



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, but on the other, because of their tremendous biodiversity, harbour great potential for Africa's development.

icipe – African Insect Science for Food and Health – 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 Paradigm – Human, Animal, Plant 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; consequently, capacity building of individual researchers and institutions in Africa is an integral part of all research and development activities at icipe – to empower women, harness the youth and build capacity to use, transfer and teach icipe's technologies. In this way, icipe will continue to work 'in Africa, for Africa'.

COVER PHOTOS

Top left: Winding of mulberry silk yarn in Alaage, Ethiopia on bobbins for weaving.

Top right: Mosquito scouts in urban Malindi, coastal Kenya, are trained community based resource persons (CORPs) who conduct malaria and mosquito control and surveillance activities to reduce malaria transmission in the municipality.

Bottom left: Campaign® – A *Metarhizium anisopliae*-based product for effective thrips management and sustainable production of vegetables in Africa. This icipe-developed product is being commercialised by The Real IPM Company (K) Ltd.

Bottom right: Improving the health and productivity of livestock through disease and vector control can improve the livelihoods of farming communities; furthermore, enhanced food security will give these children a better future.

Photos: icipe



The 4Hs Paradigm

Environmental, Human, Plant, and Animal Health



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ENVIRONMENTAL HEALTH

Top: *Hypotrigona gribodoi*, a stingless bee found in sub-Saharan Africa, on a coffee flower. To harvest stingless bee honey, collectors destroy the nest where the colony lives; but *icipe* has developed a hive that preserves the bee colonies.

Bottom: Surveillance for bee pests and diseases in a honey bee hive in Hadramawt, Yemen.



Environmental Health Theme

The Environmental Health Theme is taking a wide-ranging ecosystem approach to support participatory forest management and crop farming, to sustain bee pollination for food security. Through training, *icipe* is promoting commercial insect (honey bees and silk moths) farming for additional income. The Centre is also developing and supporting community-based industries aimed at producing insects as a source of food. Bioprospecting for useful products from living organisms such as arthropods, plants, and microorganisms, for pest, vector, and disease management, as well as industrial and other uses, helps conserve the natural habitat and its biological diversity.

icipe is developing a coherent risk management framework to address climate change challenges. It has established a Climate Change Science Research Network in East Africa to provide independent technical advice. Satellite remote sensing and geographic information systems (GIS) techniques produce land degradation maps, analyse floral cycles, and provide quantifiable data on climate change effects.



The 4Hs Paradigm

HUMAN HEALTH

Top: Trapping mosquito vectors of malaria using a light trap on Mageta Island, Lake Victoria, western Kenya.

Bottom: Mass trapping of mosquitoes on Rusinga Island, Lake Victoria, western Kenya, using the newly developed trap, 'Suna', derived from the Luo language name for mosquito.



Human Health Theme

The Human Health Theme addresses the challenges associated with vector-borne diseases through the development of tools and strategies to control the insect vectors, and therefore, break the transmission cycle of this diverse group of pathogens. The Theme works with Governments to contribute our science to policy discussions and formulation, and develops and implements integrated vector management programmes with communities.

icipe's research includes the control of vectors of human sleeping sickness, human arboviral infections, and malaria. Some of the current malaria projects are: mass trapping of mosquitoes using solar-powered trapping systems (SMoTs); integrated vector management (IVM); developing oviposition attractants, residual larvicides and traps (OviART); and studying the microorganisms that mosquitoes carry (endosymbionts) to understand and potentially control their ability to transmit the malaria parasite.



The 4Hs Paradigm

PLANT HEALTH

Top: A fruit fly scientist and a farm family with freshly picked mangoes from Mozambique: More than 21,000 small-scale mango growers in East, West and southern African countries are reaping the benefits of the *icipe*-led African Fruit Fly Programme for controlling the invasive and native mango fruit flies, the most destructive pests of mango, through integrated pest management approaches.

Bottom: A healthy sorghum crop in a "Push-pull" system, a technology for intensifying cereal production in East Africa through multiple benefits of effective stemborer and striga (inset) management, and enhancing soil fertility and livestock production. More than 110,245 smallholder farmers in eastern Africa are reaping the benefits of this *icipe*-led initiative.



Plant Health Theme

icipe contributes to sustainable food security in Africa through the development of pre- and post-harvest integrated pest management strategies for major agricultural, horticultural and plantation crops, through detailed understanding of the biology, ecology, and physiology of the pests and their natural enemies, in relation to the present and future climate change scenarios. Such strategies include biological control, use of behaviour-modifying chemicals, habitat management, and arthropod-active botanicals that have minimal detrimental impacts on the environment. *icipe* emphasises participatory development of control approaches that are designed to fit the needs of the farmers, and are developed on-farm with them. Key areas of *icipe's* plant health research focus on two broad groups: pests of horticultural and plantation crops (such as tomatoes, cabbages, kales, beans, onion, mango, avocado, and coffee), and pests of staple crops (such as maize, sorghum and grain legumes), destined for both domestic and export markets.



The 4Hs Paradigm

ANIMAL HEALTH

Top: Cattle fitted with repellent collars. In addition to identifying repellents from tsetse-avoided animals like the waterbuck, *icipe* scientists have identified potent synthetic repellents. These repellents are being used in repellent collars to protect cattle. This mobile technology of *icipe* keeps both cattle and herdsmen safe from tsetse and other biting flies.

Bottom: A NGU trap, one of the various technologies that *icipe* has developed for control of tsetse. The blue colour is used to attract flies. After landing they move on to the black target, and are then, while trying to escape, caught at the top into a plastic container where the heat of the sun kills them.



Animal Health Theme

Pests and diseases of livestock continue to hinder the development of large parts of Africa. In addition to being the source of milk and meat, domestic animals provide farmers with draught power, hides, social status, and wealth. *icipe* supports this prime role of animals by developing and promoting appropriate, environmentally-friendly and intelligent technologies for the sustainable management of livestock disease vectors, especially blood-feeding insects that transmit debilitating or fatal diseases. For instance, community-based tsetse trapping can reduce savanna fly populations by 99%. Repellents identified from synthetic sources or from animals avoided by tsetse are well suited for pastoralists like the Maasai of East Africa, and are also becoming popular with sedentary livestock keepers.



The 4Hs Paradigm