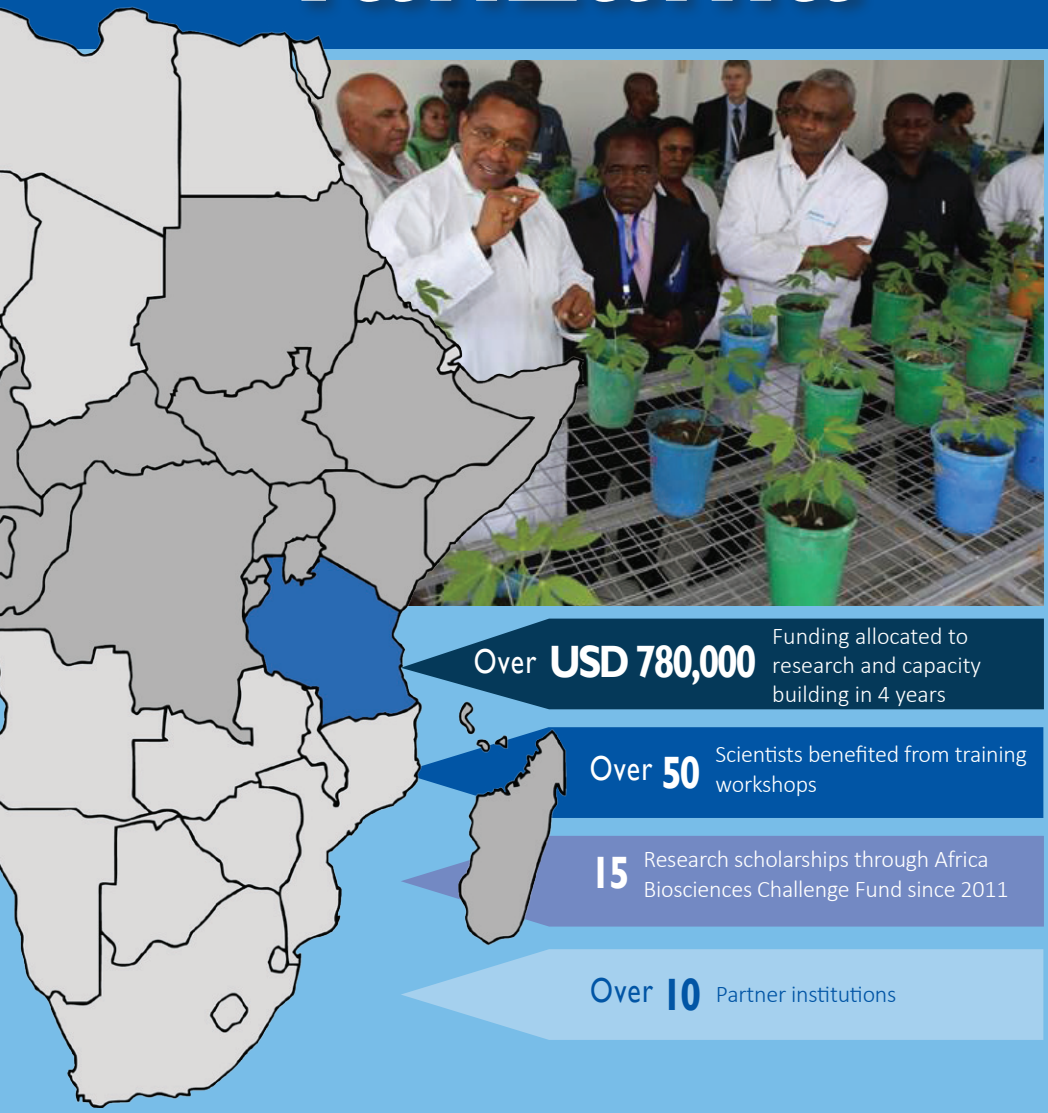
BecA-ILRI Hub in

# Tanzania





Over **USD 780,000** Funding allocated to research and capacity building in 4 years

Over **50** Scientists benefited from training workshops

**15** Research scholarships through Africa Biosciences Challenge Fund since 2011

Over **10** 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 Tanzania

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 Tanzania. 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 Tanzania 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 Tanzania.

*Dr Jagger Harvey (l), PI of the BecA-ILRI Hub led aflatoxin project and Dr Arnold Mushongi, Tanzania national partner from ARI during a farmer field visit in Arusha, Tanzania (photo: BecA-ILRI Hub).*

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

Maize is an important staple food in Tanzania, 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, the CAAREA team has been working to increase the capacity for the detection mycotoxins which will support the development of strategies to reduce their presence in the food supply. The project involves Tanzanian national maize breeders, affording their institutions their

first opportunity to screen breeding germplasm and released varieties for aflatoxin resistance.

Partners in this project include Arnold Mushongi and team from the Tanzanian Agricultural Research Institute (ARI); Deogratias Lwezaura and team from the Tanzania Ministry of Agriculture and Food Security; and Said Massomo from the Open University of Tanzania.

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

The amaranth project is addressing the main challenges facing the whole production and value-addition chain (from farm to consumption) of the leaves and grain of amaranth.

The project integrates agricultural practices, food science and technology, and engaging farmers and industrial stakeholders to produce nutritious, safe and shelf stable food products for better livelihoods in Tanzania. 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.

Tanzania partners in this project include Sokoine University of Agriculture and The World Vegetable Center (AVRDC).

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

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 Tanzania.

The testing and validation of the Capripoxviurses and Contagious Caprine Pleuropneumonia diagnostic assays is being conducted at the BecA-ILRI Hub using samples collected in Tanzania. Once the technology is validated, staff from the Tanzania Veterinary Laboratory Agency (TVLA) will receive training in the use of these assays.

In partnership with the Mikocheni Agricultural Research Institute (MARI), diagnostic assays are being developed for for the production of virus-free yam planting material.

## Domestication of wild edible mushroom species

Working with local communities, the project team analyzed the diversity of wild edible mushrooms from Kisarawe forest in the coastal region, Magamba and Bingu forests in Tanga region, Udzungwa forest in Morogoro region. The team also developed cultivation methods for selected varieties; analyzed the nutrient composition of both wild and cultivated native mushrooms; and surveyed people currently collecting wild mushrooms to understand which mushrooms they use, and how they use them as part of their dietary intake. The project was led by Amelia Kivaisi and Donatha Tibuhwa from the University of Dar es Salaam.

*Ibrahim Juma (l) and Juma Hussein from University of Dar es Salaam study wild mushrooms in Udzungwa forest, Tanzania (photo: University of Dar es Salaam).*

# Institutional partnerships

By engaging key researchers and strategic laboratories in Tanzania, 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 Tanzanian 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.

## Partner institutions

- United Republic of Tanzania
- Ministry of Agriculture, Food Security and Cooperatives
- Ministry of Livestock Development
- Department of Veterinary Services (DVS)
- Open University of Tanzania
- Sokoine University of Agriculture (SUA)
- University of Dar es Salaam
- Africa Rice Centre (ARC)
- Animal Diseases Research Institute (ADRI)
- Mikocheni Agricultural Research Institute (MARI)
- National Livestock Research Institute

## Mikocheni Agricultural Research Institute (MARI)-BecA partnership

Through an ongoing collaboration with the BecA-ILRI Hub, the molecular biology laboratory at MARI has received support to identify and acquire an informatics server and associated tools for genomics data storage, management and analysis. Researchers from the institute, led by molecular plant virologist Joseph Ndunguru, have recieved specialized bioinformatics training delivered by the BecA-ILRI Hub in collaboration with the Swedish Agricultural University (SLU) which is enabling them better manage and analyse their data. Additionally, they have received training in the use of molecular laboratory equipment.

The MARI-BecA partnership is providing opportunities for Tanzanian graduate students affiliated to MARI to recieve training and mentorship from the BecA-ILRI Hub and affords the institute genomics and bioinformatics support for its research in cassava virus diseases. Other areas of collaboration are being developed including the possible establishment of a virus indexing laboratory at MARI.

*Dr Jospeh Ndunguru in his molecular biology laboratory in Mikocheni, Tanzania (photo: MARI).*

## Nelson Mandela African Institute of Science and Technology (NM-AIST) -BecA partnership

On 14 March 2013, the BecA-ILRI Hub and NM-AIST signed the *'Joint Capacity Development, Technology and Knowledge Transfer Initiative agreement'*. Through this partnership, both institutions are benefiting from each other's resources and scientific knowledge by sharing skills, technologies and facilities to enhance their research and capacity building programs via exchange visits by researchers. The institutions will also conduct collaborative agricultural biosciences research aimed at addressing food safety and security in the region.

As an initial implementation of the agreement, Morris Agaba, professor at NM-AIST School of Life Sciences and Bioengineering (S-LSBE), took up a joint appointment with the BecA-ILRI Hub. Agaba provides overall leadership of BecA-led project *"Harnessing genetic diversity for improving goat productivity in Africa"* which brings together partners from eastern and central African countries including Cameroon, Ethiopia, Kenya and Tanzania.

*Prof. Burton Mwamila, Vice Chancellor, NM-AIST (l) and Dr. Appolinaire Djikeng, Director, BecA-ILRI Hub on the signing of the MoU at NM-AIST in Arusha, Tanzania (photo: NM-AIST).*

*Participants of the BecA-ILRI Hub 2013 Annual Scientific Writing Workshop conducted at NM-AIST in Arusha, Tanzania (photo: BecA-ILRI Hub\Valerian Aloo).*

# Capacity building

The BecA-ILRI Hub is expanding the base of expertise in agricultural research in Tanzania 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.

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

### Post graduate students

Post graduate students (MSc and PhD candidates) have conducted research at the 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 received tailor-made training and laboratory work programs. Scientists from Tanzanian universities or other research institutes have come to the Hub to use the facilities or equipment to advance their research projects.

## Training workshops

A number of Tanzanian 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, over 15 Tanzanian scientists have received support for their research fellowships, pilot project grants and training.

## The following Tanzanian scientists have benefited from the Africa Biosciences Challenge Fund fellowship program at the BecA-ILRI Hub since 2010

**Joseph Ndunguru**
Principle Agricultural Research Officer, Mikocheni Agricultural Research Institute (MARI),
1 December-30 December 2010
**Project title:** Molecular characterization of coat protein gene of wider isolates of Cassava.

**Hashim Mangosongo**
Assistant Lecturer, University of Dar es Salaam
15 January-15 April 2012
**Project title:** Genetic diversity of wild rice (*Oryza longistaminata*) in selected areas of Tanzania.

**Gladness Elibariki**
Assistant Lecturer, University of Dar es Salaam
12 January-15 April 2012; 12 May-12 July 2012
**Project title:** Genetic improvement of Tanzanian cassava landraces against cassava mosaic disease using RNA interference.

**Ibrahim Juma**
MSc student, University of Dar es Salaam
25 September 2013 - 10 April 2014
Project title: Bioprospecting of wood-based saprophytic edible mushrooms from selected indigenous forest, Tanzania.

**Juma Hussein**
MSc student, University of Dar es Salaam
25 September 2013- 10 April 2014
Project title: Bioprospecting of leaf litter and soil based saprophytic wild edible mushrooms from selected indigenous forests in Tanzania.

**Shamsa Salum**
Mikocheni Agricultural Research Institute
10 October 2013 - 10 April 2014
Project title: Development of micropropagation protocols for African baobab.

**Hamza Nassoro Msangi**
Mikocheni Agricultural Research Institute
11 October 2013 - 10 April 2014
Project title: Genotyping of baobab from Tanzania using short sequence repeats and gene-based sequencing.

**Julius Mwanandota**
Tanzania Veterinary Laboratory Agency (TVLA)
11 October 2013 - 10 April 2014
Project title: Improvement of Lumpy Skin Disease control by use of simple and efficient diagnostic tool.

**Ramadhani Juma Lipala**
Mikocheni Agricultural Research Institute
11 October 2013 - 10 April 2014
Project title: Screening and sequencing viruses infecting yam in Kagera region in Tanzania.

**Siha Mdemu**
Tanzania Veterinary Laboratory Agency (TVLA)
11 October 2013 - 10 April 2014
Project title: Development and testing of a LAMP assay for control of Contagious Caprine Pleuropneumonia in Tanzania.

**Samson Kilaza Mwaikono**
The Nelson Mandela African Institute of Science and Technology (NM-AIST)
1 October 2013 - 10 April 2014
Project title: Molecular diversity of bacteria from pigs around dumps and their importance to animal and human health.

**Fabian Manoza**
Ministry of Agriculture, Food Security and Cooperatives
4 November 2013 - 4 May 2014
Project title: Quantification of Aflatoxin contamination in hybrid maize varieties produced under optimal and sub-optimal levels of nitrogen and phosphorus fertilizer in Tanzania.

**Elpidius Rukambile**
Tanzania Veterinary Laboratory Agency (TVLA)
11 October 2013 - 9 May 2014
Project title: Validation, adoption and adaptation of Loop-mediated isothermal amplification (LAMP) and Reverse line Blot (RLB) tests for diagnosis of important tick-borne diseases (TBD) and Molecular characterization of *Theileria parva.*

**Hilda Bachwenkizi**
Mikocheni Agricultural Research Institute
18 July 2013 - 18 July 2014
Project title: Development of lamp assay for detection of cassava brown streak disease causal viruses.

**Benigni Temba**
Lecturer, Sokoine University of Agriculture/ PhD Fellow, University of Queensland
01 Oct 2014 - 30 April 2015
Mycotoxins and Mycotoxigenic fungi in Maize in East Africa: Surveillance and Characterization

In addition, to the fully funded ABCF fellows, over 10 visiting scientists and graduate students from Tanzania 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.

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