, Norway.



**Sagal Abdulle (Doctoral Scholarships Officer)**, holds a BA in International Development Studies and Anthropology from York University, Canada; and a Master of Education in Adult Education and Community Development from the University of Toronto, Canada. Prior to joining *icipe*, Sagal was a Program Manager at LifeLabs, Canada's largest Medical Laboratory Service Provider. She also served as the lead in a position that advanced women's health research for a novel funding programme housed at Women's College Hospital. Additionally, as a Program Officer at the Stephen Lewis Foundation, she managed diverse grants supporting community-based initiatives responding to HIV/AIDS in sub-Saharan Africa.



**Bonface Nyagah (Capacity Building Officer)**, holds a BSc in Leadership and Management in Public Administration and Management of Non-Profit Organization, and a Diploma in Mechanical Engineering, Production Option from the Kenya Polytechnic (Technical University of Kenya). Prior to joining *icipe*, he was a Programme Officer at the German Academic Exchange Service (DAAD), Regional Office for Africa, for the Postgraduate Scholarship Programme in eastern Africa. He also worked at the International Livestock Research Institute (ILRI) as a Consultant for the Capacity Development Unit.



**Francis Kinyanjui (Financial Management Specialist)** holds an MBA (Finance) from Newport University, California, USA. He is also a Certified Public Accountant (CPA-K). Prior to joining *icipe*, Francis worked at the World Agroforestry Centre (ICRAF) where he was a Corporate Finance Manager, and at African Medical Research Foundation (AMREF) where he was responsible for donor reporting and compliance, grant management, and financial management reporting. He started his career at Uchumi Supermarkets where he managed suppliers accounts, inventory and trading accounts. He has experience in corporate and not-for-profit sectors and expertise in developing and implementing financial policies and procedures, managing donor programmes, financial systems setup and management, financial reporting, partner management, treasury management, cash flow management, risk management and the management of internal and external audits.



**Monicah Waruini Njuguna (Supply Chain Officer)**, holds a Master's degree in Procurement and Logistics from Jomo Kenyatta University of Agriculture and Technology, a Professional Diploma in Purchasing and Supplies and a Bachelor's degree in Medical Biochemistry from the University of Nairobi. Prior to joining *icipe*, Monicah held positions as a Procurement Officer at the International Livestock Research Institute (ILRI); Medical Logistician at Alpha Medical Manufacturers; Medical Purchaser at Harleys Limited.



**Cynthia Kwamboka Orang'o (Research and Innovation Grant Officer)**, holds an MBA from the University of Nairobi, Kenya, and a BSc in Environmental Studies (Community Development) from Kenyatta University, Kenya. She is also a Certified Public Accountant. Prior to joining *icipe*, Cynthia was a Grant Management Specialist at Pathfinder International, and as a Finance and Grants Coordinator for a regional education project implemented by Aga Khan Development Agencies.



**Pauline Were Achoka (Communications Officer)**, holds a BSc degree in Computer Science from Masinde Muliro University of Science and Technology, Kenya. Prior to joining *icipe*, Pauline held positions as a Communications Consultant for Maison Shalom, Rwanda; Partnership and Communication Consultant at the International Youth Federation in Malawi; Communication Specialist, United Nations Development Programme in Malawi as an Advocacy; and Communications Officer and as an Information and Communication Technology at the United Nations Environment Programme (UNEP).



**Wilberforce Wanjala (ICT Specialist)** holds an MSc in Information Systems from the University of Nairobi and a BSc in Computer Science from Jomo Kenyatta University of Agriculture and Technology (JKUAT), Kenya. Prior to joining *icipe*, Wilberforce worked for the United Nations Economic Commission for Africa (UNECA) as a Lead Consultant for Climate Information Services; Director for IT & Operations, SODEXO; Regional IT Manager, Action Africa Help- International; IT Administrator, Regional Centre for Mapping of Resources for Development (RCMRD); Project Manager, Charleston Trave; and as a Software Developer; Jomo Kenyatta University of Agriculture and Technology (JKUAT). He has extensive experience spanning policy development, infrastructure setup, ICT security, mobile and web solutions development and business operational setup.

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## Core donors

- Swiss Agency for Development and Cooperation (SDC), Switzerland
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- UK Aid, Government of the United Kingdom
- Ministry of Higher Education, Science and Technology, Kenya
- Government of the Federal Democratic Republic of Ethiopia

## Restricted project donors

- African Union
- African Women in Agricultural Research and Development (AWARD)
- AIRD (French Inter-institution Agency for Research and Development)
- Bill & Melinda Gates Foundation
- Bioinnovate Africa Programme
- Biotechnology and Biological Sciences Research Council, UK, through Rothamsted Research, UK
- Bayer: Science For A Better Life
- Biovision Africa Trust
- Biovision Foundation for Ecological Development, Switzerland
- Canadian Government through International Development Research Centre (IDRC)
- Centre for International Migration and Development (CIM)
- CIRAD – Agricultural Research for Development, France
- Cultivate Africa's Future (CultiAF) through International Development Research Centre (IDRC)/Australian Centre for International Agricultural Research (ACIAR)
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- Innovative Vector Control Consortium (IVCC), through Wageningen University
- International Atomic Energy Agency (IAEA)
- International Centre for Genetic Engineering and Biotechnology (ICGEB)
- International Fund for Agricultural Development (IFAD)
- IRD, Institut de Recherche pour le Développement, France
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- Korean Government
- LEAP -Agri (A Long term EU-Africa research and Innovation Partnership on food and nutrition security and sustainable Agriculture)
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- National Research Fund, Kenya
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- Swiss National Science Foundation (SNSF)
- SWITCH Africa Green
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- United States National Institutes of Health (NIH)
- United States National Science Foundation (NSF)
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- World Bank
- World Federation of Scientists through the ICSC-World Laboratory
- World Health Organization
- World Trade Organization (WTO) – Enhanced Integrated Framework (EIF)

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.

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