LOUISIANA STATE UNIVERITY
College of Agriculture
School of Plant, Environmental, and Soil Sciences
AGRO 7075 Prediction-based Breeding

Course introduction

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Objectives

- **Course objective**
- Gain the ability to design effective and sustainable breeding programs and implement modern selection tools

- **Learning outcomes:**
- 1) Be able to evaluate the response from selection in complex breeding programs
- 2) Understand the trait's genetic control and the dynamics of populations under selection
- 3) Be able to use the best linear unbiased prediction (BLUP) for both conventional and genomic selection

- **Be aware that**
- I assume that all the students have (or will look for) the basic knowledge of plant breeding methods

Prerequisites

- **Methods of plant breeding** – SSD, bulk, pedigree, backcross, recurrent selection, …
- **Basic knowledge of** R

Schedule

Workflow **(4 credits)**

Class	Date	Lectures (Mondays, on campus) 9:20 -12:00 am	R Labs 1:00 to 2:30 pm
1	Jan 23	Population and quantitative genetics	Data quality control
2	Jan 30	Variance and genetic effects	Population genetics and structure
3	Feb 6	Covariance between relatives	Pedigree
4	Feb 13	Response to selection	Kinship
5	Feb 27	Inbreeding, heterosis, and heterotic pools	REML/BLUP overview
6	Mar 6	Hybrids between populations or lines	REML/BLUP (I, A, and G)
7	Mar 20	Lines, testers, and testcrosses	Adjusting phenotypes and Optimizing Training Sets
8	Mar 27	Mating designs	Diallel
9	April 3	GWAS	GWAS
10	April 10	Genomic Selection	GBLUP
11	April 17	Multivariate selection	Multi-trait GS and GS + Selection indices
12	April 24	GxE	GxE
13	May 1	Base populations and Comparing Breeding Schemes	Optimizing Breeding Schemes
14	May 8	Journal Club	

Classes and Scripts https://github.com/rfn-qtl

Evaluation

Homeworks Moodle — Every week, based on R labs

Journal Club 3 papers at the end of the course

References

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- BERNARDO, R. (2010) Breeding for quantitative traits in plants. 2ed. Stemma Press. 369 p.
- BOS, I; CALIGARI, P. (2008) Selection methods in plant breeding. 2ed. Springer. 471 p.
- HALLAUER, AR; CARENA, MJ; MIRANDA FILHO, LB. (2010) Quantitative genetics in maize breeding. 2 ed. Springer.
- MRODE, RA. (2014) Linear models for the prediction of animal breeding values. 3ed. CABI, 360 p.
- TORKAMANEH, D., AND BELZILE, F. eds. (2022). Genome-Wide Association Studies. New York, NY: Springer US doi:10.1007/978-1-0716-2237-7.
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