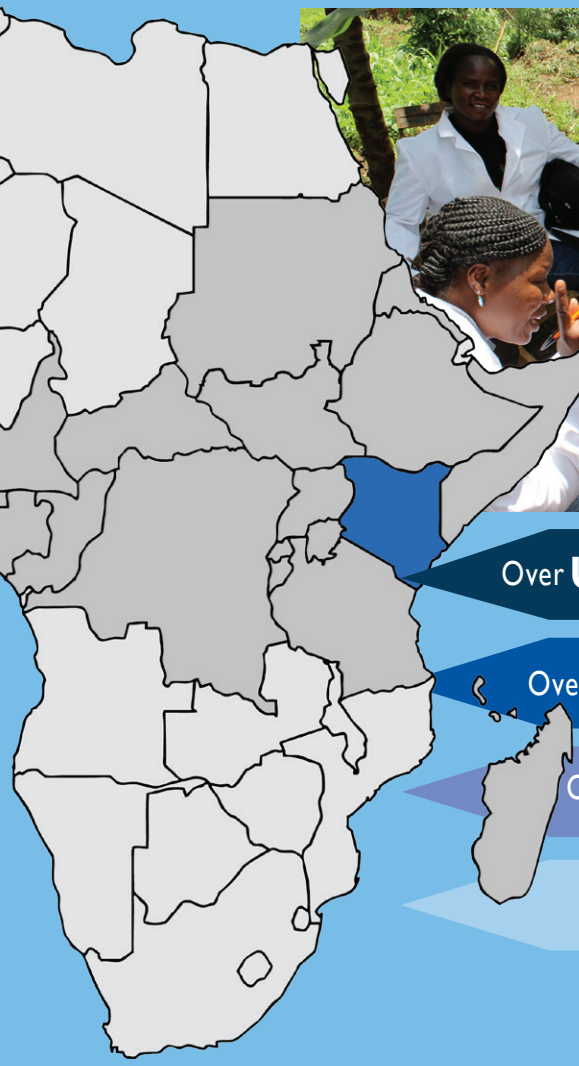
BecA-ILRI Hub in

# Kenya



**Over USD 3,335,000** Funding allocated to research and capacity building in 4 years

**Over 30** Research scholarships through Africa Biosciences Challenge Fund since 2011

**Over 100** Scientists benefited from training workshops

**Over 20** Partner institutions

**Biosciences eastern and central Africa-International Livestock Research Institute (BecA-ILRI) Hub** was established in Nairobi, Kenya, with the aim of increasing the use of cutting edge bioscience technologies to address Africa's agricultural, health, and environmental challenges. There are 18 countries in the BecA region - Burundi, Cameroon, Central Africa Republic, Congo Brazzaville, Democratic Republic of Congo, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Kenya, Madagascar, Rwanda, São Tomé and Príncipe, Somalia, South Sudan, Sudan, Tanzania and Uganda.

# The BecA-ILRI Hub in Kenya

In empowering African researchers and institutions to exploit biosciences opportunities, the BecA-ILRI Hub contributes to addressing key agricultural constraints in food production, nutrition and animal health in eastern and central African countries, including Kenya. This is achieved through partnerships with the country's national agricultural research system (NARS), development organizations and other stakeholders. Since 2010, the BecA-ILRI Hub has contributed to NARS in Kenya through various engagements including:

## Collaborative research

The projects, which include national partner-led research projects, are demand driven, responding to the high priority themes identified for increasing the productivity of food and improved agricultural systems in Kenya.

### Capacity and Action for Aflatoxin Reduction in Eastern Africa (CAAREA)

Maize is an important staple food in Kenya, providing 60 percent of daily dietary calories and is also a cash crop for 85 percent of the country's population. This important food crop is susceptible to accumulation of aflatoxins, toxic chemicals produced by a fungus present on dead plant and animal material in the soil. Aflatoxins are hazardous when eaten—they have the potential to cause cancer, are lethal in high doses, and may suppress immune systems, reduce nutrient absorption and stunt the development of infants. These toxins are colourless and odourless, making it difficult for consumers and researchers alike to identify contaminated maize and maize products.

Since 2010, CAAREA team has been working to increase the capacity for the detection of mycotoxins which will support the development of strategies to reduce their presence in the food supply. The project involves Kenyan national maize breeders, affording their institutions their first opportunity to screen breeding germplasm and released varieties for aflatoxin resistance.

*The BecA-ILRI Hub led aflatoxin project during a farmer field visit in Machakos county, eastern Kenya (photo: BecA-ILRI Hub).*

Partners in this project include James Karanja from the Kenya Agricultural and Livestock Research Organization (KALRO); and Paloma Fernandes, CEO of the Kenya Cereal Millers Association.

### African swine fever: diagnostics, surveillance, epidemiology and control

African swine fever (ASF) is a devastating emerging disease of pigs that causes almost 90-100 percent mortality in pig herds.

The BecA-ILRI Hub project on ASF seeks to contribute to disease management strategies that will benefit smallholder farmers in more than 20 countries in eastern, central, western and southern Africa including Kenya. Currently there is limited data on total numbers of farmers affected in Africa; this project has contributed to a better understanding of the impacts for Kenya.

As a result of the project, pig farmers in Kenya are better linked to the local District Veterinary Services for advice and support on general disease management and control of ASF outbreaks. There is also an increased awareness of biosecurity measures in pig

production by farmers. Through the project's validation of rapid real-time field diagnostics kits, more rapid confirmation of ASF outbreaks is enabling veterinary authorities to implement control measures during outbreaks. A major finding regarding the non-detection of the virus through blood sampling due to its location in tissues is critical to disease surveillance and monitoring, as well as quarantine strategies.

The Kenya Ministry of Agriculture Livestock and Fisheries's department of Veterinary services is a key partner in this project represented by Dr Jacqueline Kasiiti Lichoti.

## Climate-smart Brachiaria grasses for improved livestock production in East Africa

Livestock production, which contributes to 35 percent of the agricultural gross domestic product in sub-Saharan Africa (SSA), is greatly hampered by the shortage of quality forage.

The inherent ability of Brachiaria grasses to grow in drought and marginal soils make them the ideal forage for the over 54 percent of SSA which comprises arid and semi-arid zones. The BecA-ILRI Hub's program on Brachiaria grasses seeks to improve livestock productivity in five eastern African countries by increasing the availability and quality of these grasses that are adapted to drought and marginal soils.

The research being conducted with Dr Donald Njarui of KALRO as the lead national partner, has engaged smallholder farmers in Brachiaria cultivation and plans to develop seed production as a source of income. The research team has also successfully created awareness among the farmers, researchers, extension agents, policy makers and politicians on the importance of Brachiaria grasses as quality forage.

## Adding nutrition to diets through low cost sustainable processing of amaranth

Across East Africa, the common food is starchy staples particularly maize. Maize is a good source of calories but is devoid of essential amino acids. Traditional plants such as amaranth

*Dr Elias Gichangi from KALRO Katumani (l) and Dr Sita Ghimire, BecA-ILRI Hub during a site visit of the Brachiaria project (photo: ILRI\Samuel Mungai).*

offer the opportunity of complementing the nutritional properties of starchy staples since they are vital sources of macro/micro-nutrients and bioactive compounds that have health benefits. The amaranth project is addressing the main challenges facing the production and value-addition chain of the leaves and grain of the crop.

The project is engaging farmers and industrial stakeholders to produce nutritious, safe and shelf stable food products for better livelihoods in Kenya. The team has set the stage for the stimulation of a vibrant market for amaranth products through the strong networks created between growers and processors of the crop.

The partnering institution in this project is the Jomo Kenyatta University of Agriculture and Technology in Kenya, with Dr Daniel Sila, a lecturer at the institution as the key national partner.

## Healthy crops and livestock: tools to detect and address disease (diagnostics projects)

These projects are developing, validating and will establish simple and effective diagnostic tools for key livestock and crop diseases. The technologies developed will then be transferred to national laboratories in Kenya.

Partners in these projects include the Department of Veterinary Services, University of Nairobi and KALRO.

# Institutional partnerships

By engaging key researchers and strategic laboratories in Kenya, the BecA-ILRI Hub has been instrumental in driving change in the country's agricultural research institutions and universities. The BecA-ILRI Hub has successfully helped build linkages between Kenyan institutions and other national and international agricultural research institutions; provided technical and advisory support on best practices to save on costs in running their facilities; and identified institution specific interventions that have resulted in enhanced agricultural biosciences capability.

## Partnering with KALRO to combat crop and livestock disease

Through ongoing collaborations with various national agricultural research institutions as well as crop and animal health authorities, the BecA-ILRI Hub has responded to emerging agricultural priorities in Kenya with both immediate and intermediate solutions.

Research conducted through a BecA-funded fellowship by Department of Veterinary Services-Central Veterinary Laboratory researcher Dorcus Omwoga, in collaboration with the BecA-ILRI Hub diagnostics research project, validated a lamp assay for lumpy skin disease virus that had been developed in 2012. The national diagnostic laboratory now has the capacity to apply this reliable, simple to use and in-expensive tool to rapidly detect this disease of cattle that causes serious economic losses due to high morbidity from progressive debilitating effects and production losses from severe and permanent damage to hides.

A BecA-ILRI Hub funded fellowship by KALRO researcher Jane Mwathi, carried out in collaboration with the BecA-ILRI Hub's virus discovery project facilitated an in-depth study of the microorganisms causing the devastating Maize lethal nechrosis disease (MLND) which is threatening maize production in East Africa. The information generated from this research will contribute to the development of effective on-farm disease management strategies to be implemented nationwide and which will complement the existing strategies of uprooting and removing the affected plants; crop rotation or growing of alternative crops; early planting; and chemical spraying of vectors under specific circumstances.

## Partnering institutions

- Ministry of Agriculture Livestock and Fisheries
- Kenya Agricultural and Livestock Research Organization
- The Department of Veterinary Services
- Kenya Medical Research Institute
- Kenya Plant Health Inspectorate Services
- Kenya Industrial Research and Development Institute
- Kenya Wildlife Services
- National Veterinary Research Center
- Chepkoilel University College
- Egerton University
- Jomo Kenyatta University of Agriculture and Technology
- Kenyatta University
- Maseno University
- Moi University
- University of Nairobi
- African Insect Science for Food and Health (*icipe*)
- Annico Enterprises, Kenya
- VetAID Kenya
- and many others.

# Capacity building

The BecA-ILRI Hub is expanding the base of expertise in agricultural research in Kenya by hosting scientists and graduate students to conduct research, and by conducting training programs. Research placements combine training in the latest technologies, as well as giving researchers the opportunity to conduct research on topics addressing food and nutritional insecurity and livestock health.

*Research Associates Inosters Nzuki (l) and Tina Kyalo (2nd l) at work in the BecA-ILRI Hub (photo: BecA-ILRI Hub\Valerian Aloo).*

There are four main categories of capacity building and training activities that have involved several scientists and graduate students from Kenya:

## Post graduate students

Post graduate students (MSc and PhD candidates) have conducted research at the BecA-ILRI Hub either by being attached to existing Hub hosted-research projects or through stand-alone thesis projects.

## Small group training and short-term visiting scientists

Smaller groups of up to five participants have also received tailor-made training and laboratory work programs. Visiting scientists from Kenyan universities or other research institutes have come to the BecA-ILRI Hub to use the facilities or equipment to advance their research projects.

## Training workshops

Since 2009, over 100 Kenyan scientists have benefited from group training workshops which emphasize problem-solving, hands-on training, seminars, discussions and laboratory practical work. These trainings are developed within the BecA-ILRI Hub's core competencies such as genomics, bioinformatics, diagnostics, molecular marker development and applications, DNA sequencing and genotyping, and scientific paper writing.

## Africa Biosciences Challenge Fund (ABCF)

This is a competitive fund which facilitates access to the BecA-ILRI Hub for scientists and students from African National Research Institutes and universities. Through this program, Kenyan scientists have received support for their research fellowships, pilot project grants and training.

## The following Kenyan scientists have benefited from the Africa Biosciences Challenge Fund fellowship program:

**Vincent Were**
Biosciences eastern and central Africa Hub
1 October—31 December 2010
Project title: *Characterizing aflatoxin accumulation and susceptibility factors in Kenyan smallholder farmer maize*

**Esther Kanduma**
University of Nairobi
5 January—31 July 2011
- *Understanding the genetic diversity of Rhipicephalus appendiculatus, the tick vector for East Coast Fever, using EST-SSR markers*

16 April 2012—22 July 2013
- *Development and laboratory evaluation of a lateral flow test (LFT) for the serodiagnosis of Theileria parva infection in cattle*

7 February—28 April 2014
*Isolation, recombinant expression and generation of anti tick vaccines from a novel secretory-type iron transporting protein Ferritin 2 from Rhiciphalus appendiculatus*

**Ruth Wanyera**
Kenya Agricultural and Livestock Research Organization
23 November 2011—10 August 2012
Project title: *Molecular characterization of wheat stem rust and UG99 lineage*

**Sheila Ommeh**
International Livestock Research Institute
2 January—2 July 2012
Project title: *Genetic diversity among five chicken populations in Kenya: mapping associations with economically important Mendelian traits*

**Eric Magembe**
Biosciences eastern and central Africa Hub
5 March—5 December 2012
Project title: *SSR assessment of genetic variation and mating type genes in Aspergillus flavus isolates sampled from soils, and maize kernels at pre- and post-harvest in eastern Kenya*

**Dora Kilalo**
University of Nairobi
16 April—16 October 2012
Project title: *Molecular characterization and pest diagnostic of passion fruit woodiness disease*

**Grace Wanjiku Gachara**
Kenya Forestry Research Institute(KEFRI)
1 September 2012—28 February 2013
Project title: *Biocontrol of aflatoxin producing fungus aspergillus flavus in stored maize in Kenya*

**Boniface Juma Walla**
Kenya Agricultural and Livestock Research Organization
10 October 2012—6 May 2013
Project title: *Genetic relationships among Kenyan napier grass (pennisetum purpureum schumacher) germplasm using morphological and molecular methods*

**Lilian Wambua**
University of Nairobi
1 November 2012—30 September 2013
Project title: *Genetic diversity of Malignant Catarrhal Fever viruses in Kenya*

**Calleb Olweny Ochia**
Kenya Sugar Research Foundation
15 July 2013—15 January 2014
Project title: *Assessment of genetic diversity in sweet sorghum genotypes using SSR markers*

**Joshua Amimo**
University of Nairobi
1 November 2013—1 April 2014
Project title: *Molecular epidemiology of selected enteric viruses in swine in east Africa region*

**Irene Njagi**
Kenya Agricultural and Livestock Research Organization
28 Oct 2013—27 Apr 2014; 5 Jan 2015—4 May 2015
Project title: *Development of genetic transformation protocols for Kenyan cassava landraces*

**Irene Onyango**
Ministry of Agriculture Livestock and Fisheries, Department of Veterinary Services
1 July—31 December 2013
Project title: *Baseline study on honey bee viruses in Kenyan honey bee colonies*

**Berine Awuor**
30 September—31 December 2013
Moi University, School of Public Health
Project title: *Nutrient composition of selected Kenyan native edible mushroom species*

**Jane Wamaitha**
Kenya Agricultural and Livestock Research Organization
1 November 2013—30 July 2014
Project title: *Understanding the genomics of Maize Lethal Necrotic Virus and other potyviruses*

**Florence Munguti**
Kenya Plant Health Inspectorate Services (KEPHIS)
2 June 2014—28 February 2015
Project title: *PCR based diagnostics of passion fruit woodiness disease in support of phytosanitary services*

**Fredah Rimbeira**
Jomo Kenyatta University of Agriculture and Technology
2 June 2014—27 February 2015
Project title: *Genetic diversity and association mapping of beta-carotene production of mango germplasm from Kenya*

**Lilian Okiro**
Egerton University
4 July 2014—4 January 2015
Project title: *Detection of Ralstonia solanacearum species by Loop Mediated Isothermal Amplification*

**Dorcus Achieng Omoga**
Veterinary Research Laboratories
2 June 2014—2 March 2015
Project title: *Improvement of the diagnostic capacity for diseases caused by capripoxviruses*

**Carolyne Anaye Omukoko**
Chuka University
1 August 2014—31 January 2015
Project title: *Beauveria bassiana as an endophyte to control red spider mites Tetranychus evansi in potatoes*

**Sheila Okoth**
University of Nairobi
18 December 14—18 June 2015
Project title: *Characterization of Aspergillus Flavus isolates from maize kernel and maize cropped soils from different maize growing regions of Kenya*

**Jane Ambuko**
University of Nairobi
1 Oct 2014—7 Aug 2015 ; 24 Aug 2015—27 Nov 15
Project title: *Molecular and Phytochemical Characterization of Spider Plant Accessions*

**Rachel Okeyo**
University of Nairobi
Project title: *Cloning of P5CS gene into tumefaciens*

**Nina Wambiji**
Kenya Marine & Fisheries Research Institute
1 October 2014—30 April 2015
Project title: *Application of next generation sequencing approaches to assess the genetic diversity of Rabbitfish species from Kenya*

**Davis Gimode**
Kenyatta University
2 June 2014—31 March 2015
Project title: *Development of genomic resources for finger millet breeding through transcriptome analysis*

**Eric Owuor Mikwa**
Kenyatta University
2 June 2014—31 March 2015
Project title: *Transcriptome analysis of finger millet at critical stages of Striga infestation*

**Henry Sila Nzioki**
Kenya Agricultural and Livestock Research Organization
2 June 2014—31 January 2015
Project title: *Identification, occurrence and distribution of Brachiaria diseases in Kenya*

**David Odongo**
University of Nairobi
16 September 2014—15 September 2015
Project title: *Molecular cloning and expression of a vaccine antigen against infection with the larval stage of Echinococcus granulosus*

**Naftal Ombogo Ondabu**
Kenya Agricultural and Livestock Research Organization
2 June 2014—30 December 2014
Project title: *Genetic characterization of Brachiaria grass ecotypes in Kenya*

**Stephen Indieka Abwao**
Egerton University
1 July 2014—29 May 2015
Project title: *Regeneration and transformation of Kenyan Taro (Colocasia esculenta) cultivars via indirect somatic embryogenesis*

**Milcah Wagio Kigoni**
Kenyatta University
1 October 2014—30 March 2015
Project title: *Prediction of immune responsive epitopes in Theileria parva and its tick vector Rhipicephalus appendiculatus*

**Triza C. Tonui**
Jomo Kenyatta University of Agriculture and Technology
15 January 2015—14 January 2016
Project title: *Gene expression profiling during early stages of infection of bovine cells by the parasite Theileria parva*

**Ndanu Anne**
Kenyatta University
4 March 2015—3 January 2016
Project title: *Uncoupling Interaction between Maize Chlorotic Mottle Virus (MCMV) and Sugarcane Mosaic Virus (SCMV) to Develop Virus Resistant Maize*

**Bernard Korir**
Kenya Agricultural and Livestock Research Organization
16 June 2015—15 December 2015
Project title: *Effects of selected supplements of beef cattle productivity and rumen microbiology in Makueni county*

**Damaris Mwangi**
Kenya Agricultural and Livestock Research Organization
13 July 2015—12 April 2016
Project title: *Microbial communities associated with Pennisetum mezianum, Chrysopogon aucheri and Chloris roxburghiana from the rangelands of Northern Kenya*

**Elijah Nyamwange**
Kenya Agricultural and Livestock Research Organization
3 August 2015—2 February 2016
Project title: *Assesing viability of pasture germ plasm conserved at the national genebank of Kenya*

In addition, to the fully funded ABCF fellows, over 50 visiting scientists and graduate students have conducted their research at the BecA-ILRI Hub in key priority research areas including crop improvement; food safety and improved nutrition; livestock productivity; climate change reslience; and low input crop and livestock for alternative nutrition and income sources.


*Benson Onyango, Lecturer Chuka University and recipient of the Africa Biosciences Challenge Fund fellowship in his experimental field of Bambara groundnuts in Nyanza, Kenya (photo: KALRO).*

biosciences eastern and central africa

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