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Conducting Successful On-Farm Research

Many producers routinely do some form of on-farm testing in their fields. These tests often consist of side-by-side plots or split-planter variety trials. In order to provide meaningful information to make future decisions with confidence, proper consideration at all phases of planning and execution of the trial are important. This article outlines some of the important steps to achieve success with on-farm research trials.

1) Ask the Right Question

What do you want to find out? It may seem obvious, but taking time to state the question clearly will help the producer stay on the right track. Do not make the question overly complex; try to focus on a practice which could be compared to a standard practice. For example, "Does applying a fungicide on corn at V5 increase yield?" or "What is the economic optimum seeding rate for soybeans?" When choosing the question, consider practices that are important to the profitability of the farming operation.

2) Consider Field History and Variation

Productivity of a field can vary significantly due to soil type, slope, previous crop and fertilizer history, etc. For example, one portion of the field may have more clay and lower elevation, which in a wet year results in reduced yields and drowned out areas. Many producers like to split fields in half; however, this soil-type variability, if not accounted for, can influence the results of the study.

3) Replicate and Randomize

Replication and randomization helps account for variability in the field. Utilizing the original question "Does applying a fungicide on corn at V5 increase yield?" To answer this question, two practices could be compared: 1) an untreated check strip and 2) a fungicide-treated strip. Sets of these two treatment strips should be replicated or repeated multiple times throughout the field, usually a minimum of five times. All other management practices should be kept consistent across treatments. Replication provides more data across a field, improving confidence in the yield results.

Randomization is used to assign the placement of each treatment within a block to eliminate preference for one treatment over another. The assignment is made randomly, such as by flipping a coin.

4) Collect the Necessary Data

Data collection is a key element of on-farm research. The following lists information often useful for understanding on-farm research data:

- Background information: previous crop, planting and harvest date, varieties/ hybrids used, seeding rate, plant populations at harvest, chemical applications, soil types, and rainfall/irrigation.

- Treatment strip locations: flag or log strip boundaries with GPS or document with as-applied data.
- Observations: additional data may be collected such as stand counts, stalk strength, soil samples, tissue samples, disease/insect/weed pressure, storm damage, and more.
- Photos: take pictures to help document and remember what was seen. Cell phones often have good cameras which make this easy to do.
- Aerial imagery: This can be obtained in a variety of ways, from satellite to manned or drone.
- Yield: Review the research design prior to harvesting. Yield data can be recorded using a calibrated yield monitor or weigh wagon.

5) Analyze Results

After gathering harvest data, it is time to analyze the results. If the trial was set up using replication and randomization, statistical tools can be used to determine if there are real differences between the treatments. Using statistics to analyze the data will allow for confidence in the results and help determine if one would expect similar results in another field or year.

In conclusion, University of Missouri Extension has developed a grower-focused program designed to help Missouri farmers and crop advisors compare on-farm management decisions and practices in a low-cost, low-risk setting. This program is the Missouri Strip Trial Program.

Source: *Kent Shannon, natural resource engineer*

Missouri Strip Trial Program Looking for 2018 Participants

Every year, farmers across Missouri face rising input cost with volatile markets, ever increasing environmental regulations, and consumer demands for increased sustainability. Agricultural producers are continually looking for practices to maximize farm profits while improving environmental stewardship; however, adopting new practices without knowing the potential impact on the operations' bottom line is risky. The University of Missouri Extension has an opportunity for farmers looking to evaluate some of these practices, learning what works and what does not, without involving the entire operation.

The Missouri Strip Trial Program uses a variety of precision ag tools including, remote sensing, GPS, aerial imagery, and yield monitors to collect data. University of Missouri Extension specialists will work with participating farmers to provide guidance and assistance to ensure reliable, statistically valid, and unbiased evaluations of particular practices.

Strip trials are multiple long strips laid out side by side in a field with different management practices (or treatments) on each strip. Keeping the process simple is a high priority. Strips are created with the producers' equipment, looking at two or three treatments, and then replicated in the field, allowing for side-by-side comparisons. Interested producers must be able to provide GPS-referenced yield monitor data and as-applied maps to participate in the program. At the end of the season, participating growers will have their results complied into a personalized report. Participants will also have access to aggregated results from trials in their area and statewide.

The Missouri Strip Trial Program recently established strip trial protocols for the 2018 season. This year the program will continue to focus on four areas: cover crops, phosphorus, nitrogen and ILeVO seed treatment. There are three different cover crop trials supported for 2018. The first cover crop trial compares strips of winter wheat to strips of cereal rye to a no-cover crop control. The trial compares the impact of the cover crops on yield, soil cover and if winter wheat could be substituted for cereal rye. The second cover crop trial evaluates cover crops prior to corn by comparing 1) cover crop of the producer's choice to 2) cereal rye to 3) no-cover crop control. The cover crop prior to corn trial will help determine if there are cover crop systems that provide sufficient cover without compromising corn management following a soybean crop. The final cover crop trial is a kill date trial evaluating the impact of delaying the cover crop kill date on the following cash crop yield.

Phosphorus strip trials evaluate where phosphorus application produces a profitable yield response. Producers must maintain strips with no applied phosphorus (zero-P strip) with a normal application of phosphorus applied along both sides of the zero-P strip. A multi-year trial will address how long a field can maintain productivity without adding phosphorus indicating the resilience in soil phosphorus supply.

Producers continue to seek the best approach for nitrogen (N) management in corn, milo, or wheat. How often does in-season N give a yield advantage? Can in-season N rate decision tools out-perform standard rates? Nitrogen trials will attempt to answer these questions. Producers can propose additional N trials to improve nitrogen use efficiency. These proposed trials will be considered on a case-by-case basis.

The final trial for 2018 compares a standard soybean seed treatment without ILeVO to a seed treatment with ILeVO at the full rate. The trial will compare yield, overall disease expression, and soybean cyst nematode (SCN) numbers before and after the season.

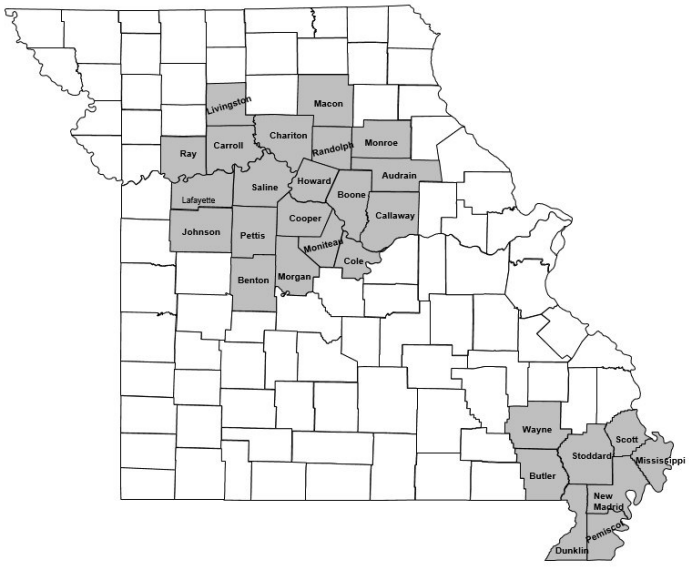
The Missouri Strip Trial Program is currently seeking participants for trials in 2018. Producers interested in participating or learning more information should contact a local University of Missouri Extension Agronomy or Natural Resource Engineering Specialist. Missouri Corn Growers, the Missouri Soybean Merchandising Council and their checkoff programs sponsor the MU Extension Strip Trial Program.

Source: *Wyatt Miller, agronomy specialist*

IRS Extends Deadline

On September 27, 2017, the IRS announced farmers and ranchers who previously were forced to sell livestock due to drought in an applicable region, now have an additional year to replace the livestock and defer tax on any gains from the forced sales. Missouri counties eligible for the additional year are shaded gray in the map below. This relief generally applies to capital gains realized by eligible farmers and ranchers on sales of livestock held for dairy or breeding purposes. Sales of other livestock, such as those raised for slaughter or held for sporting purposes, or poultry are not eligible.

To qualify, the sales must be solely due to drought, flooding or other severe weather causing the region to be designated as eligible for federal assistance.



Under these circumstances, livestock generally must be replaced within a four-year period, instead of the usual two-year period. The IRS is authorized to further extend this replacement period if the drought continues. The drought sale replacement period was scheduled to expire at the end of the 2017 tax year, but will now have an additional year.

If considering the replacement of breeding stock, which was sold due to drought, consult with a tax preparer first, as there are multiple tax strategies to consider.

For more information see: IRS Notice 2017-53 and Notice 2006-82

Source: *Mary Sobba, ag business specialist*

Seedhead Management to Improve Forage Quality

Tall fescue (*Festuca arundinacea*) is Missouri's most widely used forage crop with over 17 million acres. It is insect and nematode resistant, tolerates poor soil and climatic conditions well and has a long growing season. The downside of tall fescue is the presence of a fungal endophyte, *Neotyphodium coenophialum*, which can produce a toxic ergot alkaloid. Cattle that consume endophyte-infected tall fescue can undergo a toxicosis causing cattle to exhibit poor weight gain, rough hair coats during summer months, elevated core body temperatures, and reproductive problems such as low conception rates and poor offspring survival. Ergot alkaloid concentrations are greater in seeds than other plant parts; therefore, removal of fescue seedheads can be an effective strategy for reducing toxicosis. In a study conducted by the University of Kentucky, chemical suppression of seedhead emergence using Chaparral® (Dow AgroSciences, Indianapolis, IN) increased the nutritive value of the grass stand and showed to mitigate the adverse effects of fescue toxicosis.

Chaparral is a herbicide which can be applied early during spring vegetative growth to suppress seedhead emergence of tall fescue. It is approved for grazed pastures and does not suppress seedheads of other cool-season perennial grasses. During 2009 and 2010 growing seasons, the University of Kentucky conducted a research project with steers grazing on Kentucky 31 tall fescue pastures, with or without Chaparral treatment, for 74 and 84 days, during 2009 and 2010 growing seasons, respectively. Average daily gain (ADG) during both years was greater for treated pastures (2.1 lbs/day) versus the untreated pastures (1.5 lbs/day). Steers grazing treated fescue had lower rectal temperatures and greater serum prolactin

concentrations, indicating a mitigation of fescue toxicosis with seedhead suppression. During both years, there was a 2- to 3-week lag in fescue growth following the application of Chaparral; and forage availability in treated pastures was less than in untreated pastures.

The University of Kentucky conducted a follow up research project during 2011 and 2012 growing seasons, evaluating Chaparral treatment with light and moderate grazing intensities. The results of this study showed the herbicide treatment substantially reduced pasture carrying capacities. The higher ADG for the suppressed pastures was not enough to compensate for the lower numbers of steers, which they supported.

Managing seedheads to extend grass stands in a vegetative stage of growth can improve forage quality and cattle performance. Research focused on tall fescue seedhead suppression indicates forage quality is increased and the effects of fescue toxicosis mitigated using this management practice. Future research will need to determine if rotational grazing can be used to overcome short falls in pasture carrying capacities.

Source: *Heather Smith, livestock specialist*