Top: Push–pull technology to control stemborers and striga weed in cereal crops provides more fodder, which in turn translates to more milk obtained from dairy cattle, such as the one that this young woman is milking.

Bottom: Push–technology enables farmers to obtain better yields of maize.

Push–pull technology

In 2013, *icipe* and Biovision Foundation for Ecological Development introduced into Ethiopia the Centre's innovative push–pull strategy, a platform technology developed over the past 20 years in collaboration with Rothamsted Research (United Kingdom) and partners in eastern Africa. This simple intercropping strategy simultaneously addresses the five key constraints of cereal–livestock mixed production systems in sub-Saharan Africa: insect pests (stemborers), the parasitic *Striga* weed (and other weeds), poor soil fertility, insufficient soil moisture, and need for high quality animal feed.

In Ethiopia, push–pull was launched in regions infested with stemborer and striga (Oromia, Amhara, Tigray, Benishangul-Gumuz), and by end of 2015, there were 4025 farmers using the push–pull technology in Tolay, Oromia Region alone.

Push–pull farmers have reported improved soil fertility, increased maize yields (of as much as 35%), and better animal production because push–pull intercrops provide excellent fodder. This has resulted in enhanced household incomes and nutrition, as well as empowerment of women farmers using the technology. Due to training provided through the programme, a critical mass of farmers and other stakeholders skilled in sustainable farming has been built. The success of the push–pull technology in Tolay has opened up opportunities for expanding the benefits of the technology across Ethiopia.

Top: Signpost outside the regional satellite station in Ethiopia, one of four stations of the *icipe* African Reference Laboratory for Bee Health.

Bottom: Soon, *icipe* shall introduce its fruit fly IPM package for farmers in Ethiopia, which includes use of food-based bait mixed with an insecticide, to lure a quarantine pest, the African invader (or Asian) fruit fly, *Bactrocera invadens* into traps

Looking Forward

In addition to the ongoing activities, *icipe* now intends to commence fruit fly integrated pest management (IPM) activities in partnership with relevant institutions in Ethiopia.

icipe shall continuously conduct monitoring and evaluation of its activities in Ethiopia, to ensure maximum benefit to intended beneficiaries.

icipe – Working in Africa for Africa

Many of Africa's problems are associated with a lack of energy for growth and development. Arthropods (insects, ticks and mites, spiders and others), the most diverse and abundant forms of life on earth, are on one hand, major contributors to the continent's lack of sustainable growth, because of their ability to reduce the output of humans, animals and plants, and on the other, because of their tremendous biodiversity, harbour great potential for Africa's development.

International Centre of Insect Physiology and Ecology (*icipe*) was established in 1970 in direct response to the need for alternative and environmentally friendly pest and vector management strategies. Headquartered in Nairobi, Kenya, *icipe* is mandated to conduct research and develop methods that are effective, selective, non-polluting, non-resistance inducing, and which are affordable to resource-limited rural and urban communities. *icipe*'s mandate further extends to conserving and utilising the rich insect biodiversity found in Africa.

icipe focuses on sustainable development, to include human health as the basis for development and the environment as the foundation for sustainability. Working in a holistic and integrated approach through the 4Hs Themes – Human Health, Animal Health, Plant Health and Environmental Health – *icipe* aims at improving the overall health of communities in tropical Africa by addressing the interlinked problems of poverty, poor health, low agricultural productivity and degradation of the environment.

icipe is the only international institution in Africa working primarily on arthropods. Therefore, capacity building of individual researchers and institutions in Africa is an integral part of all research and development activities at the Centre. The goal is to empower communities, especially women, harness potential of the youth and build capacity to use, transfer and teach *icipe*'s technologies.

COVER PHOTOS

Top left: Cows wearing the *icipe* tsetse repellent collar, an innovative technology that the Centre has introduced in Ethiopia.

Top right: Mrs Zenebech Dugassa, from Tolay, Jimma Zone, Oromia Region, in her thriving push-pull maize field.

Bottom left: Ethiopian women participating in the *icipe* IVM programme and their daughters receive tree seedlings to plant on their farms, a strategy that contributes to protecting the country's rich plant biodiversity.

Bottom right: Organic certified honey produced through *icipe*-led modern beekeeping activities.

DONORS: Biovision Foundation for Ecological Development, European Union, International Fund for Agricultural Development (IFAD), The MasterCard Foundation

Photos: icipe

icipe
African Insect Science for Food and Health

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icipe in Ethiopia

Contributing to development through human, animal, plant and environmental health research

icipe
African Insect Science for Food and Health

Map of Ethiopia: The red markers indicate zones where *icipe* is undertaking activities. (Boundaries are approximate)

Background

In 1992, after the Ethiopian Transitional Government's Ministry of Foreign Affairs had subscribed to the *icipe* charter, the International Centre of Insect Physiology and Ecology (*icipe*) started its operations in Ethiopia. The Centre signed subsequent agreements with various implementing partners in Ethiopia, including the ministries of agriculture, health, education and capacity building, the Science and Technology Commission (now Ministry of Science and Technology), and Addis Ababa University.

These arrangements gave *icipe the* mandate to contribute to Ethiopia's development by introducing its portfolio of technologies under the 4-H (health) research themes—Animal, Human, Environmental and Plant Health.

As an entry point, *icipe*, with the support of the regional government and the Science and Technology Commission, established a tsetse fly and trypanosomiasis control programme in the Southern Nations, Nationalities and Peoples Regional State (SNNPRS), in Wolayita Zone, Sodo Bedessa District.

icipe has now expanded its activities in Ethiopia to include integrated vector management for the sustainable control of malaria, beneficial and commercial insects, and push–pull technology.

Top: Because *icipe* deployed thousands of its NGU traps in selected regions in Ethiopia at the start of its operations, tsetse fly infestation rates and trypanosomiasis prevalence are lower.

Bottom: Healthy cattle grazing in an area that has now been cleared of tsetse using *icipe* technologies.

Tsetse and trypanosomiasis control

icipe's initial activities in tsetse and trypanosomiasis control in Wolayita Zone involved the deployment of 1000 NGU traps made of several pieces of coloured cloth, designed to visually attract and kill tsetse, which led to reduced infestation and trypanosomiasis prevalence. As a result, the Science and Technology Commission requested *icipe* to scale-out the activities to Gurage Zone, Ghibe Valley, in particular the Luke catchment. Later, in partnership with Biovision Foundation for Ecological Development, *icipe* expanded the activities to Tolay, Jimma Zone, Oromia Region.

icipe continues to expand its tsetse fly and trypanosomiasis control activities in Ethiopia. The Centre is assisting the government's tsetse control efforts in Asosa District, Benishangul-Gumuz Region, where it is implementing a pilot programme for the integrated control of tsetse, which includes introducing the Centre's innovative tsetse repellent collars. The technology contains a blend of chemicals identified from waterbuck, an animal that tsetse avoid in tsetse-infested areas, which, when worn around the neck of cattle, protect them from tsetse bites. In addition to supplying targets, collars, and the repellent compounds, *icipe* has provided training to technical staff from Ethiopia on various aspects, including tsetse biology and control.

Top: Community members from the Tolay settlement scheme receive practical training from *icipe* researchers on how to sample mosquito larvae from breeding sites.

Bottom: Staff from the *icipe* Ethiopia Country Office test the efficacy of biopesticides developed by the Centre to control mosquitoes.

Integrated vector management for the sustainable control of malaria

Following *icipe*'s success in the control of tsetse flies and trypanosomiasis in Ethiopia, the Centre received requests to initiate interventions for malaria, a major public health problem and impediment to socio-economic development in the country. As a result, in 2008, *icipe* commenced integrated vector management (IVM) for sustainable control of malaria in Ethiopia. As is the case in most malaria-endemic countries in Africa, the primary efforts to control mosquitoes in Ethiopia had been insecticide-based, such as the extensive deployment and use of insecticide-treated nets or house spraying. However, mosquitoes became resistant to pyrethroid insecticides used in both instances; and so the *icipe* IVM strategy recommended use of chemical as well as non-chemical methods, which they could integrate into healthcare systems for malaria control.

In partnership with Biovision Foundation for Ecological Development, *icipe* IVM activities in Ethiopia were initiated in Tolay, Oromia Region. Key components included research and demonstration of the effectiveness and impact of the interventions, and capacity building and advocacy of IVM at community and policy levels. As a result, between 2013 and 2015, *Anopheles arabiensis* adult population densities were reduced by 70%, and malaria cases among school children by half.

Top: Honey on sale at the Meles Union Organic Honey Marketplace, Agulea Town, Ethiopia, one of two marketplaces established for value addition of honey.

Bottom: Quality certified organic Ethiopian honey, royal jelly and wax products on display.

Beneficial and commercial insects activities

In 2011, *icipe* introduced modern beekeeping in Tolay Region in partnership with Biovision Foundation for Ecological Development, and in Tigray Region, through funding from the International Fund for Agricultural Development (IFAD). The Centre continues to distribute modern hives, queen excluders and accessories, and to provide training. To-date, 300 model beekeepers have been trained, while another 40 have received specialised training on rearing queens and collecting royal jelly. Close to 1200 participants are involved in these *icipe*-led modern beekeeping activities in Ethiopia. Since the project started, more than 20,000 kg of honey has been produced, and about 2,000,000 birr (close to USD 95,000) realized in earnings. Two honey marketplaces have been established for the processing, packaging and sale of honey. Organic certification of honey and wax has been completed, which has enhanced the marketability and earnings from the products.

Furthermore, in 2015, with funding from the European Union, *icipe* started bee health and pollination activities in Oromia Region, Southern Nations, Nationalities and Peoples Region, and Tigray Region, and the Holeta Bee Research Centre was established as one of four regional satellite stations for bee health in Africa. In early 2016, *icipe* and The MasterCard Foundation launched the Young Entrepreneurs in Silk and Honey project, aimed at enhancing youth employment in Ethiopia through beekeeping and silk farming enterprises.