



## this issue

Introducing the partnership **P.2**  
*What is the BecA-Sweden Partnership?*

Farmer friendly genomics **P.3**  
*Conversations with goat farmers in Cameroon*

Hassle free field sampling **P.5**  
*Field sampling of goats in Ethiopia*

Coming to Africa **P.7**  
*Q&A with senior scientist Dr Sita Ghimire*

Ms Karin Andersson, Counsellor, Head of regional Development Cooperation, Embassy of Sweden and Dr Jimmy Smith, Director General, International Livestock Research Institute (ILRI), sign agreement documents for funding of the program on climate-smart livestock feeds at ILRI campus, Nairobi. Looking on is Gity Behravan, First Secretary/Senior Research Advisor, Embassy of Sweden

## A note from ILRI Director General



Dr Jimmy Smith

Director General, ILRI

I am delighted to introduce the first edition of this newsletter that highlights a partnership which represents the dedication of the Government and people of Sweden, to strengthening research for development that will contribute to the improvement of food and nutritional security in Africa.

This partnership between Sweden and the Biosciences eastern and central Africa-International Livestock Research Institute (BecA-ILRI) Hub was built against the backdrop of a longstanding dedication by Sweden to global development. With its official development assistance at almost 1% of its gross national product, Sweden is among the top donor countries. Not surprisingly, therefore, Sweden has also been a long term supporter of CGIAR and was among the founding signatory countries at the time of the creation of ILRI, one of the 15 international agricultural research centers that form the CGIAR Consortium, alongside Switzerland, Ethiopia and Kenya.

Through Sida, Sweden currently contributes about USD 38 million to the CGIAR trust fund annually. In addition to supporting the BecA-ILRI Hub, Sweden also provides support to specific programs within CGIAR including the Research Program on Livestock and Fish; the Bio-resources Innovations Network for Eastern Africa Development (Bio-Innovate), a special program hosted and managed by ILRI which focuses on product oriented innovations through biosciences; and a capacity strengthening training program that promotes sustainable and improved use of animal genetic resources in developing countries conducted by ILRI in collaboration with the Swedish University of Agricultural Sciences (SLU) through a partnership that is set to expand with the signing of a revised Memorandum of Understanding at the end of September 2013.

The development funding from Sweden is characterized not only by its generosity, but also by the quality of engagement with their development partners - the ability to target issues that are important to the beneficiary country; the inclusion, support and strengthening of national partners; the availing of Swedish expertise; and the inclination to longer term programs that ensure real impact is achieved.

This is what makes our partnership with Sweden so unique, one that we treasure and one that we will continue to rely upon as we forge ahead in reducing poverty, increasing food and nutritional security and protecting the environment in Africa and globally.

## From the BecA-ILRI Hub Director

It is with great pleasure that I welcome you to read the first issue of the BecA-Sweden Partnership newsletter. This inaugural issue introduces the reader to what the BecA-Sweden Partnership is about including the programmatic focus and ongoing project activities.

In subsequent issues, we will provide regular updates on research programs, capacity building and other related news from a flourishing partnership between the BecA-ILRI Hub; the Swedish government; and Sida.

Your views and comments are highly welcomed.



Dr Appolinaire Djikeng  
Director, BecA-ILRI Hub

biosciences

eastern and central africa



ILRI  
INTERNATIONAL  
LIVESTOCK RESEARCH  
INSTITUTE

Improving food and livestock feed security in Africa

A research and development partnership between Africa and Sweden

## About the BecA-ILRI Hub

Located at and managed by ILRI in Nairobi, Kenya, the BecA-ILRI Hub provides a common biosciences research platform, research-related services and capacity building opportunities in Africa. The Hub increases access for African scientists to affordable, world-class research facilities, while creating and strengthening human resources in biosciences and related disciplines. The Hub activities focus on addressing key constraints in African agriculture.

The Hub is one of four biosciences centres for excellence that are part of the African Union-New Partnership for Africa's Development (AU-NEPAD) African Biosciences Initiative. It has been created under the Comprehensive African Agricultural Productivity Programme (CAADP) to service the needs of countries in eastern and central Africa. CAADP's goal is to support agriculture-led development that eliminates hunger and reduces poverty and food insecurity, generating agricultural growth.



*A practical training session during the 2013 "Introduction to Molecular Biology and Bioinformatics Workshop"*

With funding from the Swedish Ministry for Foreign Affairs and the Sida, the BecA-ILRI Hub, together with partners from National Agricultural Research Institutions (NARIs), African universities and regulatory bodies, private sector, international research institutes, foreign universities, CGIAR and other participants designed a number of unique research projects focused on two major issues with which agricultural developments in Africa are concerned – achieving food security and climate change mitigation.

The partnership with Sweden goes beyond building up specialised skills to empowering African scientists, NARIs and universities to solve Africa's agricultural challenges by strengthening research for development capacity in biosciences.

## Food security

The Swedish Ministry for Foreign Affairs is funding a multi-year food security program which supports research projects on crop and livestock improvement with a special emphasis on under-researched crops and livestock. Through this program the BecA-ILRI Hub receives core funding to

bolster the management of the Hub facilities; develop new technology platforms and support capacity building activities including the training workshops and fellowships for African scientists through the Africa Bioscience Challenge Fund (ABCF) programme.

The bioinformatics platform has also benefited greatly from this partnership which gives scientists access to technical advice and enhanced expertise from SLU, including infrastructure upgrade.

The research component brings together scientists from 16 institutions across five African countries, the United States of America and Europe on projects to improve the productivity of a range of underutilized crops and of livestock through improved health and breeding practices.

## Plant tissue culture and transformation projects

Tissue culture is one of the most widely used biotechnologies in African agricultural improvement. When applied correctly, it enables large scale production of disease-free, high performing, farmer-preferred varieties. Many

## What is the BecA-Sweden Partnership?

The partnership on food security goes beyond research to strengthening the capacity of the Hub in specialized areas such as bioinformatics.

tissue culture facilities are already operational in sub-Saharan Africa, disseminating products to small holder farmers through established networks. However, most laboratories currently using tissue culture for production of planting materials are only doing so for a limited range of crop species and are not incorporating virus indexing, the measure used to ascertain that planting materials are disease-free.

The plant tissue culture and transformation projects will enhance the operations of tissue culture facilities in eastern and central Africa, enabling them to produce disease-free planting materials for a wider range of crop species grown by small holder farmers.

Participating laboratories and focus species have been strategically chosen to achieve increased food and nutritional security in eastern and central Africa. The following projects are currently being undertaken in this Partnership:

**Development of enset with resistance to bacterial wilt:** Over 15 million people in Ethiopia rely on enset or 'false banana', an economically important food crop in the country. This project includes





Teddy Amunge from Uganda (left) during the 2012 annual workshop on Advanced Genomics and Bioinformatics, one of the capacity building activities that receives substantial support from the BecA-Sweden partnership

partners from Ethiopian Institute of Agricultural Research (EIAR) and International Institute of Tropical Agriculture (IITA). The project focuses on developing transformation protocols that can be applied to produce enset resistant to bacterial wilt.

Tissue culture methods for *in vitro* multiplication of the indigenous tree species baobab (*Adansonia digitata*) and rose apple (*Syzygium jambos*) being carried out in partnership with the Mikocheni Agricultural Research Institute (MARI) in Tanzania.

Tissue culture methods for the production of virus-free garlic with EIAR in Ethiopia.

Tissue culture for the production of quality yam planting material with the National Crops Resources Research Institute (NaCRRI) in Uganda. Yam is a critical staple for food security and is an attractive alternative crop in areas currently being decimated by cassava diseases. The lack of quality planting material is a key gap that is leading to reduced yam cultivation in the region.

Tissue culture methods for the

production of quality passion fruit planting material, with Makerere University in Uganda. Passion fruit is a source of nutrition and income for many women farmers in the region.

### **Healthy crops and livestock: Diagnostics tools to detect and facilitate control of diseases of selected crops and animals**

While diagnostic tools that are highly sensitive and specific in identifying diseases have been developed, a range of factors prevent their wider deployment in the developing world,

## **Farmer friendly genomics - conversations with goat farmers**

by Morris Agaba, project leader, *Harnessing genetic diversity for improved goat productivity*



Imagine you own a small piece of land where you keep goats. Imagine that your herd of goats has five does (she-goats) that each produce 3-4 kids at a time and that each doe has an average of 1.5 kidding cycles in a year. Imagine further that each kid is worth between USD50-USD100 at weaning, and that the demand is so high that they are sold out at

birth! If everything goes according to plan your annual income on this herd would be  $5 \times 3 \times 1.5 \times \text{USD}50 = \text{USD}1125$  - more than a year's milk sales, about USD200, from one native cow kept on the same piece of land.

On a recent visit to Kouoptamo in North West Cameroon, we met a farmer with a high fecundity herd of goats. We explained to him how exceptional his goats were and how

the high fecundity trait (ability to produce more than one kid at a time) might change the lives of other goat farmers across Africa. We talked to him about the ability to predict whether his younger does are capable of producing multiple kids and if so, how many. The idea was attractive enough for him to pay for such information, a fee equal to USD 50, the cost of one male weaner. In another village in Bafoussam on the Cameroon plateau, we met a farmer who believes that the value of his flock would increase if he knew more about the genetics - knowledge he would be willing to pay for.

These informal conversations presented an entry point for introducing how advanced genetics can make a difference to small holder farming systems. Understanding the genetic basis of the extraordinary reproductive capacity of West African Dwarf goats is critical knowledge that will be used to empower breeders to develop larger goats that have the high fecundity trait.





*Solomon Maina tends to cassava grown in the green house at the BecA-ILRI Hub, Nairobi*

particularly cost. The aim of this project is to develop diagnostic tools that are robust, inexpensive and suitable for distribution and use in countries lacking access to expensive equipment and consumables.

An example is the loop mediated isothermal amplification (LAMP) method. This recent advance in molecular diagnostics is sensitive, specific and has a simpler process that does not require expensive equipment. The method is also more suited for deployment in non-specialized laboratories with limited equipment and resources. Through the BecA-Sweden partnership, a set of projects is developing tools to detect and address critical crop and livestock diseases

which pose a significant threat to food security in the region. The diagnostic projects include:

Development, validation and technology transfer of a lower-tech laboratory and field assay - LAMP for Capripoxviruses and Contagious Caprine Pleuropneumonia (CCPP), with the Department of Veterinary Services (DVS), Kenya; National Animal Disease Diagnostics and Epidemiology Center (NADDEC), Uganda; Tanzania Veterinary Laboratory Agency (TVLA); Foreign Animal Disease Diagnostic Laboratory/ United States Department of Agriculture/Animal and Plant Health Inspection Service/Foreign Animal Diagnostics Laboratory (USDA/APHIS/ FADDL), USA.

LAMP assays for the production of clean passion fruit planting material, with the University of Nairobi in Kenya.

Developing virus detection tools for the production of virus-free yam planting material, with MARI in Tanzania.

Developing virus detection tools for the production of virus-free garlic planting material, with EIAR in Ethiopia.

Developing tissue culture methods suited for the production of quality taro planting material by NARIs, African universities and the private sector, with EIAR, the University of Burundi and the Institut des Sciences Agronomique du Burundi (ISABU).

Fighting bacterial diseases of rice through the development of diagnostic tools from genomic information, with partners from Institut de recherche pour le développement (IRD), France; Colorado State University (CSU), USA; and MARI in Tanzania.

### ***Harnessing genetic diversity for improved goat productivity***

Goats are a significant component of the livelihoods of smallholder farmers and pastoralists in Cameroon and Ethiopia. This project aims to increase goat productivity through strengthening the capacity of national goat breeding programs in the two countries. This includes studying the goat diversity present, knowledge which enables breeders to develop better goats suited to resource-poor



*A "super doe" in Kouoptamo, North-West Cameroon with her three kids*

farmers; and developing Information and Communications Technology (ICT) based tools to support management decisions through the production chain including using mobile phones to help farmers improve recording and farm management.

The project is also investigating the genetic basis of the extraordinary reproductive capacity of West African

dwarf goats, to accelerate their use in breeding of non-dwarf goats with similar high capacity to reproduce. High reproductive efficiency directly increases the off-take and productivity and reduces the negative environmental impacts of goat production.

The tools and breeds developed by this project will enhance the food security of the millions of farmers who depend

on goats for their livelihoods.

### Research Partners

- The BecA-ILRI Hub
- EIAR
- Institute of Biodiversity Conservation (IBC),
- Tigray Regional Agricultural Research Institute (TARI), Amhara
- Regional Agricultural Research

## Pose and Click: Hassle-free goat sampling in Ethiopia

By Sarah Osama, research technician



Sarah Osama takes a blood sample from a goat



The “famacha” guide

‘Sign shot’ shows identity of the goat

Taking blood, tissue or hair samples for genetic analysis and at the same time doing physical measurements of livestock in the field can be a very hectic and time consuming activity.

This tedious but necessary sampling process has greatly been eased by the use of a sampling method (AdaptMap photo protocol and sampling kit) developed by United States Department of Agriculture (USDA). When I visited the villages of Haro Wolkite and Luma Tatesain in Ethiopia on a mission to investigate the genetic basis of goats in that region, I had the opportunity to test the sampling kit which had a slight modification made to it at the Hub.

### Photo shoot

By taking photographs of the goats at different angles, we were able to deduce the physical measurements

of the goats without struggling to pin them down. The process involved making markings on the animal’s pin bones which could easily be viewed by the photographer. An identifying card was then attached to the animal on which information such as the animal’s unique identity number, sex, birth date, owner, breed, sampling date, district/location, country and the distance from the camera was recorded.

A photograph of the goat’s eye with a color guide placed next to it was taken to determine the anemic state of the animal. This “famacha” guide has five levels of red and an animal giving a low score of 5 (very pale red) indicates the animal could be suffering from anemia. A photograph of the teeth helped us estimate its age while various profile shots were taken to deduce the pin bone width; the chest girth; height and length; and the points of shoulder width. All the information acquired from the photo shoot was recorded onto the card attached to the animal.

Finally, blood samples were drawn immediately after taking photos of each animal. The blood samples were labeled using the identity numbers given to the animals while taking the pictures for physical measurements.

### Take and give

The farmers in the two villages visited were very cooperative with the researchers and gave extra assistance in managing the blood samples on FTA cards (cards developed for the collection and storage of DNA from organic samples), as they dried under the shade of a tree before storage. The farmers expressed their satisfaction with the minimal handling of their animals and in return for their cooperation in the sampling process they received on-the-spot diagnosis and treatment for worms based on the eye exam. Since the team included production experts, the farmers also received advice on better production practices.

This sampling exercise was part of the field activities being carried out by the BecA-ILRI Hub led team researching the genetic diversity of goats for improved productivity in Ethiopia and Cameroon.



- Institute (ARARI), Ethiopia
- Ethiopian Wildlife Conservation Authority (EWCA)
- South Regional Agricultural Research Institute (SARI), Ethiopia
- University of Dschang, Cameroon
- Institute for Agricultural Research for Development (IRAD), Cameroon
- Small Ruminant Support Programme (PADPR) Cameroon
- The Nelson Mandela African Institute for Science and Technology (NM-AIST), Tanzania.

## Capacity building

The partnership with Sweden provides support for the Hub's group training workshops which include *Introduction to Molecular Biology and Bioinformatics*; *Introduction to Principles of Laboratory Management and Equipment Operation*; *Advanced Bioinformatics and Genomics*; and *Scientific Writing*. In addition, individual training in specialized areas has been conducted to enhance research skills of national partners. A workshop in *Designing Rapid Diagnostic Kits For Livestock Diseases* was conducted in collaboration with the USDA/APHIS/ FADDL, and a two-day workshop on the *Phenotypic Characterization of Goats* organized jointly by ILRI and the International Center for Agricultural Research in the Dry Areas (ICARDA) in 2012. The BecA-Sweden partnership avails technical advice and enhanced capacity from SLU to the Hub bioinformatics platform. This includes an infrastructure upgrade carried out to facilitate better bioinformatics support to more researchers in the plant virome, goat genetic diversity and diagnostics projects.

## Bioinformatics platform

Using modern bioinformatics tools, databases, data storage and high-performance computing, the Hub bioinformatics platform provides support for research projects. In 2012, research projects from fourteen African and international institutions and two international research organizations received support from this platform. The bioinformatics platform is also actively engaged in strengthening bioinformatics skills in the region through group training workshops,

ABCF fellowships, hosting post-graduate students and collaborative workshops with institutions.

## Climate change adaptation and mitigation

Across many parts of Africa, effects of climate change, increasing pressure on land-use and degradation are posing a threat to the livelihoods of communities who rely on agriculture and livestock for their survival. Sub-Saharan Africa is particularly vulnerable to climate change because of the high dependence on rain-fed agriculture and inadequate quantity and quality of feed is a major problem, particularly during the dry season. The BecA-ILRI Hub's "Climate change adaptation and mitigation Program" aims to provide smallholder farmers in arid and semi-arid areas of sub-Saharan Africa with climate-smart crops and farming systems to increase agricultural productivity in the face of harsh climate conditions.

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

Funded by the Sida, the "Climate-Smart *Brachiaria* Grasses for Increasing Livestock Production in East Africa" research project aims to address the problem of inadequate quantity and quality of forage for smallholder

farmers in the dry, low fertility soils of the arid and semi-arid lands (ASALs) of Kenya and Rwanda.

*Brachiaria* grasses are native to eastern Africa and are an important component of savannah grassland ecosystems. These grasses were taken to various parts of the world at different times in history, and are currently extensively grown as forage crops in South America and East Asia. Besides their use as livestock feed, *Brachiaria* grasses also contribute significantly to reducing carbon dioxide levels in the atmosphere, ecological restoration and soil erosion control. Therefore, in their adopted homes in South America and Asia, there have been several research and development efforts to improve the productivity, nutritive value and other agronomic characteristics of these grasses. However, in Africa, their native homeland, *Brachiaria* grasses are less known and under-explored.

In the climate-smart *Brachiaria* grasses research, endophyte microbial technology and conventional varietal selection will be used to provide drought resilient, high nutrition, biological nitrification inhibiting, productive varieties of *Brachiaria* grasses to smallholder livestock farmers. Through this project, farmers/cooperatives led *Brachiaria* seed production enterprises will also be developed to provide additional income for the resource poor farmers.



Climate-smart *Brachiaria* grasses program team from BecA-ILRI Hub, KARI-Kenya, RAB-Rwanda, CIAT-Colombia and Grasslanz Technology Ltd-New Zealand during the 1st Biannual Review Meeting in July 2013

## Research partners

Collaborating partners in the climate-smart *Brachiaria* grasses research include the International Center for Tropical Agriculture (CIAT) in

Colombia; Grasslanz Technology Ltd in New Zealand; and two NARS partners - the Kenya Agricultural Research Institute (KARI) and the Rwanda Agricultural Board (RAB). Farmers in

the two target countries (Kenya and Rwanda) are key partners who are being involved from the beginning of research to determine their needs and preferences for livestock feed.

# Coming to Africa: Q&A with Dr Ghimire



*Dr. Sita Ghimire joined the BecA-ILRI Hub in June 2013 as senior scientist for the Swedish funded "Climate-smart Brachiaria grasses for improving livestock production in East Africa" program. Prior to joining the Hub, Sita was a research microbiologist at the Research Triangle Institute (RTI) International in North Carolina, USA.*

*Find out more about his passion for his work and what drew him out of USA and into Africa in this issue of the BecA-Sweden Partnership newsletter.*

**Q** Dr Ghimire, in your online profile, you talk about growing up in a farming family in Nepal. Did your early family life have anything to do with your choice of career?

**A** When I was growing up, almost 95% of the population in Nepal depended on agriculture for their livelihoods. As a farming community, we all looked up to government employed agricultural officials to solve all our farming problems. They were very highly regarded in the community and it was every child's dream to graduate from high school, be trained in an agriculture college and become an agricultural official. That was my ultimate dream too. However after joining the agriculture school, my eyes were opened up to so many other possibilities beyond being a local extension official.

**Q** Can you tell us a bit about your journey from extension official to crop research scientist?

**A** After my undergraduate studies, I worked in remote villages where people's livelihoods were based on potatoes. My role there was to support a community based potato bacterial wilt management program funded by the User's Perspective with Agricultural Research & Development Program, a sister organization of International Potato Center (CIP). The area had a severe bacteria wilt problem and the idea of the program

was to alleviate potato losses through the implementation of an integrated disease management approach that included a three year crop rotation with non-Solanaceous crops. The plant pests and diseases problems faced by these farming communities persuaded me to specialize in plant pathology for my Masters' degree, and later conduct research on potato late blight pathogen as part of my PhD studies.

**Q** How did you end up in the USA?

**A** During a period of civil unrest in Nepal (1996-2006), government funding on agricultural research and development was severely affected. Law and order in the country was also deteriorating and as a result many people from Nepal moved to other parts of the world. I moved to USA in 2003, taking up a Post-Doctoral position with the Mississippi State University.

**Q** Your stay in the US ended up being more than 10 years - what made you choose to come to Africa?

**A** My greatest desire at the time I responded to the job advertisement was to move from working in a commercial environment, to doing research that I was sure will have an impact for millions of small holder subsistence farmers of sub-Saharan Africa. I was sure I would get more satisfaction from the kind of impact I could have in such a position. Something else that touched me was the fact that Appolinaire, the Director

of the BecA-ILRI Hub left his job as an assistant professor in a very prestigious institution in the US to come and work here. I thought - if he could, why couldn't I?

**Q** What excites you most about this research program?

**A** There are so many things that make my work exciting! Over the past several decades, extensive research has been carried out on endophytes (beneficial microorganisms growing within the plants) of cool season grasses, the grasses mostly grown in temperate parts of the world. However, the endophytes of warm season grasses, grasses commonly found in the tropics including *Brachiaria* are very little researched. This program provides the unique opportunity of studying *Brachiaria* grasses and their associated microbes in their center of origin - East Africa.

In addition, through this program I see a big opportunity to take the ground-breaking research of Dr Segenet Kelemu (former BecA-ILRI Hub director) and her colleagues to the next level and make it benefit farmers - there is a possibility of developing microbe based pesticides, herbicides and fertilizers with wider applications.

Lastly, since the BecA-ILRI Hub has such a broad mandate to work in eastern and central Africa and even beyond, I look forward to the prospects of developing the Hub into the leading endophyte research center in Africa. I am very hopeful about the future.



## Upcoming Partnership Events

Workshop on Loop-mediated isothermal amplification of DNA (LAMP) Assay  
28 – 30 October, 2013 in Kenya

This is a 4-day workshop on Loop-Mediated Isothermal Amplification of DNA (LAMP) Assay for rapid detection of capripoxviruses in sheep, goats and cattle. It will be held at the BecA-ILRI Hub as part of the Molecular Diagnosis of Livestock Diseases: Adapting and Adopting Existing Diagnostics for Developing Country Laboratories Project.

Trainers will be drawn from Colorado State University, USA and the BecA-ILRI Hub.

Annual Food Security program review, 7 - 8 November, 2013 in Kenya

The BecA-Sweden program on Food Security will be undergoing an internal review of all its projects. During this review, progress and challenges in achieving project milestones will be discussed as well as opportunities for expansion of the program.

Climate-smart *Brachiaria* (CSB) program 1st annual review and planning meeting  
20 September 2013 in Sydney Australia

The BecA-Sweden Climate-smart *Brachiaria* program will be holding its 1st annual review and planning meeting in Sydney Australia on the 20th of September 2013. This meeting will follow the 22nd International Grassland Congress taking place in Sydney from 16- 19 September 2013, and is being attended by all the CBS partners. During this annual review and planning meeting, program partners will review the 2013 progress and 2014 work plan of all its projects.

Climate-smart *Brachiaria* (CSB) program visit to Grasslanz Technology Ltd  
21-24 September 2013 in New Zealand

CSB Program team members will make a familiarization visit to New Zealand partner, Grasslanz Technology Ltd and the AgResearch Grasslands site in New Zealand.

biosciences  
eastern and central africa



ILRI  
INTERNATIONAL  
LIVESTOCK RESEARCH  
INSTITUTE

<http://hub.africabiosciences.org>

*Mobilizing biosciences for Africa's development*

Box 30709, Nairobi 00100, Kenya

Phone: +254 20 422 3000

Fax: +254 20 422 3001

Email: [BecA-Hub@cgiar.org](mailto:BecA-Hub@cgiar.org)