

Research and extension services

EFIELDS: CONNECTING SCIENCE TO FIELDS

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Abstract

Ohio State University Extension has a long standing tradition of using on-farm research to enhance education through collaboration with farmers. Recently, to address the need for improved communication and sharing of research results, a team of Extension educators and researchers came together to formalize an on-farm research network. The program, eFields: Connecting Science to Fields, aims to be the premier source of research-based information in the age of digital agriculture. The program began in 2017 with 39 field-scale trials including high speed planting, corn and soybean seeding rate trials, corn nitrogen trials, and side dressing corn with manure using a drag hose. In 2018, over 100 trials were conducted in 23 counties. Analysis was expanded to include the economics of seeding rate, nitrogen rate and nitrogen timing studies to help farmers improve input decision making. Research results are reported in an annual publication that is available as a printed book and an electronic version at go.osu.edu/eFields. Implementation of results from the seeding rate trials alone on corn and soybean acreage across Ohio has the potential to generate \$1 million USD in savings for farm managers.

Keywords: Research, Inputs, Production, Profitability

Introduction

Ohio State University Extension (OSUE) has a long standing tradition of using on-farm research to enhance education through collaboration with farmers. Farmers have a higher confidence level in local, on-farm research results. They are better able to relate to local situations and the scale of on-farm research compared with small plot research. Through precision agriculture technology, it is easier to conduct on-farm research and collect accurate trial results. Through the program, *eFields: Connecting Science to Fields*, collaboration between OSUE Professionals and between OSUE Professionals and farmers

has increased. There are a greater number of on-farm research trials across the state and the information from those trials is being shared with farmers.

Trial results are compiled and reported in the publication released at the beginning of January each year. Today, purchasing decisions of inputs for crops are occurring earlier, often before the previous season's harvest has been completed. While peer-reviewed on-farm research reports are still very relevant and important, they cannot be reported in a timely manner due to the peer review process. With eFields, Extension Educators and Specialists can share current research results with farm managers quicker while management decision for the coming year still can be influenced.

Material Studied

The eFields team launched in 2017 and provided corn and soybean seeding rate protocols to OSUE Educators as an introduction for newer Educators to become involved in on-farm research. A standardized protocol to report in the eFields publication at the end of the growing season increased efficiency in pulling the report together. In collaboration with 23 Extension Educators and Specialists, 39 studies in 2017 was expanded to 91 on-farm research trials working with over 40 farmers across the state of Ohio. Trials conducted in 2018 included cover crop termination, nitrogen rates and timing for corn and wheat, seeding rates for corn and soybeans, starter fertilizer, dragline swine manure, foliar feeding, fungicides, phosphorus and potassium applications to soybeans and sulfur applications to wheat.

While yield results are important, the economics of a practice will help farmers better decide crop production decisions. In 2018, economic calculations were added to the four most conducted studies: corn seeding rates, soybean seeding rates, nitrogen application rate in corn, and nitrogen timing in corn. With depressed corn and soybean prices, this will better enable farmers to fine tune input costs and strengthen their bottom line.

Results

There are several useful outcomes from the eFields project. First is the main purpose for the project, which is to generate best management production practices for farm managers in Ohio. Having the unbiased research to support or refute what the agronomy supply industry is marketing to Ohio farmers provides confidence for farm managers to make production decisions.

The second outcome is the research becomes a platform to expand outreach and education efforts for OSUE Specialists. Through the development of research protocols by state specialists, OSUE Educators with no or limited on-farm research experience are able to confidently take the protocol to farmers in their counties and implement replicated research that can be included in the eFields report and shared across the state.

The third outcome is the educational opportunity created by the eFields report when used as an educational tool that can be distributed by OSUE Educators. There are several purposes this document can serve such as a promotional piece to introduce OSUE to farm managers not familiar with our organization or to stakeholders and political leaders that are asked to fund the organization. Additionally, the report can be used as a teaching tool when sharing the research results with farm managers.

In 2017, more than 700 hardcopy publications were distributed in the two weeks following publication, nearly 2,000 e-version 'reads' were documented in this same time period. To date, there have been 381 direct downloads of the publication in pdf format, 1,188 previews and 3,193 online reads. People from over 16 countries have accessed the publication online. For 2018, 7,500 hard copies have been requested for distribution at Extension meetings. The team has developed a social media strategy to drive interest in the report and expand the reach of the e-version.

Discussion

The economic impact of the various research results demonstrates how much money farmers can save by choosing the most economically efficient practice. Although there needs to be more years of research to definitively make recommendations, early results lend credence to the following recommendations.

1. Corn seeding rates – Several seed companies are moving growers in the direction to increase seeding rates to 86,450-98,800 seeds per hectare [35,000-40,000 seeds per acre]. 2017 research results from the eFields cooperators indicated that corn yields plateaued at 74,100 seeds per hectare [30,000 seeds per acre] statistically. Assuming seed costs were \$3.50USD per 1,000 seeds, the cost saving going from 83,980 back to 74,100 [34,000 back to 30,000] would be \$34.58 [\$14.00 per acre]. In 2017, there were 1.4

million hectares [3.4 million acres] of corn planted and the potential saving to the agricultural industry would exceed \$47 million dollars.

2. Soybean seeding rates - Soybean seed costs have increased over the last decade, driven in part by soybean seed being priced similar to corn seed. That is, farmers are now buying soybeans by the seed, a departure from buying soybeans by the pound. There has also been significant improvement in planter technology resulting in better seed placement and plant emergence. Even with these changes, many farmers continued to plant soybeans at 395,200 - 444,600 seeds per hectare [160,000 - 180,000 seeds per acre]. 2017 research results as published in the eFields report indicated that soybean yields were not statistically different in most of the 13 trials within the 197,600 to 592,800 plants per hectare [80,000 to 240,000 plants per acre]. Based on this data, if farmers choose to plant 296,400 seeds per hectare [120,000 seeds per acre] instead of 395,200 seeds per hectare [160,000 seeds per acre] without any yield losses, the saving in seed costs would be \$42.29USD per hectare [\$17.12 per acre] based on \$0.428 per 1,000 seeds. For the 2.1 million hectares [5.1 million acres] of soybeans in Ohio, this would save more than \$87 million in input costs for farm managers.

3. Nitrogen application rate and nitrogen timing in corn – Nitrogen leaching from fields has gathered significant attention in the United States in recent years contributing to increased public water purification costs and the hypoxia zone in the Gulf of Mexico. Research results from the eFields trails support the notion that applying nitrogen later in the growing season (V5 – V10 verses at plant), when a better rate decision can be made, does not adversely affect yield. The delayed application of part of the total nitrogen needs allows farm managers to use remote sensing tools and incorporate weather concerns into the amount of nitrogen applied. This has the potential to lower the total amount of nitrogen used in growing the corn crop.

Educators and specialists are able to use this platform to expand outreach and education efforts. Through research protocols developed by state specialists, educators who have not conducted on-farm research before are able to confidently take the protocol to farmers in their counties and implement replicated research that can be included in the eFields report and shared across the state.

The eFields report is also a valuable tool that Educators can distribute at programs and one-on-one meetings. Some educators have used it to promote OSUE and their program by distributing to farmers while they are harvesting in the fields. The report is an easy teaching tool when sharing the research results with farmers. eFields can also be used as a promotional piece to stakeholders and funders to share the impact Extension has with farmers. The economic piece can easily show how much money farmers can save by choosing the most economically efficient practice.

Conclusion

eFields: Connecting Science to Fields provides a platform for county Extension Educators and farm managers to conduct on-farm research together and report results of those trials across the state within a time frame to allow the data to be used in making better production decisions. This partnership has resulted in an expansion of research across the state and strengthened relationships between farm managers and Extension professionals. With hardcopy and online distribution, access to the report information is easy for farm managers and agricultural industry professionals. Results can be shared during the following winter meeting season and aid farmers in their decision making process as they prepare for the next growing season. Preliminary results are affecting decisions as informal feedback from farm managers indicates seeding rates for corn and soybean are being reduced. Many farm managers planted several seeding rates on their farm to determine what seeding rate reductions their soil will support. There is also anecdotal evidence that farmers are lowering their nitrogen rates and tending to use less pre-plant nitrogen so a later season application decision can be made. eFields has opened the door to the future of on-farm research, is having substantial impact of farm managers' decisions, and is leading the way for Extension and Outreach services.