Purposes:

1. Team based assessment.
2. Demonstrate how to identify relevant information to meet the objectives of the ALA.
3. Assess student's ability to design a field plot experiment involving incomplete blocks.

Keywords:

Data model, Phenotypic Model

References:

Plant Breeding Basics: *"Review Models"*.

Applied Learning Activity:

Consider a soybean breeding program for Maturity Zone 2 in Iowa. The primary objective of this breeding program is genetic improvement of grain yield, as evidenced by annual releases of cultivars with grain yields that are at least 2% better than existing commercial varieties.

Next, let's consider the first stage of yield trials. For this first stage you have sufficient budget to grow 10,000 plots in two environments located in close proximity to the breeding station. From the winter nurseries you have advanced a sample of 65 $F_{3:5}$ lines from each of 125 crosses. Samples of segregating lines derived from bi-parental crosses are often incorrectly referred to as populations. Herein we adopt the use of family to describe samples of segregating lines derived from crosses of inbred lines. The pedigrees of the cultivars used in the bi-parental crosses are known. There is enough seed of each $F_{3:5}$ line to evaluate it for yield and maturity twice with 2-row plots. The breeding station is equidistant from two environments (Ames and Castana) that are distinct and represent the types of environments that are typical of your maturity zone market.

For this early stage field trial the breeder is primarily interested in evaluating the genetic variability, among and within the families, of two traits: yield and maturity,

1. If you are the breeder how will you allocate 10,000 plots to evaluate yield and maturity both among and within the 125 segregating families? Assume that you want equal information among and within families from each location.

Based on what is known about field variability within each of the locations, it is advisable to block the field such that no more than 20 plots are grown in each block.

2. What are principles of field plot design that need to be employed in assigning families and lines within families to the field plots?

3. Demonstrate these principles in a description of how you will design the field plots: In particular, how will the lines from each family be distributed to the plots so that you will be able to evaluate yield and maturity among and within families?