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A LOOK INSIDE:

HYBRID PERFORMANCE
Working Towards a
Better Understanding

BREMER COUNTY
School Opening Farms and Minds

RELATIONSHIPS MATTER
In a Competitive Global Market

UNLEADED 88 Q AND A
with Kelly Nieuwenhuis

June 2019

It is critical for plant breeders to be able to precisely design genetic combinations, which will give the desired characteristics across a range of growing

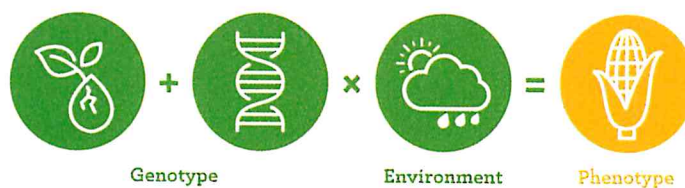# Working Towards a Better Understanding of Hybrid Performance

To leverage the incredible amount of genetic information that is now available for corn, we need to understand how genes in the corn plant translate into traits in your fields. To better interpret the usefulness of specific genes, the Iowa Corn Promotion Board® (ICPB) has invested checkoff dollars to initiate a national research initiative known as Genomes to Fields. The purpose of this initiative is to generate phenotype data to help researchers link corn genetic information — gathered from previous research mapping the corn genome — with traits in the field.

The phenotype of a corn plant is simply the outward expression of a trait, such as plant height, lodging resistance or yield. Collectively, all traits of a plant are called the "phenome," just as all the genes are called the "genome." We do not yet understand all the genes that control the economically important traits in the corn plant, and this initiative is an attempt to begin doing just that.

In 2014, the first trials were grown and the program has continued to grow every year. This research effort now includes 23 universities and USDA-ARS facilities across North America, where researchers at these institutions are growing the same hybrids and collecting the same traits, along with field and weather environmental data.

All of these hybrids have also been genotyped, meaning we know the genes contained in each hybrid. The traits, or phenotype, of a hybrid is determined by both the genes it contains and the environment in which it is grown.

Genotype + [DNA] × Environment = Phenotype

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In addition, genes interact with the environment creating what's called Genotype x Environment interaction, or GxE. Understanding this interaction is critical for optimal placement of the right hybrid in the right field. It is also critical for plant breeders to be able to precisely design genetic combinations, which will give the desired characteristics across a range of growing conditions. The knowledge generated by this research initiative will ultimately result in hybrids that are more resilient to weather stresses, more efficient in nutrient and water use and more stable in performance.

One requirement for the researchers involved in this initiative is that the data they generate becomes available to the public, so researchers anywhere can use the data to learn and apply to their research. To date, four years' worth of data are now in the public domain, and scientific journal articles are being published on the learnings from this information.

This is the largest public dataset containing hybrid genotype, environmental and performance data ever assembled.

In 2014, ICPB began investing funds to kick off this initiative and has continued to do so every year since. These funds were leveraged by funding from public research grants, university and USDA-ARS scientists, a number of other state corn boards and the National Corn Growers Association.

The Iowa Corn Growers Association has been working hard to help ensure that more funding becomes available for future plant phenomics research. As a result in this effort, the 2018 Farm Bill included authorization for funding this type of research for the first time through a program titled the Agricultural Genome to Phenome Initiative. This program authorizes up to $40 million per year for this type of research directly benefiting Iowa corn farmers.

Additional information can be found at iowacorn.org and genomes2fields.org.