Integrated Genotyping Service and Support Platform (IGSS)

- IGSS is a program that is part of the ILRI-BecA hub

- Funded by the Bill & Melinda Gates Foundation

- Partnership of BecA with Diversity Array Technology Pty Ltd

- Other partners and contributors: JIC, DAS, …

Goals of IGSS

- Contribute to increase genetic gains in breeding programs in Africa via high-throughput genotyping and breeding support

- Improve the efficiency of plant breeding

- Enable **USE** of modern, molecular breeding technologies by African plant and animal breeders
    - Marker-Assisted Selection
    - **Genomic Selection**

Challenges for African Breeders and IGSS

Breeding programs:

- Small breeding programs with limited funding (additional CoPs?)
- Sample tracking and identification
- Data management and organization (BMS)
- Adequate, accurate and standardized phenotyping across programs
- Data analysis and interpretation
- Optimal phenotyping field design

IGSS:

- Lower the cost of genotyping for genomic selection
- Handling KASPs assays, coordination with HTPG

What IGSS can provide

- A **partner** for implementing molecular plant breeding
- High density, high throughput SNP genotyping (DArTSeq) (GWAS, QTL)
- Medium density, high throughput SNP genotyping (GS)
- Low density, high throughput SNP genotyping (KASP)(MAS)
- Data curation and management
- Bioinfomatics support
- Data analyses and interpretation (Phenotypic, Genotypic, QTL, GEBVs, breeding applications)
- Advice on designing molecular plant breeding programs
- Training in all aspect of molecular plant breeding (on-line modules, workshops, etc)
- Partner for pursuing funds, grants

DArTseq™ – Genotyping by Sequencing

- 17 years of technology development (complexity reduced representations – reducing volume of sequencing and the cost)

- Complexity reduction optimised for each organism
  - Pair of Restriction Enzymes, at least one methylation sensitive

- Targeting c 200,000 mostly low copy sequences (methyl filtration)

- Most assays read at >10X
  - High call rate
  - High data quality

- Extensive quality control including QC individual libraries

- Technical replication -> selection of best markers (SNPs & SilicoDArTs)

- Scalable technology working from hundreds of markers to >100,000

HTPG & IGSS (EiB)

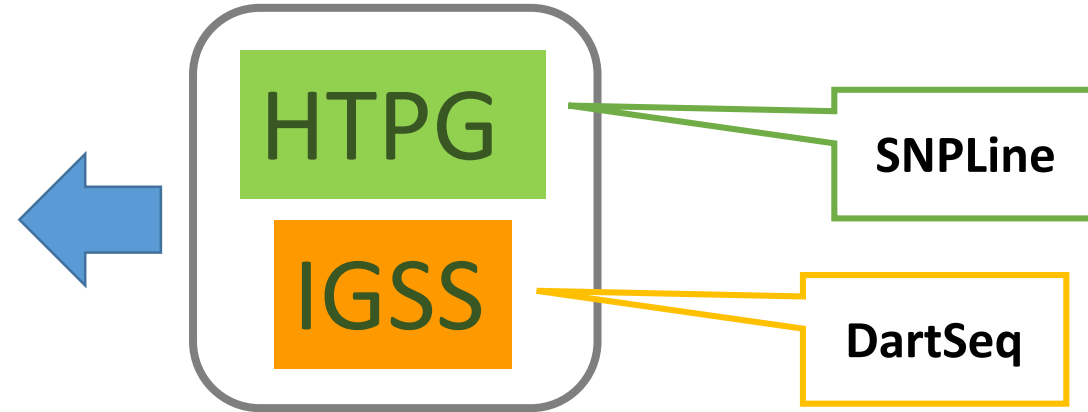

1 **Breeding program excellence**

Joining efforts to define and promote a standard breeding program performance management system to monitor success and highlight investment needs of breeding programs targeting the developing world.

2 **Trait discovery and breeding tools and services**

A common platform to share tools, information and training modules on how to successfully incorporate new approaches into the breeding process, from trait discovery to cultivar development.

3 **Genotyping and sequencing**

Broker access to genotyping services at reduced cost, assess the latest advances and support breeding programs to optimize the use of genotyping in their work.

4 **Phenotyping**

Adapt cutting edge phenotyping approaches for routine use in breeding programs, broker access to phenotyping capacities and expertise, and share and improve infrastructure.

5 **Bioinformatics and data management**
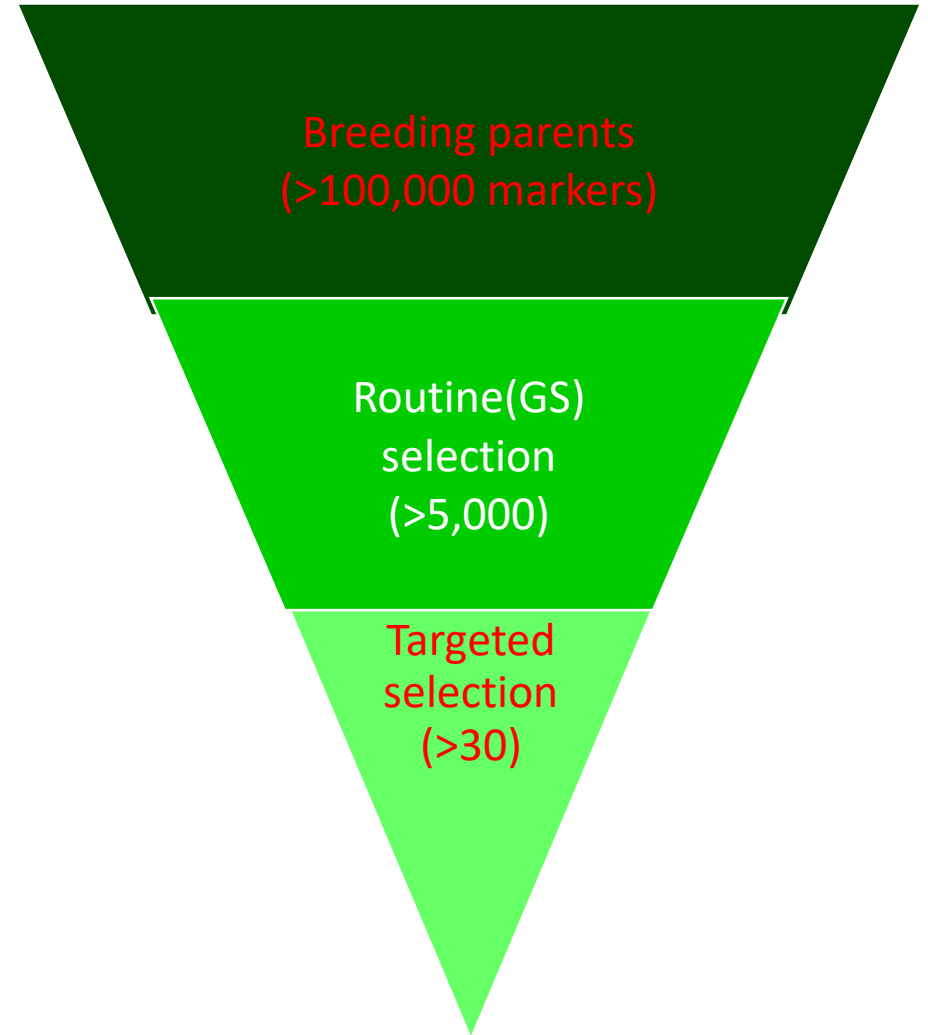
Harness the power of genotype, phenotype and other data by providing access to integrated bioinformatics tools and biometrics support.

CGIAR

Excellence in Breeding PLATFORM

HTPG — **SNPLine**

IGSS — **DartSeq**

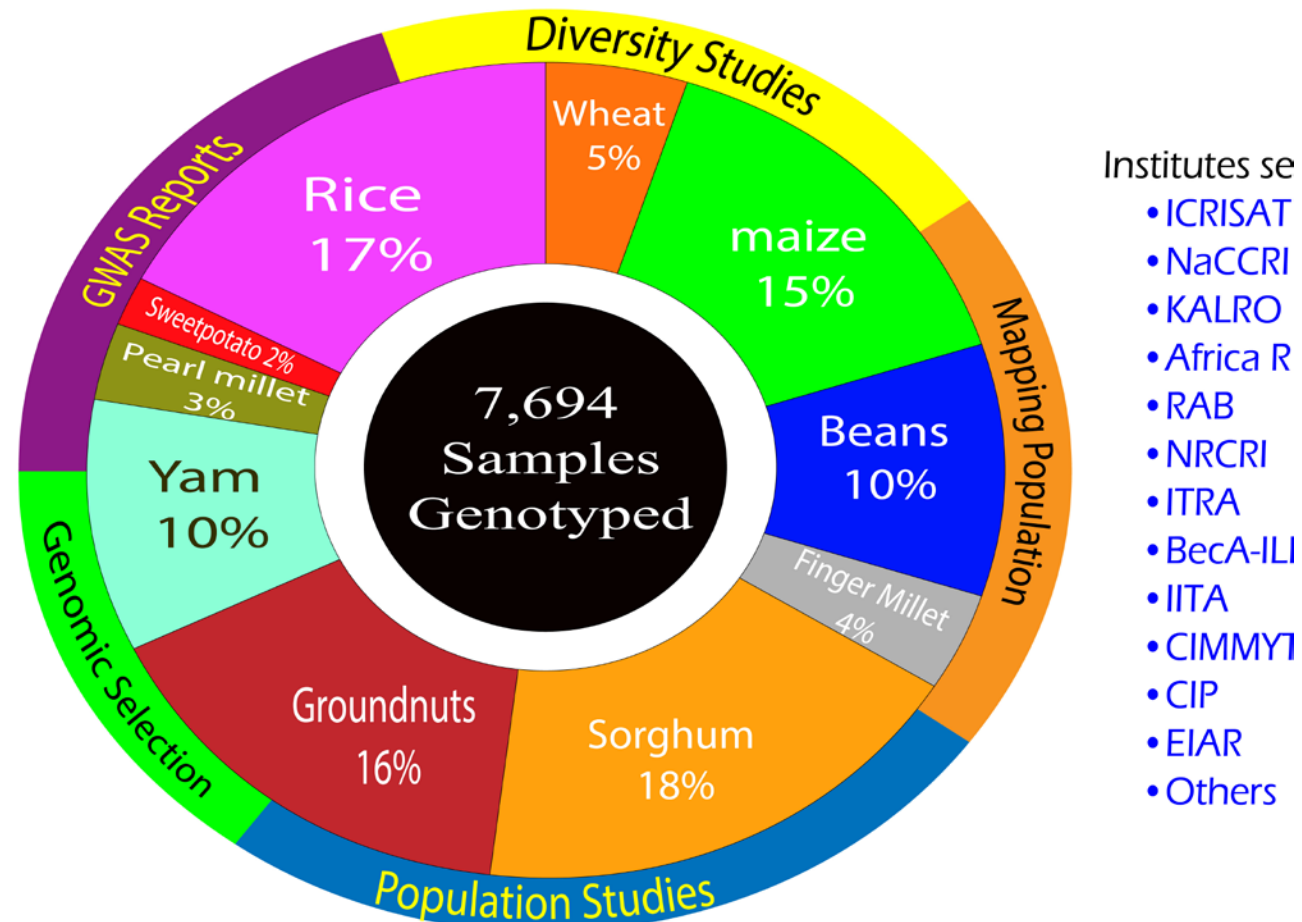**Source: http://excellenceinbreeding.org/**

Cost/Assay Type considerations - DarTseq

- Cost of assay and platform choice driven by size of demand and application type
- Assay densities
  - Hundreds of thousands for parents
  - Thousands for selections/biparental crosses
  - Dozens for "targeted selection"
- High density~$30-50/sample (c 2.5 million reads)
- Cheaper versions of assay ($5-20) depending on the sequencing volume
  - With lower depth with imputation
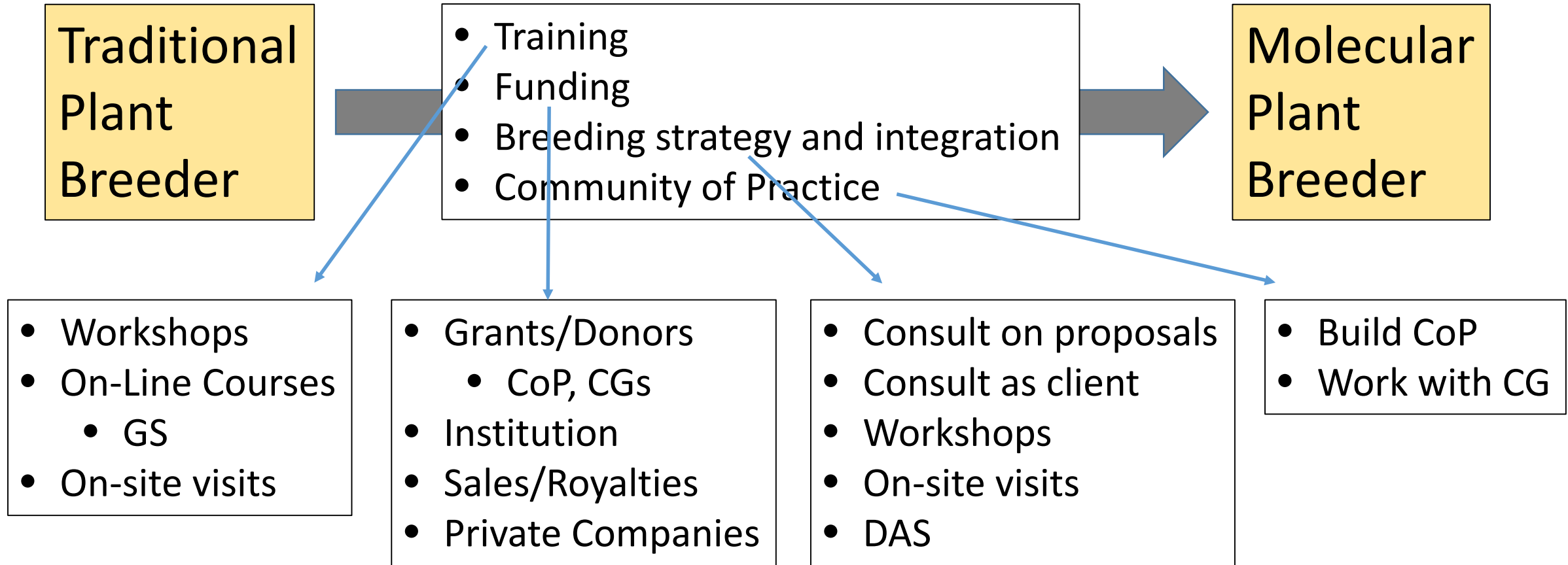- Markers from the same representation-> efficient imputation

Breeding parents
(>100,000 markers)

Routine(GS)
selection
(>5,000)

Targeted
selection
(>30)

Update on IGSS Breeding Services

IGSS Outputs 2017

7,694 Samples Genotyped

Diversity Studies
Wheat 5%
maize 15%
Mapping Population
Beans 10%
Finger Millet 4%
Sorghum 18%
Population Studies
Groundnuts 16%
Genomic Selection
Yam 10%
Pearl millet 3%
Sweetpotato 2%
Rice 17%
GWAS Reports

Institutes se
• ICRISAT
• NaCCRI
• KALRO
• Africa R
• RAB
• NRCRI
• ITRA
• BecA-ILI
• IITA
• CIMMYI
• CIP
• EIAR
• Others
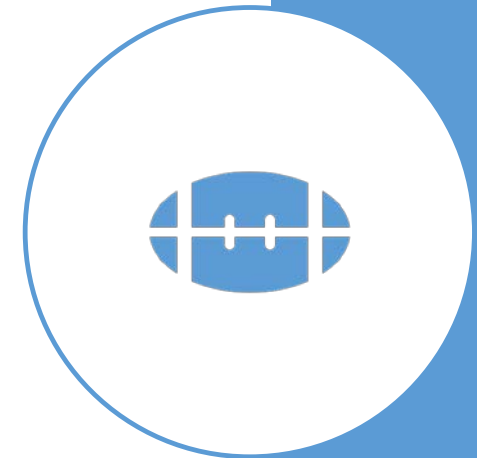
Strengths and Opportunities

- The IGSS lab team: skilled and enthusiastic
- Partnership with DArT: enables ability to evolve services
- JIC, DAS, others
- Ready to move into the business phase, service clientele, grow
  - Projects in place
  - Lab ready
- New projects are available
- Untapped avenues to identify additional partners

IGSS Contacts

Lead Scientists:Clay Sneller c.sneller@cigar.org ;Cathrine Ziyomo c.ziyomo@cigar.org

Platform Coordinator Jackline Chepkoech j.chepkoech@cigar.org

IT Assistance Mercy Chepngetich m.chepngetich@cigar.org

Thank You