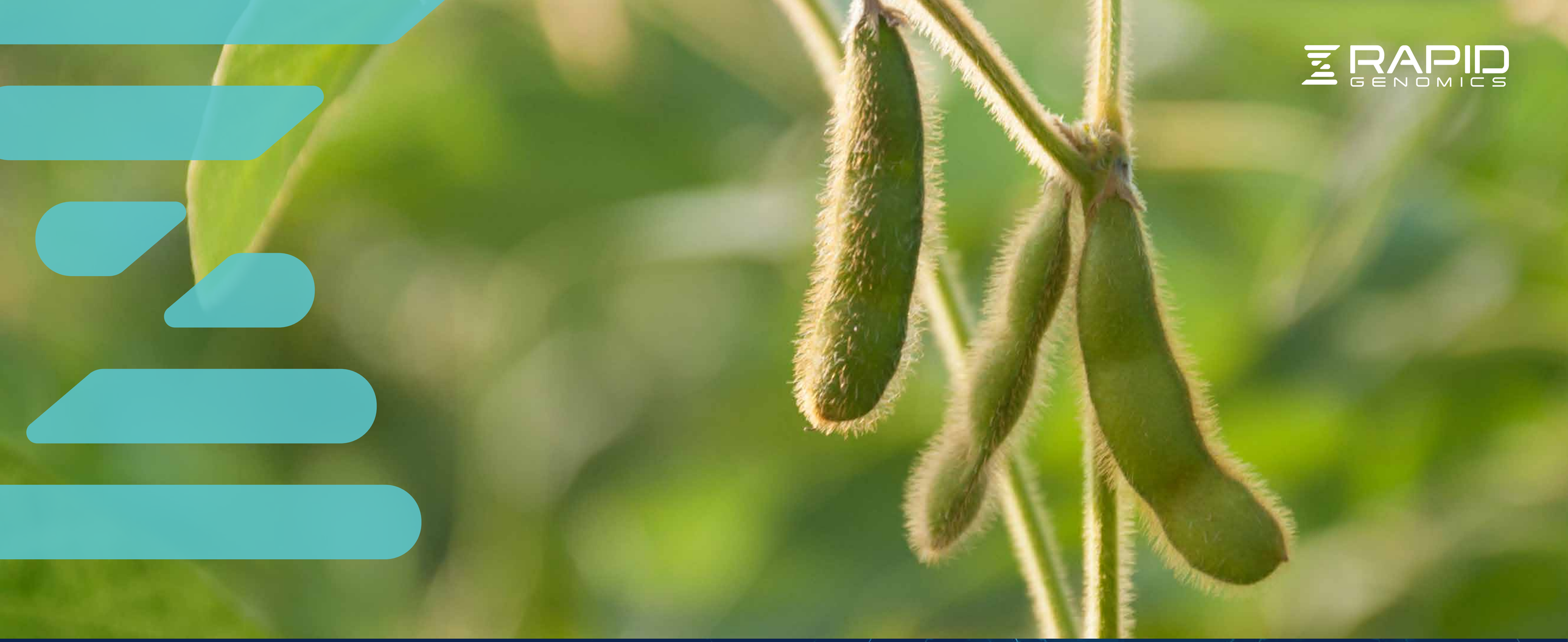

RAPID GENOMICS

GENOMIC SELECTION FOR BREEDING

Unlocking the Genome to Improve Agriculture

Incorporating Genomic Selection for Improved Breeding

Modern analytical DNA sequencing technology (genotyping) empowers breeders to improve yields with better, faster decisions than ever before using the predictive abilities of Genomic Selection (GS). GS merges genotyping with phenotyping to identify the highest performing (and most valuable) breeding individuals at their earliest developmental stage, well in advance of the traditional, lengthier timeframes previously required to identify the best candidates. Any developing or established breeding program can utilize GS.

GS measures and compares genetic markers against agricultural traits to calculate genomic estimated breeding values (GEBV), which predict the performance and selection value of breeding individuals. GEBVs may be calculated without the need for repeated, laborious and time-consuming phenotyping, thereby enabling earlier selections for faster advancement to the next breeding round. Earlier breeding selections (at the seedling or infant stage) with GS, before a trait can be phenotyped, saves time and resources without compromising desirable traits or increased yield.

In addition to reducing/removing the need for phenotyping at each breeding cycle, GS breeders can accelerate their breeding program by performing more crosses on an annual basis, increasing the net annual rate of gains.

Establishing a GS program is done via analysis of a founding breeding population, called the training population. Results obtained from the training population are then used to construct a predictive model for estimating breeding values in future breeding individuals. Once defined, this GS model can be used to predict the breeding value of individuals in subsequent breeding populations using genotype data only.

Full-service genotyping solutions for incorporating genomic selection are available at Rapid Genomics from tissue to GS model construction, analysis and reporting. Although complex from a genomic analytics perspective, Rapid Genomics ensures that the process of implementing GS is simple.

Use genomic selection for:

- Improved genetic gains per breeding cycle
- Faster breeding cycles via earlier selections
- Reduced phenotyping costs

Advantages of Genomic Selection

Genomic selection advances breeding goals with increased accuracy and efficiency vs traditional breeding methods. In addition to improving genetic gains per breeding cycle, GS enables faster breeding cycles via earlier selections, thereby further increasing the net genetic gains realized per year and reducing the time required to achieve breeding goals.

Traditional Breeding vs Genomic Selection

	Traditional Breeding	Genomic Selection
# Breeding cycles per year	3	5
Genetic gains (z) per cycle	z	1.2z
Net genetic gain per cycle	3z	6z
Years to achieve breeding goals	X	X-3

Advantages of Genomic Selection

Incorporating Genomic Selection Follows 3 Stages:

1 Planning & Design

- Breeding goals & objectives
- Breeding program review & consultation

2 Genomic Selection Modeling

- Training population phenotyping
- Training population genotyping
- Bioinformatics & GS model calibration

3 Commercial Genomic Selection

- Send samples
- Receive data

LEADING A NEW ERA OF GENOMICS

At Rapid Genomics, the key to improving the future is within the secrets of the genome. Our mission is to expand global access to the technologies required for uncovering those secrets with the highest standards of accuracy and reliability. We provide flexible solutions to a range of commercial and research interests focused on agriculture, veterinary genomics, healthcare, and evolutionary biology. Our customers partner with us to advance their goals and, ultimately, strengthen the industries that do everything from producing our food to curing disease.

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