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BREEDERS TAKE QUANTUM LEAP TOWARDS STATE-OF-THE-ART DATA METHODS AT WHEAT INITIATIVE TRAININGS

Wheat breeders from across the globe took a big step towards modernizing their molecular breeding skills at a recent workshop sponsored by the Wheat Initiative, with the CGIAR Excellence in Breeding Platform (EiB), and the International Maize and Wheat Improvement Center (CIMMYT).

The workshop focused on training in three open-source tools used in molecular breeding: GOBii-GDM for genomic data management, Flapjack for data visualization and breeding analysis, and Galaxy for Genomic Selection. These tools help breeders make selections more quickly and precisely, and ultimately lead to more cost effective and efficient improvement of varieties.

The Wheat Initiative – a global scientific collaboration whose goals are to create improved wheat varieties and disseminate better agronomic practices worldwide – and its "Breeding Methods and Strategies" Expert Working Group had planned to host these trainings during the 2020 Borlaug Global Rust Initiative Technical Workshop in the UK. After it became obvious that in-person trainings were not possible, the course organizers – including CIMMYT molecular wheat breeder Susanne Dreisigacker, and EiB Adoption Lead and former GOBii project Director, Elizabeth Jones -- decided to come together to host online workshops.

The workshop series, "Transforming Wheat Breeding Through Integrated Data Management with GOBii and Analysis in Flapjack," aims to benefit breeders from wheat producing countries all over the world, with sessions over two different time zones – for US/Europe, and Australasia – spread out over 3 days to reduce "zoom fatigue." Participants joined the first session from Australia, Canada, Ethiopia, France, India, Ireland, Italy, Morocco, Pakistan, Switzerland, Tunisia, the UK, and the United States.

"It was wonderful to see the diversity of participants that we were able to train through an online workshop, many of whom otherwise might not have been able to travel to the UK for the original meeting," said Jones. "Participants were very engaged, making the workshop so rewarding."

Guided by Teresa Saavedra, Wheat Initiative program manager, the training team included Susanne Dreisigacker, Elizabeth Jones, as well as:

- Iain Milne from the James Hutton Institute in Scotland, developer of the Flapjack genotyping visualization tool that includes analysis for pedigree verification, marker assisted backcrossing and forward breeding;
- Clay Sneller, wheat breeder at Ohio State University and major contributor towards training materials for important molecular breeding tools;
- Carlos Ignacio, previously based at the International Rice Research Center (IRRI) as a GOBii team member and a major contributor towards the design of Flapjack tools, now working on a PhD in Genomic Selection at Ohio State University;
- Star Gao, application specialist with GOBii and now a requirements analyst for the Enterprise Breeding System; and
- Andrew Kowalczyk, developer of the genotyping data QC tool DArTView at Diversity Arrays Technology, Australia.

Gilles Charmet, research director at the France's National Research Institute for Agriculture, Food and Environment (INRAE), introduced the sessions in the US/EU time zone with welcome remarks and overview of the goals of the Wheat Initiative.

Alison Bentley, director of the CIMMYT Global Wheat Program, briefed on the achievements and goals of the CIMMYT wheat program and the Accelerating Genetic Gains in Maize and Wheat for Improved Livelihoods (AGG) project.

"This training will contribute towards us reaching our AGG goals of accelerating gains in wheat, by sharing technical knowledge, and allowing our beneficiary partners to have state of the art know-how in the use of genetic and genomic data," said Bentley.

Participant Stéphane Boury from Caussade Semences, France commented, "This was a very effective way to learn about new tools in wheat breeding."

The sessions continue in Australasia this week (week 7), and will be introduced by Peter Langridge, chair of the Scientific Board for the Wheat Initiative, and EiB Director Michael Quinn. Sanjay Kumar Singh, incoming chair of the breeding Expert Working Group for the Wheat Initiative, will close the event.

Many of the tools will be incorporated into Excellence in Breeding's Enterprise Breeding System (EBS), a new integrated data management system being developed for CGIAR breeders. Elizabeth plans to also design training modules for these molecular breeding tools that will be accessible to anyone through the EiB Toolbox.

In the meantime, the tools used in the workshop are all freely available, or logins are available upon request:

- DArtView: https://software.kddart.com/kdxplore/dartview/
- Flapjack: https://ics.hutton.ac.uk/flapjack/download-flapjack/
    - Training videos: http://flapjack.hutton.ac.uk/en/latest/videos.html
- GOBii-GDM: http://gdm-demo.gobii.org:8081/gobii-portal/
    - Request access here: http://cbsugobii05.biohpc.cornell.edu/wordpress/index.php/gdm-access/ or email ej245@cornell.edu
- Galaxy Genomic Selection: http://cropgalaxy.excellenceinbreeding.org/