

Molecular Breeding Platform at the BecA-ILRI Hub: Supporting breeders in the region



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About the Molecular Breeding Platform

The Breeding platform at the BecA-ILRI Hub aims at enhancing plant breeding and livestock research using modern breeding tools. The platform is built around three key components: the Breeding Management System (BMS), the Integrated Genotyping Support and Service (IGSS) and the Demand-led variety design. BMS is a suite of comprehensive tools, embedded in a single place, and commonly used by breeders for their day to day breeding activities. IGSS is an innovative genotyping service and support to local plant/livestock breeding programs and small and medium enterprises in sub-Saharan Africa to accelerate the rate of genetic gain, development and release of new crop varieties or improved livestock. Through the demand-led variety design approach, the breeding platform aims at making plant breeding in Africa a business model responsive to market demand. The platform also generates and manages genomic and marker data and provides support to breeders and other scientists in integrating DNA marker assays and genomic tools into their breeding program and research activities for both cultivated and orphaned living organisms (crops and livestock). Major fields covered under the platform include: 1) training of breeders to make efficient use of breeding decision tools (BMS and IGSS), 2) provision of advice and guidance in elaborating an holistic breeding strategies (demand-led variety design) using modern breeding tools, 3) genome sequencing-based genetic profiling and generation of various genotyping data types from low to high throughput facilities, 4) support in populations' development and data management followed by required analyses, interpretation of result and supporting scientists to get the suitable breeding decision for the next step, 5) genome wide association study and 6) genomic selection.

Outputs

More than 200 breeders and agriculturists from NARS trained to use modern breeding management and decision tool (Fig. 1)

Establishment of nodes and migration of historical data from several breeding programs in Africa into the BMS tool

15 research scientists trained in Demand-led variety design approach

SSR genotyping of tubers (banana, cassava), cereals (rice, maize), tree crops (mango, eucalyptus), vegetable (bitter leaf), forage, fish and livestock (cattle, goat) from Sub Saharan Africa, USA and Ecuador (Fig 2)

SNP genotyping of 3230 samples including forage, maize, rice, sorghum, fish and sheep from CG centers (70%), National Agricultural Research System (NARS) (15%) and the Program for African Seed System (PASS) (15%) (Fig. 3).

Genomic assisted breeding jointly implemented with partners in Tanzania and Eritrea

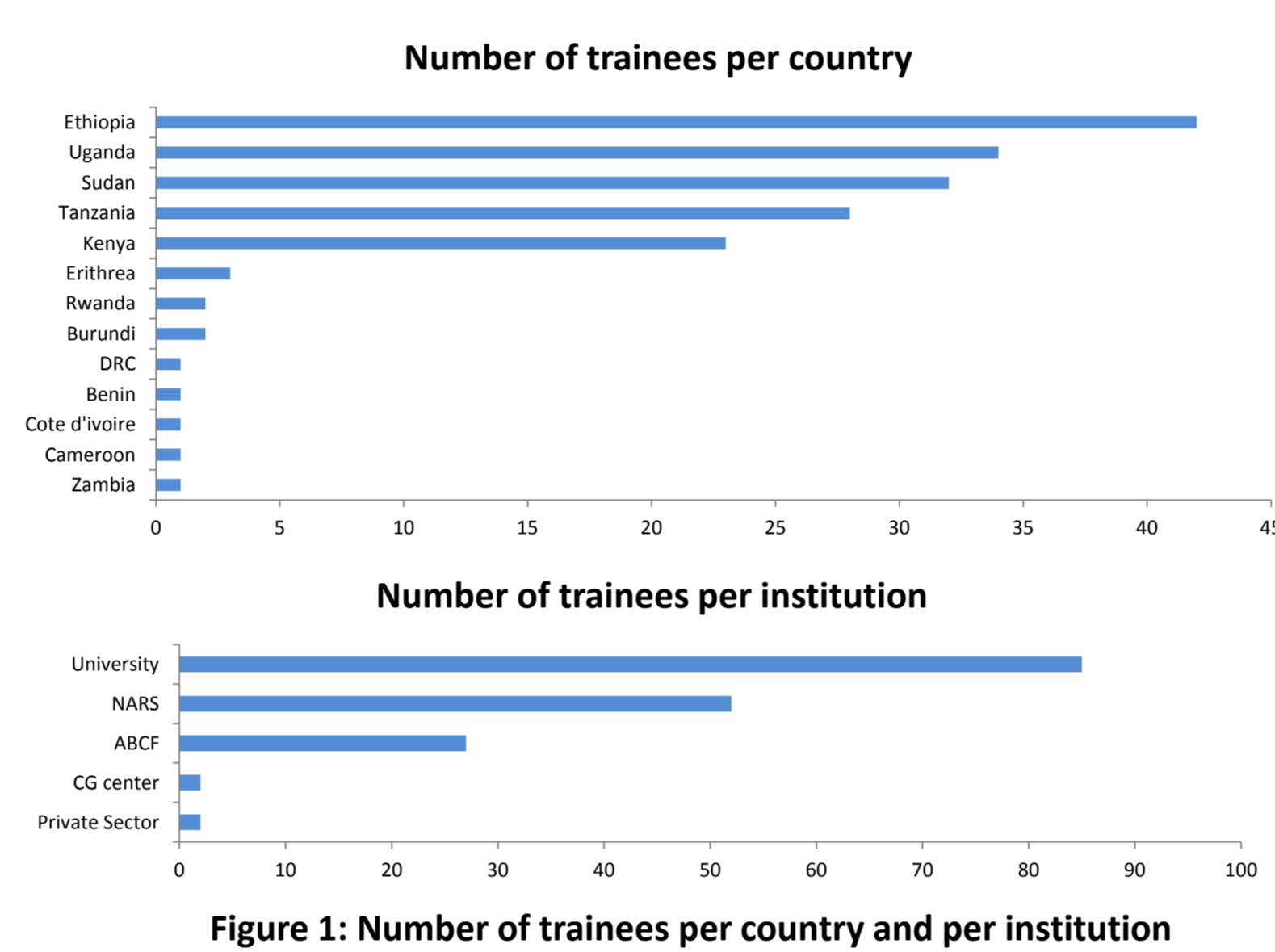


Figure 1: Number of trainees per country and per institution

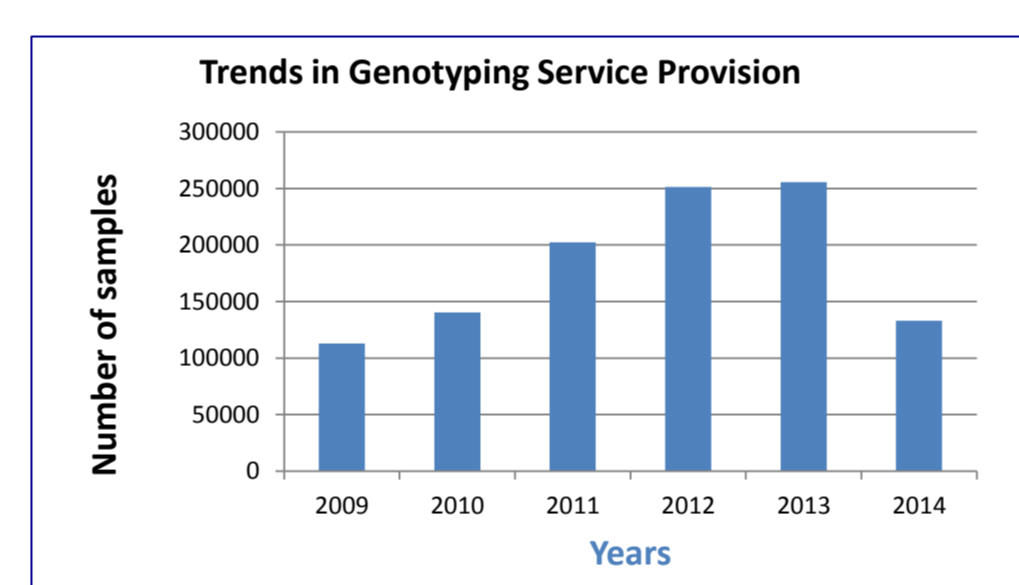


Figure 2: SSR genotyping service provision and trend from 2009 to 2014

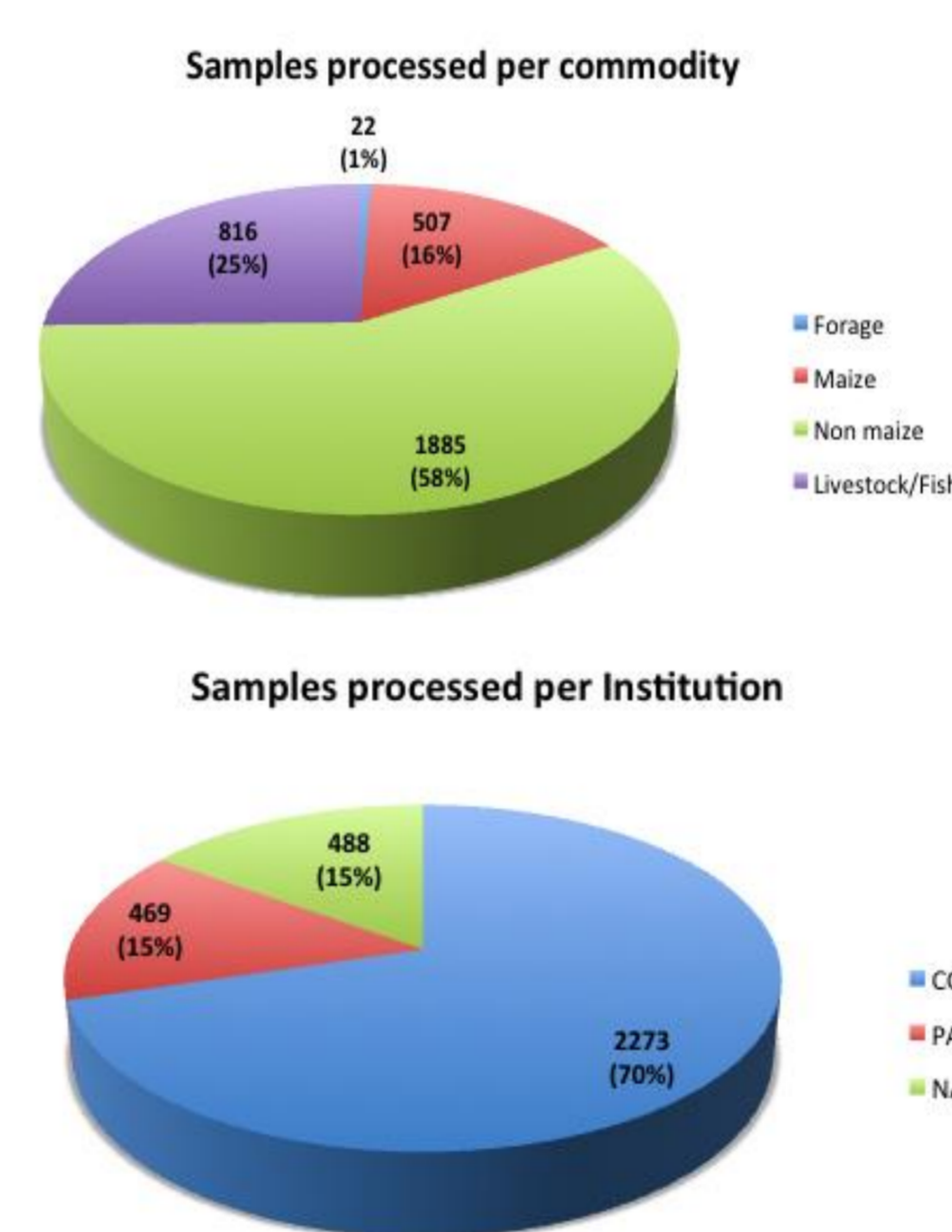


Figure 3: Number of samples processed per commodity and per institution under IGSS

Outcomes

Modern breeding tool adopted and used in several breeding programs in eastern, central and southern Africa including Ethiopia, Uganda, Tanzania, Sudan and Kenya

Conversion of historical data and manual data capture directly into BMS and ready for use

Major QTL for Maize Lethal Necrosis (MLN) identified in partnership with CIMMYT

Genetic profiling of 350 rice accessions, comprising a unique collection of the African Oryza and key rice germplasm used by the rice community as parental lines or elite material, are currently serving several breeding purposes at the Africa Rice Centre

Institutions (Naliendele Agricultural Research Institute (NARI) in Tanzania and the Hamalmele College of Agriculture, Eritrea) capacity strengthened in genomic-based/molecular assisted breeding

Partnerships



Potential to scale-up

- Genetic profiling of key crop and livestock commodities from breeding programs in Ethiopia, Kenya, Rwanda, Tanzania and Uganda
- Design of product profiles for major crops/livestock
- Development of cultivar development pipelines for major crop/livestock
- Linkage with the Global Open-source Breeding and Informatics Initiative (GOBII) and Diversity Seek (DivSeek) initiatives

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