





Genebank Platform

#### DSI's contributions to conservation, sustainable use and benefit sharing: Views from the CGIAR

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ITPGRFA, GB7, Special Event on Genomics information,, Oct 28, 2017, Kigali, Rwanda

**CBD** three main objectives (Article 1)

- 1. The conservation of biological diversity
- 2. The sustainable use of its components
- 3. The fair and equitable sharing of the benefits arising out of the use of genetic resources

#### Aichi Target 13 states:

By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.



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## How do we define and measure *diversity*?

- Do we have a baseline with which to measure diversity?
- Do we really know what this means?
- Do we know how to assess/quantify?
- Digital sequence information is a fundamental tool for quantifying!
- Phenotypes are not enough!





**CBD** three main objectives (Article 1)

- 1. The conservation of biological diversity
- 2. The sustainable use of its components
- 3. The fair and equitable sharing of the benefits arising out of the use of genetic resources
- Although the CG is the main access point for genetic resources in the MLS:



- If we do not know how our germplasm is used, how can we ensure sustainable use or fair sharing?
- A tracible, quantifiable barcode for each genetic resource = 100% verification
- We are talking about a technology that could help us achieve this





### **CGIAR** In Trust Collections

CGIAR mission: 'to advance agricultural science and innovation to enable poor people, especially women, to better nourish their families, and improve productivity and resilience so they can share in economic growth and manage natural resources in the face of climate change and other challenges

- Strategic research for agricultural development ensuring food security
- 93% of MLS distributions from 11 CG genebanks
  - 400,000 PGRFA samples per year



- 3.9 M samples over last 10 years to developing or transitioning countries
- All collections held *in trust* for humanity under Article 15

# Use of digital genomic sequence data in *in trust* collections

 Assess genetic diversity of ex situ collections



- Identify unique germplasm in farmers' fields which is not included in *ex situ* collections
- Baseline info essential for developing effective ex situ and in situ conservation strategies.





### **DArTseq Markers in Sweetpotato**



1345 unique accessions 55,000 DArTSeq markers STRUCTURE K=6



# Use of genomic sequence data to aid sustainable use

- Rarely used alone but as complement to phenotypic and other data
- ID of genotypes adapted to different, and changing, agro-ecological conditions.
- Integration with crop breeding programs to:
  - Ensure targeted and/or efficient use of genetic diversity in sustainable agriculture.
- Improved food and livelihood security
  - Most important benefit in agricultural research & development and plant breeding

### Where are benefits seen?



- Non-monetary benefits
  - Farmers' improved access to technologies
  - Enhanced institutional capacities of developing country research organizations
  - Shared research results
  - Local and regional economic development
- Monetary benefits
  - Tip of the iceberg huge potential
  - Linked to Centres' use, information and distribution of PGRFA under MLS ABS system





## Subscription system option could:

- Dissolve the distinction between access to and use of material genetic resources and genomic information
- Benefit sharing and fee based on total seed sales which would in turn reflect the benefits to the commercial user of accessing and using both genetic resources and genomic sequence data



## <u>Use</u> of genomic sequence data has proven practical, however ....

- Relatively small investments in the initial generation of genomic sequences, must:
  - be coupled with significantly larger investments to analyze genomic sequences,
  - linking genetic variability to useful phenotypic traits or performance is difficult
- Incredible potential but also a lot of research is still needed







## CGIAR poised to enable national partners



- In position to train and transfer this <u>and</u> other revolutionary and rapidly evolving technologies
- Technological and knowledge gaps need to be closed
- To that end, CGIAR centers are providing training and technology transfer for scientists in developing countries to realize the impact and advantages DSI

### Challenges

Capacity Building



- Development of technology to limit N-S gap in use and benefits
- Even the most sophisticated labs cannot handle all the data
- Contain the hype so that it does not continue to blur reality



 Hold on to the reins as the technology is powerful but also very dynamic and changing



#### **Summarized from:**



Genebank Platform

#### Potential implications of the use of digital sequence information on genetic resources for the three objectives of the Convention on Biological Diversity

### A submission from CGIAR to the Secretary of the Convention on Biological Diversity\*

With special thanks to: Michael Halewood, Isabel Lopez Noriega, Ruaraidh Sackville Hamilton, Selim Guvener and the Secretariat

\*Limited hardcopies will be available – see one of us if you would like an electronic copy