



Mokamorigo Tamali, a smallholder from Okara Sector, harvests Brachiaria from her field to feed her cattle, Okara Sector, Rwanda. (photo credit: CIAT/Stephanie Malyon)

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Vibrant innovation platforms equals relevant research

Often, adoption of new technologies or practices designed to improve people's lives does not take place due to various factors including lack of understanding by communities and the absence of support for the innovations from leadership. Félix Meutchieye, Cameroon national coordinator of the “Harnessing genetic diversity for improved goat productivity” project speaks about the strides being made by the project in involving communities and increasing the chances of adoption of research findings through innovation platforms.



Harnessing the diversity of native livestock in Africa is becoming a pressing need as continual changes in the environment exert pressure on small holder livestock farmers. The higher temperatures and changing rainfall patterns are contributing to the increased spread of existing vector-borne diseases and the emergence of

new diseases as well affecting the feed production.

Small ruminants play a significant role in livestock production systems throughout the wide range of agro-ecological regions in Africa. For many rural farmers, they are a critical resource of nutrition and income, and goats in particular are more resilient and adapted to different husbandry conditions. It is well documented that genetic variation in ability to various infections and diseases as well as to adapt to harsh environments with higher temperatures and less water, exists between and within different breeds of goats. This adaptation is especially evident in indigenous breeds, but gaps still exist in the knowledge available.

The “Harnessing genetic diversity for improved goat productivity” project is focused on bridging this knowledge gap by helping

farmers take advantage of the best genetic resources locally available. Our strategy involves working closely with the goat keepers, traders, policy makers and all other stakeholders so that there is collective ownership of the existing problems and in the approach to finding solutions. Through the innovation platform (IP) system, the project is drawing from the existing indigenous knowledge, receiving guidance in terms of farmers' actual needs and preferences and establishing effective channels that act as vehicles for information on research findings and promotion of sustainable livestock keeping practices.

Already in Cameroon, one regional IP in Kouoptamo (West Highlands) has identified high fecundity as a desirable trait in their goats and are promoting their animals as high value breeding stock for proven twinning ability. Additionally, as a result of close engagement with the project through the Cameroon National goat IP, the Ministry of Livestock, fisheries and animal industries has recognized the importance of goats and small ruminants as an important resource to grow the country's rural economy and has started a program to revitalize three small ruminant breeding and multiplication stations in different agro-ecological regions.

Our counterparts in Ethiopia have established a community based goat breeding initiative where a group of 50 farmers have formed a cooperative society to drive the breeding activities. The cooperative members brought their goats for selection to form the next generation of goat parents in their village and in the neighbouring villages as well.

I see this active participation by communities as a very exciting and practical way of doing research. Through community involvement, the project has been able to stay relevant and ensure that good science supports the things that are most relevant to Africa's development.

biosciences

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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.

East to west, goats are best – Cameroonian livestock experts learn about breeding from Ethiopian villagers

In the northern dry region of Cameroon, a group of smallholder goat farmers are looking for ways to increase the productivity of their goats. The farmers are faced with scarce water resources and limited feed for their flocks because of the scanty rainfall and rocky soils that characterize the area in which they live.

Despite many hardships, the farmers who mainly keep indigenous goats are determined to find new strategies to increase their herd sizes and improve the quality of their products. The goats which are easier to acquire and maintain than cattle are of great importance to their subsistence, economic and social livelihoods.

Almost 4,000 kilometres away in Belaku, a village in the Sokota district in northern Ethiopia, are celebrating the first anniversary of their community based breeding program (CBBP) for indigenous goats. The village which has similar environmental conditions to the northern Cameroon region has a strong tradition of goat keeping for income generation through sale of meat, hides, and milk as well as for household consumption.

On 10th July 2014, Dr Jacques Terenstra Djomika (Director of animal industries, small ruminant project, Cameroon) and Dr David Sakansou (Director of Lougguere Breeding station, Cameroon) went on a learning mission to Belaku in Ethiopia. The two representatives of the Cameroon Ministry of Livestock, fisheries and industries are members of the

Cameroon Innovation Platform established by the BecA-led project on *Harnessing genetic diversity for improved goat productivity*. Djomika and Sakansou were accompanied by the Cameroon national coordinator of the project Félix Meutchieye, a lecturer in Animal Breeding and Production Systems at the University of Dschang, and were visiting the CBBP that the Ethiopia component of the same project had helped to set up.

From their visit, Djomika and Sakansou took home valuable lessons on how involving a whole community in the planning and execution of a livestock breeding program can give positive results within a short time. The Belaku community was involved in setting the objectives for the improvement program which included deciding which traits in their indigenous goats they wanted to breed for. Selected farmers from the community were also trained as enumerators who were responsible collection of data that helped the project team understand the genetic variability and diversity of the major indigenous goat populations in the region; the goat production system in the study area; and the on-farm performance of the different local breeds. Having community members perform these tasks worked very well because they were able sensitive to the local practices eg the taboo against counting animals in a herd.

At the end of the visit, the Cameroon government representatives resolved to revive two small ruminant breeding stations, one at Lougguere in the arid northern region and the other at Batouri in the humid southern region. The breeding program will be a hybrid between on-station breeding and community based breeding with community members participating in data collection.

The visit to Ethiopia by Cameroon IP members was one of several such exchange visits planned to take place in the course of the project which enables farmers to benefit from lessons learnt beyond their borders. In April, 2014 an exchange visit from Ethiopia gave the team an insight on how to establish, manage and use a broad innovation platform to drive the agenda of research.

Félix Meutchieye, Cameroon national coordinator of the "Harnessing genetic diversity for improved goat productivity" project and Ethel Makila, Communications Officer, BecA-ILRI Hub



A goat farmer ties his goats to a fence during market day in Ndu, north western Cameroon (photo credit: University of Dschang/ Idriss Nyebe)

Ear tags stir fresh interest in goats in Ethiopian village

After many years of keeping goats, cattle and sheep, Tilahun Seyoum has in the last few months, learnt one new thing - the yellow tag now hanging from the ear of his goat means that the goat will sell for a higher price compared to that of his friend in the neighbouring village. That yellow tag means the parents of the animals are known and performances of its future offspring can be predicted hence the higher value compared to untagged animals.

Tilahun lives in Luma Tatesa kebele, in Meta Robi, Oromia region of Ethiopia where the BecA-led project on improved goat productivity has helped establish a community based goat breeding initiative whose main goal is to exploit existing genetic diversity in goats to improve goat productivity in Ethiopia.

Since July 2013, Temesgen Jembere (Graduate Fellow), Grum Gebreyesus (Research Assistant), focal person, Demeke Tadese and two enumerators – Ketema Tesfaye and Abush Girma have faithfully mediated between the project team, the local Ethiopian government administration and the community to establish the community breeding group and outline its objectives.

When the villagers were convinced that the group of researchers visiting their village at intervals had interesting ideas to offer, fifty of them came together and formed a cooperative society. They selected a committee led by Tilahun. with each member paying 25 Ethiopian birr (1 US dollars ≈ 20 Ethiopian Birr) as registration fees and a further 100 Ethiopian birr for a share in the business. Each member then brought their goats for selection to form the next generation of goat parents in Tatesa and neighbouring villages. The cooperative society has been registered and by-laws established, thus all 50 members are expected to be faithful to the agreement.

From previous discussions, final breeding goal traits are yet to be published. Researchers knew the community was looking for bigger size goats and



Ethiopian goat displays its identity card proudly. (Photo credit: ILRI/Wondmeneh Esatu)

ability to have more than one kid per pregnancy because goats are primarily used here for income generation. The researchers first identified the mothers – known as does. Then at six months of age, they checked the new born kids from those does for two traits – body size and twinning ability.

The next step was to identify the bucks (known as sires). The pedigree, whose birth history the farmers could narrate well, were brought to the common pool and record based as well as indigenous knowledge based selection was made. Farmers were advised to castrate the unselected bucks so they do not interfere with the breeding program. The community has a culture of exchanging breeding bucks, but they sold the best ones using them for breeding only accidentally if they happened to still be in the flock undergoing fattening before sale.

The farmers were then grouped according to the number of does they had, and the bucks were assigned accordingly. Scientifically, one buck can service more than 30 female goats but under the farmers condition fifteen (15) females were targeted per sire. A total of twenty five (25) sires are used as a revolving fund by the community.

They service the does and when they get old, they are sold and new ones bought. Some farmers were provided with recording facilities to keep records of their own flock while the two enumerators keep records of the entire village flock.

Arrangements were made at the start to have the animal health worker at the nearby Minare town, provide services to the member farmers at a cost covered from the project funds. The veterinarian at the post was provided with the necessary drugs and a list of member farmers from whom he was to receive no payment. Unpublished data indicated that the major goat diseases in the area are Contagious Capra Pleuro Pneumonia (CCPP) and external parasites.

Tilahun now says: 'I now know I ignored the health of my herd and I sold the best bucks (male goats). I have learnt to observe differences in their performance that may indicate illness so I can take them for treatment. I also retain the best bucks for breeding'.

Jane Gitau, Communications Specialist, Animal Science for Sustainable Productivity, ILRI

Exploring Brachiaria the “wonder grass” in eastern Africa



Farmers compare notes during the selection exercise at the Kenya Agriculture and Livestock Research Organization research station in Katumani, eastern Kenya (photo credit: ILRI/Samuel Mungai)

The inherent ability of Brachiaria grasses to grow in drought and marginal soils make them ideal forage for arid and semi-arid regions of East Africa. Native to Africa, Brachiaria grasses produce palatable and nutritious biomass and increase both milk and meat production. These grasses are good for the environment as they enhance nitrogen use efficiency, sequester carbon, reduce greenhouse gas emission and ground water pollutions. These attributes make Brachiaria one of the most widely cultivated forages in South and Central America, and Australia.

Despite their copious presence across sub-Saharan Africa, these grasses are yet to be explored and fully utilized as forage on the continent. The implementation of the Swedish funded research program “Climate-smart Brachiaria grasses for improved livestock production in East Africa” which is led by BecA-ILRI Hub in partnership with International Center for Tropical Agriculture (CIAT); Kenya Agricultural and Livestock Research Organization

(KALRO); Rwanda Agriculture Board (RAB); and Glasslanz, has led to the heightened publicity of the importance of Brachiaria grasses. As a result, there is now substantial interest in these grasses among farmers, policy makers and researchers across the continent.

Kenyan farmers work with researchers to choose preferred local varieties for improvement

The enthusiasm of local livestock keepers was evident in the participation of more than 100 farmers from eastern Kenya in the project’s participatory variety selection process. This exercise was involved small scale farmers in the selection of Brachiaria grass varieties that best fit to their needs.

During the participatory varietal selection process, the farmers identified preferred varieties based on their top five criteria - drought tolerance; soil erosion control; plant height at harvest; growth habit; and herbage colour. The selection took place at the project’s experimental plots situated at the KALRO -Katumani Experimental Station in eastern Kenya.

The participating farmers were representative of the 80% of milk producers in Kenya who operate smallholder crop-livestock mixed farms on less than 10 ha and keep less than ten dairy animals. These farmers rely on fresh milk as an income source and are at pains to increase their production in a set up where natural grazing is limited or no longer available. Large scale on farm evaluations of selected Brachiaria grasses and livestock feeding trials in Kenya are planned to take place in the next season.

Rwandan farmers try imported varieties

In Rwanda where land is under severe pressure from a rapidly growing

population, farmers are experiencing difficulties in feeding their livestock. The average farm size in the country is among the smallest in sub-Saharan Africa at just over half a hectare, from which farmers must grow their household food, cash crops and livestock feed. This has contributed to year round shortage of cultivated forages and resulted overuse and degradation of soils as well as decline in soil fertility.

Here, national partner RAB is working with Rwandan farmers to evaluate the performance of eight different cultivars of this “wonder grass” which has been shown to increase milk and meat yields in cattle in South-America. The grass has proved popular among the farmers in Rwanda and farmer to farmer dissemination of grasses is happening with 33 farmers growing this grass at present. The initial feeding trials have demonstrated up to 78% increase in the milk production.

This collaborative effort of five different institutions is giving renewed hope to millions of smallholder livestock farmers across eastern Africa.

Ethel Makila, Communications Officer, BecA-ILRI Hub and Stephanie Malyon Communications Specialist, CIAT



Farmer in Rwanda makes hay from improved variety of Brachiaria grass (photo credit: CIAT/ Stephanie Malyon)

Combating food loss through pests and disease diagnostics: A five-day workshop in Nairobi



Workshop participants attend a practical session (photo credit: BecA-ILRI Hub/Marvin Wasonga)

In August 2014, the BecA-ILRI Hub hosted a 5-day workshop on the use of molecular tools to diagnose livestock and crop diseases. The workshop was open to participants from national research systems and the private sector in eastern, central and western Africa. Participants received hands-on training in the design of tools which they can easily apply in their home institutions.

Clean taro for Burundi

Michel Ntimpirangeza, an agronomist and plant breeder of root and tuber crops for over 30 years in Burundi's national agricultural research institute ISABU has an ambition to develop a diagnostic tool for virus diseases in taro, an important staple food crop in Burundi. His interest in crop virus diagnostics was motivated by the devastation of sweet potato in Burundi witnessed in the 80s.

"Having faced the frustration of discovering that more than 50% of sweet potato planting materials I received in the 80s was virus infected, I am eager to ensure all materials used particularly for breeding are clean" says Ntimpirangeza.

The training he received during the diagnostics workshop will catalyse his upcoming work in taro virus discovery and in the development of a diagnostic kit that can be used in under equipped field laboratories.

Protecting cash crops in Uganda

For Josephine Nayiga, head of the diagnostic unit at BioCrops Uganda Ltd, the workshop is a step towards incorporating virus indexing in the operations of her company which distributes certified banana and sweet potato planting materials.

"Currently, we send all our materials for virus indexing to external laboratories. We want to be able to index both incoming materials and outgoing ones to ascertain the quality of our products," said Nayiga.

Nayiga's new skills will contribute to the BioCrops' soon to be established molecular laboratory. The company hopes to contribute towards Uganda's food security and national GDP by protecting crops such as banana, passion fruit, pineapple and potato, on which 16 million Ugandans depend for food, income and employment.

Crop protection services in Kenya

Since 2007, Joyce Waithira has been a laboratory technologist at the plant quarantine centre of the Kenya Plant Health Inspection Service (KEPHIS). Waithira, who helped to set up the institution's molecular laboratory, views molecular diagnostics as an area in which KEPHIS needs to grow.

"With the volumes of clients we serve, it is important to have fast turn-around and the real-time results that the LAMP assay technique provides."

Waithira believes the workshop was tailored specifically for her needs and has helped her create linkages with scientists working in areas of interest to her.

"I learnt about the existence of an assay that detects the sugar cane mosaic virus, one of the pathogens causing Maize Lethal Necrosis, a devastating disease affecting Kenya's biggest staple food crop. I think having this assay is a major step towards tackling it the disease."

Partnerships for capacity building

In addition to staff from the BecA-ILRI Hub, Dr. Valerie Verdier from the Institut de Recherche pour le Développement (UMR RPB) and Jillian Lang, Lab Manager Colorado State University were amongst the trainers. Both are among BecA-ILRI Hub's extended faculty of international scientists who enable a broader and deeper range of research and capacity strengthening programmes to be offered to African scientists.

Verdier's hope is that the introduction to bioinformatics tools as part of the workshop will stimulate a more collaborative approach to managing livestock and crop diseases in Africa. Such an approach has recently led to the development of new tools for rapid and accurate detection of various bacterial diseases of rice.

"There are many scientists working on similar crop and livestock diseases in Africa and across the globe," said Verdier, "we stand a better chance of finding solutions to food losses through disease if we share up-to-date research, diagnostic tools, surveillance and technology information."

Ethel Makila, Communications Officer, BecA-ILRI Hub.

Assessing Food Security in Kenya: the Plant virome project explores the country's virome and microbiome ecology



The plant virome project was launched to strengthen the BecA genomics platform and increase the use of Next Generation Sequencing (NGS) technologies by National Agricultural Research System (NARS) researchers in understanding existing and emerging crop diseases.

The additional MiSeq System acquired and installed at the BecA-ILRI Hub in 2014 greatly increased the genomics platform's capacity to serve more NARS researchers from eastern and central Africa. By establishing high throughput sequencing platforms and a bioinformatics pipeline at the BecA-ILRI Hub, the project is also contributing to the assessment of

pathogen diversity and discovery as well as microbial diversity studies in Kenyan maize mixed small farming systems.

The full genome of a novel Waikavirus has been recovered from a sample of kale. The Maize Chlorotic mottle virus (MCMV) and Sugarcane mosaic virus (SMV) have also been detected in symptomatic maize leaves and different crops. Their genomes have been covered almost entirely and analysis is ongoing to elucidate the presence of new variants among the viral signatures. The results of the analyses will be shared with National partners (Kenya Agricultural and Livestock Research Organization and the University of Nairobi) and

collaborations are ongoing to make use of this knowledge in the design of risk management strategies based on pathogens geographical distribution.

Through this project, researchers in the region have been trained in the use of genomics technologies and applications. More than 10 research fellows from African NARS who were at the BecA-ILRI Hub under the Africa Biosciences Challenge Fund fellowship program were trained and made use of genomics platform as part of their research.

Support was also offered to an East African consortium that is sequencing the whole genome of *Busseola fusca* - a crop pest that devastates up to 30% of the maize crop in East Africa every year; the Safe food, fair food project that is working to improve food safety and participation of the poor in informal markets of livestock products in sub-Saharan Africa; researchers from the Mikocheni Agricultural Research Institute who are working to tackle the Cassava brown streak disease (CBSD) and Cassava mosaic disease (CMD) in Africa; and the International Institute of Tropical Agriculture (IITA) that is also working to fight CBSD through molecular breeding of disease resistant cassava.



National project partners Douglas Miano and Dora Kilalo from the University of Nairobi compare notes during the sampling process in Trans Nzoia County, Kenya (photo credit: BecA-ILRI Hub/Francesca Stomeo)

Francesca Stomeo, Co-PI, Plant Virome project.

Collaboration with the National Veterinary Institute (SVA) Sweden

As part of Sweden's support for institutional capacity building in Africa, the Swedish National Veterinary Institute (SVA) is supporting BecA-ILRI Hub in establishing a state of the art molecular diagnostic platform. This platform will support rapid, efficient and accurate detection of livestock pathogens for disease diagnosis, surveillance and improved disease management.

Under this collaboration, the BecA-ILRI Hub Technology Manager, Josephine Birungi spent three weeks (14 September to 5 October 2014) at the SVA which is a World Organization for Animal Health (OIE) laboratory (an accredited facility with a quality management system in accordance with the ISO/IEC 17205:2005 accreditation standards, ISO 9001 quality management system,

ISO 14001 environment management system and OHSAS 18001 occupational Health and Safety.)

The SVA laboratory currently receives up to 15,000 samples annually and has the ability to test over 50 animal pathogens with limited staff given the availability of automated equipment for RNA/DNA isolation, optimized real-time PCR systems that enable the detection of more than one pathogen per assay using the same thermal profile and a good laboratory management systems that reduce manipulation of sample information.

Birungi was introduced to the laboratory management and operations by Mats Isaksson, Technical Leader, Molecular Diagnostics at SVA. She also gained hands-on experience in various molecular diagnostics techniques and held discussions on biosafety/biosecurity issues

with experts including Allard Bengtsson Ulrika, who would guide the establishment of a similar accredited diagnostic at the BecA-ILRI Hub; management of the bacterial diagnostic labs with Tomas Jinnerot; management of the viral diagnostic labs with Lena Renström; the set-up of avian disease diagnostic labs with Zohari Siamak; quality assurance systems with Suzanne Kjellberg; the establishment of the BecA diagnostic lab as a reference lab for the region with Karl Stahl; and the adoption of African swine fever (ASFV) and classical swine fever (CSFV) assays as one of the first assays to be adopted at the BecA diagnostic platform and proficiency panels as part of a quality assurance system and a requirement of an ISO laboratory with Neil LeBlanc.

The partnership between the two institutions will ensure that technology and knowledge transfer of quality controlled molecular diagnostic tools will improve disease diagnosis, risk mitigation, and disease management in Africa. As a technology hub for eastern and central Africa, the BecA-ILRI Hub has a mandate to serve as a competent diagnostic reference laboratory for its region and as such, has the goal to become an internationally certified laboratory performing key diagnostic function of important diseases affecting the region.

Ethel Makila, Communications Officer and Josephine Birungi, Technology Manager, BecA-ILRI Hub



The SVA laboratories in Uppsala, Sweden

About the BecA-Sweden Partnership

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.



A man and his goat at the ILRI Campus in Addis Ababa, December 2012 (photo credit: ILRI/Liya Dejene)

Upcoming Partnership Events

Biosciences for sustainable goat production in Africa workshop
8 – 10 December, 2014 in Kenya

This is a 3-day workshop for experts in small ruminant research from Africa and around the globe to share their accomplishments, critically explore a way forward for small ruminant research and to highlight potential new frontiers in this area.

There will be presentations on, among other areas:

- Goat production and husbandry – including forage and feeding.
- Goat production and breeding
- Goat genomics resources and biosciences
- Markets and Value chains – goat business
- Policies and innovation platforms

These dialogues are aimed at guiding efforts to strategically apply science and technology to improve African livelihoods.

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