

Beca-ILRI Hub Research Fellows'  
Impact Statements Vol 1

# Building a community of **Science Leaders in Africa** *The Africa Biosciences Challenge Fund*



biosciences  
eastern and central africa



**ILRI**  
INTERNATIONAL  
LIVESTOCK RESEARCH  
INSTITUTE

© 2014 Biosciences eastern and central Africa-International Livestock Research Institute (BeCA-ILRI) Hub  
Editing: Ethel Makila  
Design and layout: Ethel Makila  
Printing: Ecomedia

# FOREWORD

The Africa Bioscience Challenge Fund (ABCF) represents the brand for the BecA-ILRI Hub's Capacity Building Program. It is an innovative approach to building Africa's biosciences capacity and leadership while at the same time tackling priority agricultural constraints through (1) research fellowships that enable African scientists spend up to 12 months addressing key agricultural constraints through research using high-end research facilities; (2) hands-on training workshops to strengthen and refine relevant research skills (3) national agricultural research system (NARS) institutional capacity building through support and mentoring of African scientists and improvement of laboratory facilities; (4) brokering and catalyzing connectivity between scientists within Africa and beyond.

Since inception in 2010, the ABCF program has received over 1000 applications for research placements and close to 6000 applications for training workshops. Through this program, the BecA-ILRI Hub has trained more than 120 NARS researchers in bioscience through research placements, and over 300 scientists through short-term training workshops. The resulting research outputs have led to the publication of highly rated scientific papers in international peer-reviewed journals.

The remarkably successful ABCF program is now recognized in Africa as a high-profile science and capacity building program and a successful model for delivering capacity strengthening and research outcomes for the region. It has had a distinct impact on national programs and their agendas, and contributed to the development of new collaborations and research programs on key regional priorities in Africa. The ABCF provides a clear path for better engagement between advanced research institutions and African NARS. The ABCF program is poised to support African NARS and sub-regional organizations as key actors for implementation of the new Science Agenda for African Agriculture (S3A). Recent independent assessments have suggested that the ABCF is leading to downstream impacts. In 2014, *Dalberg Global Development Advisors* concluded... ***“Our findings were very positive and point to the significant reach and impact the ABCF program has achieved in a short timeframe. Over 90% of stakeholders stated that the BecA-ILRI Hub promotes access to world-class research and training facilities, builds the biosciences capacity of individuals and institutions, and promotes African scientists to lead and sustain biosciences research in Africa”.***

The success of the ABCF program has been achieved through strong partnerships and linkages with national programs, sub-regional organizations, private sector and donors.

This booklet presents a very limited, but representative (in context and quality), sample profile of ABCF alumni and their work supported under the program.

***June 2014***



*(photo credit: ILRI/Zerihun Sewunet)*

## MOLECULAR CHARACTERIZATION OF WHEAT STEM RUST AND UG99 LINEAGE IN KENYA

Ruth was awarded an ABCF fellowship for a period of nine months from 22 November 2011 – 10 August 2012, to determine different populations of wheat stem rust in the four wheat growing regions of Kenya and determine if there is any exchange of geneflow between the populations.

Wheat production is faced by many challenges, among them wheat stem rust, a disease causing severe losses to wheat production in many parts of the world. Heavy rust infections of this disease may cause yield losses of 100% on susceptible varieties with the

most highly affected farmers being the smallholders who are not able to use fungicides due to the high costs.

For over three decades, the problem of this fungal disease had been solved through the use of genetic resistance. However, the pathogens causing the rust change rapidly, often by mutation and the detection of a new, virulent race of stem rust called Ug99 in Uganda has raised major concerns. The Ug99 has spread to the wheat growing areas of Kenya, Ethiopia, Yemen, Iran, Sudan, Eritrea, Tanzania, South Africa, Zimbabwe, Mozambique

and South Africa. It is predicted to spread towards North Africa, Middle East, Asia and beyond, raising serious concerns of major epidemics that could destroy the wheat crop in various parts of the world. More variants of race Ug99 (TTKSK): TTKST, TTTSK, PTKSK PTKST, show that Ug99 is evolving. Regular monitoring, sampling, identification and genetic characterization of the races provide knowledge on the pathogen population dynamics and evolution. The information generated through Ruth's study is useful to the wheat breeding team both nationally and internationally.



## Ruth Wanyera, Principal Research Scientist/ National Wheat Coordinator, Kenya Agricultural Research Institute, Njoro Co-funded by African Women in Agricultural Research and Development (AWARD)

Securing the ABCF fellowship was a great achievement for me. The moment I got the fellowship, I enrolled for PhD studies at Egerton University and am using part of the results generated during the placement to write my thesis. I don't think I would have been able to enrol for my PhD without this fellowship.

Through the fellowship, I acquired the skills to address yet another wheat rust disease - yellow rust, an equally economically important fungal disease globally. I have been able to transfer the skills I learned to one of the young women scientists I mentor and who is enrolled for a PhD through a joint research proposal I wrote with scientists in the UK and India.

*(wanyera @plantprotection.co.ke)*



**The knowledge and skills I acquired at the BecA-ILRI Hub, the support from AWARD and from all the donors who support the two institutions are jsuch a blessing to my career. Thank you BecA for being there for African scientists!**

## Dawit Beyene Kidanemariam, Researcher, Ethiopian Institute of Agricultural Research (EIAR) and PhD student at Queensland University of Science and Technology, Australia



**My growth as a researcher and the skills I am now using for my PhD research are thanks to the time spent at the BecA-ILRI Hub. In addition, the contacts I developed and the scientific circle I now belong to is an important component of my career development. I could never forget the BecA-ILRI Hub Team!**

The preliminary results from my research at the BecA-ILRI Hub gave more insight to the extent of the problem of viral diseases not only in taro but also in other vegetatively propagated crops in Ethiopia. I have given three practical trainings and three seminars to researchers from different laboratories on plant virus diagnostics in planting materials before dissemination to farmers. A bigger project to address the problem of taro viruses in the region has been designed and I will undertake part of the research for this project as my PhD studies funded by an Australian Awards for Africa scholarship. My PhD which will be co-supervised by a BecA-ILRI Hub scientist will be carried out partly at Queensland University of Science and Technology, Australia and at BecA. The manuscript developed from my work during the ABCF fellowship is currently under preparation before submission for publication.

*([dawiteth@gmail.com](mailto:dawiteth@gmail.com) /  
[d.kidanemariam@qut.edu.au](mailto:d.kidanemariam@qut.edu.au) )*

## THE OCCURRENCE AND DISTRIBUTION OF VIRAL DISEASES OF TARO IN ETHIOPIA

Dawit Beyene was awarded a fellowship for a period of six months from 16 July 2012 – 14 January 2013 to study the occurrence and distribution of viral diseases of taro in Ethiopia.

A large population in south and southwest Ethiopia solely depends on the root crops enset, potato, sweet potato and taro for their daily food. Taro is a tropical plant grown primarily for its edible starchy corms. Being vegetatively propagated, taro is prone to viral infection and as a result, its production has declined significantly.

The main objective of this project was to determine the identity and incidence of viruses associated with taro in Ethiopia. The results of the study show that there is a high infestation of taro plantations by Dasheen mosaic virus (DsMV) and possibly two new viruses. Further investigation of these viruses is still in progress.







*(photo credit: IITA)*

## GENETIC TRANSFORMATION OF UGANDAN FARMER PREFERRED CASSAVA CULTIVARS FOR VIRUS RESISTANCE

Hellen was awarded a fellowship for a period of three months from 5 June – 4 September 2013 to carry out a study on genetic transformation of Ugandan farmer preferred cassava cultivars for virus resistance. The aim of her study was to ascertain the ability of the preferred Ugandan genotypes of cassava to be transformed using molecular techniques like polymerase chain reaction.

Cassava, a major staple food crop and source of income for over 800 million people in eastern, central and southern Africa is significantly affected by Cassava mosaic

disease (CMD) and Cassava brown streak disease (CBSD). Concurrent epidemics of the two diseases are currently ravaging cassava in East and Central Africa.

Conventional breeding to develop virus resistant cassava varieties is hampered by the high degree of genetic variation, long breeding cycle, genetic overload, low pollen fertility, self-incompatibility and low fruit set rate. Therefore, genetic transformation of cassava has been recommended as a complementary approach.

Genetic engineering has shown great potential in cassava genetic

improvement and has been used to counteract some of the limitations of conventional breeding. To date, three different genetic transformation systems have been developed.

Given that different genotypes respond differently to the genetic transformation systems in place, there is need to develop protocols with respect to the different genotypes. Specifically, genetic transformation protocols need to be developed for farmer preferred cultivars which are already locally adapted and accepted.



## Hellen Beatrice Apio, Research Assistant, National Crops Resources Research Institute (NaCRRI) Namulonge, Uganda

The research I conducted at the BecA-ILRI Hub was very successful and as a result I have been able to demonstrate the same technique at my home institute's tissue culture and transformation platform. The techniques I have learnt have been fed into the institution's existing projects within the root crops program for instance the *Virus Resistant Cassava for Africa Project (VIRCA)*, whose focus is to engineer cassava plants for resistance to disease; and the *Cassava Seed Systems Project* which is meant to produce clean planting materials which will be availed and made accessible to farmers in the East African region, thus improving livelihoods of farmers.

([apiohb@yahoo.com](mailto:apiohb@yahoo.com))



**The skills that I acquired during my fellowship at the BecA-ILRI Hub made it possible for me to impact mainstream research at my home institution, with successful results. I would like to sincerely thank the BecA-ILRI Hub partners and donors who made my fellowship possible.**

Christian Keambou Tiambo, Lecturer, University of Buea, Cameroon; African Principal Investigator – joint African and Brazil project



**Thanks to the ABCF fellowship, I finalized and successfully defended my PhD and won the Africa Brazil grant, both of which contributed to my promotion from Assistant lecturer to Senior lecturer. Now many lecturers and students at my home institution and other national universities can benefit from my experience.**

While at the BecA-ILRI Hub, I developed a concept note for the Africa-Brazil Agricultural Innovation Market Place. My concept note interested researchers from Brazilian Enterprise for Agricultural Research (Embrapa) Pantanal, Brazil and together we wrote a proposal on *“Development and sustainable breeding of local chicken for improved productivity under local alternative feed management system and health control”* that was selected for funding.

The project is being implemented successfully in the South West and Western regions of Cameroon as well as in Rural Brazil.

*(christike2002@yahoo.fr)*



*(photo credit: ILRI)*

## DIVERSITY OF INDIGENOUS CHICKEN POPULATIONS OF CAMEROON

Christian Keambou was awarded a fellowship for a period of four months from 15 January – 26 May 2012 to study the diversity of indigenous chicken populations of Cameroon, and to link molecular data to the phenotypic data previously collected in the country.

Local chicken are the most widespread livestock in rural Africa, present in 85% of rural households. They present a unique opportunity for savings, investment and guard against

risk for smallholder farmers in developing countries as they are technically and financially easy to breed and are mostly kept by women and children. Indigenous chicken are a high quality protein source for the family and a living asset which can quickly be liquidized in case of financial emergency. However, the productivity of local breeds of chicken is low as compared to that of commercial breeds. Increased production of local chicken in Cameroon as in other developing

countries can act as a pathway to alleviate food insecurity and poverty amongst smallholder farmers. .

This study was focused on understanding the different physical and genetic traits of indigenous chicken which can make them better performers in terms of disease resistance and meat and egg production. Findings from the study will constitute the basis for efficient decision making for conservation and genetic improvement.





*(photo credit: ILRI/Mann)*

## NEXT-GENERATION DNA SEQUENCING OF AFRICAN SWINE FEVER VIRUS (ASFV) IN UGANDA

Charles Masembe was awarded a fellowship for a period of two and a half months from 8 November – 6 December 2010 and 5 June – 29 July 2011 to carry out deep sequencing of the African swine fever virus (ASFV) and full genome generation using BeCA-ILRI Hub's Roche 454 Genome Sequencer FLX System.

Uganda has the largest and most rapidly growing pig production in Eastern Africa, with the pig

population standing at 3.2 million. This area of farming has become very attractive throughout the country as a means of food production, income generation and employment and pigs are considered “walking banks” in the local communities. Seventy five percent of pig keeping is found in the rural areas, and is mostly practiced by women.

However, the growing pig industry is threatened by several problems

including infectious diseases such as African swine fever (ASF), a devastating viral disease that is endemic in Uganda. The disease periodically kills 90 – 100 percent of affected animals and has neither treatment nor vaccine. There is lack of data regarding the molecular variation and evolution of this devastating virus, a problem which Charles helped to address by enabling deep sequencing of selected ASFV fragments and full genome sequencing of the virus.

## Charles Masembe, Senior Lecturer, Department of Biological Sciences, Makerere University, Uganda,

While at the BecA-ILRI Hub, I not only acquired molecular biology skills, but also generated interesting results including the first time discovery of the Ndumu virus in domestic pigs. The findings of this research which was done in collaboration with other scientists were published in a peer reviewed scientific article *“Masembe, C., Michuki, G., Onyango, M., Rumberia, C., Bishop, R.P., Appolinaire Djikeng, A., Stephen J. Kemp, S.J., Orth, A., Skilton, R., Stahl, K., and Fischer, A., 2012, Viral metagenomics demonstrates that domestic pigs are a potential reservoir for Ndumu virus. Virology Journal 9:218: doi:10.1186/1743-422X-9-218.”*

I continue to conduct research and teach at Makerere University, Uganda in the areas of animal health and food security using the molecular skills I acquired at the BecA-ILRI Hub

*(cmasembe@zoology.mak.ac.ug or  
cmasembe@gmail.com )*



**The skills learnt, interactions with scientists and the exposure to technology at the BecA-ILRI Hub have contributed to my success as a researcher. I am grateful to the BecA-ILRI Hub, its partners and donors who allowed me to spend a substantial amount of time at the Hub. I will always reserve a special place in my memoirs for the BecA-ILRI HubTeam!**

Helen Nigussie, Lecturer, Ambo University; PhD student, Haramaya University, Ethiopia



**My experience in molecular techniques, data analysis and all other skills I am now using in writing my dissertation are thanks to my fellowship at the BecA-ILRI Hub. The few months spent with the most talented scientists in my field and with a very dedicated team of people have impacted me forever!**

While at the BecA-ILRI Hub, I acquired experience in molecular biology which I applied to my research. I also gained confidence in conducting laboratory work independently. I was fortunate to have the opportunity to participate in different workshops including the annual *Advanced Bioinformatics* and *Scientific Research Paper Writing* workshops which gave me skills that will greatly advance my career. I have shared my experience with my colleagues and will contribute more to the research and teaching activities at my university.

*(helennigussie21@gmail.com)*





*(photo credit: ILRI/Zerihun Sewunet)*

## GENETIC DIVERSITY OF LOCAL SHEEP POPULATIONS IN ETHIOPIA

Helen was awarded an ABCF fellowship for a period of six and a half months from 5 June – 15 December 2013. Her project was a study of the genetic diversity and matrilineal genetic origin of local sheep populations of eastern Ethiopia and also involved linking molecular data to the phenotypic data previously collected on local sheep in the country.

Sheep are the second most important livestock in Ethiopia after cattle, with a population of about 24.2 million heads. Out

of the total sheep population in Ethiopia, 99.7% are indigenous breeds with a diversity of nine local breeds found across different agro-ecological zones ranging from mountainous highlands to arid pastoral lowland areas.

Sheep play a major role in the food security and social well-being of rural populations living under conditions of extreme poverty in Ethiopia. However, the productivity of indigenous sheep is currently very low. Improved productivity of local sheep would

contribute to the alleviation of food insecurity and poverty of farmers and pastoralists.

The focus of this study was to understand the genetic diversity, population structure and maternal genetic origin of indigenous sheep. Eastern Ethiopian sheep have an outstanding adaptation for feed scarcity, high temperature and disease resistance. Findings from the study will help to set up a sustainable genetic sheep improvement and conservation program.

(photo credit: IITA)



## EVALUATING CONTRIBUTION OF RHIZOBIUM BACTERIA WHICH ASSOCIATE WITH BAMBARA GROUNDNUTS TO SOIL PRODUCTIVITY

Benson Onyango was awarded a fellowship for a period of six months from 31 April – 30 October 2013, to carry out the genetic characterization of rhizobium, the bacteria responsible for nitrogen fixation in soybean and bambara groundnuts.

Bambara groundnut is an important legume crop with a huge potential of providing protein rich diets and improving the food security situation in Sub-Saharan Africa. The crop can tolerate the marginal growing conditions of semi-arid parts of

Africa while raising soil fertility through nitrogen fixation that can result in substantial increase in crop productivity. However, the crop is currently underutilized in East African agriculture with most farmers concentrating on maize and common beans. Local landraces of the groundnuts are mostly cultivated by women and insignificant efforts have been made to improve them.

This project aimed at evaluating the diversity of rhizobium bacteria which associate with Bambara groundnuts in the soils of Lake

Victoria basin; determining the extent to which local bambara groundnut landraces deliver nitrogen to the soil; and the effect of increased soil nitrogen on the yield of crops grown under intercrop. The findings of this research will provide an opportunity to raise bambara groundnuts and intercropped cereal crops productivity, expanding the production base in East Africa to enhance food security and reduce poverty among semi-arid resource poor farmers.

## Benson Onyango, Lecturer of Plant Sciences, Chuka University, Kenya and Co-Principal Investigator, “Bambara groundnuts -sorghum cropping and soil fertility management strategies for improved productivity in semi-arid regions of East Africa”

During my placement at the BecA-ILRI Hub, I wrote a joint proposal with researchers from Southern Cross University, Australia; Crops for the Future Research Centre, Malaysia; Washington State University, USA; and Agricultural Research Institute-Ilona, Tanzania on bambara groundnuts-sorghum cropping and soil fertility management strategies for improved productivity in semi-arid regions. We used comments given to us by the Bill & Melinda Gates Foundation to improve the proposal and submitted it to a different funding body where it is currently under review. I also got involved in a collaborative project with Kenya Agricultural Research Institute (KARI) which will teach farmers in Western Kenya how to inoculate bambara groundnuts with rhizobium bacteria to increase production. The rhizobium samples to be used are those that I characterized at the BecA-ILRI Hub.

*(benboyih@yahoo.com)*



**I sincerely thank the BecA-ILRI Hub team for developing me as a scientist. I learnt invaluable skills in molecular biology and bioinformatics which I will continue to apply as I develop in my career. I gained massive information during bench-work, the weekly progress meetings and from internal seminars organized at the Hub.**



Parfait Kouadio Kouakou, Lecturer, Animal Breeding and Genetic Improvement, University Peleforo Gon Coulibaly of Korhogo, Ivory Coast



**All the skills I am now using in my research is thanks to the training and mentorship I received from the very dedicated BecA team. My special thanks go to leadership and the team of research technicians who supported me throughout my stay.**

While I was at the BecA-ILRI Hub, I wrote a proposal for the Africa-Brazil Agricultural Innovation Market Place. My proposal interested researchers from other universities in Cote d'Ivoire and Burkina Faso, and together we wrote a proposal on improvement of the guinea fowl and the grasscutter as small livestock. The proposed project is to be implemented in three regions of Côte d'ivoire and has already attracted the interest of farmers in these regions.

Although the project was not selected for this specific funding my colleagues and I are hopeful that we can secure funding for it from other sources.

*(kouakouparfait@yahoo.fr)*



## GENETIC DIVERSITY OF DOMESTIC CAVIES IN CÔTE D'IVOIRE

Parfait Kouakou was awarded a fellowship for a period of four months from 15 May – 15 October 2012 to carry out studies on the genetic diversity of domestic cavies in Côte d'Ivoire.

Despite the increasing demand for animal protein in Africa that has arisen due to growing populations; rising urbanization; and to an extent increased wealth, many households do not get a regular supply of animal protein from large livestock due to its cost and cultural issues, where large

livestock are viewed as a source of wealth and prestige.

Domestic cavies can be used to address this nutrition gap both quantitatively and qualitatively. Cavies require little investment, feed from kitchen waste, and yield an inexpensive but high quality meat. The cavy has rapid growth, high reproductive rate with up to 5 litters per year, and is less prone to diseases than chickens, rabbits and pigs. In addition to nutrition, trade in cavies has served as a source of income and there

is increasing awareness of the commercial viability of cavies.

Despite its potential, the cavy is a neglected livestock species and little is known about husbandry practices or existing breeds. The aim of this study was to investigate the diversity, inbreeding levels and population structure of cavies in Côte d'Ivoire so as to better inform the breeding strategies to be used in improving small-scale cavy farming.



## MOLECULAR CHARACTERIZATION OF SOME BANANA AND PLANTAIN GENOTYPES FROM THE AFRICAN CENTRE FOR RESEARCH ON BANANA AND PLANTAIN (CARBAP)

Cécile Annie EWANE was awarded a fellowship for a period of four and a half months from 3 August – 20 December 2012, to carry out the molecular characterization of banana and plantain genotypes from the African Centre for Research on Banana and Plantain (CARBAP), and to link molecular data to phenotypic data previously generated in CARBAP, Cameroon.

Plantains are a major staple food in West and Central Africa and play a vital role in contributing to food security for more than 250 million people in this region as indicated by the very high per

capita consumption in Gabon and Cameroon (159 and 126 kg/person/year respectively). Plantain production for food or for sale on local markets is managed by smallholder farmers in small sized family farm holdings and in home gardens which are characterised by low productivity. As a result, demand largely outstrips supply provoking very high prices for this commodity on rural, urban and trans-border markets. There is a great need to improve the performance of this crop from about 10 tons/ha/year to more than 30 tons/ha/year.

CARBAP in Cameroon hosts and conserves the world's second largest collection of *Musa* world reference materials. CARBAP's breeding programs have led to the development of a number of improved plantain varieties with consistently superior performance regarding yield and resistance to diseases and pests. However CARBAP does not have information on the genetic profiles of these accessions. Proper profiling of these collections will help streamline the materials and maintain only essential accessions.



Cécile Annie Ewane, Senior Lecturer; Associate Chief of the Laboratory of Phytoprotection and Valorization of Plant Resources, Biotechnology Center (Nkolbisson), University of Yaoundé 1, Cameroon

My ABCF experience helped me acquire knowledge in molecular biology, skills in people management and improve my English language skills. I acquired tools that are useful in teaching, training and introducing young researchers into the research field. I am also trying to improve the level of research at the Biotechnology Center in Nkolbisson, Yaoundé using the skills I acquired and through the network of researchers I formed during my fellowship at the BecA-ILRI Hub. My work at the BecA-ILRI Hub was the forerunner of a bigger project at CARBAP which will lead to the characterization of the whole CARBAP collection of plantain and bananas. I am currently writing a project proposal that will leverage further funding through the ABCF and of course, look forward to many publications of the findings from my work.

*(cewanea@yahoo.fr)*



**The fellowship at BecA-ILRI Hub was a wonderful experience for me. I gained confidence in conducting research and presenting my work. I have had the opportunity to work in similar facilities in Europe before, but thanks to the BecA-ILRI Hub, its partners and donors there is no need to travel so far any more!**

Christopher Mukasa, Research Geneticist, Animal Breeding and Genetic Improvement, National Animal Genetic Resource Centre and Data Bank, Entebbe, Uganda; Principal Investigator – “Harnessing genetic diversity for conservation, resistance to disease and improving productivity in some African goats”



**My successful proposal submission and all the skills I am now using in running the project is thanks to the time I spent at the BecA-ILRI Hub. Professionally, the BecA-ILRI Hub team is truly my maker. As an alumnus I am committed to doing the Hub proud everywhere that science takes me. I am grateful for the golden opportunity afforded me through the ABCF Fellowship.**

During my fellowship at BecA, I wrote a proposal to study functional genomics and epigenetics in African cattle and candidate gene analysis in sheep and goats for the United States Department of Agriculture (USDA). My proposal interested some colleagues from USDA and Cornell University and together we wrote a proposal on functional genomics and epigenetics in African cattle and candidate gene analysis in sheep and goats that will be funded by Cornell University.

The project is being implemented successfully in a few developing countries in Africa. We hope to raise more funds and extend it to as many countries as possible in Africa.

*(cmukasauk@gmail.com)*



*(photo credit: niversity of Dschang)*

## **HARNESSING GENETIC DIVERSITY FOR CONSERVATION, DISEASE RESISTANCE AND IMPROVED PRODUCTIVITY OF GOATS IN UGANDA AND NIGERIA**

Christopher Mukasa was awarded a fellowship for a period of five and a half months from 12 June – 21 November 2012, to study the genetic diversity of indigenous goats in Uganda and Nigeria.

Goats serve as a secure form of investment, a means of income, source of manure and for various religious and ceremonial functions to many communities in sub-Saharan Africa. Indigenous goat breeds are more important to small-scale farmers than cattle since they are easier to acquire and maintain. These animals often provide the only practical means of utilizing vast areas of natural grasslands in the areas where crop production is uneconomical.

The primary constraints faced by goat smallholders in sub-Saharan Africa are mortalities; reduced production due to diseases caused by internal and external parasites; and direct costs associated with pest control.

There is well-documented evidence for within and between breed genetic variation in resistance to gastrointestinal nematode infections; diseases due to mycotoxins; bacterial diseases including foot rot and mastitis; ectoparasites such as flies and lice; and scrapie, the small ruminant transmissible progressive disease affecting the animals' brain and nervous system. Genetic disease resistance is particularly

relevant in developing countries, as indigenous breeds usually display enhanced resistance to local diseases as compared to exotic ones reared in the same environment. However, little is known on the genetic components affecting adaptation to local environments as well as similar ecological regions worldwide.

A better understanding of genetic diversity of African goats will contribute to sustained genetic improvement and facilitate rapid adaptation to changing environments and breeding objectives, thus meeting growing production needs in various environments.





*(photo credit: ILRI)*

## UNDERSTANDING THE GENETIC DIVERSITY OF NAPIER GRASS IN UGANDA

Geoffrey Kawube was awarded a fellowship for a period of seven months from 8 October 2012 – 5 May 2013 to determine the genetic diversity of Napier grass in Uganda.

The livestock subsector has been identified by the government of Uganda as key in eradicating poverty in the country. Due to increasing population pressure, intensive and semi intensive livestock keeping systems are being promoted in the country with Napier grass as the main fodder. However, livestock productivity is constrained by Napier grass stunt disease which causes fodder yield loss of as high as 100 per cent.

Developing host resistance would be the most effective and affordable means of managing this diseases especially by smallholder farmers, majority of whom are poor. In order to develop stunt-resistant Napier grass, sources of resistance must be identified either from already cultivated varieties or wild clones or both.

This study was conducted to determine the genetic diversity of cultivated and wild Napier grass germplasm in Uganda, which will form the basis for efficient decision making for screening for resistance against Napier grass stunt disease, conservation and genetic improvement.

## Geoffrey Kawube, Lecturer, Plant Pathology - Gulu University, Uganda

While I was at the BecA-ILRI Hub, I learnt a lot about Genetic markers - Simple sequence repeat (SSRs) and Sequence Related Amplified Polymorphism (SRAP), their analysis and application. With that knowledge, I am guiding postgraduate and other researchers wishing to use these genetic markers in investigation in my home institution. I teamed up with two other colleagues to develop a proposal for research that will contribute to the basic understanding of the cause and management of pineapple heart rot disease. We look forward to funding from the National Agricultural Research Organization (NARO). We are looking forward for other funding opportunities so as to help make our dreams a reality. I have also made progress with my PhD studies as a result of the placement at the BecA-ILRI Hub.

*(kawgeoff@gmail.com)*



**The time spent at the BecA-ILRI Hub improved my research capacity and has opened many opportunities for scientific advancement. The skills I acquired are impacting other researchers, and hopefully will increase the research capacity in Uganda. I am grateful to for the mentorship I received from a team of very talented scientists.**

Célestine Bembide, Researcher-Animal Breeding and Genetic Improvement, Central African Agricultural Research Institute, Central African Republic



**I encourage all researchers to apply for the ABCF fellowship, especially the French speakers – I am a French speaker but I was able to work and present my work progress to an English speaking audience. I am very grateful to all the supporters of this fellowship. Thank you for making my research possible.**

Before my placement at the BecA-ILRI Hub, such research on our national livestock resources had never been conducted. At first, I was worried about my lack of experience in using molecular tools but this was never a problem since the BecA-ILRI Hub staff helped me to quickly acquire the skills and apply them in my research. My experience has helped other researchers from my home institution and country to think about incorporating molecular biology in research and they are now looking for opportunities to put this into practice. I would like to continue my research on native chicken until I can identify the best breed for our local production systems and develop strategies for their conservation.

*(cedelyc@yahoo.fr)*



## DIVERSITY STUDIES OF NATIVE CHICKEN POPULATIONS IN CENTRAL AFRICAN REPUBLIC

Célestine was awarded a fellowship to carry out the genetic diversity studies of native chicken populations in Central African Republic for a period of five months from 23 July – 21 December 2012.

Native chicken are the most widely distributed livestock in sub-Saharan Africa. In Central African Republic, native chicken play an important role in poverty alleviation and food security, supplying quality protein through meat and eggs to families in the rural areas where almost all households keep these livestock.

The genetic make up of the indigenous chicken gives them the ability to adapt and survive in the challenging environmental and ecological conditions including drought and disease, associated with farming in the Central African Republic.

A better knowledge of this species will facilitate the development of strategies for genetic improvement and conservation of genetic resources.



*(photo credit: ILRI/M Sajjad Khan)*





## GENETIC DIVERSITY OF MICROBIAL COMMUNITY IN STEEP WATER OF TRADITIONAL DRIED YAM – GBODO’

Joan was awarded a fellowship for a period of six months from 11 April – 25 September 2013, to carry out studies on the genetic diversity of the microbial community in steep water of ‘gbodo’ – the traditional dried yam.

‘Gbodo’ is a traditionally processed yam in rural Nigeria and other parts of West Africa that is dried, parboiled and fermented by steeping in water for days. The fermented yam ‘gbodo’ is then milled into flour which has a distinctive taste, colour and texture depending on the fermentation process. Sometimes the steep water is repeatedly re-used to enhance the desired qualities of subsequent products and reduce the steeping time. The actual organisms responsible for the desired attributes are however yet to be fully ascertained.

The identification of micro-organisms in steep water could lead to improvement in the processing. The specific microorganisms responsible for achieving the desired quality characteristics of ‘gbodo’ could be cultured in large quantity and sold serving as an additional source of income for ‘gbodo’ processors.

This study aimed at understanding the genetic diversity of the fungi and bacteria present in the steep water at the fermentation stage in gbodo production in order to support the improvement of ‘gbodo’ processing.

## Joan M. Babajide, Lecturer, Federal University of Agriculture, Abeokuta, Nigeria; Co-funded by African Women in Agricultural Research and Development (AWARD)

Out of the work I did at the BecA-ILRI Hub, I generated two posters that I presented at the International Society for Tropical Root Crops (ISTRC) conference in Ghana (Sept 30 – Oct 5, 2013), Nigerian Institute of Food Science and Technology (NIFST) conference in Nigeria (22-26 Oct 2013). One of my posters was awarded the “Best Poster Presentation”.

I am now transferring the skills I learned at the BecA-ILRI Hub in molecular analysis, good laboratory practice and health and safety to the molecular laboratory at the Federal University Of Agriculture, Abeokuta and to the students I teach. I am also supervising postgraduate students in area of basic molecular biology.

*(jmbabajide@gmail.com )*



**With the skills I acquired and armed with the findings of my research, I have started writing a proposal on further research on ‘gbodo’. I am grateful to the BecA-ILRI Hub, its partners, AWARD and other donors for the opportunity to spend time at the Hub amongst a dedicated team of scientists and researchers. I will always remember the BecA-ILRI Hub team for their tremendous impact on my research focus!**



## Fatuma Ali Mzingirwa, Scientist, Kenya Marine and Fisheries Research Institute; MSc Student, Moi University



**I owe the BecA-ILRI Hub for the successful completion of my MSc research; the paper I have written and which is still under review; and for the acquisition of knowledge and skills that I will continue to use as I grow in my career. All this was made possible through the support I received from a team of very competent staff. Thank you BecA!**

My fellowship at the BecA-ILRI Hub enabled me acquire skills in molecular biology which are now additional expertise for the Kenya Marine and Fisheries Research Institute in the area of genetics research and will contribute to the development of a molecular laboratory at the institute.

I developed a proposal on connectivity of Mangrove jack commonly known as red snapper in the marine protected areas and the open fishing zones, which is currently under review. I am also working in collaboration with colleagues from my home institute to develop a proposal on the assessment of marine biodiversity of the East African coast which will entail identification of new species, barcoding of marine species and determining population structure of commonly occurring species using molecular techniques.

*(mfatuma@kmfri.co.ke or fatmwaa@yahoo.com)*



(photo credit: batamfishing.com)

## GENETIC POPULATION STRUCTURE OF CRIMSON JOB FISH IN SOUTH WEST INDIAN OCEAN

Fatuma's three-month fellowship from 1 March -21 May 2013 at the BecA-ILRI Hub was funded by the South West Indian Ocean Fisheries Project (SWIOFP). The placement at BecA was to enable her carry out a study on the genetic population structure of Crimson jobfish (*Pristipomoides filamentosus*) in South West Indian Ocean using samples collected from Kenya, Tanzania, Madagascar, Comoros,

Seychelles, Mauritius and South Africa.

The Crimson jobfish is commercially important tropical snapper that is caught with hand-lines, electric fishing reels, and deep-water gill nets. Because of its popularity, the Crimson jobfish is commonly targeted by fishermen and their aggressive nature and relatively large size makes them more

vulnerable to fishing gears. The low growth rates, natural mortality and prolongation in the attainment of sexual maturity of this fish species make it particularly vulnerable to overfishing.

The outcome of this research will contribute to the development of long term conservation and management initiatives of Crimson jobfish in South West Indian Ocean region.

*(photo credit: ILRI/Stevie Mann)*



## **DIVERSITY STUDIES OF CAMEROON NATIVE GOAT POPULATIONS**

Felix was awarded a fellowship to conduct research in two stages. The first stage was to receive training in the application of molecular techniques for one month in October 2010; the second stage was to apply these techniques in conducting a broad investigation on “Cameroon native goat population genetic diversity” from 1 August – 27 October 2011.

Small ruminants are present in more than 80% of production systems throughout the wide range of Cameroon ecological regions. Goats are more resilient and adapted to different husbandry conditions, but the diversity of local goat populations is not well documented.

The aim of the research was to contribute to a better knowledge of goat genetic landscapes in Cameroon. The information from this research will be used to improve goat productivity for increased food security and incomes for rural communities. The main findings are also intended for use by policy makers to build sustainable and comprehensive national goat breeding schemes.



Felix Meutchieye, Lecturer, University of Dschang; Principal Investigator, “Harnessing husbandry of domestic cavity for alternative and rapid access to food and income” and Co-PI of “Harnessing genetic diversity for improving goat productivity in Africa” projects

I was able to generate four papers and give oral presentations at five international events. My teaching, research and leadership skills have improved immensely and I proposed three new courses now being taught in my home institution (basic bioinformatics, molecular genetics and conservation genetics). During the placement, I was involved in the writing of proposals that led to an Australian funded project on improvement domestic cavies spanning Cameroon and the Democratic Republic of Congo (DRC) and a Swedish funded project on genetic improvement of goat productivity covering Cameroon and Ethiopia. Over 20 postgraduate students from Cameroon and DRC have received training within the framework of these projects. The projects have also stimulated the establishment of several partnerships between my institution and local and regional organizations.

*(fmeutchieye@gmail.com)*



**The fellowship program at BecA-ILRI Hub is very unique, challenging and holistic. The networking, follow-up and continuous communication makes this program a powerful tool to help African scientists overcome challenges they face in keeping their research relevant and up-to-date. I am very grateful for the mentorship I received from the BecA-ILRI Hub team.**

## About the BecA-ILRI Hub

The Biosciences eastern and central Africa-International Livestock Research Institute (BecA-ILRI) Hub is a shared agricultural research and biosciences platform located at and managed by ILRI in Nairobi, Kenya. The platform increases access to world class laboratories for African and international scientists conducting research on African agricultural challenges.

## Capacity building at the BecA-ILRI Hub

Capacity building at the BecA-ILRI Hub is focused on increasing the capability of African scientists and research institutions to use the tools of modern biology in addressing the priority constraints to African agriculture. Capacity building is conducted through annual hands-on training workshops in key skill areas; research placements enabling African scientists to spend up to one year at the Hub conducting research on their own projects; and institutional support through the identification of key laboratories and individuals in the region who are strategically placed to benefit from support from the Hub.

## The Africa Biosciences Challenge Fund

The Africa Biosciences Challenge Fund (ABCF), managed by the BecA-ILRI Hub provides fellowships to scientists and graduate students from African national agricultural research organizations and universities to undertake biosciences research-for-development projects at the BecA-ILRI Hub. The purpose of the ABCF fellowship program is to develop capacity for agricultural biosciences research in Africa, to support research projects that ultimately contribute towards increasing food and nutritional security or food safety in Africa, and to facilitate access to the BecA-ILRI Hub by African researchers.







***“Our findings were very positive and point to the significant reach and impact the ABCF program has achieved in a short timeframe. Over 90% of stakeholders stated that the Beca-ILRI Hub promotes access to world- class research and training facilities, builds the biosciences capacity of individuals and institutions, and promotes African scientists to lead and sustain biosciences research in Africa”***

*[statement by Dalberg Global Development Advisors following first evaluation of ABCF program, 2014]*

<http://hub.africabiosciences.org>  
 Box 30709, Nairobi 00100, Kenya  
 Phone +254 20 422 3000  
 Fax +254 20 422 3001  
 Email: Beca-Hub@cgiar.org

biosciences

eastern and central africa



The Beca-ILRI Hub capacity building program is supported by:

