Purpose:

- Evaluate student's ability to compare potential breeding methods using simulations and Genomic Selection

Keywords: Realized Genetic Gain, additive genetic variance, Genomic Selection

References:

- Chapter 9: Selection Response
- Bernardo-Chapter 13, Section 11.9

ALA: Selection using GBLUP

An alternative to the traditional F_5 breeding strategy is to utilize GBLUP to evaluate a larger number of progeny per family without growing all of the lines in all of the environments. In this alternative, 100 $F_{5\text{-derived}}$ lines per family are available for evaluation, but only 50 are evaluated in any given environment. Molecular information is combined with phenotypic data to produce predicted values for all lines, and selections are made on the predicted values. This enables the breeder to double the selection intensity without increasing the number of field trials.

Alternative **F5 Generation Test**		**F5 Generation Test**	
Fall:	*E x I*	Fall:	*E x I*
Winter:	*F_1*	Winter:	*F_1*
Summer:	*F_2*	Summer:	*F_2*
Fall:	*F3*	Fall:	*F_3*
Winter:	*F_4*	Winter:	*F_4*
Summer:	*F_5*	Summer:	*F_5*
Fall:	*$F_{5:6}$ and genotype F_5's*	Fall:	*$F_{5:6}$*
Winter:	*$F_{5:7}$*	Winter:	*$F_{5:7}$*
Summer:	GBLUP *Eval 100 $F_{5:8}$*	Summer:	*Eval 50 $F_{5:8}$*

Conduct 3 cycles of evaluation and selection for each method and compare the realized gain from each. After each cycle of evaluation create two families with the best set of (3 or 4) lines that will be used to create the next cycle of segregating lines. For the alternative F_5 breeding strategy use the EXCEL simulator (DS8 RILs.xlsx) and the RRBLUP package in R to obtain GBLUP values. In both strategies, evaluate the lines in one rep at each of four environments. Assume the cost of a field plot is $20 for the home site and $35 for an offsite environment and assume the cost of genotyping is $20 per line.

QG   Simulation and Genomic Selection – Compare Breeding Methods

Scott Sebastion, a molecular soybean breeder at Pioneer Hi-Bred has advocated an alternative EGT procedure in which Genomic Selection is practiced in the early generation ($F_{2:3}$) field trial. In this alternative project 2x the number of lines are evaluated as $F_{2:3}$ in a single replicate during the first summer after the nursery (see figure below). The idea is to eliminate ½ of the lines, followed by development of $F_{4:7}$ for GBLUP evaluation in the same number of environments as the traditional F_5 GT.

2nd Alternative
Early Generation Test

Summer: *E x I*
Fall: *F_1*
Winter: *F_2*
Summer: *GBLUP Eval 100 $F_{2:3}$*
Fall: *F_4*
Winter: *$F_{4:6}$*
Summer: GBLUP *Eval 50 $F_{4:7}$*

Determine whether the proposed 2nd Alternative EGT will result in greater genetic gain than any of the previously suggested methods.