HIDAP: A unified platform for clonal crops breeders

Background
Breeding programs involve large investments of time and money, but can pay very large returns on investment in the form of improved varieties which benefit farmers, societies and the environment. International breeding efforts involving multiple partners and targeting regionally important constraints have great potential for efficiently and rapidly achieving impact. Standardized information on the performance of progenies and selected clones across environments is necessary in order to assist breeders to efficiently make decisions about selection and targeting regionally important constraints.

Highly Interactive Data Analysis Platform (HIDAP) has been developed to address the above challenge. For clonal crop breeders, the challenge has been how to improve the usability and power of existing tools, leveraging on advancements in various open source software technologies in the breeding space. The Highly Interactive Data Analysis Platform (HIDAP) has been developed to address the above challenge.

HIDAP is linked with relevant corporate and community databases for example CIP’s Corporate Database (https://research.cip.cgiar.org/gtdms/biomart) and the SweetPotatoBase (www.sweetpotatobase.org). The latter will be implemented via the Breeding API (BrAPI). BrAPI specifies a standard interface for plant phenotype/genotype databases to serve their data to crop breeding applications like HIDAP.

Key features
HIDAP builds on the statistical platform R. This includes the R shiny tools, the knitr package, the agricolae package, and more than 100 other R packages. The R shiny package enables implementation of interactive web pages that are usable online and offline. The knitr package enables the creation of reproducible reports. The statistical analysis is performed using R and R functions developed at CIP. The software is available for download at https://research.cip.cgiar.org/gtdms/hidap/.

Key features of HIDAP include:
1. Easy to install. End users can download a stable release of the software from https://research.cip.cgiar.org/gtdms/hidap/ and follow a friendly graphical interface to complete the set up. CloneSelector in particular had an ineluctably complex installation process.
2. Provides a unified platform for clonal crops breeders.
3. Supports offline usage. Online usage has been successfully tested and will be ready in 2018.
4. Can read information (pedigree and passport genotypes) from CIP’s Corporate Database (https://research.cip.cgiar.org/gtdms/biomart). The experimental data can also be uploaded to the database via the Field Book Registry Tool (https://research.cip.cgiar.org/gtdms/fieldbook) and can be published in Open Access through CIP’s Dataverse (https://data.cipotato.org).
5. Entirely Open Source.
6. Has an improved web based user interface, making it easy to present users with a more refined and improved usability and data quality.
7. Has improved usability and data quality.
8. Supports design of field experiments under several different experimental designs.
9. Supports creation of FieldBooks, which can be manipulated using Excel.
10. Supports analysis of single and multi-environment experiments.
11. Custom analysis with results output in the form of reproducible reports, available in both MS Word and HTML formats.

Future plans
The development of HIDAP is led by the Research Informatics Unit (RIU), based at CIP headquarters in Lima, Peru. End user feedback from both within CIP and external partners informs a lot of the development work. Some of the major focus areas will include the integration of mobile data collection and management of data exchange with external databases.

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Key achievements so far
1. First major stable release done early 2017, with two major updates mid2017.
3. Reference manuals and training materials from the introductory webinars available for download to the public on the HIDAP website.
4. HIDAP introduced to several sweetpotato breeders from across SSA during the 2017 annual sweetpotato breeders meeting in Kigali, Rwanda.
5. Two follow up in-country trainings held in July and August 2017 for Sweetpotato breeders based at Ethiopia’s Southern Agricultural Research Institute (SARI) and Tigray Agricultural Research Institute (TARI) and Tanzania’s Ukiriguru Agriculture Research Institute (LZARDI).

Figure 1. HIDAP software screenshot.

Figure 2. Sample dot plot from HIDAP.