

Genetic Improvement + Integration

Intro Lectures Eisenbode 11/13/2015

Focus on extreme environment 5 year period of testing might miss the crop failure environment

Souza

Yield increases over the last 70 years

- breeders can identify the technology that has contributed to yield input
- management improvements like precision fertilizer applications
- Precision technology

- physiological traits are related to climate

- Management system that blocks for GxE as GBS doesn't handle GxE

- Consideration of the fundamental starts to narrow the variation - utilize fixed effect trial designs instead of random effects.

Griff

Covered the USAID Grant

Climate resilient wheat

- develop heat tolerant varieties using marker assisted background selection and forward breeding approaches
- Used ~~marker~~ - friendly markers for heat tolerance
- Pyramid genes with complementary mechanisms
- Understand physiological processes

- Discussed Breeding strategy
~~strategy~~
- Donor Selection
- Heat tolerance
 - Sugar transport
 - Sugar Starch
 - photosynthesis
- List of selected genes
- Notes that also working on drought, root morphology
- Effect of temperature ^{× coleoptile length} on germination, in parts of the world where soil temperature is high at planting.
- Genoplasm doesn't seed set under extreme temperatures, except some lines.
- needs a crop modeler

Anderson

- Typical breeding program
- Crop review

Disease resistance

Abiotic - water + NUE, Yield
- Protein
- Regular agronomic traits

Utilized panels for traits, large SW panel
+ 4000 lines.

Discussed breeding program, disease resistance,
impacts of change in rotation (Corn), cultural
practices in both wheat + Corn

Genome Selection

Bacterial leaf streak is a major

problem w. yield

yield stability

Discussion

~~Q~~ Synthetic approach

- WUE on a lot of breeding efficiency
- canopy spectral reflectance
 - Rain fed vs irrigated + non irrigated trials
- Used yield + yield stability
Spectral reflectance as a predictor

Variation in low yielding situation ~~is~~ is
sufficient to render many users
select on fewer traits

G x E x M

Big data issue John Deere fusion
need to light fungicide incidence of
disease, RT's varieties plugged into
Mach analysis - get it to the point
that will drive decisions

K6 - stability issue use stable
wheat as a control

Yield vs protein as in G x E

Protein selection as a heritable trait
Shifts protein curve

Characterizing of environment
target environments

Genetic selection not suited for GxE all
needs a range of environments?

Have to deal with GxE in the model as
it could slow the progress.
Target ^{population} environment changes?

Challenge stereotypes of management systems

Variation declines as the environment
becomes more extreme.

Hybrid wheat, not much heterosis

CO₂ response - why is best please not already there?
Cimmut germplasm

Gaps & opportunities

Disease & insect pressure changes - prediction + modeling

Need ~~for~~ long term data sets

Useful for predicting what's coming shift
selection parameters

short & long term activities

int based development

Computational power for G & M x E

Limit to the
environmental envelope
of wheat

need to know
what to breed for.
Limiting factors.

for range
plants