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Development of a Team-Based On-Farm Learning Program While Challenging Soybean Growers to Increase Yield

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Abstract: *Illinois soybean growers have not been satisfied with recent lagging yield trends. A yield "challenge" was created to blend the motivation and creativity of a yield contest with the learning power of teamwork and on-farm demonstration. In the initial year (2010), 123 on-farm side-by-side demonstration plots were located throughout the state; 81% of those locations showed increased soybean yields through additional management, and 55% of the experimental challenge plots were profitable. Participant surveys indicated that 92% learned a new production practice and that 69% would adopt experimental practices on more production acres the following year.*

Introduction

Soybean (*Glycine max*) is an important U.S. agricultural commodity. The value of the U.S. soybean crop was approximately \$27 billion in 2007 (USDA NASS 2010). Illinois ranks second in the U.S., with a value of almost \$4 billion dollars. Soybean yields increased in Illinois by an average of 0.4 bu per year between 1950 and 2005 (Egli, 2008; Specht, Hume, & Kumudini, 1999; USDA NASS, 2010). However, from 2005 to 2009, soybean yields declined 0.2 bu per year, causing frustration and concern by growers.

During the same time, soybean production records of 139 bu per acre were established in 2006 and then 154 bushels per acre in 2007 by a Southwest Missouri soybean yield contest participant, Kip Cullers. More interesting were the reports that this grower applied his contest-gained knowledge to increase yields to greater than 100 bu per acre in other soybean production fields (Harrington, 2009). This perceived lagging yield trend and these high contest yield reports raised questions about the management needed to produce higher soybean yields in Illinois.

Responding to these reports, the Illinois Soybean Association began plans for a statewide yield program. Through cooperation among the Illinois Soybean Association, agribusiness industry representatives, National Soybean Research Laboratory, Extension and crop science researchers from the University of Illinois, Southern Illinois University, Western Illinois University, Illinois

State University, and University of Illinois, the Illinois Soybean Yield Challenge <www.soyyieldchallenge.com> was created.

Purpose and Objective

The intent of the Illinois Soybean Yield Challenge is to blend the motivation and creativity of a yield contest with the learning power of teamwork and on-farm demonstration. The overall objective is to discover the management practices and environmental conditions that enable maximum soybean yields, promote sustainability of higher yields through on-farm learning, and facilitate cooperation among soybean growers, agribusiness industry leaders, and University Extension.

Concept and Design

Characteristics of yield contests typically include the entry of yield data from an individual grower for one high-yielding plot location that satisfies a minimum size requirement. Contest plot locations are usually determined late in the growing season, which allows growers to choose areas that appear to be the most productive that season. During plot harvest, an official representative oversees harvest to ensure validity of yield data. Generally, the data collected includes the variety and yield, and the yield reported generally competes with other yields reported statewide within a certain crop production category. Moreover, yield contests usually are coordinated by one entity, such as a commodity group. In contrast, the Illinois Soybean Yield Challenge has several unique characteristics.

The Illinois Soybean Yield Challenge program:

1. Is designed to harness the power of cooperation between the soybean commodity association, state universities, agribusiness leaders, student organizations, and Extension;
2. Provides a mechanism for formal agribusiness sponsorship of participants and therefore recognition;
3. Is team oriented by requiring a minimum of five and maximum of 10 growers per team, no individual growers allowed to compete for awards;
4. Is focused on data collection for the entire production system, and every location has adjoining side-by-side research plots with an "investigative" plot and a "standard practices" plot;
5. Requires plot locations of five acres each to be identified prior to planting and a minimum of two contiguous acres to be harvested within the original five acres per plot for final yield determination;
6. Is grouped according to the nine USDA National Agriculture Statistics Service (NASS) state crop reporting districts to level the competition and provide a mechanism to capture and compare more localized data; thus, no overall state yield winners are determined;

A common soybean variety must be grown on both the investigative plot and the adjoining standard practices plot. The ability to manipulate yield by variety selection is well established, and this program seeks to explore other management techniques influencing yield. Participants also must be willing to share season-long crop management data regarding soybean variety selection, cultural practices, nutrient and pesticide applications, and in-season scouting reports. Global Positioning Satellite (GPS) coordinates of the plots' corners are to be established prior to planting. Participants can submit one soil sample per plot for soil fertility and soybean cyst nematode analysis, which is paid by the Illinois Soybean Association. Also, the GPS coordinates are used to collect soil characteristics from the USDA Web Soil Survey (WSS) database. Last, the final harvest must be accomplished with a qualifying witness that does not sponsor the team.

Awards are given to highest and second highest team average yields. The average is calculated

using the five highest yielding plots on each team, allowing for flexibility if locations yield poorly. There are also additional award categories such as Economic Development, Novel Practices, and Data Completion. University plots, public plots, and student plots do not need to form teams. Their yields are compared to the USDA NASS district yields to determine awards. Public plots are plots managed by university Extension or community college instructors for the purpose of having land laboratories or teaching in each of the nine districts, and university plots are plots managed by university researchers for the purpose of researching novel production practices at each of the four state Universities in Illinois. These plots do not accept prizes, but student plots managed by 4-H or FFA organizations can earn cash prizes for their school. More specific details can be found at the Illinois Soybean Yield Challenge website: <www.soyyieldchallenge.com>.

Partnerships Addressing a Need

Partnerships among university researchers, Extension, and the Illinois Soybean Association contributed to the first year's success and offered several advantages. First, this key partnership demonstrates the ability of commodity leaders and Extension to come together to address relevant soybean growers' concerns, like increasing soybean yield in a sustainable manner. Case-in-point: corn and soybean growers and consultants were asked two survey questions during the University of Illinois Extension-led meeting series called the Corn and Soybean Classics, which were located throughout the state in January 2010. Questions were approved under IRB protocol number 09258. The questions were:

1. Has soybean yield hit a plateau? There were 702 total responses that indicated:
 - 31%, Yes, I'm frustrated with soybean yields
 - 11%, Yes, but they're stable
 - 53%, No, but they're not increasing fast enough
 - 4%, No, I'm satisfied with soybean yields

2. What is your goal to change soybean yield on your farm next year? There were 665 responses to the second question that indicated:
 - 50% would like to increase yields 5 to 10 bu per acre
 - 38% would like to increase yields 2 to 5 bu per acre
 - 6% would like to increase yields 1 to 2 bu per acre
 - 6% indicated a desire to increase by less than 1 bu per acre or remain the same

In summary, only 4% of soybean growers and consultants were satisfied with soybean yield levels, and only 6% had a goal to increase soybean yields at rates similar to the 60-year trend. Aligning the development of this yield challenge with the attitudes of Illinois' soybean growers at the time of program initiation showcases the ability of Extension to partner with stakeholders and be relevant to clientele needs by investigating the situation with the collection of on-farm data and experimentation. This is a contrast to the arguments of West, Drake, & Londo (2009), which highlight an inability for Extension to remain relevant in modern times.

The Yield Challenge program was funded by soybean check-off funds. Therefore, a second program success was the demonstration of how soybean check-off funds support university research efforts and how those efforts relate to producing higher yields. Third, generation of data from plot locations across the state produced preliminary data and research ideas for university researchers. This provided new avenues of communication and understanding from observation of growers' needs. Fourth, it provided a mechanism to combine information contact lists and e-mail list-serves for distribution of soybean management information. Examples

included the ability to promote and share materials such as:

- <http://www.vipsoybeans.org>
- http://www.planthealth.info/pdf_docs/SCN_Management.pdf
- <http://www.vipsoybeans.org/v4/vpinfo/Help%20Stop%20Glyphosate%20Resistance.pdf>
- <http://www.vipsoybeans.org/v4/vpinfo/Foliar%20Fungicides--Playing%20the%20Odds.pdf>
- http://www.vipsoybeans.org/v4/vpinfo/SCN--The_Invisible_Threat.pdf

Overall, the benefits of university crop science researchers, Extension, the soybean commodity group (Illinois Soybean Association), and the National Soybean Research Laboratory cooperating together have been similar to those reported by Kandel, Ransom, Torgerson, & Wiersma, (2010). Those authors demonstrated similar benefits when they worked closely with soybean and wheat commodity groups to provide hands-on demonstrations for North Dakota and Minnesota growers. The benefits noted include increased participation due to commodity organizational mailing lists, indirect producer funding through check-off funds, strengthened relationships between commodity groups and extension, and producer-driven planning resulted in a different way of approaching the problem.

Program Participation

There were 233 growers representing 32 teams that started the program. Final yield reports were submitted for 123 growers and 17 teams. The reasons for attrition included poor weather conditions such as excessive rainfall that ruined plots in some areas, team leadership changes due to personal transitions within some agribusinesses involved, and some participants who just did not follow through with their intentions to collect and/or enter their data into the program. Year two will build and improve upon year one and include a new data entry system to streamline and expedite data entry for all participants and/or sponsors. Additionally, participants and team sponsors learned how to organize internally to maximize the value of the Yield Challenge.

Yield Influence and Educational Impact

Across the 123 locations that submitted yield data, 81% of the challenge plots had a higher yield than standard practice plots. The yield advantage for challenge plots was 7% over standard plots on average. The highest team average yield for the "investigative" plot was 85.3 bu per acre, and the highest individual plot yield was 89.3 bu per acre. With the many types of data collected to relate to these yield differences, the program has started successfully by allowing crop science researchers to examine relationships between grower production practices and soybean yields. From an Extension standpoint, five regional meetings were held throughout the state in the winter of 2011. These meetings facilitated a means to share the data collected and discuss the benefits and challenges of the program with 2010 participants and many interested 2011 participants. The full program data report outlining the agronomic data collections can be viewed at <http://www.soyyieldchallenge.com/data/mediaCenter/files/1204.pdf>.

To evaluate the program, three key questions were included on the yield submission form. Growers were asked if the practices they employed on their investigative plots were profitable, and 55% indicated they were profitable. Growers were also asked if they would adopt some practices they implemented for their normal production acres the following year, and 69% indicated they would try a new practice. Last, growers were asked if they learned something from participating in the Yield Challenge, and 92% indicated they did learn the value of a new practice from their participation.

Conclusion

Yield contests have been one mechanism for crop producers to push the normal limits of crop

production boundaries for many years. One positive feature of yield contests is that growers learn more about the crop through hands-on experimentation, and those lessons can translate into positive management changes that have the potential to allow growers to increase profitability and sustainability in their overall farming operation.

Our results indicated more than half our growers found experimental practices profitable, over two thirds identified practices to adopt on more acres, and a majority (92%) learned something new from the program. These results resemble similar experiences reported by Kip Cullers (Harrington, 2009). Moreover, Barker and Miller (1996) reported how a Knox County Ohio No-Till Yield Contest demonstrated the ability to promote better environmental stewardship. This program also demonstrated the ability for stakeholders and Extension to join forces to address relevant clientele needs. It was mutually beneficial for demonstrating the value of check-off-funded production research, as well as sharing Extension materials and resources. For states interested in initiating statewide production programs with a goal to increase grower profitability and yield sustainability, the essential elements include strong leadership, open dialogue, an easy user-friendly data collection infrastructure, and collaborations among industry, academia, and farmers.

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