



PURDUE UNIVERSITY

# CENTER FOR COMMERCIAL AGRICULTURE

ANNUAL REPORT 2019



# LETTER FROM THE DIRECTOR



This past year was one that those of engaged in production agriculture will never forget. An ongoing trade dispute with China and a delayed planting season that, ultimately, led to record prevented plantings of spring crops helped give us a wild year. African Swine Fever that devastated China's pork production and spread to

other Asian pork producers disrupted meat markets and meat trade. Ag trade concerns were not limited to China as a replacement for NAFTA, the U.S.-Mexico-Canada Agreement, was negotiated and then debated in the halls of Congress. The unprecedented volatility in agriculture meant there was a tremendous need for ongoing updates and management education among the nation's farmers, which the Center helped fulfill.

Webinars and recorded videos have proven to be a great way for the Center to reach out to the nation's agricultural producers. The Center produced nine webinars during 2019 that were subsequently made available on the Center's YouTube channel. Combining registrations for the live broadcasts with subsequent YouTube viewership indicates these programs reached over 10,000 viewers during 2019.

Interest in what U.S. farmers were thinking with respect to the ag economy was never higher than in 2019. The Purdue-CME Group Ag Economy Barometer completed its fourth year of operation in 2019 and the barometer's reach keeps expanding. Widely quoted in both the agricultural and business press, the monthly surveys create opportunities to query producers on a variety of timely topics ranging from their perspective on agricultural trade to their interest in investing in new technology. In addition to the monthly reports provided via the barometer's web site, the Center recaps each month's barometer results in a short video. The barometer also results in countless press interviews with the Center's Associate Director, Michael Langemeier and me each month. Once again, the Ag Economy Barometer and related information were featured in a session with Center staff at the national corn and soybean producer convention, the Commodity Classic, held during late February in Orlando, Florida.

A summer highlight each year is the Purdue Farm Management Tour. This year's Tour featured 4 family farming operations in north central Indiana's Wabash and Huntington counties. The Tour is a joint effort between the Center and Purdue Extension Educators in the two host counties. Each year the Tour features in-depth discussions with successful farming operations to help attendees identify management strategies they can implement on their own farms to improve profitability. In spite of this year's weather-related planting delays, over 300 farmers and agribusiness staff members attended this year's Tour at four top-notch north central Indiana crop and seed production operations.

The Purdue Farm Business Internship program was in its third year in 2019. The program matches Purdue student interns with progressive commercial operations to provide students with valuable work experience and an opportunity to learn more about farm business operations. Participation was up in 2019 and, although the program remains small, interest is growing among both Purdue students and Indiana farms and we expect more students to participate in 2020 than a year earlier.

Finally, in cooperation with two of our newer agricultural economics faculty members, Nate Delay and Nathan Thompson, the Center surveyed 800 U.S. corn and soybean farmers to learn more about the farm data they collect and how they use that data to improve decision making on their farms. More details regarding information garnered from that survey are available in this year's report.

Thank you for interest in and support of the Purdue Center for Commercial Agriculture. As always, if you have suggestions for future programs or research, or you just want to chat, we'd love to hear from you.

Sincerely,

A handwritten signature in black ink that reads "Jim".

James Mintert  
Director



# CENTER ACTIVITIES

## WEBINARS

Webinars are a key information delivery technique for the center. Webinars make it possible to connect with a broad audience on a variety of timely topics. From 2014 through 2019, the center delivered 91 webinars and recorded videos on farm and financial management, agricultural outlook and strategy topics. Archived webinars are available on the center's YouTube channel for participants unable to watch live.

### 2020 AG OUTLOOK

*December 19, 2019*

Purdue agricultural economists Michael Langemeier and James Mintert provide an overview of key supply and demand drivers for corn and soybeans, examine basis patterns and possible storage returns, provide updated 2020 crop budget projections, and take a first look at pricing opportunities for the 2020 corn and soybean crops.

*YouTube views: 267*

*Registrations: 459*

### FALL 2019 CROP OUTLOOK: FOLLOWING USDA'S SEPTEMBER CROP PRODUCTION REPORT

*September 13, 2019*

Purdue agricultural economists Michael Langemeier and James Mintert provide an updated corn and soybean outlook following the release of USDA's September Crop Production and World Agricultural Supply & Demand Estimates (WASDE) reports. These reports provide USDA's first objective yield estimates for the 2019 corn and soybean crops. They discuss the outlook, market analysis, and discuss marketing considerations for the 2019 crops.

*YouTube views: 323*

*Registrations: 203*

### INDIANA FARMLAND VALUES AND CASH RENTS

*August 21, 2019*

Purdue ag economists Craig Dobbins, Michael Langemeier, and James Mintert discuss marketing strategies for 2019 corn and soybean crops, provide updated farmland value and cash rent info. from the June 2019 Purdue Land Values Survey and make projections for 2020 corn and soybean returns.

*YouTube views: 447*

*Registrations: 248*

### CORN & SOYBEAN OUTLOOK: FOLLOWING USDA'S ACREAGE REPORT

*July 2, 2019*

Purdue agricultural economists Chris Hurt, Michael

Langemeier, and James Mintert provide an updated review of corn and soybean acreage, which includes information from USDA's Acreage report along with their own assessment of prevented planting of corn and soybeans. They also review 2019 yield prospects and the implications for prices. They conclude with a review of the income outlook in 2019 for corn and soybean operations under various prevented planting and yield scenarios.

*YouTube views: 673*

*Registrations: 324*

### CORN & SOYBEAN PRICE OUTLOOK: MAKING YOUR 2019 SOYBEAN PREVENTED PLANTING DECISIONS

*June 17, 2019*

Purdue agricultural economists Chris Hurt, Michael Langemeier, and James Mintert provide an updated corn and soybean price outlook, which includes information from USDA's June 17 Crop Progress report. They also provide an analysis of the soybean prevented planting alternatives facing Corn Belt farmers. The webinar looks at multiple scenarios to help sort through your alternatives as the June 20th final soybean planting date for full crop insurance coverage approaches in Indiana and the Eastern Corn Belt.

*YouTube views: 971*

*Registrations: 220*

### LATE CORN & SOYBEAN PLANTING DECISIONS

*June 6, 2019*

As a follow-up to their previous webinar, Delayed Corn & Soybean Planting Decisions, Purdue agricultural economists James Mintert and Michael Langemeier review the alternatives farmers have in this late planting season. In particular, they analyze the potential returns from taking the Prevented Planting option for corn and compare it to potential returns from delayed planting of both corn and soybeans, under a couple of different scenarios.

*YouTube views: 1,495*

*Registrations: 203*



### **DELAYED CORN & SOYBEAN PLANTING DECISIONS**

*May 24, 2019*

Purdue ag economists James Mintert and Michael Langemeier join Purdue agronomists, Bob Nielsen, and Shaun Casteel to discuss late planting alternatives for Eastern Corn Belt corn and soybean farming operations. Included is a discussion of crop insurance alternatives as well as corn and soybean agronomic management considerations.

*YouTube views: 2,041*

*Registrations: 1,088*

### **SPRING 2019 CORN & SOYBEAN OUTLOOK**

*April 1, 2019*

Purdue agricultural economists Michael Langemeier and James Mintert review the crop outlook following the March 29th release of USDA's Prospective Planting and Grain Stocks reports.

*YouTube views: 397*

*Registrations: 185*

### **MAKING YOUR 2019 CROP INSURANCE DECISIONS**

*February 19, 2019*

Purdue agricultural economists Michael Langemeier and James Mintert discuss 2019 corn and soybean crop insurance choices and provide insight into decision making for corn and soybean farmers.

*YouTube views: 378*

*Registrations: 300*

### **PURDUE/CME GROUP AG ECONOMY BAROMETER BREAKDOWN VIDEOS**

The Center for Commercial Agriculture, in partnership with the CME Group, recorded monthly videos breaking down the survey insights from the Ag Economy Barometer. Each video included discussions about producer sentiment toward the agricultural economy and drivers of sentiment. Barometer breakdown videos are available on the center's YouTube channel.

*December 3 - YouTube views: 97*

*November 5 - YouTube views: 84*

*October 1 - YouTube views: 113*

*September 3 - YouTube views: 158*

*August 6 - YouTube views: 170*

*July 2 - YouTube views: 123*

*June 4 - YouTube views: 234*

*May 7 - YouTube views: 213*

*April 2 - YouTube views: 92*

*March 5 - YouTube views: 111*

*February 5 - YouTube views: 89*

*January 8 - YouTube views: 235*





# CENTER ACTIVITIES

## PROGRAMMING AND PUBLICATIONS

### ASSOCIATION OF AGRICULTURAL PRODUCTION EXECUTIVES

The membership of the Association of Agricultural Production Executives (AAPEX), an organization that is now more than two decades old, is composed of many of the nation's leading agricultural producers. The Center for Commercial Agriculture delivered the 2019 AAPEX Annual Meeting in San Diego, California, February 6 – 9, 2019. Over 150 members attended the 2019 meeting representing 30 states and three countries. There were several great speakers and topics covered but the highlight was the farm business profile series, which consisted of three AAPEX members sharing the story of their business and lessons learned through both success and failure. The program continued the pre-meeting field tour that included a visit to two very unique horticultural greenhouse farm businesses operating in the urban setting of greater San Diego. Working with this group of producers provides the Purdue faculty and staff with insights into the research and educational needs of America's leading farmers and provides opportunities for further collaboration.

### PURDUE TOP FARMER CONFERENCE



The 52<sup>nd</sup> Purdue Top Farmer Conference took place on January 10, 2020, with an optional half-day pre-conference workshop on January 9. The conference is one of the most successful

and longest running management programs geared specifically for farmers. This year's conference focused on strategies for mitigating risk in 2020 and featured some of the nation's top experts on marketing, risk management and crop production. Farmers got hands-on experience developing strategies for managing risks in their operation during the pre-conference and the main conference included sessions on: long- and short-term ag outlook; recent trends and prospects for farmland markets across the Corn Belt; insights into the use of and impacts of using cover crops; and a comparison of the ARC and PLC programs as farmers prepared for their Farm Bill decisions. Speakers included agricultural experts from the Center for Commercial Agriculture, Iowa State University, University of Nebraska-Lincoln, University of Wyoming, Nutrien Ag Solutions, Purdue's Department of Agricultural Economics, and Purdue's Department of Agronomy. In addition to educational sessions, the more than 150 conference participants had multiple opportunities to network with their peers from across the country.

### PURDUE FARM MANAGEMENT TOUR

The 87th Annual Purdue Farm Management Tour was held June 27-28, 2019, in Huntington and Wabash counties. One of the tour's primary goals is to encourage Hoosier farmers to develop high-level management knowledge and skills. Anson Farm, Dennis Grain & Farms, Bowman Agri Corp., and McKillip Farms hosted and provided tour attendees with insights about innovative ways to approach the challenges facing today's farming operations. These farms have demonstrated highly successful business management practices. In addition to touring four progressive and diverse operations, the 2019 tour also included an agricultural outlook update by Howard Halderman, and the Indiana Prairie Farmer Master Farmer Banquet.



### CROP MARKETING & FARM FINANCE WORKSHOPS

The center put on several Crop Marketing & Farm Finance Workshops in the winter of 2019, to help producers improve profitability. Each workshop provided farmers an opportunity to improve both their crop marketing and financial management skill sets. James Mintert, Nathan Thompson, and Michael Langemeier, all from Purdue's Center for Commercial Agriculture, conducted the 8 workshops located around the state of Indiana, co-organized with Purdue Extension Extension Educators. Nearly, 100 workshop participants attended one of the regional workshops and learned about local basis patterns, storage opportunities, enterprise profitability, and whole-farm financial projections.





## **INTRODUCTION TO THE BUSINESS OF COMMERCIAL AGRICULTURE**

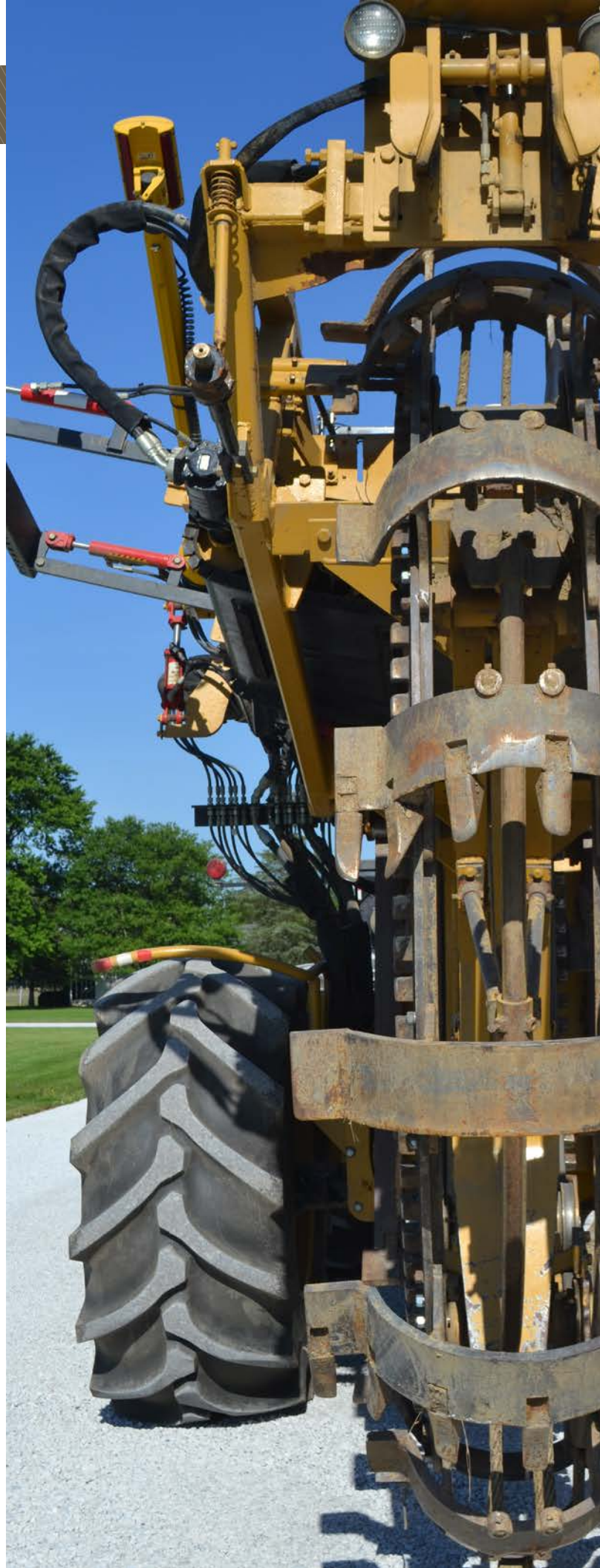
This two-credit undergraduate class provides an overview of U.S. commercial agriculture from an insider's perspective. Each class period features a presentation by a farmer or agribusiness executive focused on their firm's position within the industry and their work experiences. Students enrolled in the course gain a better appreciation of the diversity among U.S. farms and agribusinesses in addition to gaining insight into business strategy from professionals in the field. Students also learn more about the wide range of career opportunities available to College of Agriculture graduates and how they can position themselves for future success. In addition to guest speakers, this course includes a field trip to an area farm and agribusiness. Although class presentations by farmers and agribusiness executives cover a wide range of topics, there are several common themes covered each year, including an emphasis on the importance of understanding the markets in which the business operates, information gathering, efficiency and technical innovation in competitive advantage, and business relationships. The course also emphasizes the importance of financial management and business culture.

## **FARM BUSINESS INTERNSHIP**

The Center for Commercial Agriculture's Farm Business Internship moved into its third year in the summer of 2019. Four Purdue Agriculture students were placed on Indiana farms during summer break where they gained experience working with progressive commercial farming operations. Interns gained valuable experience in farm business operations combined with on-farm work experience. The program will move into its fourth year in the summer of 2020, looking to increase student and farm participation.

## **CENTER'S WEBSITE REDESIGN**

The faculty and staff from the Center for Commercial Agriculture and Purdue's Department of Agricultural Economics create excellent farm management content. The center launched a new search-friendly website in 2019. Resources can be filtered by topic, author, or keyword. As the reader begins to read, other topic relevant items populate in the sidebar to help with navigation. With the new website launch, the center began a monthly newsletter, *Commercial AGNews*. The newsletter is distributed mid-month and provides updates regarding upcoming programs as well as new articles and resources available on the revamped website.



# AG ECONOMY BAROMETER



## PURDUE-CME GROUP AG ECONOMY BAROMETER

*James Mintert & Michael Langemeier*

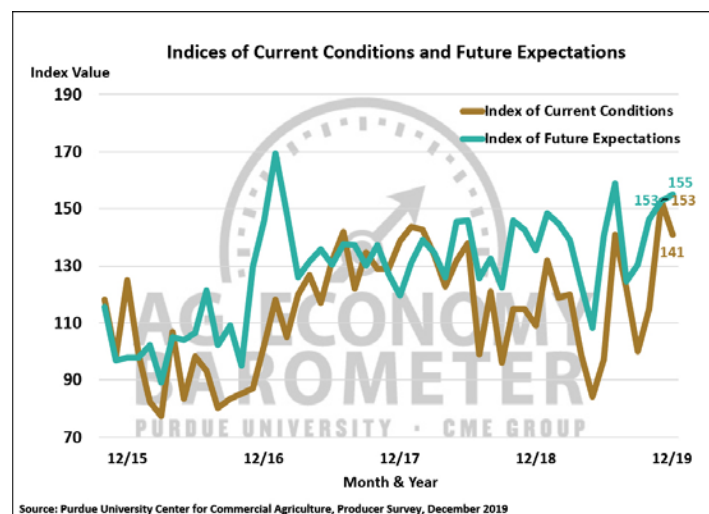
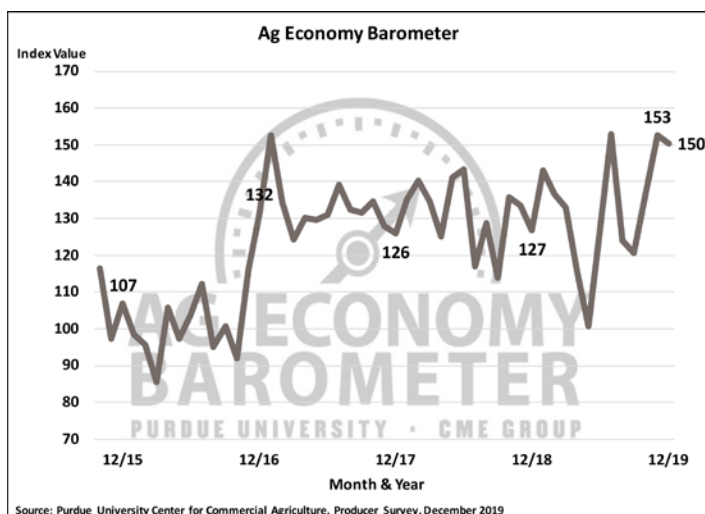
Producer sentiment fluctuated widely during 2019. At the end of 2018 the barometer, based upon a monthly nationwide survey of U.S. agricultural producers, stood at a reading of 127. As worries spread about the effect of delayed spring plantings, compounded by the trade dispute with China, the barometer dipped to a low of 101 in May. But as conditions improved during the last half of the year the barometer hit a peak reading of 153 in November and actually ended the year at 150, 23 points higher than a year earlier. During the course of the year the Index of Current Conditions improved to a reading of 141, compared to 109 a year earlier, and the Index of Future Expectations rose to 155 in December 2019 vs. 135 in December 2018.

The Farm Capital Investment Index dipped to its all-time low of 37 in May, when farmer sentiment bottomed out, but recovered by year end to a reading

of 72 in December 2019. The rise in the capital investment index during the last half of 2019 left the capital investment index just short of its peak value of 75, which was reached back in late 2015.

To monitor producers' perceptions regarding the trade dispute with China, the barometer began asking producers whether or not they expect the trade dispute to end soon, commencing with the March 2019 survey. From mid-spring to early summer producers were skeptical that a quick resolution was likely with China.

Another indication of producer unease was their viewpoint on whether or not this is a good time to bring a new generation into a family farming operation. Responses to this question in 2016 and 2017 were essentially split 50-50. But on the December 2018 survey, producers were noticeably more negative with 58 percent of respondents saying now was not a good time, and just 42 percent indicating this is a good time, to join a family farming operation.





# RESEARCH, PAPERS AND PRESENTATIONS

## ASSESSING STRATEGIC POSITIONING SKILLS

Michael Langemeier

### Introduction

As farms continue to consolidate it becomes increasingly important to assess a farm's management skills. At a certain farm size, it is no longer easy or feasible for the manager or managers to wear every management hat. How does the management team determine when to focus on professional development, delegate management tasks among managers, and seek outside assistance? This is the eighth and final article in a series pertaining to the assessment of management skills. The topic of this article is the assessment of strategic positioning skills.

### Strategic Positioning Skills

Table 1 presents important strategic positioning skills. Important skills in this management area include the following: articulating a vision for the farm business; identifying factors critical to the long-term success of the business; capitalizing on new and emerging markets; assessing your farm's advantages and disadvantages compared to competing farms; updating written strategies and action plans at least annually; and updating equipment and facility replacement plans at least annually. Each farm operator should rank their ability with respect to each skill using a 1 to 5 scale with 1 be relatively weak and 5 being relatively strong with respect to that skill. The idea behind checklists such as that presented in table 1 is to assess whether a farm has a skills gap, which is defined as the difference between skills that a farm needs and the skills of their current workforce (operators and employees). Conducting a skills gap analysis helps a farm to identify skills that will be needed to become more efficient and expand.

The checklist in table 1 does not include a final tally score, nor does it address tradeoffs in various skill or ability areas that may lead to success. Rather, the checklist helps farm operators evaluate their skills and abilities in areas critical to long-term financial

success. As farm operators fill out the checklist, they should try to determine which of the skills listed are most essential to improving efficiency and expansion plans.

The discussion below will focus on strategic direction and managing strategic risk. Strategic direction involves thinking about whether a farm is going to focus on a commodity based strategy or a differentiated product strategy. Strategic risk involves the sensitivity of a farm's strategic direction and vulnerability to business climate uncertainties.

### Strategic Direction

Management of a farm business can be broken down into two categories: tactical and strategic management (Edwards et al., 2016). Tactical management involves day-to-day management tasks that ensure that the business is doing things right. Conversely, strategic management involves charting the long-run course for the business or ensuring that the farm is doing the right things.

Strategic direction or management involves determining whether the operation is interested in a commodity based strategy or a differentiated product strategy (Boehlje and Langemeier, 2017). A commodity based strategy focuses primarily on cost control while a differentiated product strategy focuses on value-added production or receiving an above average price for a farm's products.

When evaluating strategic direction, it is important to conduct an internal and external analysis of your operation. An internal analysis identifies key resources, capabilities, and core competencies. An external analysis examines the social and industry environments the farm faces, and involves answering questions pertaining to supply and demand. For example, what

Table 1. Strategic Positioning Skills

		Weak to Strong (Check the Appropriate Box)				
		1	2	3	4	5
1	Articulate a vision of the farm business.					
2	Identify factors critical to the long-term success of the business.					
3	Capitalize on new and emerging markets.					
4	Regularly assess your farm's advantages and disadvantages compared to competing farms.					
5	Written strategies and action plans are updated annually.					
6	Written equipment and facility replacement plans are updated annually.					

# RESEARCH, PAPERS AND PRESENTATIONS

is the demand for the farm's current products? If we produce a value-added commodity, is there sufficient demand to warrant a relatively high price?

Identifying a farm's sources of competitive advantage is important when developing a strategic direction. Competitive advantage involves establishing a difference in financial performance than can be preserved. To do this, a farm must either deliver greater value to customers, create comparable value at a lower per unit cost, or do both. One useful technique that can be used to determine whether a farm has a competitive advantage is to identify whether the farm has a unique resource or capability that enables it to have a competitive advantage (Langemeier, 2016).

## Assessing and Managing Strategic Risk

Strategic risk involves the sensitivity of the farm's strategic direction and ultimate vulnerability to uncertainties in the business climate (Boehlje and Langemeier, 2017). Uncertainties pertaining to strategic risk may be derived from the following sources: international, government policy, government regulation, macroeconomics, social, environment, industrialization, technological uncertainty, or competitive conditions.

Though it is difficult to manage strategic risk using typical risk mitigation strategies such as controlling leverage, using futures and options, or using crop insurance, it is still imperative that a farm manage its exposure to strategic risk. One of the ways to think about strategic risk is to use scenario analysis. Scenarios can provide insight and an understanding of the forces and drivers that may shape the uncertain future. Scenarios such as low price, most likely price, and high price provide a framework about what may happen, and more importantly what a farm might do if one of the scenarios plays out. When evaluating scenarios, it is important to gauge the impact of each scenario on a farm's balance sheet and income statement using pro forma statements or projections.

## Concluding Comments

Assessing strategic positioning skills is an important part of benchmarking farm performance and figuring out where improvements may be needed. If the operators on the farm identify management areas which are not currently being addressed, they will need to determine whether someone is going to get up to speed with regard to these areas or outside help is going to be sought to address weaknesses.

Strategic direction involves thinking about whether the farm is going to focus on a commodity based strategy or a differentiated product strategy. Traditionally, farms have focused on a commodity based or low cost strategy. With the recent increase in opportunities to produce unique products that add value, it is important to also examine whether a product differentiation or value-added strategy should be pursued. Strategic risk involves the sensitivity of a farm's strategic direction and vulnerability to uncertainties in the business climate. It can be extremely expensive to unravel a strategic mistake. When developing strategic plans, make sure to compute the cost of unwinding a decision.

## FARM DATA USAGE IN COMMERCIAL AGRICULTURE

*Nathan DeLay, Nathanael Thompson, James Mintert*

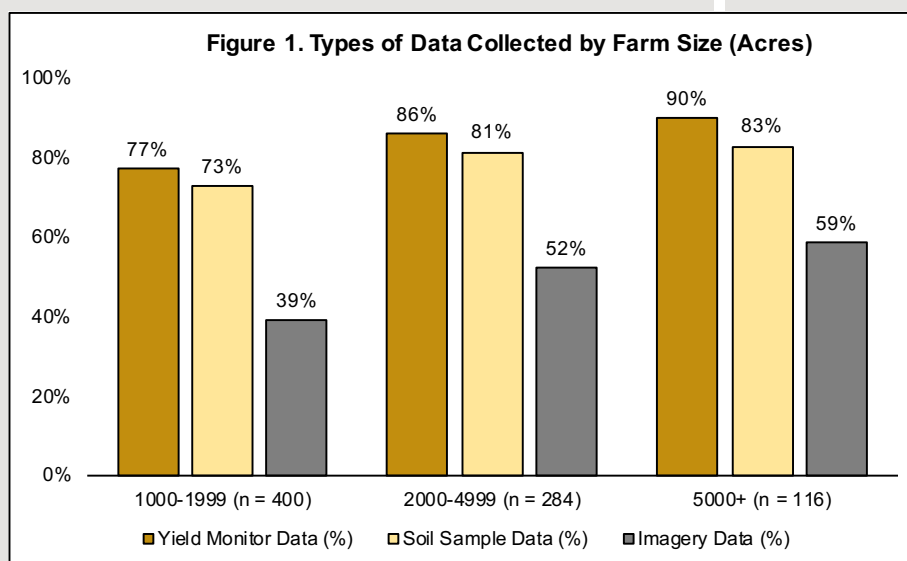
### Introduction

While the amount of data that can be collected from farms is growing rapidly, questions remain about how farmers leverage this data to make decisions. To begin to answer these questions, researchers from Purdue's Center for Commercial Agriculture surveyed 800 large corn and soybean producers regarding their collection, management, and usage of farm data. The survey asked respondents questions regarding the types of data collected on the farm, farm management decisions influenced by data, data management practices, and data sharing with outside service providers. The goal of the survey is to understand the farm data lifecycle from collection to decision making and the various channels through which data becomes actionable.

### Data Collection

Collection among the sample is common—particularly for yield monitor and soil data at 82% and 77%, respectively. Satellite or drone imagery data is the least likely to be collected (47% of the sample) but given the novelty of the technology, this could be considered high. The vast majority (73%) create GPS maps from their data, suggesting a high degree of engagement with data once collected. Data collection is strongly related to farm characteristics. Figure 1 displays the percentage of farms collecting each data type by farm size. Data collection is most prevalent among large farms—a result consistent with previous findings. Collecting farm data—particularly drone or satellite imagery data—likely involve scale economies that favor larger operations.





Farms with young operators and more educational attainment are generally more prone to collecting farm data. Again, imagery data from a drone or satellite bears the clearest relationship to age and education. Of the 800 respondents, 58 (7%) do not collect any of the data types included in the survey. When asked to identify the primary reason for not collecting farm data, 36% said data collection is “too costly” while 19% find the benefits of doing so unclear. Taken together, over half of non-collectors perceive farm data to be un-profitable. Over one-third report uncertainty in how to use farm data once collected—suggesting a disconnect between collection and action. Surprisingly, only 10% of farms cited privacy concerns as the reason for not collecting farm data.

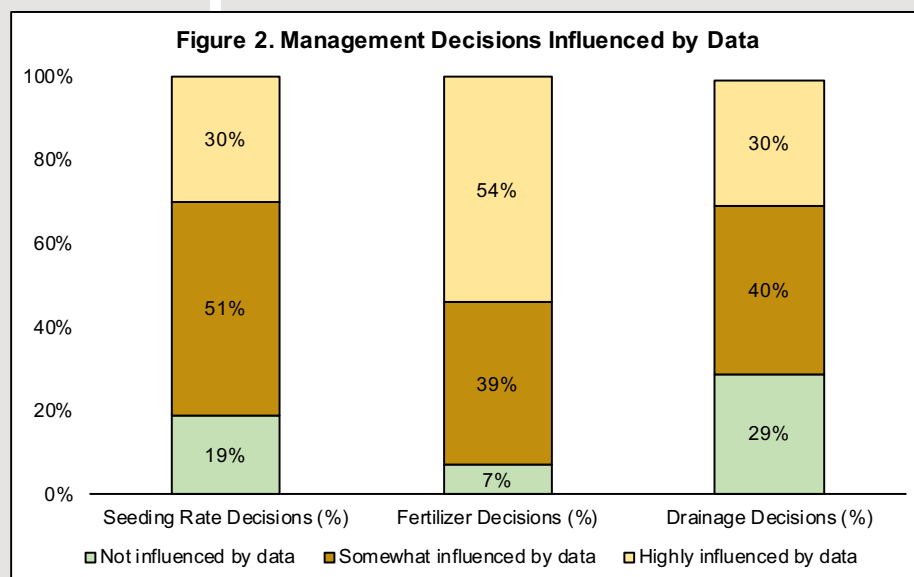
### Data Decision Making

Farmers that currently collect data were asked to rate the extent to which their data influences their decision making in three crop management areas: seeding rates, nutrient management/fertilizer application, and drainage investments. Figure 2 summarizes the responses. Farm data appears to have the largest influence on nutrient management with 93% reporting their fertilizer decisions to be “somewhat” or “highly” influenced by data. The share of farms reporting seeding rate and drainage decisions as at least somewhat influenced by data is 81% and 71%, respectively. Fertilizer application decisions

are nearly twice likely to be “highly” influenced by farm data as seeding rate and drainage investment decisions—reflecting the popularity of variable rate fertilizer application within the sample. Farms making decisions based on their data appear satisfied with the results. Seventy-two percent of those making data-driven seeding rate decisions report a positive yield impact vs. 81% for fertilizer decisions and 85% for drainage decisions. Levels of satisfaction rise as farmers collect more data types. For example, the proportion indicating a positive yield result from data-informed seeding rate decisions is 64% if the farm only collects only one type of data (e.g. just yield monitor data) but rises to 77% if the farm collects all three data types—a 21% increase. This suggests that individual data streams are made more actionable when combined with other data sources.

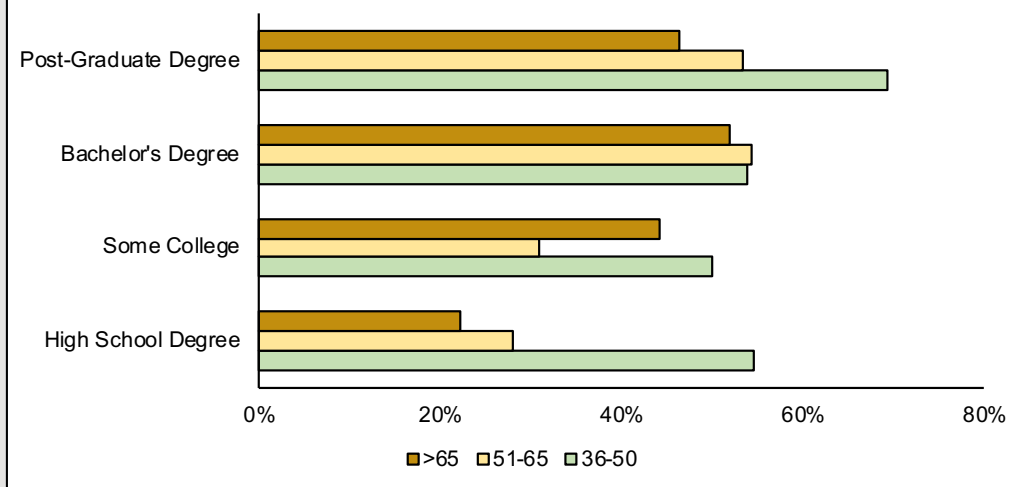
### Data Management Practices

The survey broadly focuses on two data management practices in the farm data pipeline: adoption of farm data software platforms and sharing of data with outside service providers. Overall, 47% of farms that collect data use at least one data software product, but adoption rates are significantly higher among larger operations—63% of farms with 5,000 acres or more vs. 36% of farms in the 1,000-1,999-acre category. Farms with higher educational attainment have higher rates of farm data software adoption but the relationship



# RESEARCH, PAPERS AND PRESENTATIONS

**Figure 3. Use of Farm Data Software by Education and Age**

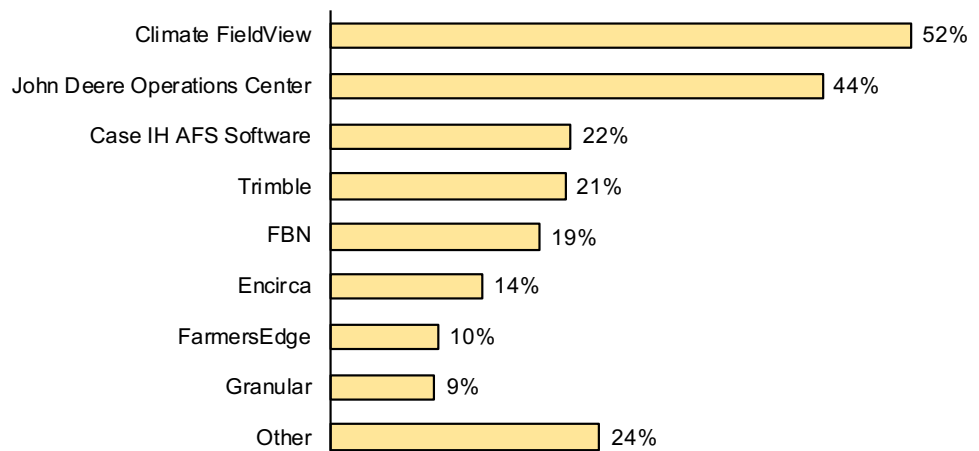


varies by operator age. Figure 3 shows that, among operators over 65, those with some college are nearly twice as likely to use farm data software than those with a high school diploma. Getting a Bachelor's degree has a similar effect on adoption rates among those age 51-65. Software platforms are popular with young operators across all levels of education but adoption rises to nearly 70% for those with a post-graduate degree (e.g. Master's or Ph.D.). Farmers that use at least one data service platform were asked to identify all of the products they currently subscribe to from a list of eight popular brands (see Figure 4). The most widely used software product is Climate FieldView (Bayer), used by over half of surveyed software subscribers. Forty-four percent use John Deere Operations Center while 22% use Case IH AFS Software platform—generally reflecting their respective market shares for farm equipment. Trimble is the next most frequently used at 21%, followed by Farmers Business Network (FBN) (19%), Corteva's Encirca (14%), FarmersEdge (10%), and Granular (also Corteva) at 9%. Nearly one fourth of users subscribe to a service not listed in the survey, suggesting a long tail in the farm data software market. Our survey indicates that 63% of subscribers receive seed or fertilizer application recommendations

(prescriptions) from their software. However, only 44% follow their software recommendations "closely" while 52% follow "somewhat closely," and 4% do not follow recommendations at all. Seventy percent of software users subscribe to more than one product—indicating the absence of a "one-stop-shop" for farm data solutions. Although farms use an average of two software platforms, almost 90% subscribe to three or fewer. This implies an upper-bound on the number of

platforms farms are willing to adopt. Given the growth of investment in farm-facing technology companies, it may be difficult to incent existing adopters to add another product to their software suite. Companies could instead target non-adopters. Of farmers not using any farm data software, close to half indicate uncertainty in how to use the technology as the primary reason for not subscribing. Forty-one percent of non-adopters perceive farm data software as too costly or the associated benefits unclear, indicating a breakdown in value proposition. Privacy concerns are surprisingly unimportant as a deterrent to software use—only 12% identified privacy as the main reason for not subscribing to farm data service. Farmers were asked if they share their data with agronomists, agricultural input suppliers, and equipment

**Figure 4. Types of Software Used by Software Users (n = 353)**





dealers/manufacturers for the purpose of generating crop management recommendations. Over 70% of respondents share their farm data with at least one service provider and of these, 63% share with two or more. Farmers are most willing to share data with service providers that operate close to on-farm crop management decisions. Fifty-eight percent of farms share data with their agronomist followed by ag input suppliers at 44%. Only 12% report sharing their data with equipment dealers and 7% share with a service provider not listed in the survey. Surprisingly, the share of farms that follow recommendations provided by outside service providers “very closely” is 31%, 13 percentage points lower than the share that follow their software recommendations closely. The willingness to follow software generated recommendations over those provided by an outside advisor may be due to a perception that service providers—particularly ag input suppliers—pair recommendations with product sales. We find that farm data is more influential in the crop management decisions of farms that subscribe to a data software platform or share their data with an outside service provider. Farms that perform both data management practices are over four times more likely to make seeding rate decisions that are “highly influenced” by data than farms that collect data but do not share or use software. The proportion of data-driven fertilizer decisions among the software plus sharing cohort is over twice that of the no-software, no-sharing group. Software use is positively associated with the degree to which data influences drainage investments. Data sharing however, has little to no impact on the importance of data in drainage decisions. Similarly, farms that subscribe to a data software product are more likely to report increased yields as are farms that share data with an agronomist, input supplier, dealer, or other service provider.

### **Conclusion**

Often ag data ends up siloed on the farm, stored on desktops or USB flash drives collecting dust in a shop drawer. These survey results suggest that pro-actively managing and analyzing farm data can improve decision making and generate positive yield results. Understanding how data management practices shape on-farm decision making is of crucial importance in bringing the farm of the future into reality. Downstream players in the agricultural value chain must recognize the data needs of growers as data transparency and data integration demands rise.

## **MEASURING FINANCIAL STRESS**

*Michael Langemeier*

Financial stress is typically measured using a profitability measure and a solvency measure. For example, profitability could be measured using the operating profit margin ratio and solvency could be measured using the debt to asset ratio. As noted in Langemeier (2016) and Langemeier and Yeager (2018), the operating profit margin is a useful benchmark when comparing financial performance among farms. The operating profit margin ratio is computed by adding interest expense and subtracting unpaid family and operator labor from net farm income and dividing the result by either value of farm production or gross revenue. A long-run benchmark for the operating profit margin ratio is 20 percent. The average profit margin has been relatively lower than this benchmark during the last few years, particularly for farms with below average long-run performance (e.g., bottom quartile). For the operating profit margin to be positive, net farm income plus interest expense has to be large enough to cover unpaid family and operator labor. The debt to asset ratio is computed by dividing total farm debt by total farm assets. Given the importance of land to total farm assets, land values are an extremely critical determinant of a farm’s debt to asset ratio. Farms with little to no owned land tend to have relatively higher debt to asset ratios.

Farms are said to be financially stressed if the operating margin is relatively low and the debt to asset ratio is relatively high. Specifically, a farm is said to be financially stressed if the operating profit margin is negative and the debt to asset ratio is above 0.70. Measuring financial stress is not the same thing as measuring credit quality or the probability of default. Measures involving credit quality and probability of default typically include the percentage of assets owned, repayment capacity, and working capital (Featherstone and Langemeier, 2017). Comparing the two concepts, financial stress provides a warning signal whereas credit quality reflects the risk that a farm may not be able to repay short-term and long-term debt.

### **Operating Profit Margin Ratio**

During the 2007 to 2013 period, real U.S. net farm income ranged from \$68.5 billion in 2009 to \$132.0 billion in 2013, and averaged \$97.6 billion. Since 2014, U.S. net farm income has averaged \$82.0 billion, which is 16 percent lower than the average for the 2007 to 2013

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period (USDA-ERS, 2019). The operating profit margin ratio for the U.S. farm sector averaged 14.3 percent from 2007 to 2013, and 9.8 percent from 2014 to 2018. In terms of net cash farm income, 56 percent of all farms and 42 percent of farms with a gross cash farm income greater than \$350,000 reported negative income during the 2007 to 2016 period (Key et al., 2018). Because net cash farm income does not include family and operator labor, the percentage of farms with a negative operating profit margin ratio was likely higher than these percentages.

Using FINBIN data summarized by the Center for Farm Financial Management at the University of Minnesota, the average operating profit margin ratio was 21.3 percent from 2007 to 2013, and 7.0 percent from 2014 to 2018. The operating profit margin varies widely among farms. In 2018, the median operating profit margin ratio for the farms summarized in FINBIN was 6.1 percent. Over 20 percent of the farms had a ratio above 20 percent, a commonly used benchmark. In contrast, approximately 40 percent of the farms had a negative operating profit margin ratio.

## Debt to Asset Ratio

Due to its inclusion of both part-time and full-time farm operators, the farms included in U.S. farm balance sheet typically exhibit an average debt to asset ratio that is considerably lower than that exhibited by farms included in databases, such as FINBIN, that focus on full-time farms. The average debt to asset ratio for all U.S. farms averaged 0.124 from 2007 to 2013, and 0.127 from 2014 to 2018. Since 2012, the debt to asset ratio has steadily increased, moving from 0.113 in 2012 to 0.133 in 2018. The percentage of farms with a gross cash farm income greater than \$500,000 that had a debt to asset ratio greater than 55 percent increased from 7.6 percent in 2012 to 13.5 percent in 2017 (Key et al., 2019).

The average debt to asset ratio for the farms summarized in the FINBIN database, averaged 0.383 from 2007 to 2013, and 0.388 from 2014 to 2018. The median debt to asset ratio in 2018 was 0.45. The 20 percent of farms with the lowest debt to asset ratio had ratios below 30 percent. Approximately 20 percent of the farms had a debt to asset ratio above 0.70.

The median debt to asset ratio for Illinois FBFM farms was 0.204 in 2017 and 0.214 in 2018 (Zwilling and Raab, 2019). However, debt to asset ratios vary widely among farms. In an analysis of Illinois grain farms in

2017, Schnitkey and Swanson (2018) indicated that approximately 39 percent of the farms had a debt to asset ratio of 30 percent or below, and approximately 10.3 percent and 2.4 percent of the farms had debt to asset ratios above 50 and 75 percent, respectively.

## Financial Stress

As indicated above, financial stress can be measured by examining farms with both a negative operating profit margin ratio and a debt to asset ratio above 0.70. Information from the data sources mentioned in the previous two sections pertaining to financial stress is limited. Using U.S. data for farms with a gross cash farm income greater than \$500,000, and a total debt coverage ratio below 1 and a debt to asset ratio above 0.55 as a measure of financial stress, Key et al. (2019) indicated that 3.7 percent of large farms were financially stressed in 2017, representing a 2.4 percent increase compared to financial stress in 2012. Using Illinois FBFM and University of Minnesota FINBIN data and assuming that less than one-half of the farms had a negative operating profit margin, financial stress as measured in this article would be less than 10 percent. An upcoming article will estimate financial stress for a sample of farms in the Great Plains.

## Concluding Comments

Farms with low profitability and high solvency are typically financially stressed. This article used the operating profit margin ratio and the debt to asset ratio to create a measure of financial stress. Specifically, farms with a negative profit margin ratio and a debt to asset ratio above 0.70 were defined as being financially stressed.

The operating profit margin ratio has been relatively low since 2013. After increasing dramatically from 2006 to 2013, land values have dropped. However, for many farms the drop in net farm income has been larger than the decline in land values. As a result, even with relatively low profit levels, farm solvency has remained strong for most farms, mitigating financial stress.

This article focused on measuring financial stress. An upcoming article will illustrate trends in the operating profit margin ratio, the debt to asset ratio, and financial stress for a sample of farms in the Great Plains.



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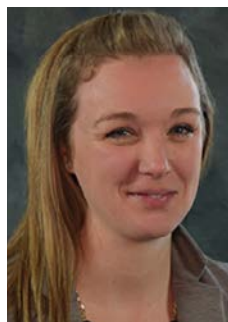
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