iGrow Soybean

BEST MANAGEMENT PRACTICES

Chapter 54: Developing On-Farm Research Protocols

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To combine data sets from different farms, common protocols must be followed. To develop on-farm protocols several conventions should be followed (Table 54.1). The purpose of this chapter is to discuss those conventions and develops guidelines for developing new protocols.

Table 54.1. Guidelines for developing on-farm research protocols.

1. The learning community identifies a critical need.
2. Based on current recommendations, identify the critical value that should be measured.
3. All collaborators should read, review, and agree to the stated protocols.
   a. Collaborators need to agree to share data.
4. Identify fields where differences are likely.
5. Collect archived yield monitor data from the field.
6. Conduct the experiments.
7. Conduct a field day where the experiments are reviewed by the different collaborators.
8. Calibrate the yield monitor on the combine.
9. Collect and analyze the yield responses and determine economic optimum algorithms.
10. Develop optimized input recommendation algorithms and distribute results.

Case Study 1

Critical need: Profitability and energy efficiency can be improved by using variable rate seeding. Typical planting population recommendations of approximately 150,000 seeds per acre were developed from experiments conducted on uniform topography.

Experiment: Plant Different Populations Across the Field

1. Select fields for the study. In the analysis, historical yield maps (actually the yield monitor data is needed) will improve the calculations. There should be five years of yield monitor data for the selected field.
2. Place strips perpendicular to the landscape topography (i.e., running uphill and downhill).
3. Apply at least one complete set of a minimum of four rates, the length of the field. Document cultural practices such as planting date, hybrid, condition of seedbed, etc.

   A grower with a variable rate planter will plant ½ mile strips (of width greater than the combine header) at 80,000 130,000, 180,000, and 230,000 thousand seeds/acre.
4. Collect soil samples (0-6 and 6-24 inches) to document soil fertility. Consolidate onto a single memory device all historical yield monitor data taken from the field on which the experiment is to be accomplished.
5. Vary only the planting population. Uniformly apply all other inputs in the field.
6. Accurately record the GPS coordinates of the experiment. If rows are not straight (not planted on an A-B line with an auto steer), an agronomy professional will walk the strip centers with a recording GPS receiver.
7. Measure stand counts and planter uniformity.
8. The trial must be harvested with a data recording, GPS-equipped combine. The yield monitor must have been recently calibrated for the variety of beans in the trial. Harvest the entire trial area on the same day. Combine direction of travel should be the same for all strips within a set. GPS yield data should be submitted within 30 days of harvest or no later than December 1, as raw yield from the memory card.
9. Measure post harvest losses both on the ground and on stems.
10. Allow SDSU to analyze and use data collected from the study sites for research, educational, and informational purposes.
11. Measure rainfall and scout the field regularly. Document as much auxiliary information as is possible (precipitation, weed, insect, disease problems, soil test analysis, etc.)

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Case Study 2

Critical issue: Profitability can be improved by using variable rate P applications. This information is needed to address increasing costs of phosphorous fertilizer. Our current P recommendations were developed from studies conducted on uniform soil types. This approach may lead to incorrect rates on certain soils.

Experiment Option 1: Apply Different P Rates Across the Field

1. Select fields for the study. In the analysis, prior yield records will improve the calculations. The availability of five years of data should be checked before selecting the field.
   a. Soil test P level should be in the medium to low range.
   b. No recent history of manure applications.
2. Consolidate onto a single memory devise all historical yield monitor data taken from the field on

which the experiment is to be accomplished. Submit this data with strip trial yield monitor data.

3. Place treatment strips perpendicular to the landscape topography (i.e., running uphill and downhill) variability.
4. Apply at least one complete set of alternating strips of four rates, the length of the field (Fig. 54.1). Document cultural practices such as planting date, hybrid, condition of seedbed, etc.
   a. 500 lb of actual P_2O_5/Acre (If DAP is applied, 18-46-0; this will be 1087 lb DAP/acre—after application soil test will increase ~25 points)
   b. 300 lb of actual P_2O_5/Acre (652 lb DAP/acre—after application soil test will increase ~15 points)
   c. 100 lb of actual P_2O_5/Acre (217 lb DAP—after application soil test will increase ~5 points)
   d. 0 lb of actual P_2O_5/Acre

Figure 54.1. The placement of different treatments across a landscape.

5. Collect soil sample (0-6 and 6-24 inches) to document soil fertility.
   a. Both depths should be analyzed for either Olsen or Bray P.
   b. Before fertilizer application 15 soil sample cores (cores to be composited for each depth) will be taken on a spacing of approximately every 400-foot on the ½ mile center of the strips transect. Across ½ mile, there will be about six sites from which samples are taken. Sites can be adjusted so that samples are taken to adequately represent every topographic feature of the transect. (hill top, side hill, foot slope, bottom ground). A GPS receiver will be used to document the location of each sampling location. A year after treatment and every two years after, the same sampling protocol will be accomplished for each treatment strip. If there are four treatments and six sites, there will be 24 sites at which samples will be taken.
   c. Use the same laboratory to do the soil analysis.
6. Within a strip, P should be uniformly applied.
7. Record in a experimental notebook the GPS coordinates of the various treatments. If rows are not straight (not planted on an A-B line with an auto steer), an agronomy professional will walk the strip centers with a recording GPS receiver.
8. Measure stand counts and planter uniformity.
9. Measure yield losses. The trial must be harvested with a data recording, GPS-equipped combine. The yield monitor must have been recently calibrated for the variety of beans in the trial. Harvest the entire trial area on the same day. Combine direction of travel should be the same for all strips within a set. GPS yield data should be submitted within 30 days of harvest or no later than December 1, as raw yield from the memory card.
10. Allow SDSU to analyze and use data collected from the study sites for research, educational, and informational purposes.
11. Measure rainfall and scout the field regularly. Document as much auxiliary information as is

possible (precipitation, weed, insect, disease problems, soil test analysis, etc.)

Experiment Option 2: Apply One P Rate Across Field

1. Spread heavy rates of P or K perpendicular to the rows. The width of the spreader swath is typically greater than 90 ft.
2. The P rate for the strip should be designed to increase the soil test P value to greater than 16 ppm (very high soil P level). Typically it takes around 20 lbs of P_2O_5/acre to increase the soil test value 1 ppm (1 pt of Olsen P). (Fig. 54.2)
3. Harvest going in the same direction as the rows and evaluate yield monitor data. An increase in yield indicates that there is fertilizer response.

Figure 54.2. Calculating the fertilizer rate for a fertilizer strip. The soil test value is 7 ppm and you designer to increase the rate to 16 ppm. How much DAP should be applied? DAP has a fertilizer grade of 18-48-0.

The desired increase in soil test P = (16-7 ppm) = 9 ppm

$$\text{The amount of } P_2O_5 \text{ that should be applied} = 9\text{ppm} \times \frac{20 \text{ lbs } P_2O_5}{1\text{ppm}} = 180 \text{ lbs } P_2O_5/\text{acre}$$

$$\frac{\text{lbs DAP}}{\text{acre}} = \frac{180 \text{ lbs } P_2O_5}{\text{acre}} \times \frac{\text{l lb DAP}}{0.48 \text{ lbs } P_2O_5} = \frac{375 \text{ lbs DAP}}{\text{acre}}$$

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Acknowledgements

Funding for developing this chapter was provided by the South Dakota Soybean Research and Promotion Council, USDA-AFRI, and South Dakota 2010 research program.

Carlson, C.G., and G. Reicks, 2013. Developing on-farm research protocols. In Clay, D.E., C.G. Carlson, S.A. Clay, L. Wagner, D. Deneke, and C. Hay (eds). iGrow Soybeans: Best Management Practices for Soybean Production. South Dakota State University, SDSU Extension, Brookings, SD.