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30,000

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31

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11

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Dr Lukas Bertschinger,
Chair, *icipe* Governing Council

Dear Colleagues and Friends of *icipe*,

For close to two years, the highly destructive fall armyworm has caused devastation across Africa leading to monetary losses of up to US\$ 6.1 billion, while affecting over 300 million people across the continent. A recently published study by *icipe* shows that the climate-adapted version of the Centre's Push-Pull technology is effective in controlling the fall armyworm, offering the first tangible hope of managing this pest. The ability to tackle such a devastating pest clearly demonstrates Push-Pull's utility as a platform technology in addressing the multitude of challenges that affect cereal-livestock farming systems in Africa.

It is indeed for this reason that in this publication, we focus in depth on Push-Pull. While we present details of the latest findings in the [Recently Published](#) section, the Director General's Thought Leadership column draws lessons from the technology for the transformation of agriculture and livelihoods in Africa. Also highlighted is Push-Pull's tremendous progress in Ethiopia, with over 8,000 farmers having adopted the technology in just a few years. The Push-Pull coverage winds up with two stories: a profile of Sister Gonzaga Achieng, an unlikely, yet one of the most successful Push-Pull farmers in Uganda; and a first person account by Mr Alex Chingoli, a Malawian farmer who was the first to alert *icipe* to the possibility that Push-Pull could be having an impact on the fall armyworm.

The rest of this *e-bulletin* consists of our regular sections with a few items worth emphasizing. Under [Funding News](#), you will find information about the Centre's newly launched donation tool that will enable individuals and institutions to support *icipe*. The [Recently Published](#) section spotlights breakthroughs in research on fruit flies, and novel findings on malaria transmission from people to mosquitoes. Among various other activities, our [Research Highlights](#) over the past several

months include major progress towards designing a bee research strategy, and commencement of the evaluation of the Centre's scientific units, starting with the Animal Health Theme. Meanwhile, BiInnovate Africa Programme, one of the continent's largest regional innovation-driven science initiative, which is hosted and managed by *icipe*, has recently announced grants winners for 2017, and made a new call that will close in 2018.

The Capacity Building news include the arrival, in September, of 11 new postgraduate students from seven African countries. In this section, we also have a profile of Vincent Nyasembe a young, rising chemical ecologist who recently concluded his PhD studies at *icipe* with groundbreaking discoveries on the relationship between disease vectors and plants. Vincent's story resonates with those of Sister Gonzaga and Mr Chingoli (mentioned previously). These two inspirational narratives of determination, hope and transformation are a validation of *icipe*'s mission: to produce world-class knowledge, build the capacity and leadership of African scientists, and to provide communities across Africa with sustainable solutions to developmental challenges.

As 2017 comes to a close we thank you sincerely for your continued partnership. We look forward to 2018, a significant year for *icipe*, with the Centre's Periodic External Review, commissioned every five years by the Sponsoring Group of *icipe* together with the Governing Council, due to be undertaken in the first quarter. We will keep you updated on the outcomes of this valuable exercise, which is intended to guide the Centre's programmatic and institutional agenda amidst present and emerging regional and global challenges.

Dr Lukas Bertschinger,
Chair, *icipe* Governing Council

***icipe* greatly appreciates the partnership of all our donors, collaborators, community groups and staff in 2017. We wish you a happy holiday season and a prosperous 2018.**



Dr Segenet Kelemu
Director General, *icipe*

icipe technologies and innovations: Transforming Africa's agriculture and livelihoods

In recent decades, the ideal of agriculture as the cornerstone of Africa's development has become more recognised, with governments, research institutions and development partners committing significant investments in the sector. Although progress has been made, continued efforts are necessary to addressing a range of challenges. As an example, many regions of the continent are already experiencing the impacts of climate change including drier and hotter weather, stressed out soils, increased outbreaks of existing pests and arrival of various invasive species. Further,

in a continent where over two-thirds of the population depends on livestock for everyday survival, lack of adequate and high quality fodder, as well as vectors that transmit debilitating or fatal diseases to the animals, are major obstacles. Over the years, *icipe* has developed a variety of technologies and strategies that have proven effective in addressing the challenges discussed above. In this article, I discuss two of the Centre's technologies: **Push-Pull** and **tsetse repellent collars**, and the lessons they provide for transforming agriculture and livelihoods.

Push-Pull technology

icipe's Push-Pull technology stands out as a rare example of success, due to its ability to provide a platform to address a complex set of issues. Push-Pull, an innovative companion cropping technology developed over the past 20 years by *icipe* in close collaboration with national partners in eastern Africa and Rothamsted Research, United Kingdom, is modelled along the African smallholder farming system of multiple cropping.

Originally developed for the control of stemborers, the key pests of cereal crops across most of Africa, and the parasitic Striga weeds, Push-Pull involves intercropping cereal crops with insect repellent legumes in the *Desmodium* genus, and planting an attractive forage plant such as Napier grass as a border around this intercrop.

The intercrop emits a blend of compounds that repel ('push') away stemborer moths, while the border plants emit semiochemicals that are attractive ('pull') to the pests.

Push-Pull has recently been adapted to drier areas through the incorporation of drought tolerant companion plants: Greenleaf *Desmodium* as an intercrop and *Brachiaria* cv Mulato as a border crop.

In addition, Push-Pull also controls maize ear rots and mycotoxins, while improving soil health and providing high quality fodder, since the companion crops are superior forages. Therefore, the technology facilitates crop-livestock integration thus expanding farmers' income streams.

We are excited to recently discover that Push-Pull is effective in controlling the fall armyworm, as described in different sections of this newsletter.



Reasons for Push-Pull's success

The push-pull technology demonstrates a convergence between high class scientific research, and an enduring vision to improve the lives of communities across Africa, around the seven key points discussed below.

New knowledge on plant-insect interactions



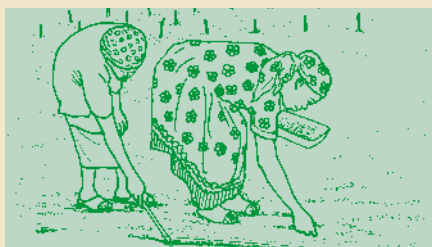
In Africa, intercropping is traditionally a predominant practice. However, the idea of using this strategy to affect insect behaviour has previously not been well understood. Similarly, the concept of using stimulant deterrent approaches is not new to science. But in contrast to other studies that often target a single chemical and a single phase in the life cycle of a single pest species, the Push-Pull research investigates a broader range of behaviour-affecting chemicals produced by a variety of plants and insects. In addition, unlike previous research, Push-Pull does not make use of synthetic deterrents or toxins. The system purely exploits and introduces into farming systems, natural insect-plant relationships.

Scientific validation



Push-Pull is a knowledge intensive technology, evident in the fact that in 2017, the researchers published their 100th peer reviewed scientific publication. The knowledge production is based on a reciprocal relationship between activities in the laboratory and in the field. Therefore, the researchers are constantly pursuing novel ideas that continuously improve the technology, while significantly contributing to the global chemical ecology knowledge pool.

Participatory research



Push-Pull researchers recognise farmers as an important resource to be included in every stage, a strategy that ensures vital indigenous insights are incorporated into the technology. Farmers also receive basic training in scientific methods, and demonstration and trial sites have been set up at *icipe* and on selected farmers' fields for this purpose.

Innovative dissemination strategies



To ensure rapid and effective adoption of the Push-Pull, *icipe* and partners use novel dissemination strategies, for instance farmer-teachers, farmer field schools, trainings and field days, drama, comic books, as well as radio and print media, reaching thousands of farmers every year. These efforts will be boosted even further by the recently established *icipe* Technology Transfer Unit.

Responsiveness to sustainable development goals (SDGs)



Due to its multiple benefits, Push-Pull impacts on SDG 1 (no poverty), SDG 2 (end hunger), SDG3 (good health and well-being), SDG 5 (gender equality), SDG 13 (climate action) and SDG 15 (life on land).

Inclusivity



Push-Pull is deliberately designed to include critical sections of society, for instance, women, youth and people living with disabilities. For example, due to targeted dissemination campaigns, majority of the technology adopters are women. Push-Pull has also proven to be an appropriate alternative for people living with disabilities, who often struggle with the heavy physical labour demanded by agriculture. This is because once a Push-Pull plot is established, relatively little labour is needed. The farmers can also use fodder obtained through the technology to keep stall-fed livestock, which are easier to manage than free-grazing animals. It is also worth noting that about 25% (30,000) of all Push-Pull farmers are youth.

Partnerships



As with all other research activities, the Push-Pull research thrives on close relationships with private and public sector partners, bringing together researchers, government agricultural extension systems, non-governmental organisations, civil societies, farmers groups among many others. In addition, several donors have over the past 20 years dedicatedly supported Push-Pull, thus ensuring availability of resources for various aspects.

Tsetse repellent technology

Tsetse flies are one of the main constraints for agro-pastoralism, food security and overall development in Africa. Found only in this continent, tsetse carry trypanosome parasites that cause animal African trypanosomiasis (AAT, or Nagana), and human African trypanosomiasis (HAT, also known as sleeping sickness). Nagana causes over three million cattle deaths each year, leading to annual losses exceeding US\$ 5 million annually. Tsetse also have significant implications for land use and crop production in Africa. Because of their adverse impact on animal draught power, the flies are one of the main reasons why 80% of the continent's land is tilled by hand. In addition, tsetse infestation has turned huge portions of Africa's fertile landscape into 'green deserts' that lie uninhabited and unused. Control of the flies with synthetic insecticides is difficult, expensive, ineffective and harmful to people, animals and the environment, and

fly re-invasions remain a major problem. *icipe* and partners have developed a series of environmentally friendly tools and strategies for the control of tsetse and trypanosomiasis, among them the innovative tsetse repellent collars. This technology is based on research conducted by various *icipe* scientists largely led by Prof. Ahmed Hassanali, which investigated chemical cues from the waterbuck (an animal that is common in tsetse habitats but is not readily fed upon by the insects), and found certain compounds with the capacity to repel tsetse flies. A blend of these chemicals has been packaged in innovative dispensers which, when worn as collars around the neck of cattle, essentially make cattle unattractive to tsetse flies.



Lessons from the tsetse repellent collar technology

Technology effectiveness

Through field trials in Shimba Hills, coastal Kenya, the tsetse repellent collar technology has been found to reduce levels of Nagana by more than 80% in protected animals, thereby also lowering the frequency in the application of trypanocides – often harmful and ineffective drugs used in the treatment of Nagana. Together with associated costs, it is estimated that a reduction in household costs of about US\$52.32 annually was achieved. Due to improved health, the traction power of protected oxen was enhanced, while lower incidents of Nagana allowed more farmers to own such animals. As a result, farmers in the trial ploughed 73% more land than before, thus increasing their crop production with yields surpassing household needs. Therefore, it is clear that the technology is effective in improving food security and general well-being of households.

Understanding of tsetse and trypanosomiasis

icipe's goal is to develop integrated and environmentally friendly strategies that are based on a sound understanding of the tsetse's biology, behaviour and ecology, as well as tsetse–trypanosome and tsetse–host relationships. For example, *icipe* was part of a 10-year project led by the International Glossina Genome Initiative (IGGI), which brought together more than 150 researchers from

nearly 100 institutions across the world, to successfully map the genome of *Glossina morsitans morsitans* tsetse species. The high profile research, completed in April 2014, was a major global milestone. *icipe* was instrumental in the description of the sensory genes, which, in this and other tsetse species, are responsible for guiding the interactions between tsetse flies and their environment. The Centre has also contributed to awareness creation to support introduction of tsetse repellent technology, and to also highlight the tsetse and trypanosomiasis problem in Africa.

Thorough technology validation

The tsetse technology collars have been validated throughout the various stage of development, including proof-of-concept and large-scale field trials, using community-based partnerships.

Contribution to scientific knowledge

icipe research towards developing the tsetse repellent collars has contributed much needed global knowledge on how disease transmitting insects, including tsetse, mosquitoes and ticks, interact with people and animals. Such understanding can enable researchers to modify the behaviour of insects to develop tools or strategies that would reduce contact between the vectors and potential hosts, thereby reducing the risk of pathogen transmission. If implemented

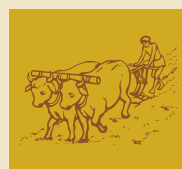
as part of integrated vector management, this approach can contribute to disease elimination.

Broad potential in tsetse and biting flies control

In addition to its proven effectiveness against *Glossina pallidipes*, the predominant savannah tsetse species that cause animal trypanosomiasis in East Africa, the technology has also been evaluated for riverine tsetse flies that transmit human sleeping sickness, showing a reduction of approximately 30%. The repellent collars technology can also be integrated into other tsetse control tactics, to enhance fly suppression and to develop much needed efficient barriers to stop flies from re-invading tsetse control areas.

Lessons for the innovation process

In Africa, there are concerted efforts towards developing innovation value chains that translate research findings into readily available commercially viable products. The *icipe* tsetse repellent collar technology can provide important lessons to address key knowledge gaps. These include, how to translate knowledge into tangible products, testing and optimising prototypes, balancing quality and affordability, private public partnerships to scale-up technologies, intellectual property issues, and ensuring inclusiveness and sustainability development.



Emerging zoonotic diseases

Dr Michael Okal (left), a Postdoctoral Fellow in the *icipe* Animal Health Theme, has been granted the THRIVE-2 Career Development Award, to support his research on livestock as reservoirs of emerging zoonoses in the human-wildlife-livestock interface, in Kwale County, coastal Kenya. THRIVE – The Training Health Researchers into Vocational Excellence (thrive.or.ug), is a regional network of research excellence, including some of

the best universities and research institutes in East Africa in partnership with two leading UK universities. Dr Okal's research will be supported through the Developing Excellence in Leadership, Training and Science (DELTA) Africa Initiative grant to THRIVE-2. Deltas Africa is funded by the Wellcome Trust and the UK Department for International Development (DFID).

Stingless bees

Through a project funded by Bayer AG, Germany, *icipe* has commenced studies on stingless bee as a better option for crop pollination in tropical and subtropical regions. The initiative will evaluate the pollination efficiency of 10 stingless bee species for a variety of vegetables and nuts under greenhouse conditions. The studies will also focus on molecular and conventional taxonomic characterisation of African stingless bee species.

EANBiT

icipe has received funding from the United States National Institutes of Health (NIH) for a project titled Eastern Africa Network for Bioinformatics Training (EANBiT), whose core objective is to measurably strengthen the application of bioinformatics in biomedical research, through individual training, research mentorship and enhancing institutional capacity in East and Central Africa. The project will be led by *icipe*, with Dr Dan Masiga as the principal investigator. The network will consist of: Biosciences eastern and central Africa - International Livestock Research Institute (BecA - ILRI) Hub, Kenya Medical Research Institute (KEMRI)-Wellcome Trust, Kilifi and Pwani University in Kenya; Makerere University, and Uganda Virus Research Institute (UVRI), in Uganda; and University of Dar es Salaam, Tanzania.

Arboviruses

Building on previous research that led to the discovery of the novel, sandfly-borne *Phlebotomus* in Kenya, *icipe* has recently secured funding from the German Research Foundation (DFG), to monitor the spectrum of causative arboviruses, prevalence, and social impact in Kenya, where such knowledge remains poor. Specifically, through a comparative approach, the study will aim to detect arbovirus activity in disease vectors (like sandflies, ticks, mosquitoes, biting midges), and exposure risk to animal reservoirs (livestock and rodent) and humans in three Kenyan regions. The study will be conducted along a gradient of rural, urban and livestock-human-wildlife interface. The project will also build capacity of researchers and other stakeholders.

Visceral leishmaniasis

icipe has received a Wellcome Trust, Health Research Capacity Strengthening Initiative postdoctoral fellowship, awarded to Dr Damaris Matoke, for a proof of principle study towards developing an 'attract-and-kill' strategy for the control study of visceral leishmaniasis a neglected tropical disease. Through studies to be conducted in Kenya's Rift Valley, one of the areas where the disease is most prevalent, the efficiency and efficacy of the tool will be evaluated in comparison to other approaches currently being employed, by assessing vector abundance, diversity, physiological status, sex and blood meals of the trapped sand flies. If successful, the tool will be scaled up for adoption by private sector and government partners.

Donation tool launched

icipe has launched a donation tool that will enable individuals and institutions to support the Centre in its unique mission of conducting insect science and designing strategies for its practical application, for better health and food security and enhanced livelihoods in Africa.

For further information visit: <http://www.icipe.org/support-icipe>



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INSECTS FOR FOOD AND FEED
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Landscape setup and honeybee colony integrity

Pamela Ochungo, a PhD scholar in the *icipe* Environmental Health Theme, has been awarded a National Geographic Society grant, to support her research on linking landscape characteristics with honeybee colony productivity and strength as well as pollen amounts and diversity in eastern Kenya. The study intends to fill this knowledge gap by collecting multi-seasonal honeybee colony strength data across varying landscape types and linking these with landscape indices in order to derive correlations between them.

Fall armyworm management strategy

The USAID Office of U.S. Foreign Disaster Assistance (USAID/OFDA), has provided funds towards the establishment of a community-based fall armyworm monitoring, forecasting, early warning and management strategy in the eastern Africa region. The initiative will be led by the Food and Agriculture Organization of the United Nations (FAO) Subregional Office for Eastern Africa in partnership with *icipe*; CAB International; Desert Locust Control Organization for Eastern Africa; and ministries of agriculture of Burundi, Ethiopia, Kenya, Rwanda, Tanzania and Uganda.

icipe Push-Pull technology halts fall armyworm rampage

The fall armyworm is a destructive moth that causes devastating damage to almost 100 plant species, thereby threatening food and nutritional security, trade, household incomes and overall economies. In January 2016, the pest was reported in Nigeria and it has since spread at an alarming rate across Africa; its presence has been confirmed in more than 28 African countries. Estimates from 12 African countries indicate that the fall armyworm is causing annual maize losses of between 8 – 21 million tonnes, leading to monetary losses of up to US\$ 6.1 billion, while affecting over



300 million people in Africa, who, directly or indirectly, depend on the crop for food and well-being. The pest's impact is likely to be even higher when its damage on other crops is quantified. A recent study has established that a climate-adapted version of the Push-

Pull technology developed by *icipe* and partners is effective in controlling the fall armyworm, providing a suitable, accessible, environmentally friendly and cost-effective strategy for management of the pest. These findings represent the first documented report of a readily available technology that can efficiently manage the fall armyworm.

Paper link: <http://www.sciencedirect.com/science/article/pii/S0261219417303216>;
Press release: <http://www.icipe.org/news/icipe-push-pull-technology-halts-fall-armyworm-rampage>

Bactrocera dorsalis identity

A paper by *icipe* researchers that reported the resolution of the identity of an invasive fruit fly in Africa was recently among the top 25% most cited articles published in *PLOS ONE* journal. The fruit fly, which was first recorded in Kenya in 2003 before its spread across the continent, was initially inaccurately described as a new pest to science and accorded the name *Bactrocera invadens* in 2005. This imprecise identification created challenges for African fruit growers, due to phytosanitary restrictions posed by lucrative horticultural import markets based on the pest's seemingly novel status. However, using morphometric techniques and molecular barcoding, the *icipe* study established the pest to be synonymous to *B. dorsalis*, an oriental fruit fly already present in many countries worldwide. The settlement of pest's identity will enable the African horticultural industry

to regain market access. In addition, researchers can now source control tools developed for the *B. dorsalis* species complex from regions where the pest has been in existence for longer periods.

Paper link: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0044862&utm_source=plos&utm_medium=email-title&utm_campaign=one-1707-alms



Bactrocera dorsalis

Human malaria parasite reservoirs

It is commonly known that mosquitoes transmit the malaria-causing parasite, *Plasmodium falciparum*, to people. A less considered reality is the reverse; that human beings act as reservoirs of the parasite, which the mosquitoes pick up and transfer to other people. It is important to understand the dynamics of this scenario, to design interventions that target individuals most important in transmission of infection to mosquitoes. In accordance, *icipe* and partners have published findings of a study to assess the role of different sections of the population in passing on *Plasmodium falciparum* to mosquitoes. Conducted in Burkina Faso and Kenya, the research indicates that about 45 – 75% of all mosquito infections are caused by people, with a greater prevalence in areas with high malaria intensity. Children are often more infectious to mosquitoes than adults, but because adults are more exposed and thus bitten more by mosquitoes, their contribution to malaria infections in mosquitoes is higher. These findings highlight the need for sensitive diagnostics and interventions that target all age groups. Paper link: <https://www.ncbi.nlm.nih.gov/pubmed/29074880>

Host marking pheromone discovery

Some fruit flies use host marking pheromones to indicate fruits where they have already laid eggs, thereby pre-empting repeated egg-laying on the same fruit. Understanding host marking behaviour and pheromones is potentially useful in the control of fruit flies which exhibit this phenomena. For instance, if a product containing such host marking pheromones is sprayed onto fruits,

it could deter and prevent some fruit flies from laying eggs on them. *icipe* researchers have identified glutathione as a host marking pheromone of *Ceratitits cosyra* fruit fly species. Through laboratory evaluations, the scientists confirmed glutathione's ability to reduce egg laying in *C. cosyra*, *C. rosa*, *C. fasciventris*, *C. capitata*, as well as the invasive *Zeugodacus cucurbitae*. Therefore,

glutathione can be exploited to develop tools for fruit fly management. Notably, a paper reporting these results was recently used by the *Journal of Agricultural and Food Chemistry* (in which it appeared), as its website's homepage banner. Paper link: <https://www.ncbi.nlm.nih.gov/pubmed/28911226>

Scientific units evaluation

The *icipe* Governing Council and Management have established a Sustainable Research Evaluation System Framework to evaluate all its scientific units to ensure adherence to international standards. The assessments commenced in 2017 with the review of the Centre's Animal Health Theme, which was conducted by three international experts: Prof. Diana Williams (University of Liverpool, UK), Dr John Gilleard (University of Calgary, Canada) and Prof Ulf Magnusson (Swedish University of Agricultural Sciences, Sweden) led by the *icipe* Governing Council Vice Chair Prof Bill Hansson. The interim findings of the review show the *icipe* Animal Health Theme to be internationally competitive. The reviewers also proposed areas of improvement, such as strengthening of the veterinary epidemiology component. The Centre intends to implement the review reports, once complete, to reinforce individual themes, towards overall achievement of the Centre's goals and objectives.

IBCARP meetings

The annual meetings of the Integrated Biological Control Applied Research Program (IBCARP) Technical Advisory and Steering committees were held in August and September respectively. IBCARP is an initiative funded by the European Union through a Euro 12 million grant, with additional funds from *icipe*'s core funds and other sources. It aims to support the adoption of the Centre's technologies and strategies for improved cereal, horticulture and livestock productivity by an estimated 350,000 additional farmers and pastoralists in Kenya, Ethiopia and Tanzania. The two committees, which are composed of experts representing donors, partners and collaborators, are critical in ensuring effective implementation of IBCARP.

Bee health strategy

A workshop organised by *icipe* in late September marked a major milestone towards the development of the Centre's bee health strategy. The goal of the forum was to identify and recommend a portfolio of bee research and development, and outline procedures for creating an allied strategic document. The event was attended by over 40 participants including researchers and policymakers and other key stakeholders from Africa, United Kingdom, France, Germany and the United States of America. Discussions focused on four sub categories: bee health; pollination; bee nutrition and endosymbionts.

Thrips IPM success

The *icipe* thrips integrated pest management project has been featured among success stories from the African Union Research Grants programme on Africa-Europe collaboration in research and innovation on food and nutrition security. The article outlines the development and successful testing of a new eco-friendly control strategy that overcomes the negative consequences arising from excessive synthetic pesticide use. The new tool, known as 'lure and infect', translates new scientific knowledge developed by *icipe* and partners into two integrated biological pest management techniques, a thrips attractants and a fungus that infects thrips, both manufactured by a private sector bio-pesticide company, Real IPM in Kenya, working closely with the project. For more information: <http://l.caast-net-plus.org/nY>

Sister Gonzaga Achieng: Testimony of an unlikely Push-Pull farmer

Since 2012, with the support of UK's Department for International Development (DFID), and Biovision Foundation for Ecological Foundation, Switzerland, and the European Union, the Push-Pull technology has been disseminated in 10 districts in eastern Uganda, with close to 20,000 farmers now practising the technology. One of the more unlikely, and yet most successful Push-Pull farmers in the country is Sister Gonzaga Achieng, of St Benedict catholic congregation. Read her inspiration story here: <http://www.icipe.org/news/sister-gonzaga-achieng-testimony-unlikely-push-pull-farmer>

Bioinformatics training

On 18 – 22 September, the *icipe* bioinformatics group hosted an international training workshop on VectorBase (www.vectorbase.org) – a National Institute of Allergy and Infectious Diseases (NIAID) Bioinformatics Resource Center (BRC) providing genomic, phenotypic and population-centric data to the scientific community for invertebrate vectors of human pathogens. The training demonstrates *icipe*'s growing capacity and competence in bioinformatics. In particular, this advancement has been due to the Centre's participation in the H3Africa bioinformatics network (h3abionet.org), a programme coordinated by the University of Cape Town, South Africa, bringing together about 30 African institutions. H3ABioNet has recently received approval for a second phase from the National Institutes of Health (NIH), USA, to run from 2017 – 2022.

BioInnovate Africa grants winners and new call announced

Eleven research teams from Ethiopia, Kenya, Rwanda, Uganda and Tanzania have received grants totalling US\$ 6 million, to enable them turn their innovative ideas and technologies, based on biological sciences, into viable businesses. The funding has been provided by BioInnovate Africa Programme, a regional initiative hosted at *icipe*, which currently operational in Burundi, Ethiopia, Kenya, Rwanda, Tanzania and Uganda, with the generous support of the Swedish International Development Cooperation Agency (Sida). Read more: <http://www.icipe.org/news/winners-bioinnovate-africa-grants-announced>

BioInnovate Africa has also announced a new call for proposals for grant funds totalling approximately US\$ 3.5 million. Applications can be submitted between 2 November 2017 and 2 February 2018, by scientists, researchers, innovators or entrepreneurs resident in Burundi, Ethiopia, Kenya, Rwanda, Tanzania and Uganda. Complete details are available at <http://bioinnovate-africa.org>

Push-Pull and fall armyworm: First account

In early 2016, the Push-Pull technology was introduced in Malawi and Zambia through the Push-pull sub Saharan Africa project, funded by Biovision Foundation for Ecological Development, Switzerland. *icipe* and partners are now testing the technology on-station and on-farm. Among farmers who were involved in the trials is Mr Alex Chingoli from Salima district, central Malawi, who later became the first farmer to report the possibility that Push-Pull could be tackling the fall armyworm. Read his story here: <http://www.icipe.org/news/push-pull-and-fall-armyworm-first-account>

Push-Pull progress



❖ *icipe* Director General, Dr Segenet Kelemu (in green cap and glasses), talks to farmers, researchers and partners during a visit by the Centre's senior management team to Push-Pull field sites in Ethiopia.

icipe's innovative Push-Pull has progressed tremendously in Ethiopia since its introduction in the country five years ago, with over 8,000 farmers now using the

technology. Of these farmers, 2,500 have adapted the technology over the past one year through a massive scale-out initiative by *icipe* and the Government of Ethiopia, in

collaboration with various partners. Ethiopian Push-Pull farmers are now benefiting from the multiple advantages of the technology, including combating stemborers and *Striga* weed and improving soil health and fertility, and aflatoxin reduction, leading to increased cereal productivity. In addition, Push-Pull intercrops provide farmers with high quality livestock fodder, resulting to improved milk yields. Therefore, household nutrition and incomes are also enhanced. Importantly, beneficiaries and partners have noted that, in addition to its proven gains, Push-Pull is also now demonstrating ability to control the Fall Armyworm, an invasive pest first reported in Africa in January 2016, which is causing devastating impact to cereals and other crops across the continent.

Courtesy calls to Ethiopia government officials

On 6 September, the *icipe* senior management committee (SMC) paid courtesy calls to high level Ethiopian government officials, including: His Excellency Dr Eyasu Abraha, Minister, Ministry of Agriculture and Natural Resources; His Excellency Prof. Fekadu Beyene, Minister, Ministry of Livestock Development and Fisheries, and His Excellency Dr Gebregziabher Gebreyohannes, State Minister for Livestock Development. Discussions centred on areas of mutual interest, future cooperation, joint resource mobilisation and capacity building, towards enhanced agricultural transformation in Ethiopia.

The officials acknowledged *icipe*'s contribution, while the SMC reaffirmed the Centre's commitment to supporting socio-economic development in Ethiopia.



His Excellency Dr Abraha (second left), pictured with (l-r) *icipe* Director of Research and Partnerships, Dr Sunday Ekesi; Director General, Dr Segenet Kelemu, and Dr Tadele Tafera, Head, *icipe* Ethiopia Office.



His Excellency Dr Gebregziabher (centre), pictured with I-r Workneh Ayalew, *icipe* Coordinator, Young Entrepreneurs in Silk and Honey project; Director General, Dr Segenet Kelemu; Director of Research and Partnerships, Dr Sunday Ekesi and Dr Tadele Tafera, Head, *icipe* Ethiopia Office.

icipe Governing Council Awards

During its annual general meeting held in Nairobi, Kenya, in November 2017, the *icipe* Governing Council, will consists of globally reknowned scientists, honoured six outstanding postgraduate scholars, currently undertaking their research at the Centre.

Best published science paper by an *icipe* scholar

Annette O. Busula (PhD scholar)

Paper title and link: Gametocytemia and attractiveness of *Plasmodium falciparum*-infected Kenyan children to *Anopheles gambiae* mosquitoes. Paper link: <https://www.ncbi.nlm.nih.gov/pubmed/28859429>

Funding: This research was supported by the Netherlands Organization for Scientific Research, divisions of Medical Science (TOP Grant 91211038 to W. T.) and Earth and Life Sciences (VIDI Fellowship Grant 016.158.306 to T. B.).

Winner



Best science poster by an *icipe* scholar

Nancy Karimi Njeru (PhD scholar)

Poster title: Effect of stemborer management under Push-Pull cropping system on ear rots of maize in western Kenya.

Funding: This study was conducted with funding from the German Academic Exchange Service (DAAD) through the *icipe* African Regional Postgraduate Programme in Insect Science (ARPPIS).

Winner



Ruth Muthoni Kihika (MSc scholar)

Paper title and link: Parasitic nematode *Meloidogyne incognita* interactions with different Capsicum annum cultivars reveal the chemical constituents modulating root herbivory. Paper link: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5460232/>

Funding: Financial support for this research was provided by: United States Department of Agriculture/Agricultural Research Service, Grant No. 58-6615-3-011 F

First Runner Up



Faith Akinyi Obange (MSc scholar)

Poster title: On the trail of a killer: a multi locus sequence typing approach to characterizing deformed wing virus strains.

Funding: This work was conducted with funded by DAAD through the *icipe* ARPPIS programme.

First Runner Up



David K. Mfuti

Paper title and link: Lure and infect strategy for application of entomopathogenic fungus for the control of bean flower thrips in cowpea. Available at: <http://www.sciencedirect.com/science/article/pii/S1049964417300117>

Funding: The research was conducted with funding from the German Academic Exchange Service (DAAD) through *icipe*'s African Regional Postgraduate Programme in Insect Science (ARPPIS), the African Union through the African Union Research Grant Contract no: AURG/108/2012 and the BMZ (The German Federal Ministry for Economic Cooperation and Development) and GlZ (Deutsche Gesellschaft für Internationale Zusammenarbeit) Project number: 11.7860.7-001.00, Contract number: 81141840

Second Runner Up



Seydou Diabaté (PhD scholar)

Poster title: Effect of host and non-host volatiles on the behaviour of *Megalurothrips sjostedti*

Funding: This research was conducted with funding from the Federal Ministry for Economic Cooperation and Development (BMZ) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GlZ) GmbH, Project Number: 13.1432.7-001.00 & Grant No. 81170265.

Second Runner Up



In addition, all the above mentioned research benefitted from *icipe* core funding provided by UK Aid from the UK Government, Swedish International Development Cooperation Agency (Sida), the Swiss Agency for Development and Cooperation (SDC), and the Kenyan Government. The views expressed herein do not necessarily reflect the official opinion of the core or project donors.

For more information on the *icipe* Governing Council Students Awards visit: <http://www.icipe.org/news/awards-and-recognition/icipe-governing-council-awards>



Support *icipe* >> <http://www.icipe.org/support-icipe>



ARPPIS scholars, class of 2017

In September 2017, 11 postgraduate students joined *icipe* through the African Regional Postgraduate Programme in Insect Science (ARPPIS), with support from the German Academic Exchange Service (DAAD). The scholars, who are from Benin, Ethiopia, Kenya, Nigeria, Sudan, Uganda and Zimbabwe will be hosted within various projects being implemented by the Centre. For more information, visit: <http://www.icipe.org/news/arppis-scholars-class-2017>

Profile: Rising chemical ecology researcher

At the age of seven, Vincent Nyasembe contracted malaria and found himself hospitalised for three months, an episode that inspired a career in research on the control of neglected tropical diseases. Nyasembe recently completed his PhD studies in the *icipe* Behavioural

and Chemical Ecology Unit having made several groundbreaking discoveries on the relationship between disease vectors and plants. Read his inspiring story here: <http://www.icipe.org/news/vincent-nyasembe-when-chemical-ecology-meets-enduring-dream-public-health-improvement>



Insects for food research award

Poster by *icipe* PhD student Elizabeth Kusia, titled: Community Perceptions, Practices and Knowledge of Insects for Food in Kenya: A Case of Saturniidae, was ranked third out of about 300 African agriculture related posters presented during the Tropentag 2017 conference (<http://www.tropentag.de/>). Elizabeth is registered at the Center for Development Research (ZEF),

University of Bonn, Germany. Her research is located within the EntoNUTRI project, funded by the Federal Ministry for Economic Cooperation and Development (BMZ), Germany, and implemented by *icipe*, ZEF and the Food Security Center, University of Hohenheim, both in Germany, in partnership with national agricultural research systems partners from Kenya and Uganda.



‘Leading in the Library’ workshop

On 3 and 4 October 2017, the *icipe* Information Resources Centre hosted a workshop organised and funded by the International Network for Access to Scientific Publications (INASP), in collaboration with Caplor Horizon, UK. The forum brought together chief librarians from universities and research centres

in Kenya who form the leadership of the Kenya Library and Information Services Consortium. Themed ‘Leading in the Library’, the workshop, focused on developing organisational effectiveness, and is part of a series intended to empower digitisation, especially acquisition of quality electronic publications at most the affordable rates.



High profile visits by *icipe* senior management

The *icipe* senior management has over the recent months made high profile engagements with key research and development partners including visits to: the World Bank, Washington DC, where they delivered a keynote lecture titled 'Highlighting the African insect science for food and health operations on food security and health in

Africa', and to the Bill & Melinda Gates Foundation, Seattle, Washington, USA, for a series of meetings with the Agricultural Development and Global Health teams.

In addition, in October, Dr Segenet Kelemu, was a speaker at the 2017 Borlaug Dialogue International Symposium. Dr Kelemu was a

panelist in a side event titled: Fall Armyworm: A clear and present danger to Africa, and Transformation of the Savannah Initiative (TASI). The Director General discussed the evident effectiveness of the Push-Pull technology in managing fall armyworm, and ongoing research being conducted by *icipe* in this regard.



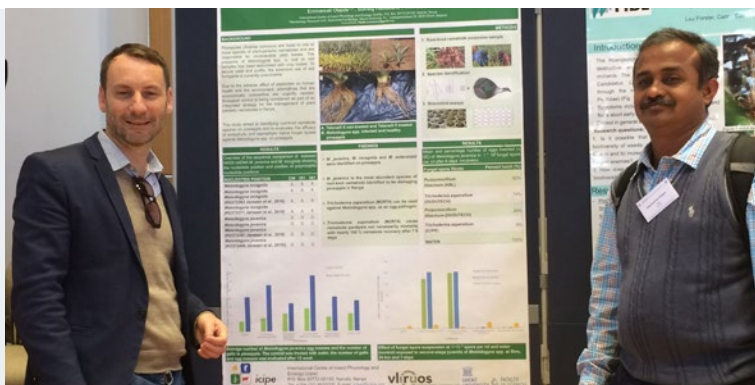
Pictured during the visit to the World Bank (l-r): Prof. Baldwyn Torto, Head Behavioural and Chemical Ecology Unit; Dr Sunday Ekesi, Director of Research and Partnerships; Dr Segenet Kelemu, Director General and Dr Dan Masiga, Head, Animal Health Theme.



Pictured during the visit to the Bill & Melinda Gates Foundation (l-r): Dr Dan Masiga, Head, Animal Health Theme; Dr Sunday Ekesi, Director of Research and Partnerships; Dr Segenet Kelemu, Director General and Prof. Baldwyn Torto, Head Behavioural and Chemical Ecology Unit.

icipe at TROPENTAG

icipe was well represented at this year's TROPENTAG conference (<http://www.tropentag.de/>). Pictured: (l-r) Dr Tobias Landmann, an expert of the German Development Cooperation (GIZ), Centre for International Migration and Development (CIM) programme, and Head, *icipe* Geo-Information Unit; and Dr Sevgan Subramanian, leader, EntoNutri project, which is supported by the Federal Ministry for Economic Cooperation and Development (BMZ).



Promoting a bioeconomy in eastern Africa

On 2 and 3 November 2017, a high-level forum on developing a bioeconomy in eastern Africa was held in Kigali, Rwanda, through a partnership between the country's National Commission of Science and Technology (NCST); BioInnovate Africa programme and *icipe*. The meeting also marked the official entry of BioInnovate Africa into its second phase, which runs from 2016 –2012.

Read more: <http://www.icipe.org/news/bioinnovate-africa-phase-ii-launched>



L-r: Dr Sunday Ekesi, Director of Research and Partnerships, *icipe*; Hon. Prof. Ruth Oniang'o, Chief Executive Officer, Rural Outreach Africa and BioInnovate Africa Programme Advisory Committee Member; Mrs Gertrude Ngabirano, Executive Secretary, East African Science & Technology Commission; Dr Papias M. Musafiri, Minister of Education, Rwanda; Dr Elioda Tumwesigye, Minister of Science, Technology & Innovation, Uganda; Dr Claes Kjellstrom, Swedish International Development Cooperation Agency (Sida) and Prof. Manasse Mbonye, Executive Secretary, National Council for Science and Technology, Rwanda.

NEW APPOINTMENTS



Vuhya Amulyoto has been appointed Head, *icipe* Human Resources Unit. Previously, she was Head of Human Resources at the Alliance for a Green Revolution in Africa (AGRA). She also served as Manager, Human Resources & Office Administration, Rockefeller Foundation. Vuhya holds an MBA and a BA from Kenyatta University, Kenya.

She is a member of the Institute of Human Resources Management – Kenya, and a Certified Human Resources Manager of the International Academy of Business and Financial Management (IABFM), USA.



Dr Oscar Mbare has been appointed a Postdoctoral Fellow, through a Wellcome Trust Training Fellowship in Public Health and Tropical Medicine, to undertake a research project titled: “Understanding the influence of newly developed irrigation schemes on malaria prevalence and the risk of malaria transmission in western Kenya in the context of malaria elimination”. Oscar holds a PhD in Medical Entomology from the London School

of Hygiene and Tropical Medicine, and he has a strong interest in the ecology of vector-borne infectious diseases. Previously, he was a Research Assistant in the Malaria Research Programme at the *icipe* Thomas Odhiambo Campus. He also served as a Research Assistant in the United States Army Medical Research Unit/Walter Reed Project (USAMRU-Kenya) at the National Influenza Centre Laboratories.



Terry Wanja Mwenda is the new Administrator of the International Journal of Tropical Insect Science, published on behalf of *icipe* by Cambridge University Press. She will provide oversight to the entire process of manuscript submission through to publication. Terry is an editor with over 12 years' experience in the publishing and media

industry. She holds a BSc in Information Sciences from Moi University and is currently pursuing an Msc in Management and Leadership at the Management University of Africa. Previously, Terry worked at Oxford University Press – East Africa, where she was the Science Publisher, managing science-related editorial projects.



Esther Wangui Ndung'u joins *icipe* as an Administrative Assistant in the Capacity Building and Institutional Development Unit. She holds a diploma in Business and Office Management from Kenya School of Professional Studies. She has over eight years of work experience

in handling functions at executive, administrative and programmes level. Previously, Esther was an Administrative Assistant at the International Livestock Research Institute (ILRI), attached to the CGIAR Research program on Livestock.



Vicky Chemutai Koech has joined *icipe* as a Communications Officer in the Technology Transfer Unit (TTU). She will assist in the planning, coordination and implementation of communication activities, to enable TTU achieve its objectives. Vicky holds a BA in Mass Communications from Makerere University, Uganda, and

a Postgraduate Diploma in Financial Management from Uganda Institute of Management. Prior to joining *icipe*, she was a Public Relations Manager at Warid Telecom, Uganda, where she was involved in maintaining close relationships with the media and other stakeholders to promote the interests of the company.

RETIREMENT



Ruth Molly Wekesa, Manager, *icipe* guest centres, retired in August 2017 after 32 years of service. Having joined *icipe* in 1985 as a receptionist and cashier at the Duduville International Guest Centre (DIGC), Ruth rose through the ranks, serving as Acting Manager, and Assistant Manager

of DIGC in 2005 and 2006 respectively, before taking on her most recent leadership role in 2011. Previously, she worked for nine years at the Kenya Revenue Authority, where she acquired the skills needed to offer quality services in the hotel industry.

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Core donors

- Ministry of Higher Education, Science and Technology, Kenya
- Swiss Agency for Development and Cooperation (SDC), Switzerland
- Swedish International Development Cooperation Agency (Sida)
- UK Aid, Government of the United Kingdom

Restricted project donors

- ACDI/VOCA Agribusiness Systems International (ASI) Kenya
- African Union
- African Women in Agricultural Research and Development (AWARD)
- AIRD (French Inter-institution Agency for Research and Development)
- Australian Centre for International Agricultural Research (ACIAR)
- 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)
- CIRAD – Agricultural Research for Development, France
- Consortium for National Health Research (CNHR), Kenya
- Cultivate Africa's Future (CultiAF) through International Development Research Centre (IDRC)/Australian Centre for International Agricultural Research (ACIAR)
- European Union
- Federal Ministry for Economic Cooperation and Development (BMZ), Germany
- Food and Agriculture Organization of the United Nations (FAO)
- German Academic Exchange Service (DAAD)
- Deutsche Forschungsgemeinschaft (DFG)
- Global Environment Facility (GEF)/United Nations Environment Programme (UNEP)
- Grand Challenges Canada (GCC)
- Humidtropics CGIAR Research Programme (CRP) led by International Institute of Tropical Agriculture (IITA)
- 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
- JRS Biodiversity Foundation through Royal Museum for Central Africa (RMCA)
- Liechtenstein Development Service (LED), Principality of Liechtenstein
- McKnight Foundation, USA
- Ministry for Foreign Affairs of Finland
- National Commission for Science, Technology and Innovation (NACOSTI), Kenya
- National Geographic Society
- Netherlands Organisation for Scientific Research (NWO)
- Newton Fund
- R. Geigy Foundation, Switzerland
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- Swedish Research Council through the Kungliga Tekniska Högskolan (KTH)
- Swiss National Science Foundation (SNSF)
- SWITCH Africa Green
- The MasterCard Foundation, Canada
- The Volkswagen Foundation, Germany
- United Nations Environmental Programme (UNEP)
- USAID—United States Agency for International Development's IPM Innovation Lab (Feed The Future Innovation Lab for Integrated Pest Management) of Virginia Tech, USA
- United States Agency for International Development Partnerships for Enhanced Engagement in Research (USAID-PEER) Science program with funding from National Academy of Sciences (NAS)
- United States Department of Agriculture (USDA)
- United States National Institutes of Health (NIH)
- United States National Science Foundation (NSF)
- Wellcome Trust, UK
- 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.

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

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