



## **FIELD PHENOMICS IN BREEDING**

Presented by  
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### **Abstract:**

Despite justified skepticism of statements in the modeling literature, some breeders have the expectation that the quantitative application of gene to phenotype understanding within crop models will contribute substantially to the future of plant breeding. This optimism is well-founded based on a committed investment in and experience of a strong integration of genetics, physiology and modeling within commercial maize breeding, where crop models can both provide guidance (targeting of products) and influence how physiological understanding is leveraged into breeding outcomes. This degree of integration is beyond the capability of many public research efforts, although there are many initiatives to study 'GxExM' (Genotype by Environment by Management) in multiple crops around the world. A breeding program runs a cycle of repeatedly improving germplasm to shuffle (with skill) gene combinations that result in improved adaptation. In rain fed environments, environment characterization facilitates the targeting of testing resources, and understanding of opportunities for different types of adaptation. Gene-based prediction of flowering time in wheat assists breeders to target germplasm with 'safe' flowering windows to avoid frost and heat. While generation of GxExM landscapes in sorghum can nudge the 'fanciful' area of physiology, it can be instructive when the underlying model is physiologically 'robust', as well as provide testbeds for statistical models. Finally, a current need is in integrating models with high-throughput phenomics systems to provide in-season prediction of model phenotypes, that can be 'subtracted' from observed data to remove impacts of 'known' traits and reveal the underlying residual genetics. The challenge for modelers is to learn more about how plant breeding programs work, and to make greater efforts to collaborate directly with plant breeders to realize the benefits of these powerful tools.

### **Website:**

<http://www.wheatgenetics.org/news/100-friday-march-24-2016-field-phenomics-seminar>