

David M. Barton Agriculture Research Center

VIA. Research

Corn and Soybean Research

Introduction to Problem Statement

The experimental design will consist of corn (*Zea mays* L.) and soybeans (*Glycine max* (L.) Merr.) having controlled drainage with the main treatments consisting of (i) subsurface irrigation and (ii) no subsurface irrigation. Secondary treatments include 5 different plant populations for each crop.

Study Area and Design

The Study Area is a small portion of the Hubble Creek watershed in Cape Girardeau County and is located on at the Southeast MO State University David M. Barton Agriculture Research Center. The study area consists of approximately 100 acres having a controlled drainage/irrigation system. The soil resource is predominately composed of soils of the Wilbur series (Coarse-silty, mixed, superactive, mesic Fluvaquentic Eutrudepts). The Wilbur series consists of deep, somewhat poorly-drained soils having an Ochric epipedon - cambic horizon sequence developed in strongly weathered coarse-silty alluvium from mixed materials.

The controlled drainage and irrigation study area permit: (1) controlled drainage, (2) subsurface irrigation from adjacent wells. The drainage laterals are on 9.2 m (30 ft) spacing, with a one meter soil depth. Figure 1 is a graphic illustration (not drawn to scale) illustrating the study area drainage design.

The perimeter of the field has a 9 meter riparian buffer strip, with outlet #1 draining directly into Williams Creek. A ditch drains outlet #2, which subsequently drains effluent

into Williams Creek.

Corn and Soybean Design

Corn and Soybeans will be planted in the spring of 2008 on 0.77 meter (30 inch) row-spacing for the corn and 0.38 meter (15 inch) row-spacing for the soybeans. Main treatments will consist of irrigated and non-irrigated water management systems. Sub-treatments consist of corn having (i) 25,000, (ii) 27,000, (iii) 29,000, (iv) 31,000, and (v) 33,000 plant populations/acre, whereas the soybeans will have (i) 110,000, (ii) 125,000, (iii) 140,000, (iv) 155,000, and (v) 170,000 plant populations per acre. All treatments will be replicated four times. Phosphorus and K fertilization will be based on grid soil sampling, whereas N rates will be 120 lbs of N as liquid N (32% N-solution) pre-plant, with the remainder of the nitrogen applied approximately four to six weeks post-planting based on a pre-side dress nitrate soil test, stand density and yield goal.

Tissue testing (N, P, K, Ca, Mg, S, Na, Al, Fe, Mn, Zn, B, and Cu) and plant biomass accumulation will be used to assess nutrient uptake patterns and will be conducted at V7, R1 and R6 corn growth stages and V4, R1 and R8 soybean growth stages. Plant organ sampling will include biomass and nutrient accumulation in root, stem (culm), leaf and seed, with total plant uptake and biomass accumulation the summation of the plant organs. Harvestable yields will be by rigorous sampling.

Products to Be Developed

At the completion of this three year project, the following items will be available:

- (1) a profitable corn and soybean nutrient management plan for SI-CD systems,
- (2) a best nutrient management system for SI-CD systems.