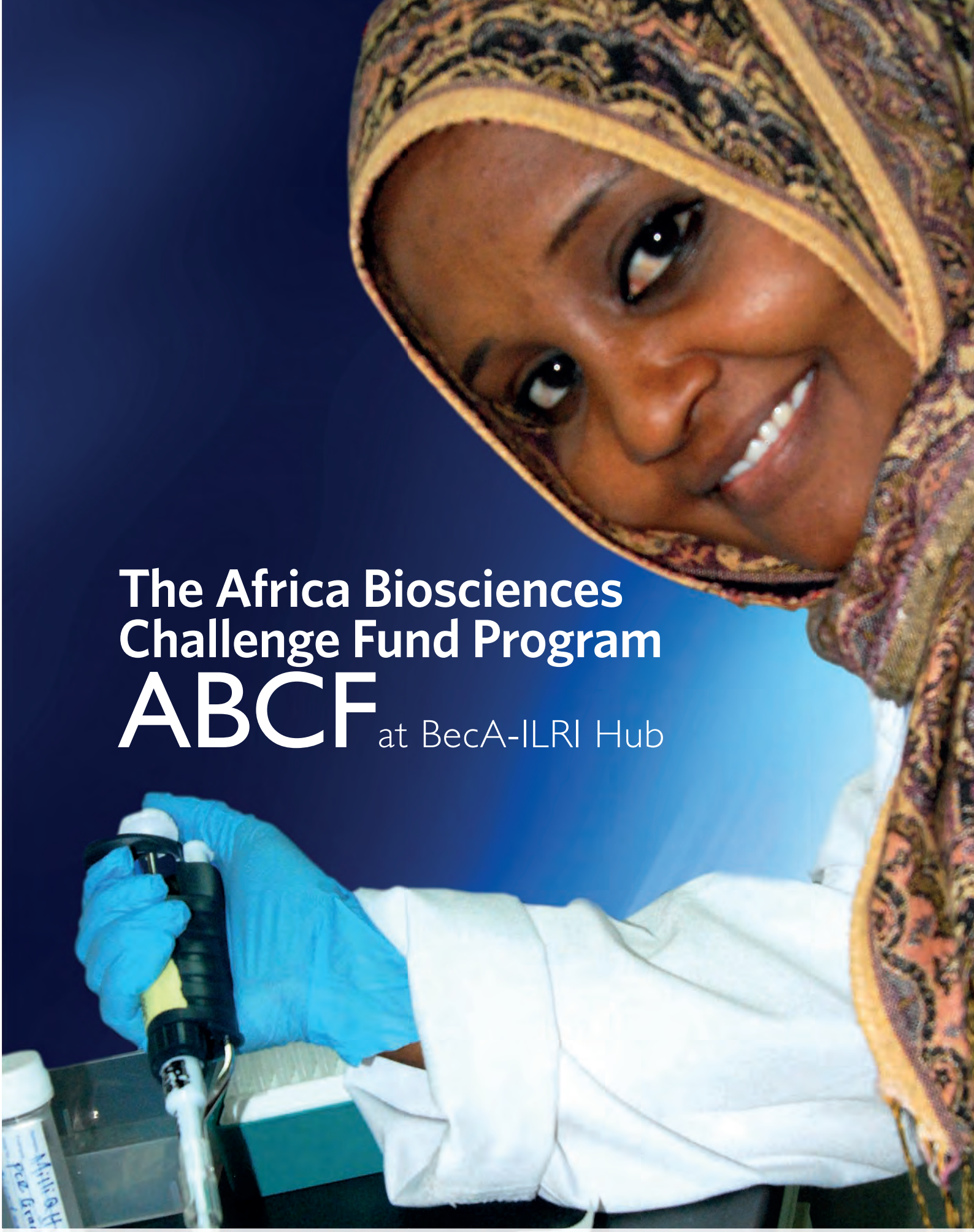


The Africa Biosciences Challenge Fund Program

ABCF at BecA-ILRI Hub

biosciences
eastern and central africa

NEPAD
TRANSFORMING AFRICA

CGIAR

ILRI
INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

91% of all stakeholders believe that the ABCF Program promotes the development of cutting edge research into applicable solutions for addressing food security and quality issues in Africa.[1]

Cover photo:
Rasha Ali Mohamed Ali ABCF Fellow – 2011/12
Institution: Agricultural Research Corporation, **Sudan**
Research topic: Genotyping of BC4F1 population with SSR markers associated with *Striga* resistance in sorghum.

[1-10] Findings by Dalberg Global Development Advisors from external evaluation of ABCF Program in 2014 (link to report):
http://hub.africabiosciences.org/media-center/publications?download=11:africa-biosciences-challenge-fund-abcf-capacity-building-evaluation-april-2014

BecA-ILRI Hub Operational Business Model

The Biosciences eastern and central Africa-International Livestock Research Institute (BecA-ILRI) Hub is a shared research and capacity building biosciences facility located at and managed by ILRI in Nairobi, Kenya. The BecA-ILRI Hub consists of a state of the art suite of shared biosciences platforms established to support the work of African and international agricultural scientists through research, capacity building and by providing research related services. The BecA-ILRI Hub hosts and supports the work of scientists from African National Agricultural Research Systems (NARS), ILRI, other CGIAR centers and the CGIAR Research Programs (CRPs) and research scientists from institutions globally.

The activities, supported by the BecA-ILRI Hub, are developed in response to high priority constraints relating to food and nutritional security in Africa. Governments and continental initiatives, such as the Comprehensive African Agriculture Development Programme (CAADP), the Africa Bioscience Initiative (ABI) and the Science Agenda for Agriculture in Africa (S3A), as well as by the CGIAR agenda guide the development of collaboration with African partners.

The BecA–ILRI Hub operating model is delivered through the following core operational areas that all focus on leveraging opportunities offered through the high-end biosciences that are complementary to capabilities already available in various NARS within the region.

1 **Capacity building**: The main driver of the BecA–ILRI Hub is to support and mentor African scientists in the application of biosciences in food security and agricultural development to address priority constraints. This is implemented through mentoring and hosting of African scientists to enable them conduct their own research projects, making use of the research facilities and technology platforms. Research scientists from NARS have access to high-end

Florence Munguti ABCF Fellow – 2014/15
Institution: Kenya Plant Health Inspectorate Service (KEPHIS), **Kenya**
Research topic: PCR based diagnostics of passion fruit woodiness disease in support of phytosanitary services.

research facilities, mentorship by the Hub's faculty consisting of BecA Hub scientists, ILRI Biosciences scientists, scientists from other CGIAR centres, some of whom are hosted at the BecA-ILRI Hub (CIMMYT, IITA, CIP, IRRI, ICRISAT), and through scientists from collaborating advanced research institutions and universities in Europe, Australia and USA.

2 **Demand-driven research**: In light of the priority thematic areas identified at the national and regional levels within Africa, the research conducted at the BecA–ILRI Hub by African and international scientists is organized around five priority themes that respond to a demand-led research agenda for African agriculture: **i)** Crop improvement to increase the productivity of staple crops; **ii)** Food safety and improved nutrition; **iii)** Livestock productivity through better health, genetics and feeds for small-scale livestock keepers in Africa including issues related to zoonotic diseases; **iv)** Climate change mitigation for better agricultural productivity and sustainable use of natural resources; **v)** Exploiting the potential of underutilized species of crops and livestock.

3 **Technology platforms and research service units:** The BecA–ILRI Hub facilitates affordable access for African scientists, students and international partners to a shared research platform allowing them access to first-class research facilities and research services. Specifically and to better meet the dynamic research needs of the region and ensure the continuous availability of an up-to-date suite of specialized bioscience technologies in Africa, the BecA-ILRI Hub has established and continues to upgrade a number of technology platforms including:

- Genomics
- Bioinformatics
- Nutrition and mycotoxin analysis
- Diagnostics Platform (for crop and livestock)
- Molecular Breeding Platform
- Vaccine Development
- Golden Gate Cloning
- Biorepository
- Biosafety Level 3 Laboratory
- Research related services
  - Genomics and genotyping
  - Oligonucleotide service
  - Other services offered (standard and customized) by leveraging some of the platforms listed above.

The BecA-ILRI Hub facilities are like a laboratory in Europe but placed in Africa.
ABCF Alumni

94% of all stakeholders believe that BecA-ILRI Hub's ABCF Program promotes access to world class research and training facilities.[2]

The BecA-ILRI Hub capacity building program is branded **The Africa Biosciences Challenge Fund (ABCF)**. The program's objective is to support and strengthen the capacity of NARS to deliver on their research for development agenda, which directly contributes to S3A and CAADP. Within the BecA-ILRI Hub, the ABCF Program draws from the two other pillars, namely Research and Technologies. The ABCF Program operates in the critically important intersection between agricultural research for development (ARD), food security, and individual and institutional capacity building.

The BecA-ILRI Hub extended faculty: The BecA-ILRI Hub has strategic and diverse partnerships with renowned international research and capacity building institutes such as the John Innes Centre (UK), Queensland University of Technology (Australia), Cornell University (USA), the International Foundation for Science (IFS), African Women in Agricultural Research and Development (AWARD), African NARS, sub-regional organizations, networks, and many others. Research scientists, trainers, mentors and other experts from the partner institutions, staff at BecA-ILRI Hub, ILRI Biosciences and other ILRI units, other CGIAR centres and programs, together form a solid extended BecA-ILRI Hub Faculty that drives the ABCF Program.

The ABCF Program is delivered through:

i) A visiting scientist program (the ABCF fellowship) targeting scientists from African NARS to undertake biosciences research-for-development projects at the BecA-ILRI Hub

ii) Annual training workshops in response to demands from NARS to enhance skills in critical gap areas such as molecular biology, genomics, bioinformatics, laboratory management, laboratory safety, equipment maintenance and scientific writing

iii) Institutional capacity strengthening, and

iv) Mobilizing national and regional capacities for joint actions.

Tadesse Haile Yohannes ABCF Fellow - 2015/16
Institution: National Agricultural Research Institute, **Eritrea**
Research topic: Identification of *Striga* resistance and associated markers in sorghum landraces from Eritrea.

ABCF fellowship

The purpose of the ABCF fellowship is to develop capacity for agricultural biosciences research in Africa, to support research for development projects that ultimately contribute towards increasing food and nutritional security and/or food safety in Africa, and to facilitate access to the BecA-ILRI Hub facilities by African researchers (and their partners). The fellowships are offered to applicants with innovative ideas for short to medium term research projects (up to 12 months) aligned with national, regional or continental agricultural development priorities, CGIAR R&D agendas, that can be undertaken at the BecA-ILRI Hub.

Areas of research

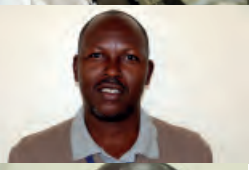
Applicants must be scientists affiliated (through employment) with an African NARS institution and conducting research in any or a combination of the following areas;

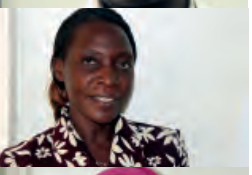
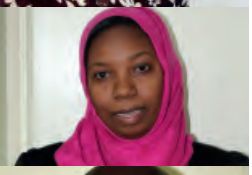
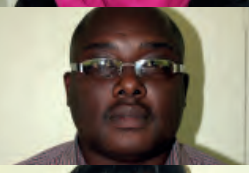
- Improved control of priority livestock and fish diseases including but not limited to: African Swine Fever (ASF); Contagious Bovine Pleuropneumonia (CBPP) and Contagious Caprine

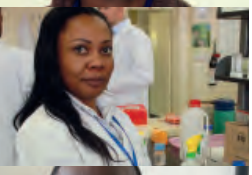
Pleuropneumonia (CCPP); Peste des Petits Ruminants (PPR); Rift Valley Fever (RVF); East Coast Fever (ECF); Capripox Virus diseases of ruminants; Foot and Mouth Disease;

- Harnessing genetic diversity for conservation, resistance to disease and improving productivity of crops and livestock and fish (livestock focus: African indigenous breeds, particularly goats, chickens, alternative small livestock species);
- Molecular breeding for important food security crops in Africa;
- Plant transformation to address food insecurity in Africa;
- Plant-microbe interactions;
- Tissue culture and virus indexing for production of virus-free planting materials in Africa;
- Orphan/underutilized species of crops and livestock
- Crop pests, pathogens and weed management research, including biological control;
- Microbial technology for improving adaptation of staple food crops and forages to biotic and abiotic stresses;

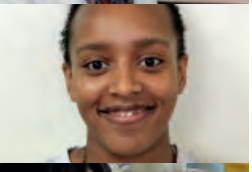
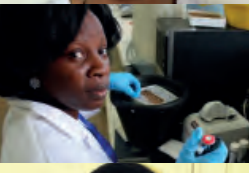
Prof. Sheila Okoth (below right) ABCF Fellow – 2015/16 Institution: School of Biological Science, University of Nairobi, **Kenya** Research topic: Characterization of *Aspergillus flavus* isolates from maize kernel and maize cropped soils from different maize growing regions of Kenya. Sheila also works as Senior Consultant with AWARD.






- Food safety, including addressing aflatoxin and other mycotoxins contamination in food and feeds;
- Nutritional analysis of food and animal feeds;
- Rapid diagnostics for crop, livestock and fish diseases;
- Genomics, bioinformatics and metagenomics including microbial discovery;
- Studies on climate-smart forage grasses and mixed livestock-crop systems;
- Soil health in agricultural systems.

This list is not exhaustive and applications on other relevant topics are welcome. Special opportunities also exist to connect with leading international scientists linked with the BecA-ILRI Hub in the following areas: wheat rust, insect pests and nitrogen fixation. Other special opportunities exist to connect with CGIAR Research Programs (CRPs). Such collaboration would allow the applicant's research to contribute more directly to an impact-oriented R4D agenda, and offer additional opportunities for joint activities.

Eligibility/applicant requirements

- The primary focus of the ABCF fellowship lies within the 18 BecA mandate countries, which are Burundi, Cameroon, Central Africa Republic, Congo Brazzaville, Democratic Republic of the Congo, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Kenya, Madagascar, Rwanda, São Tomé and Príncipe, Somalia, South Sudan, Sudan, Tanzania, Uganda. In exceptional cases, applicants from other African countries are considered;
- The above countries fall under different strategic categorization/ intervention stages, therefore each ABCF call for applications will give further eligibility details;
- The applicant MUST be a researcher employed in African NARS, currently engaged in research in food and nutritional security or food safety in Africa, or in a research area with relevance to agriculture in Africa;
- Good working knowledge of written and spoken English;
- A signed letter of endorsement of the application or letter of nomination from the head of the applicant's home institute/ organization;
- Women scientists and those from less resourced NARS are highly encouraged to apply.

What the ABCF fellowship covers

The full ABCF fellowship will normally cover the following costs;

- Research costs at the BecA-ILRI Hub;
- Travel from home country to BecA-ILRI Hub and back.
- Medical insurance;
- Accommodation;
- A modest subsistence allowance.

The ABCF fellowship does not cover fieldwork or research in the applicant's home country.

Marvin Wasonga, BecA-ILRI Hub, gets a snap shot of ABCF fellows' research work. '*A picture is worth a thousand words*'

96% of all stakeholders believe that BecA-ILRI Hub builds capacity of individuals and institutions to harness the latest biosciences technologies to improve agriculture in Africa.[3]

Installation of laboratory equipment coupled with training of laboratory technicians at Gulu University by **James Ndegwa** from ILRI Technical Services Unit (left).

ABCF PROGRAM MODEL

What is the ABCF Program responding to?

In the context of CAADP, S3A and STISA;

- Needs of NARS to build numbers towards critical mass of African scientists undertaking biosciences R4D in a technologically fast changing world,
- Ineffective individual and institutional links and partnerships to share knowledge, work across disciplines, innovate and deliver the results of innovation to users,
- Poorly equipped laboratory facilities coupled with inadequate and unsustainable financial resources and expertise,
- NARS scientists not effectively leveraging advances in bioscience and biotechnology for agricultural development,
- The weak link between bioscience R4D and policy

What is the objective of the ABCF Program?

To support and strengthen capacity of NARS to deliver on their mandate, thus more effectively contributing to CAADP, S3A and STISA.

Expected program outcomes:

- More effective ways of building bioscience capacity developed and adopted
- Bio-scientists more effectively contributing in national, regional and international knowledge sharing forums
- Increased investments in bioscience facilities
- Increased research designs from bio-scientists working as part of multi-disciplinary teams
- Bio-scientists collaborating more with development and private sector actors
- ABCF fellows and alumni actively participating in regional policy development and regulatory reform
- More scientists engaged in bioscience research, policy and client domains
- Science-informed policy
- Strengthened capacity of African NARS

IMPACT: AFRICAN AGRICULTURAL COMMU

The technical platform provided by BecA-ILRI Hub was very useful. I had planned to do research in France but that wasn't affordable. ABCF provided financial, technical support and mentorship. I achieved things that I would never have been able to in Cameroon.

ABCF Alumni

What is in the ABCF brand?

Research on NARS priorities using high-end facilities and expertise

Institutional orientation/ induction

BecA-ILRI Hub annual training courses and tailor-made workshops

Modular lectures and hands-on training at BecA-ILRI Hub by BecA faculty

Mentorship sessions – fellows' entry, progress and exit seminars; invited science speakers; ILRI institutional seminars

Training on communicating science, including to non-science audience

Preparation of fellows for re-integration into home institution environment and adaptation of protocols and tools

Connecting fellows to opportunities for individual and home institution growth

Creating plans for scaling up, sustainability and multiplier effects

NARS institutional capacity strengthening

Certificate of successful program completion

NITY BENEFITING FROM ADVANCES IN BIOSCIENCES

Whilst **over 70 African NARS** received support through research fellowships, some also received broader funding, advocacy and technical advisory support. Where provided, this support has been highly valuable in driving institutional growth and development.[4]

Sebastian Mengomo Ntutmu (below right)
ABCF Fellow – 2015/16
Institution: Agro-forestry Training School of Bata Littoral, **Equatorial Guinea**
Sebastian received a customized two-week course in Molecular Biology, focused on Animal Disease Diagnostics relevant to Equatorial Guinea. (Photo shows Roger Pelle of BecA-ILRI Hub conducting part of the training in January 2016).

What the research fellows get while at the BecA-ILRI Hub

- High-end research facilities and research environment of international standard;
- Working amidst world class, international, multi-cultural researchers from across the globe;
- Bench support by research associates and high-level scientific support from senior experienced research scientists;
- Skill and knowledge enhancement courses, including BecA-ILRI Hub's annual training workshops;
- Connection to relevant experts and opportunities world-wide
- Training modules on diverse aspects relevant to Research for Development e.g. presentation skills, project impact pathways, proposal writing for resource mobilization;
- Leadership and management, communicating scientific findings to non-science audience;
- Extra-curricular activities such as sports competitions;
- A tailor-made certificate of fellowship completion specifying the placement period and research topic.

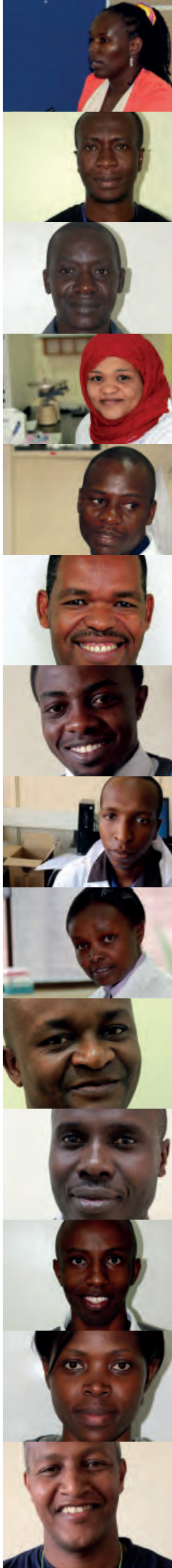
Annual Training Workshops

The BecA-ILRI Hub strengthens regional biosciences capacity through training workshops in key skill areas demanded by NARS and other partners. Workshops emphasize problem-solving and hands-on training, and require the involvement of the participants in seminars, discussions and where appropriate, practical work. The Hub holds the following demand-driven training workshops annually;

Introduction to Molecular Biology and Bioinformatics

This training workshop seeks to address the skills gap in basic molecular biology and bioinformatics, to increase the capacity of African scientists and institutions to conduct biosciences research and to develop and deliver new technologies for agriculture.

It is an intensive two-week workshop, with complimentary lectures and hands-on training in DNA purification, polymerase chain reaction



(PCR), DNA sequencing and bioinformatics. Participants to this workshop experience the research discovery process: potentially novel DNA sequences acquired by each participant are analyzed and discussed during the bioinformatics sessions.

Introduction to Lab Management and Equipment Operations

This is an intensive five-day workshop which introduces participants to principles in biosciences laboratory management and equipment operations. The training is aimed at giving skills for efficient management of laboratory facilities which is necessary to ensure that research is quality controlled and resources are utilized cost effectively. Training on laboratory management practices which ensures compliance with legal and regulatory frameworks for health and safety, waste management, import and export of biological materials and biosafety, forms part of the workshop curriculum.

90% of fellows' home institutions believe that one of the most significant direct contributions of the ABCF Program is increasing the number of researchers in the region.[5]

Advanced Genomics and Bioinformatics

In the last 10-15 years, computational biology and bioinformatics has increasingly attracted attention in developing countries, owing to the relatively low requirements in terms of capital and technological infrastructure *vis a vis* its wide scope of application in genetics, biochemistry and molecular biology research. Indeed bioinformatics has enabled researchers in many developing countries to make significant advances in diverse research areas such as virus discovery, diagnostics, environmental genomics and diverse opportunities in biotechnology. Efforts to build capacities of researchers in Africa's NARS have the potential to catalyze cutting-edge research that will accelerate Africa's scientific and technological development.

Advanced genomics and bioinformatics is a two-week workshop which includes comprehensive lectures and hands-on training sessions in; Genomics technologies and their applications; metagenomics and microbiome analysis – tools and computational approaches to study simple and complex genomes. Participants also discuss the applications and challenges of implementing next generation sequencing (NGS) technologies.

Participants at a session during the 2015 Advanced Genomics and Bioinformatics training workshop delivered in partnership Swedish University of Agricultural Sciences (SLU). Hadrien Gourle from SLU (2nd right) takes participants through a session of the training. Twenty-six participants attended the training workshop.

64% of fellows indicated their research led to invention of new techniques used in the field. **63%** said their engagement with ABCF resulted in greater awareness of their field of research.[6]

Biniam Ghebreslassie ABCF Fellow – 2014/15
Institution: Hamelmalo Agricultural College, Maekel, **Eritrea**
Research topic: Characterization of Eritrean potato genotypes using molecular markers.

Rachel Aye ABCF Fellow – 2015
Institution: Gulu University, **Uganda**
Research topic: Selection of *Mycoplasma mycoides subsp. mycoides* candidate vaccine molecules through the identification of monoclonal antibodies that inhibit pathogen-host cell adhesion.

Valerian Aloo (below 2nd right) Capacity Building Officer, ABCF Program, conducts a briefing/induction session for a group of research fellows.

Scientific Research Paper Writing

Communication of research findings in peer reviewed journals is the standard by which research scientists and their findings are evaluated by the scientific community. Publication ensures that research findings are accessible for use in related studies and are thereby better translated into agricultural improvement. Scientific writing skills are not an innate talent, but are developed and sharpened through active and continued engagement in research and writing/journal publication. The dynamic nature of today's scientific world and the associated societal demands for addressing agricultural challenges call for frequent strengthening of publication skills of researchers to facilitate information exchange and utilization to address development challenges.

The workshop is an intensive and interactive one-week training, during which participants develop their own manuscripts, with the goal of submitting to a peer-reviewed journal for publication within three to six months of completing the workshop. Participants continue to get the support from experienced trainers for up to one year after the training.

Animal Quantitative Genetics and Genomics

In addition to maintaining the existing genetic diversity, genetics and genomics provide one of the greatest opportunities to sustainably improve livestock productivity in sub-Sahara Africa. The design and application of effective breeding program are strengthened by the understanding of rigorous genetic principles. Recent advances in molecular biology imply that genetic progress can be accelerated by means of genomic selection. However, the application of successful breeding program continues to be a dream in Africa due to lack of required capacity and systems. In addition, the use of genomics in identifying genes associated with production and survival in the harsh climatic conditions of Africa has not received adequate attention.

The animal quantitative genetics and genomics is a two-week training workshop consisting of lectures and hands on practical training in population genetics, mixed linear models, variance component estimation, genome organization, genetic markers, Genome-Wide Association Studies – GWAS and genomic selection among other topics. Participants are also taught practical programming skills and the use of relevant software focussing on animal breeding.

51% of all fellows have had their sponsored research inform public policy; they cited **87%** ABCF contribution.[7]

Institutional Capacity Strengthening

The objectives are twofold; (i) to unlock the potential of NARS by improving the research environment through addressing key human resource and infrastructural challenges, and (ii) to broaden the reach of bioscience activities supported by home institutions. The main aspects of BecA-ILRI Hub's intervention are:

i) Technical assistance (lab design and management, equipment installation and commissioning, training of equipment engineers and laboratory technicians)

ii) Support for securing funding for capacity building activities, and;

iii) Connections to networks and key influencers (e.g., suppliers of reagents and lab equipment)

iv) Customized training workshops at NARS institution

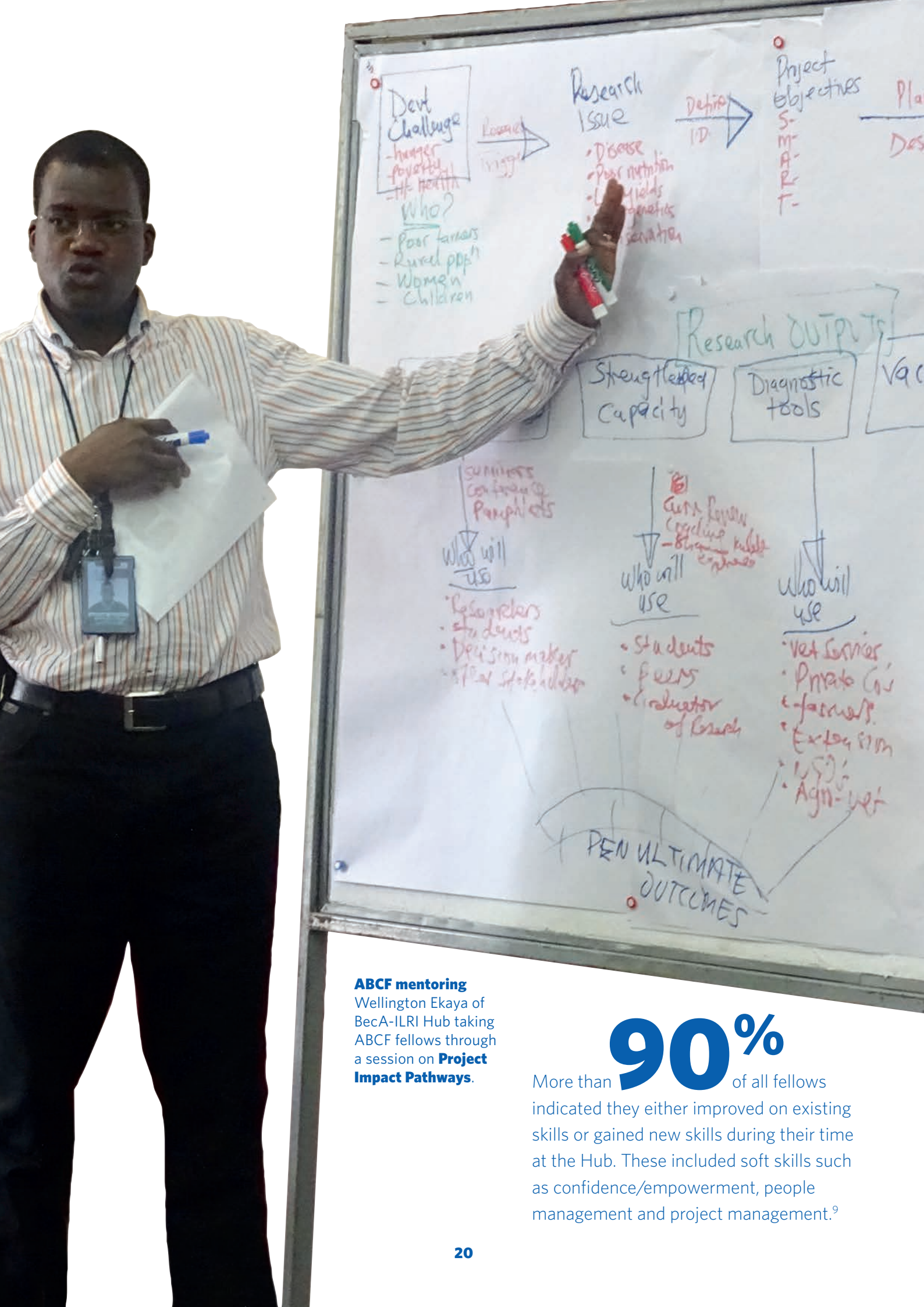
v) Brokerage of partnerships for research, training and resource mobilization.

Participants of the 2014 Scientific Research Paper Writing Training Workshop having completed the 5-days intensive training at ILRI Campus, Nairobi, Kenya. Twenty participants from 14 countries received certificates of participation.

Mobilizing Capacities for Joint Action

Given the lack of critical mass of research scientists in African NARS, BecA-ILRI Hub plays the key role of identifying where specific capacities exist, and facilitating the connection of such capacities for shared learning e.g. through Research Connections Workshop and joint NARS actions e.g. joint proposal writing responding to major calls for proposal requiring multi-disciplinary and multi-institutional participation. All joint actions emerge from and are aligned to national priorities.

50% of fellows have learnt about new educational and job opportunities, imperative to further their careers. Additionally, more than **75%** of respondents indicated that they have gained recognition with key influencers such as parent institutions, private and government sectors, and donors.[8]



ABCF mentoring
Wellington Ekaya of BecA-ILRI Hub taking ABCF fellows through a session on **Project Impact Pathways**.

90% More than of all fellows indicated they either improved on existing skills or gained new skills during their time at the Hub. These included soft skills such as confidence/empowerment, people management and project management.[9]

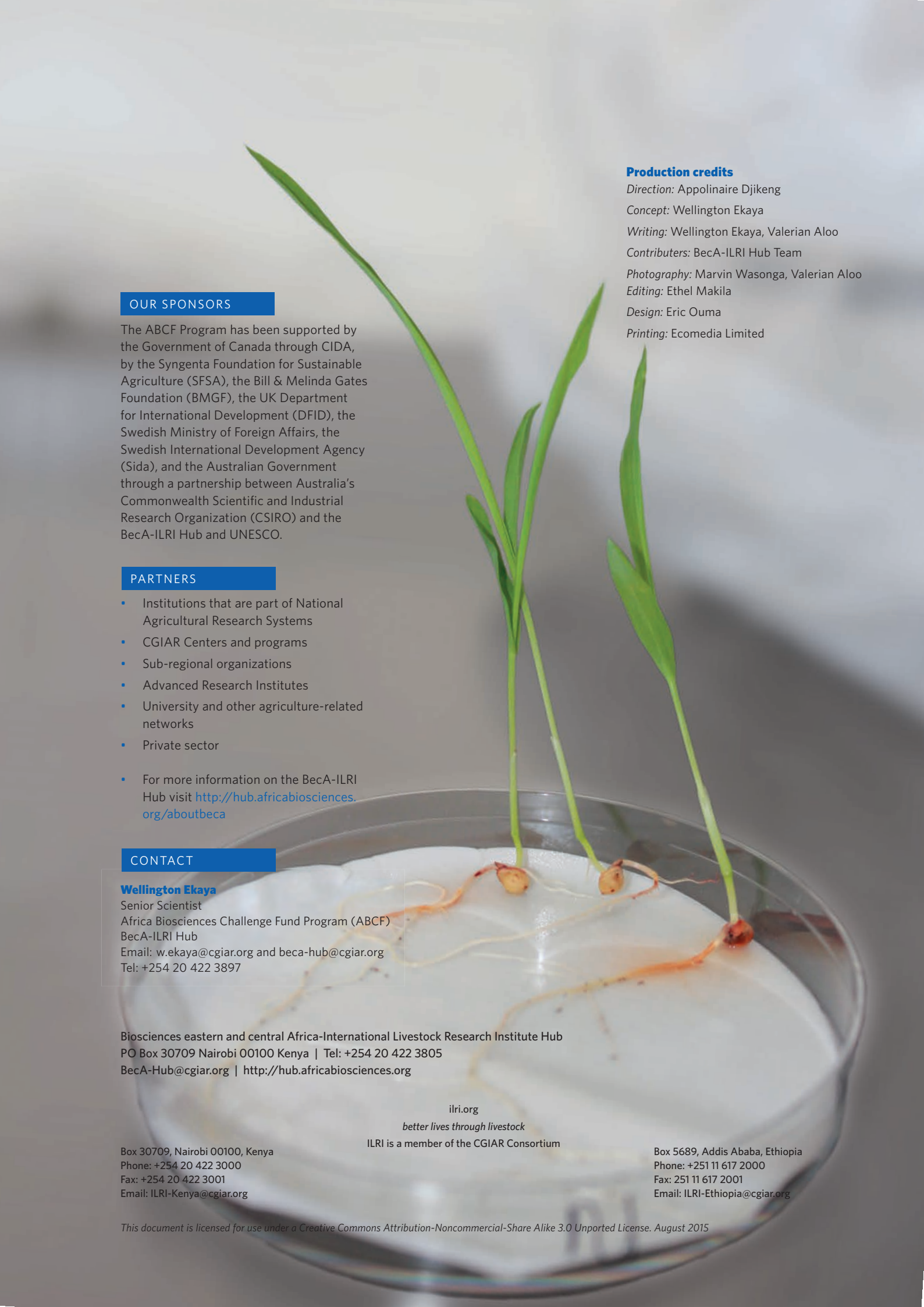
SCALING UP, SUSTAINABILITY AND MULTIPLIER EFFECTS

- **The PAPA**; BecA-ILRI Hub's capacity building activities continuously face an ever-increasing demand from NARS and beyond. The program strategically responded by designing a Participant post-training Action Plan Approach (PAPA) tool. The tool guides and facilitates/enables each participant to commit to at least three simple but effective post-training activities that will achieve the following;
  - Increased awareness about BecA-ILRI Hub at the participant home institution. This includes the course attended by the participant and/or fellowship;
  - Transfer of skills and knowledge gained at the Hub to more staff at the home institution;
  - Identification of opportunities for deepening and broadening engagement and/or partnership between home institution with BecA-ILRI Hub.

  Through these simple actions, the PAPA mechanism strengthens BecA-ILRI Hub's pathway to impact.
- **Creating NARS research leaders**; BecA-ILRI Hub strives to create research leaders within the NARS. The key avenues are through supporting alumni by actively linking them to opportunities for mentorship, further research, resource mobilization and partnership.
- **Facilitating creation of Communities of Practice**; BecA-ILRI Hub actively and continuously engages its alumni to bring together/connect research scientists and other actors within NARS to create **Communities of Practice**. These are groups that share a common research interest, passion or challenge. BecA-ILRI Hub therefore makes the connection, facilitates its creation and provides a platform for shared learning, partnership building and exploration of creative proposals to jointly mobilize resources for tackling the research challenge. The activities conducted by the Communities of Practice are all anchored within the NARS and aligned to national priorities.

Dawit Beyene
ABCF Fellow 2015/16
Institution: Ethiopian Institute of Agricultural Research, Holleta, **Ethiopia**
Research topic: Metagenomic analysis of Taro viruses in East Africa.
Dawit is currently a PhD candidate at Queensland University of Technology, Australia. He first came to BecA-ILRI Hub as ABCF research fellow for 6 months in July 2012 to conduct research on, Occurrence and Distribution of Taro (*Colocasia esculenta L.*) viral diseases in Ethiopia.

90% of stakeholders stated that BecA-ILRI builds the biosciences capacity of individuals and institutions, and promotes African scientists to lead and sustain biosciences research in Africa.[10]



OUR SPONSORS

The ABCF Program has been supported by the Government of Canada through CIDA, by the Syngenta Foundation for Sustainable Agriculture (SFSA), the Bill & Melinda Gates Foundation (BMGF), the UK Department for International Development (DFID), the Swedish Ministry of Foreign Affairs, the Swedish International Development Agency (Sida), and the Australian Government through a partnership between Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO) and the BecA-ILRI Hub and UNESCO.

PARTNERS

- Institutions that are part of National Agricultural Research Systems
- CGIAR Centers and programs
- Sub-regional organizations
- Advanced Research Institutes
- University and other agriculture-related networks
- Private sector

- For more information on the BecA-ILRI Hub visit http://hub.africabiosciences.org/aboutbeca

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Contributers: BecA-ILRI Hub Team
Photography: Marvin Wasonga, Valerian Aloo
Editing: Ethel Makila
Design: Eric Ouma
Printing: Ecomedia Limited

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