Effectiveness of Sidedressed Fluid Potassium Fertilizer in Corn and Soybean

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Plant Roots and P - K Uptake

- P and K are much less mobile than nitrate, need to reach roots by diffusion from a very short distance
- Actively growing root systems with fine roots is key for uptake of both, and P is especially needed for early growth
- Banding could help with
  - High soil “fixing” capacity
  - Soil conditions limiting root/seedling growth
  - Cold, compaction, root diseases or insects

Preplant K Placement in Corn & Soybean

- Iowa research since the 1960s has shown no difference between K fertilization broadcast, banded preplant, or banded with the planter with few exceptions
- Deep banding (4 to 6 inches)
  - Ridge-till, a must for corn, also found by G. Rehm in MN in late 1980s and early 1990s
  - No-till and strip-tillage, sometimes for corn, mainly with dry topsoil June to early July IF there is moisture in the band zone, doubtful payback

Not Surprising with Iowa Soils & Climate

- Little or no P or K “fixation”; retention of P and K by soil doesn’t mean fixation
- Good soils allow for large root systems with many fine roots for P and K uptake
- Usually humid spring weather
- Cold/wet soil early but,
  - Need to plant so early?
  - Starter P in-furrow or 2x2” is a cost-effective fix, complements broadcast preplant application

Sidedressing for P and K?

- Fluid N sidedressing for corn is common
  - Complements preplant fertilization
  - Much research has been conducted
- Sidedressing of P fertilizer, fluid or dry, is unlikely to work, crops need P very early
  - Cell multiplication and division
  - New and more leaves
  - Grain sink is determined early

Sidedressing for K?

- Doubts, scarce research without irrigation or with different preplant K application rates
  - Not much K needed early, large uptake later on
  - Not much K leaching except in sandy soils
  - No “true” starter K effect, as it is with N and P
- As a split application can be helpful in some conditions or serve as a rescue option
  - Need soil moisture for uptake, injecting fluid K with relatively new low-salt potassium acetate may be the best option

Trials and Soils

- Twelve 2-year trials with corn-soybean rotations
  - One no-till, others tillage for corn
  - Six began in 2017 and six in 2018
- Six soil series
  - Central, N, NE, S, SE, SW Iowa
  - Poorly drained to well drained
  - Texture loam, clay loam, or silty clay loam
  - Organic matter 3.2 to 4.5%
  - pH 5.8 to 6.7

Trials and Treatments

- Five preplant K treatments in large plots, two K sidedress treatments in subplots, four replications in blocks
- Used established trials, each with useful similar previous management except for K fertilization
- Each block (replication) had four large low-testing plots (no K application for 6-8 years) and one high-testing plot with history of annual K applications

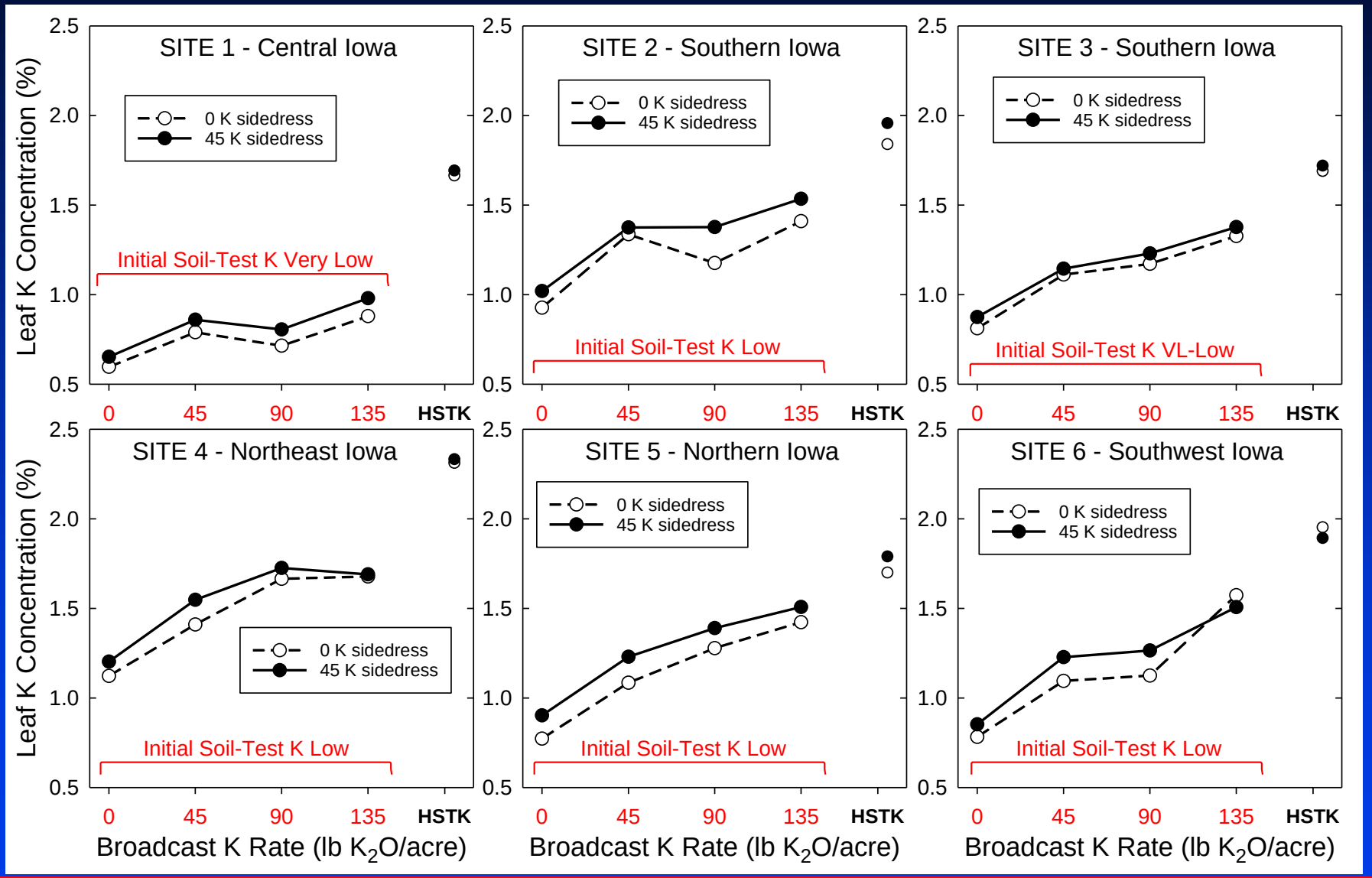
Potassium Treatments

- **Preplant K treatments only to corn (1st year)**
  - **4 broadcast rates (0, 45, 90, 135 lb K_2O/acre) 2-3 weeks before planting randomized to the four large low-testing plots of each block**
  - **No K to the high-test plot of each block**
- **Sidedress K treatments to both crops**
  - **No/Yes fluid potassium acetate (0-0-24)**
  - **45 lb K_2O/acre at the V5-V6 stage injected between the rows (30-inch spacing) to a depth of 3 to 4 inches**

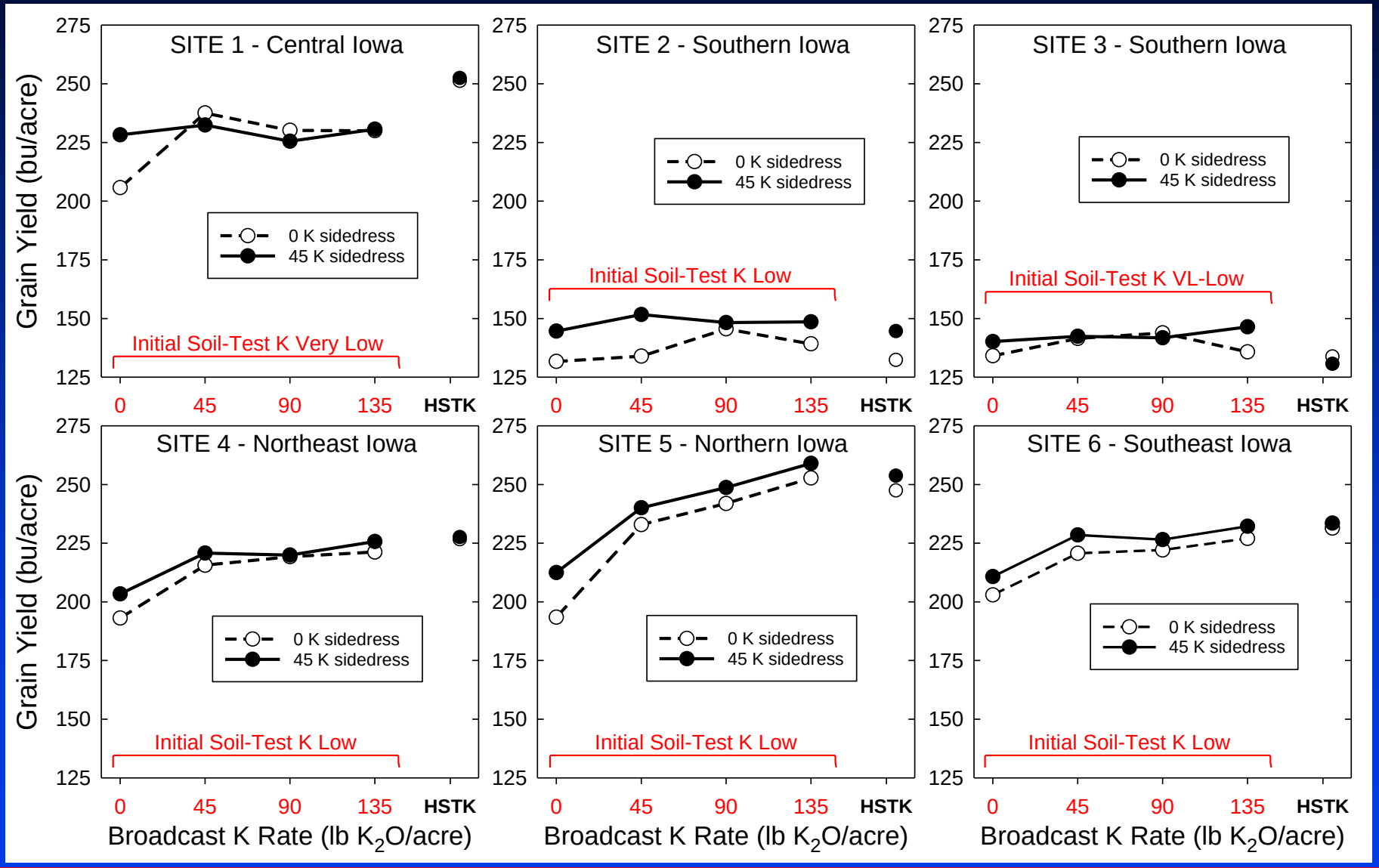
Crop and Soil Measurements

- Soil-test K, 6-inch sampling depth
  - Initial of low-testing and high-testing plots
  - After corn harvest (before soybean) of plots that didn't get sidedressed K
- Leaf K concentrations
  - Corn ear-leaf blades at R1 stage (silking)
  - Top soybean trifoliate leaves at R2-R3
- Grain yield, K concentration and removal

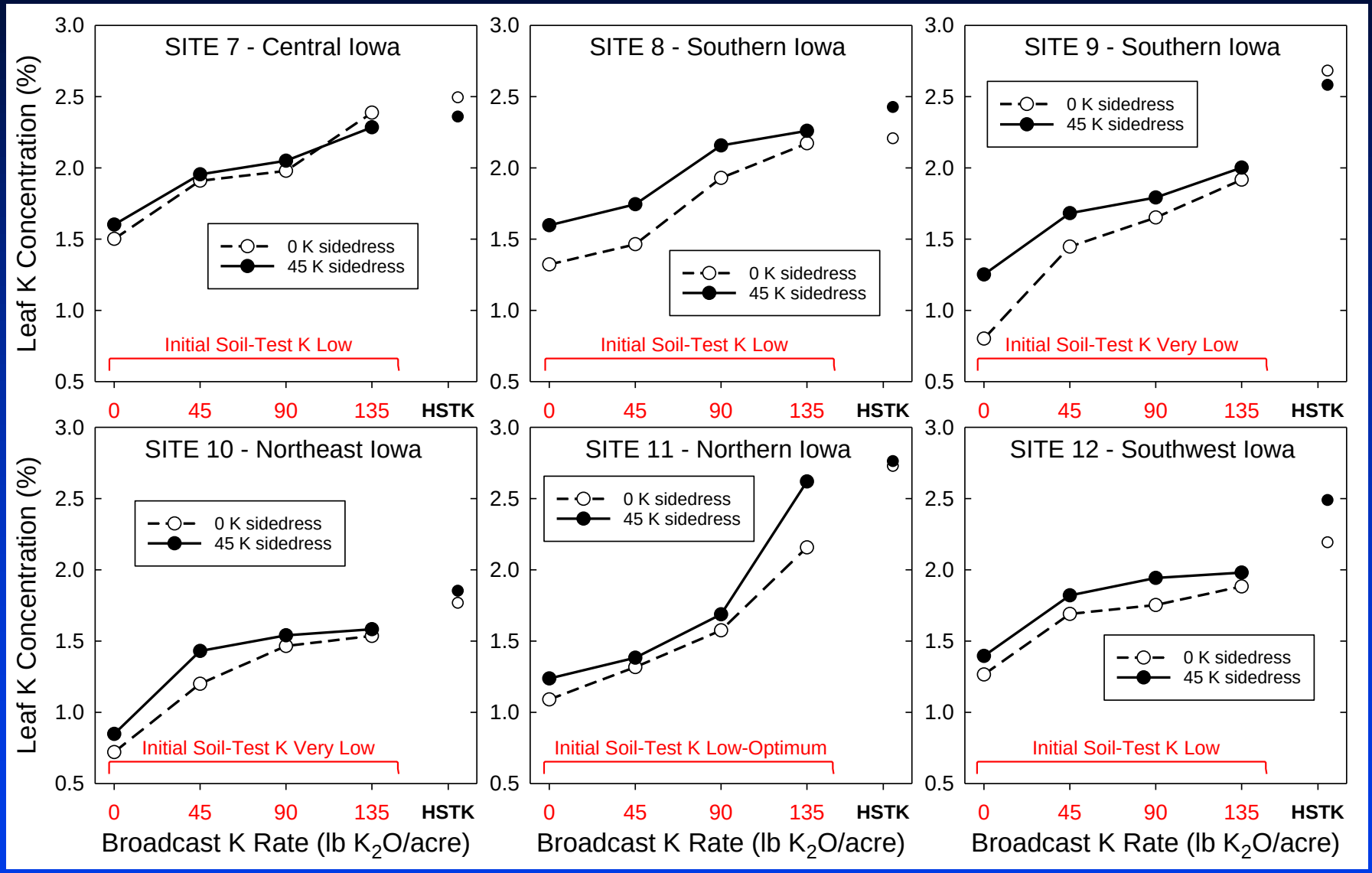
Corn 2017 Leaf K Concentration



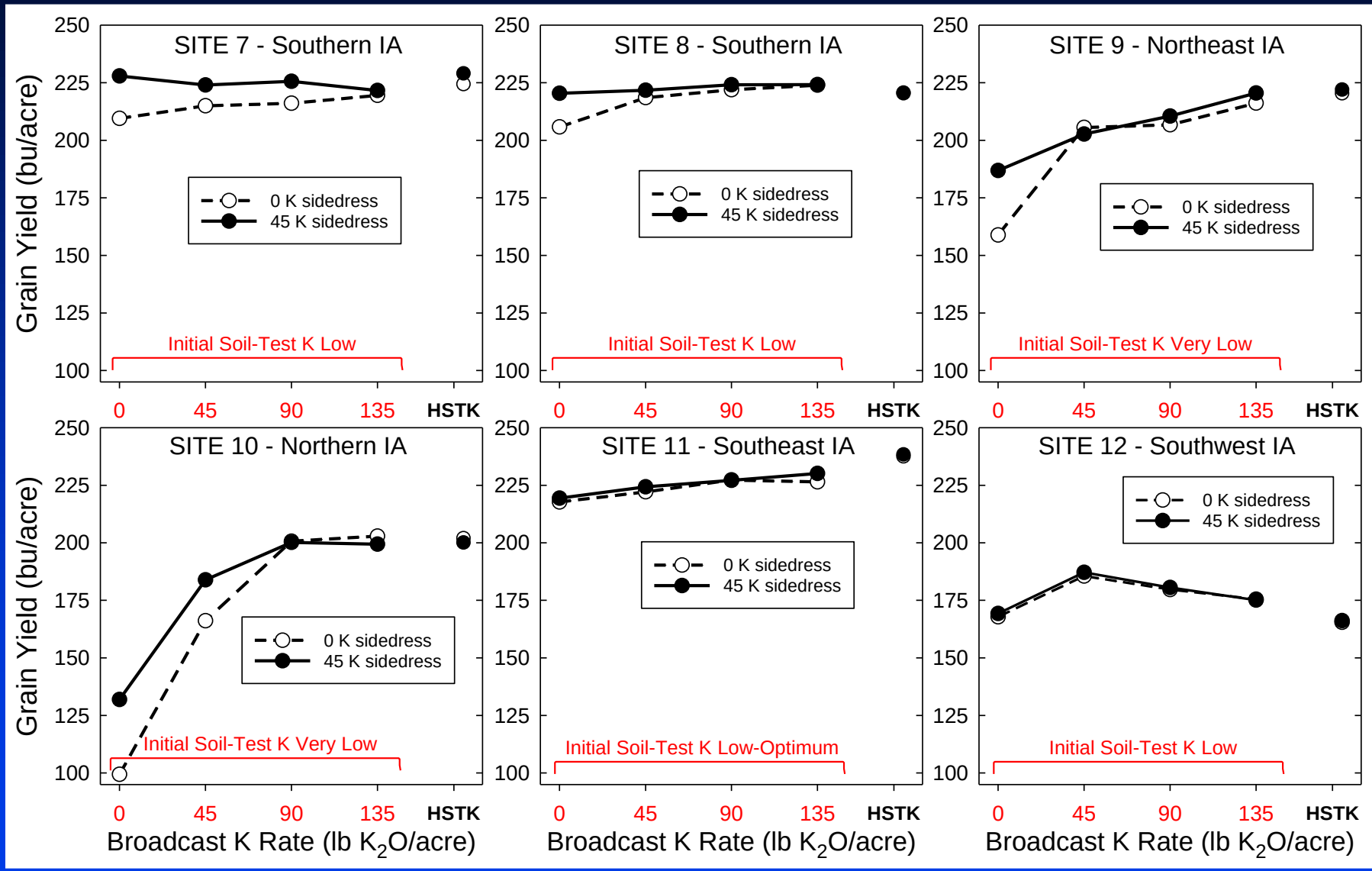
Corn 2017 Grain Yield



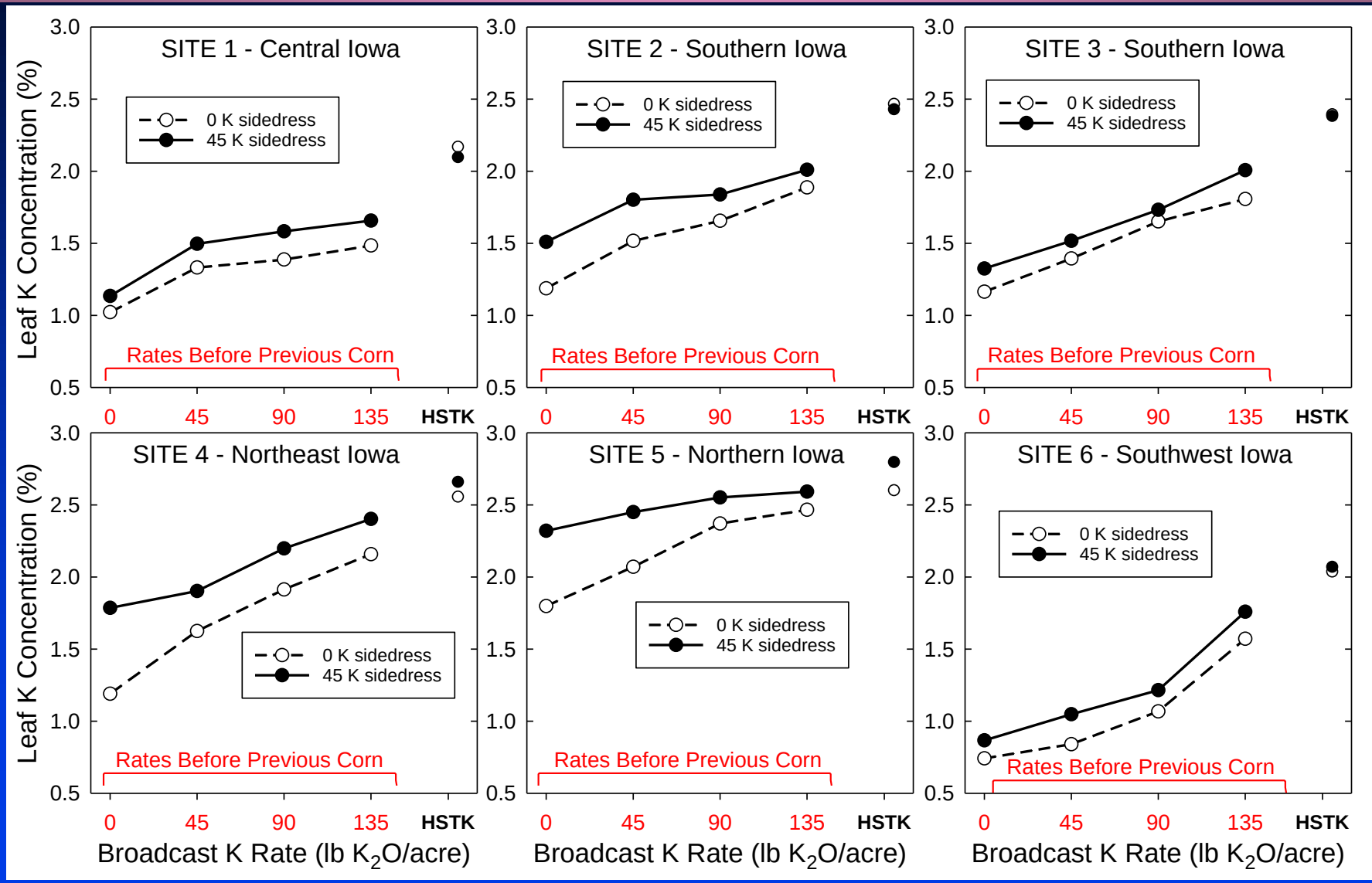
Corn 2018 Leaf K Concentration



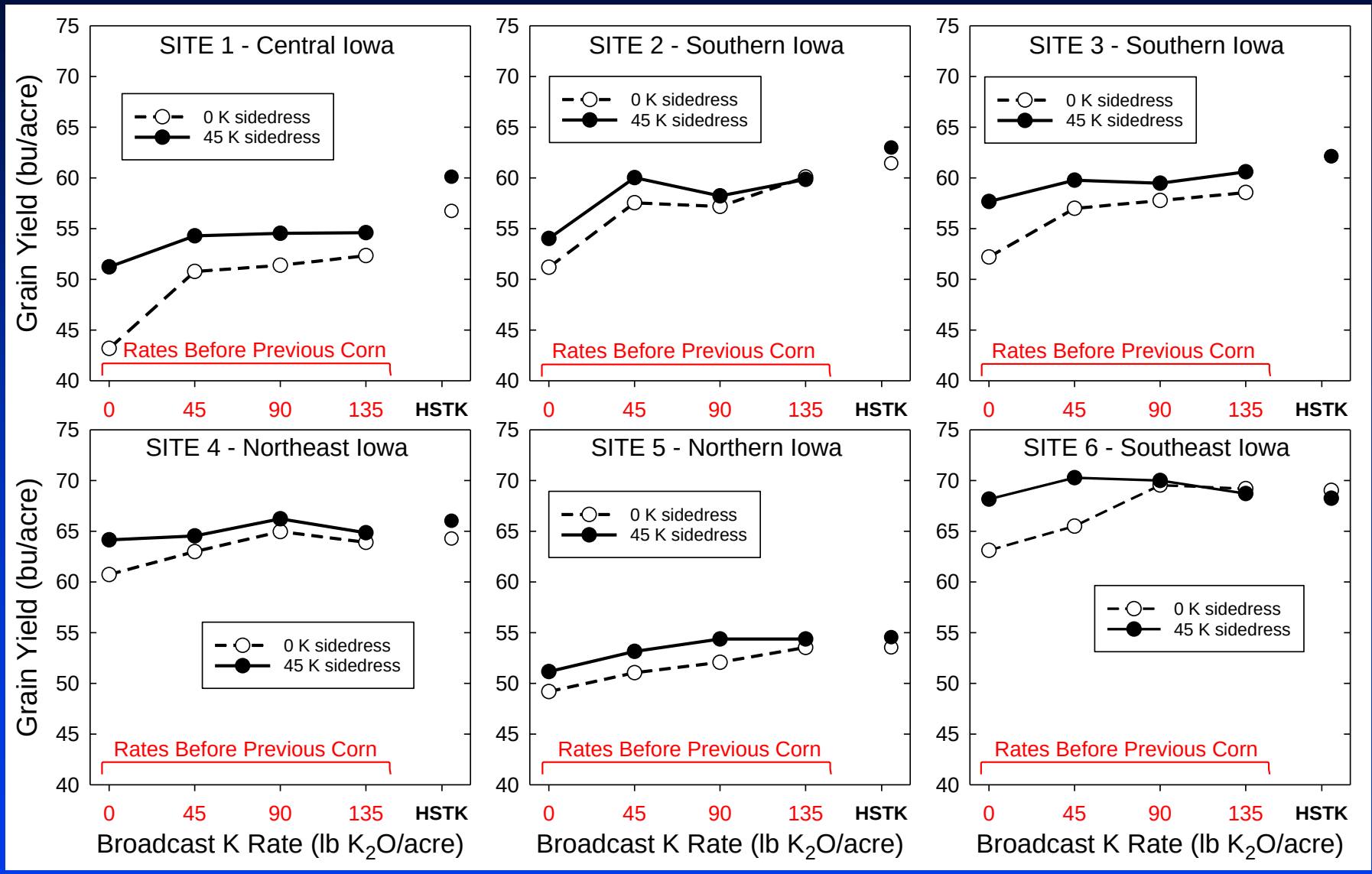
Corn 2018 Grain Yield



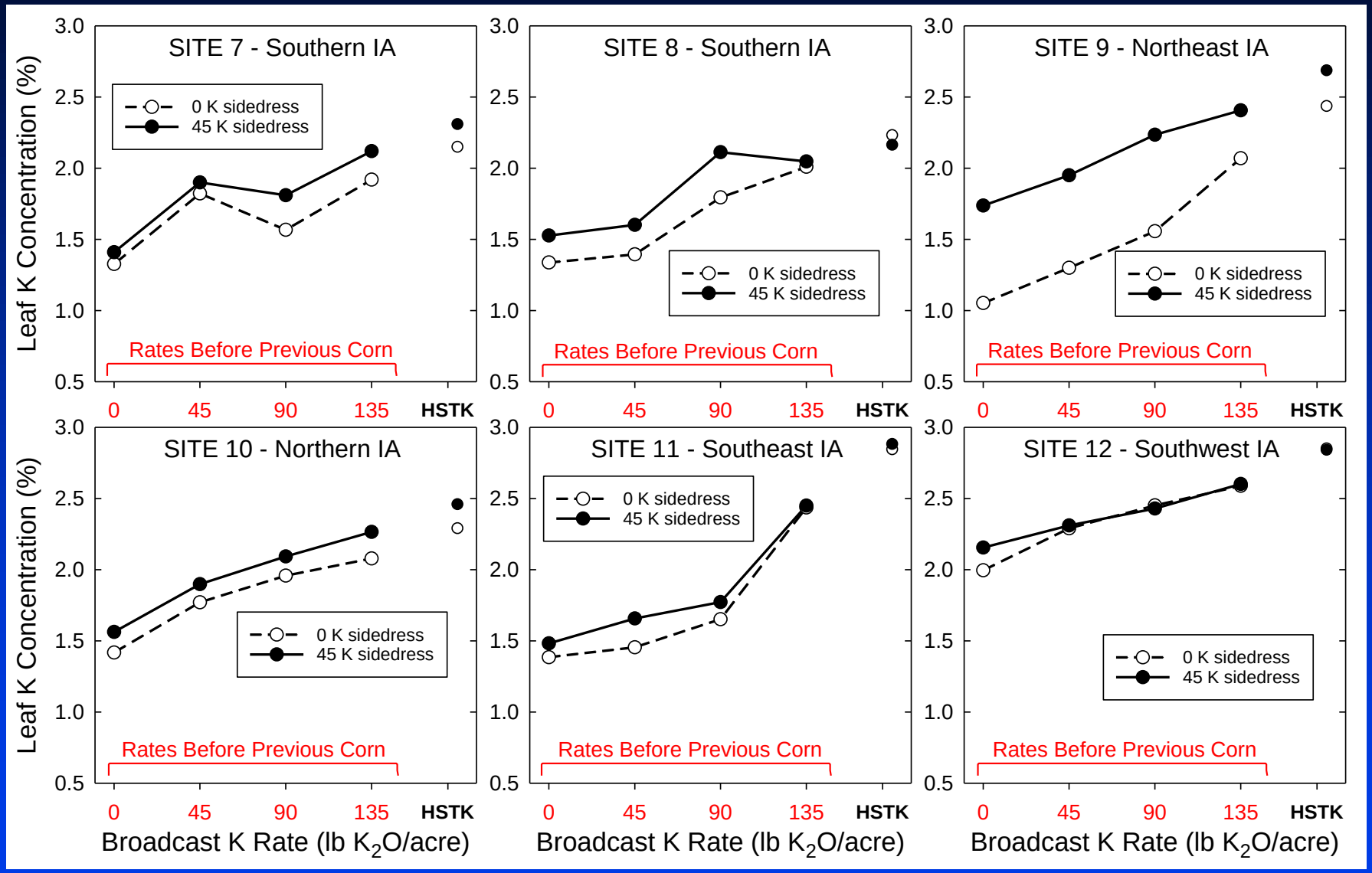
Soybean 2018 Leaf K Concentration



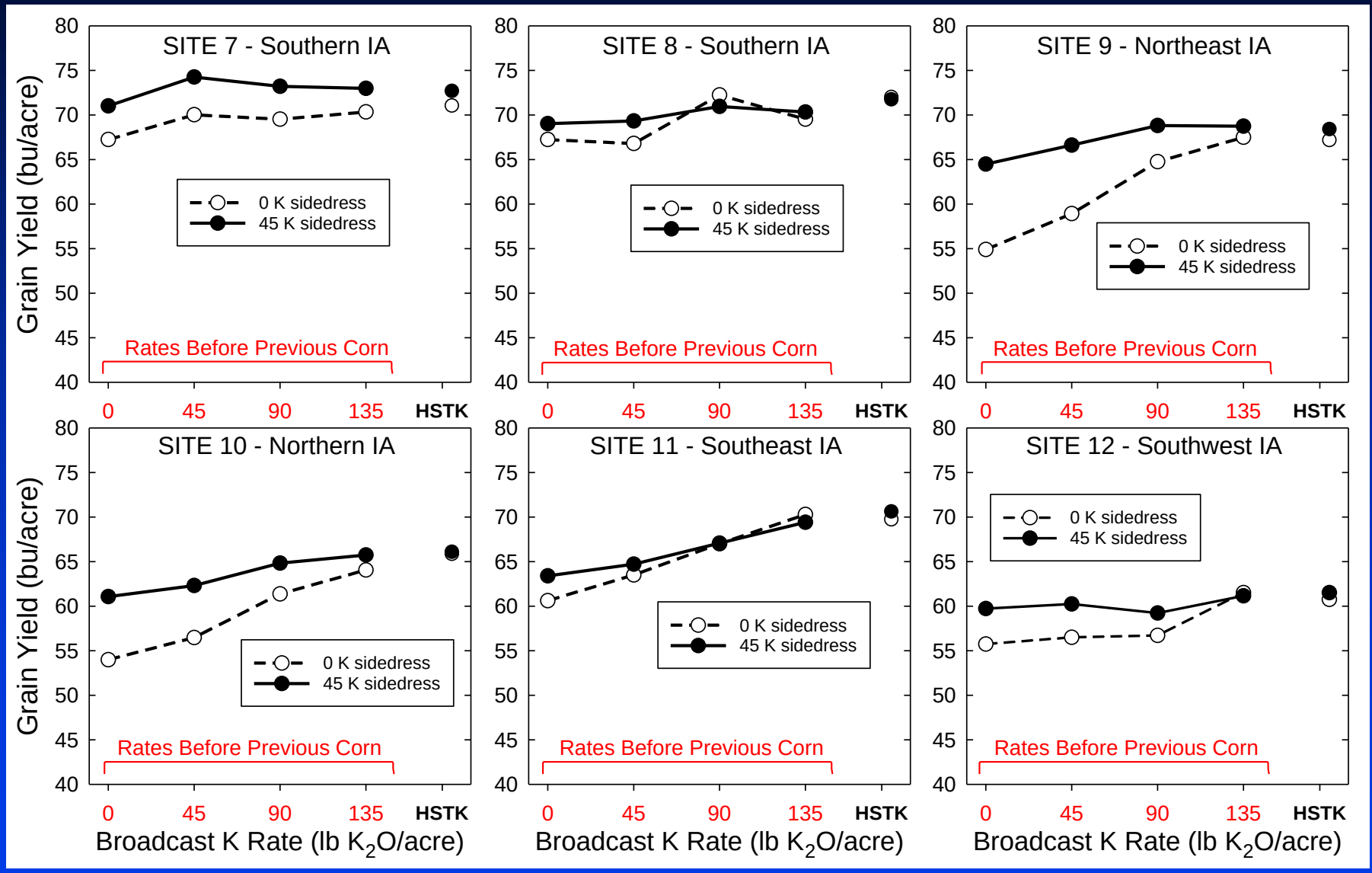
Soybean 2018 Grain Yield



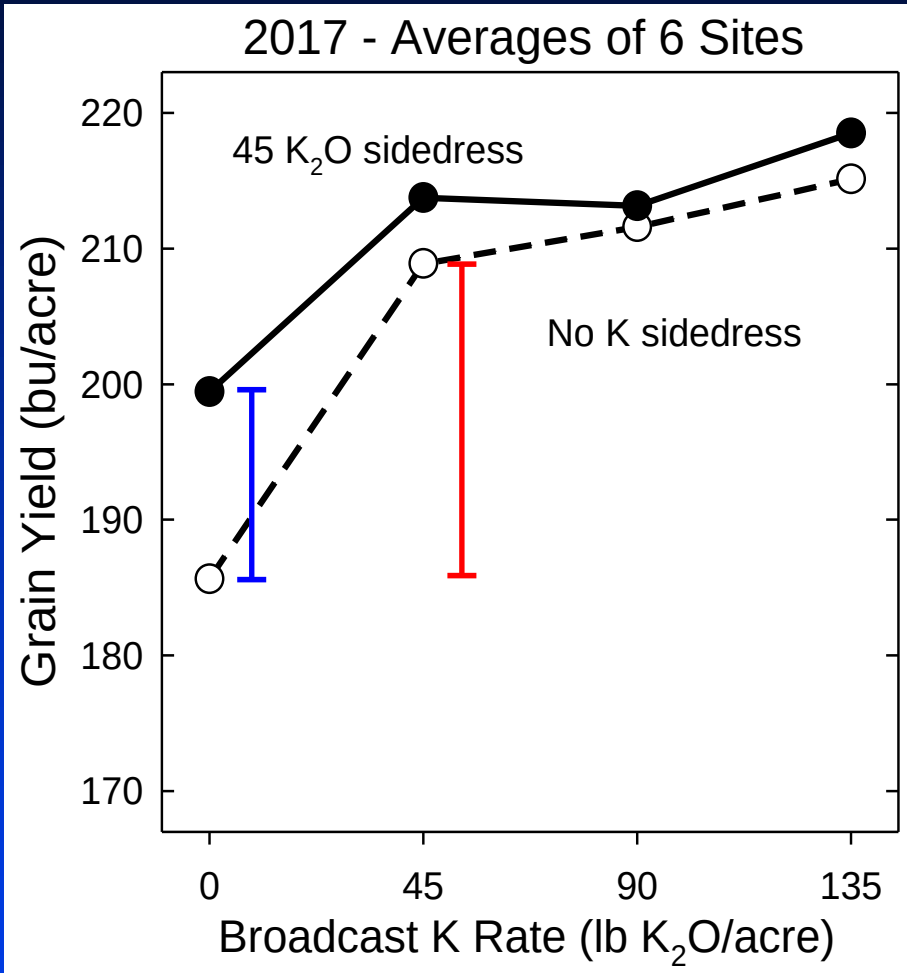
Soybean 2019 Leaf K Concentration

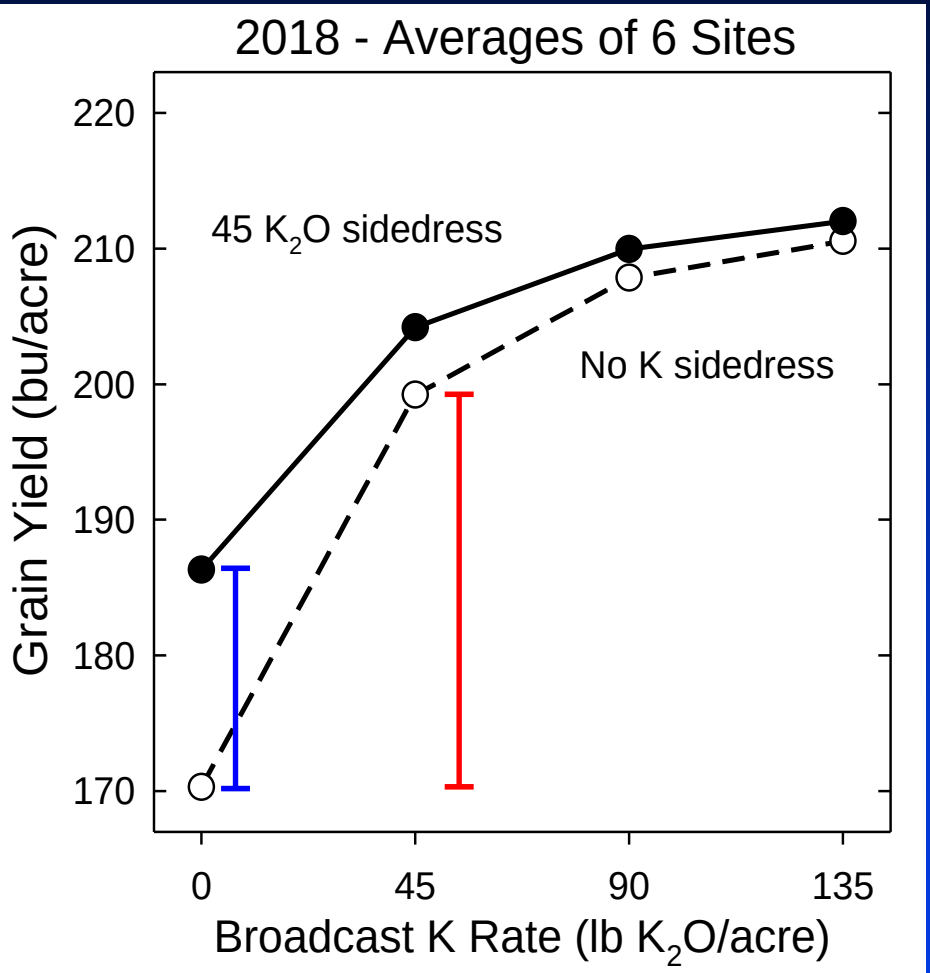


Soybean 2019 Grain Yield

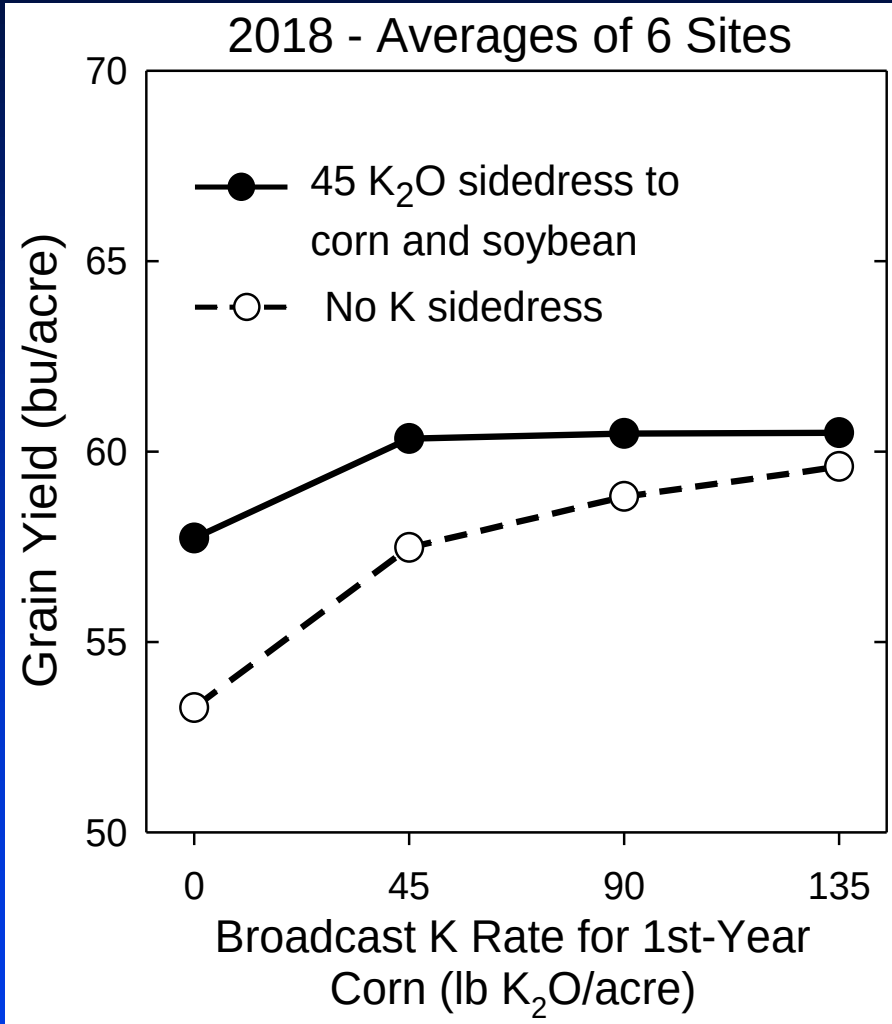


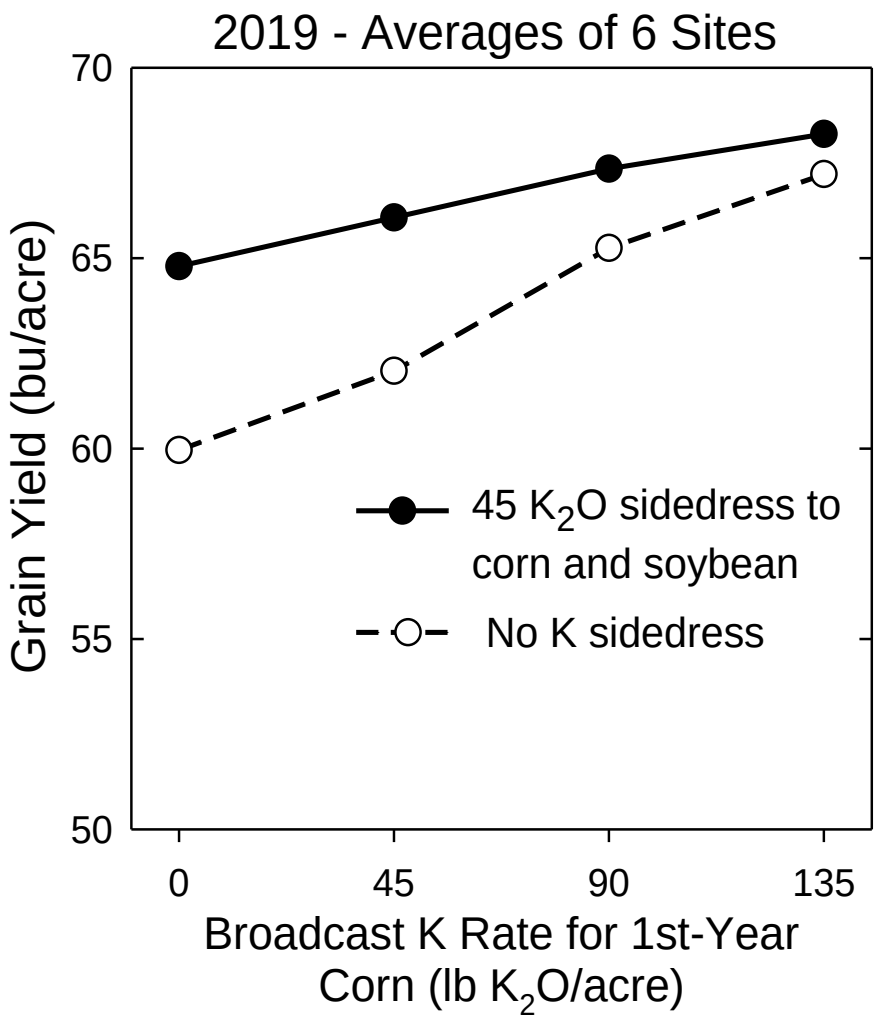
Corn Yield, 45-lb Preplant vs Sidedress





Averages for 2nd-Year Soybean





Conclusions

- **Sidedressing liquid K fertilizer doesn't increase corn yield with recommended preplant broadcast K fertilization rates**
  - **Less efficient than a preplant similar rate**
  - **Good rescue option with insufficient preplant K**
- **I doubt will get different results but:**
  - **Different sidedress K rates?**
  - **Dribbling to inter-row or with Y-drop?**
  - **Sidedressing N and K together?**

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THANK YOU

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