

**THE PURDUE UNIVERSITY-CME GROUP AG ECONOMY  
BAROMETER: PROVIDING A CONTEMPORANEOUS MEASURE OF  
PRODUCER SENTIMENT AND ECONOMIC HEALTH OF THE U.S.  
PRODUCTION AGRICULTURE SECTOR**

Sub-Theme: Knowledge and Information

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***Abstract:***

*The Purdue University-CME Group Ag Economy Barometer is a new survey-based confidence measure for the U.S. agricultural economy. The Ag Economy Barometer is based on a monthly survey of U.S. producers of corn, soybeans, wheat, cotton, beef cattle, dairy, and hogs who have a gross revenue exceeding \$500,000. The Ag Economy Barometer is based upon responses to a series of five questions focused on both current conditions in the U.S. production agricultural sector and future expectations. In addition to the Ag Economy Barometer, the survey responses are also used to generate an Index of Current Conditions and an Index of Future Expectations.*

***Key Words:*** *Ag Economy Barometer, Index of Current Conditions, Index of Future Expectations, U.S. agricultural producer sentiment*

## **Introduction**

Survey-based confidence measures for various aspects of the U.S. and world economies have been available for many years. One of the most widely known and commonly cited is from the *Surveys of Consumers* conducted by the University of Michigan, which has been conducted regularly since 1958. Another widely disseminated confidence measure is the Conference Board's *Index of Consumer Confidence*, which has been conducted regularly since 1967. But until recently, however, there has not been a survey-based confidence measure for the U.S. agricultural sector. The new *Purdue University-CME Group Agricultural Economy Barometer*, launched publicly in 2016, fills this gap using results from a monthly survey of U.S. agricultural producers to provide insights into agricultural producers' perspective on the U.S. production agriculture economy.

## **Who We Survey**

The goal of the *Agricultural Economy Barometer* is to provide a monthly measure of agricultural producer sentiment along with supplemental information regarding the agricultural production sector from the perspective of producers. Since the Barometer's objective is to provide a measure of the production agriculture sector's overall health, the survey focuses on producers engaged in the major U.S. commodity sectors. The key agricultural enterprises targeted in each survey include the following: corn; soybeans; wheat; cotton; beef cattle; dairy; and hogs. Note that specialty crop producers are not targeted in the monthly Barometer surveys. According to the U.S. Census of Agriculture, these seven enterprises collectively account for 67 percent of the value of all U.S. agricultural production.

The producer survey is further targeted by stratifying it to focus on the larger agricultural producers that provide the bulk of U.S. food production. U.S. Census of Agriculture data indicate there are 2.1 million U.S. farms. However, larger farms, those with gross farm income exceeding \$500,000, provide over 80 percent of U.S. agricultural production, by value. Farms in this size category comprise just 8 percent of the 2.1 million U.S. farms resulting in a population for the Barometer survey of approximately 168,000 farms. To further ensure that respondents to Barometer survey's accurately mirror the USDA's Census of Agriculture categorization of producers, phone sampling is employed to establish response

targets based on value of farm production as follows: 49 percent of respondents with a market value of agricultural production ranging from \$500,000 to \$999,999; 36 percent of respondents with production values ranging from \$1,000,000 to \$2,499,000; and 15 percent of respondents with a market value of production equal to or greater than \$2,500,000. Stratifying targeted responses in this manner helps ensure that survey results accurately assess opinions of the primary drivers of the U.S. production agriculture economy.

In addition to response targets based upon value of farm production, respondents are also stratified to ensure that they adequately represent the major agricultural enterprises, commensurate with USDA's Agricultural Census data. To do this, response targets are established for each of the key enterprises outlined previously. Since a single farm can engage in multiple enterprises, and the categories are not mutually exclusive, the target proportions represent a minimum for each enterprise. Minimum targets by enterprise for survey respondents each month are as follows: 53 percent corn and/or soybeans; 14 percent wheat; 3 percent cotton; 19 percent beef cattle; 5 percent dairy; 6 percent hogs. Use of a stratified sample reduces sampling variability, which become critical to the reliability of results as surveys are conducted month after month. This approach helps ensure that changes in survey results over time are attributable to changing attitudes of agricultural producers, rather than to a change in the distribution of producers surveyed. Given the population of approximately 168,000 farms that are the target of each monthly Barometer survey, a survey size of 400 respondents is sufficient to produce results with a 95 percent confidence interval of plus or minus 5 percent. Respondents are chosen randomly from a database of agricultural producers that have landline phones. Producers that respond to a survey are withheld from the future potential survey pool for a period of six months before they are eligible to be surveyed again. All surveys are conducted via telephone during the third week of the month and enumerators continue to survey producers each month until the various producer size and enterprise stratification targets are reached.

## Survey Questions and Barometer Calculations

The Agricultural Economy Barometer is an index derived from an aggregation of five individual diffusion indexes that are calculated based upon survey responses to five questions. The five questions posed to survey respondents each month are:

1. We are interested in how farmers are getting along financially. Would you say that your operation today is financially better off, worse off, or about the same compared to a year ago?
2. Looking ahead, do you think that a year from now your operation will be better off financially, worse off, or just about the same as now?
3. Turning to the general agricultural economy as a whole, do you think that during the next twelve months there will be good times financially, or bad times?
4. Looking ahead, which would you say is more likely, U.S. agriculture during the next five years will have widespread good times or widespread bad times?
5. Thinking about large farm investments – like buildings and machinery -- generally speaking, do you think now is a good time or bad time to buy such items?

The first step in computing the Barometer is to calculate a score for each of the five questions. Each question receives a score equal to the percentage of favorable responses (e.g., better off or good times) minus the percentage of unfavorable responses (e.g., worse off or bad times), plus 100. This means each question has a potential score ranging from 200 (100 percentage points favorable minus 0 percentage points unfavorable, plus 100) to zero (0 percentage points favorable less 100 percentage point unfavorable, plus 100). This approach means that a question with a score above 100 received more positive or favorable responses than negative or unfavorable responses whereas the opposite was true for questions with a score below 100.

Once the scores for each of the questions are computed, they are added together to generate a gross score. The gross score –the sum of the five individual scores from each of the five questions in a given month- is then divided by the survey's average monthly gross score during the survey's base period, which is October 2015 – March 2016. The result from this calculation is the monthly Ag Economy Barometer index value which, by definition, is relative to the base period of October 2015 – March 2016.

To provide some additional clarity to the computation of the Ag Economy Barometer, it's useful to consider examples illustrating how the Barometer calculations work. During the six-month base period the average monthly gross score equaled 309. Each monthly Ag Economy Barometer diffusion index value equals that month's gross score divided by the base period average gross score (309), multiplied by 100. Use of the October 2015 – March 2016 period for a base means that, by definition, the average of the Ag Economic Barometer over that time frame is 100. To compute the actual Barometer value for a given month, that month's gross score is divided by the base period average gross score of 309 and then multiplied by 100.

Given the base period's average gross monthly score of 309, it's possible to compute the effective mathematical range of the Ag Economy Barometer. Consider a case where every survey response was negative for all five questions. Each question would have a score of 0 (calculated as  $((0-100)+100)$ ). The resulting monthly gross score would also equal 0, yielding an Ag Economy Barometer score of 0. Alternatively, if every survey response to all five questions was positive or favorable, each question would have a score of 200 (calculated as  $((100-0)+100)$ ), resulting in a monthly gross score equal to 1,000. The Ag Economy Barometer index value resulting from a monthly gross score of 1,000, the maximum value, is 324 (calculated as  $((1000/309)*100)$ ).

In addition to computing the Ag Economy Barometer value, two other indices are computed, the Index of Current Conditions and the Index of Future Expectations. Like the Barometer, these two indexes are also diffusion indexes and the mathematical methodology is the same as for the Barometer. However, instead of using results from all five questions that are posed each month these two indexes are each computed using responses to a subset of the five questions. The Index of Current Conditions is computed using survey responses to two questions: 1) Would you say that your operation today is financially better off, worse off, or about the same compared to a year ago; and 2) Thinking about large farm investments – like buildings and machinery -- generally speaking, do you think now is a good time or bad time to buy such items. The Index of Future Expectations is computed using responses to three questions: 1) Looking ahead, do you think that a year from now your operation will be better off financially, worse off, or just about the same as now; 2) Turning to the general

agricultural economy as a whole, do you think that during the next twelve months there will be good times financially, or bad time; and 3) Looking ahead, which would you say is more likely, U.S. agriculture during the next five years will have widespread good times or widespread bad times.

To encourage participation in each month's survey, each month's phone questionnaire is limited to a maximum length of approximately five minutes. Although this is a relatively short amount of time, it does provide the ability to pose additional questions to survey respondents, beyond the base five questions used to calculate the Ag Economy Barometer, on a variety of timely topics. Responses to the additional questions posed each month can provide insight into the drivers of producers' overall perspective regarding the economic health of the U.S. agricultural sector.

### **Ag Economy Barometer Results to Date**

Data collection for the Ag Economy Barometer began during the third week of October 2015 and monthly surveys have been conducted every month since through March 2017, resulting in a data collection period of 18 months to date. Data was collected from October 2015 through March 2016 and results calculated, but not publicly released to ensure that survey procedures were working well and to provide context for the Barometer. The first public release of the Barometer took place in May 2016 with results from the April 2016 survey and releases have continued monthly since then with the Barometer made available to the public on the first Tuesday of the month. Barometer results, including a monthly summary report, historical data and charts, are available at [purdue.edu/agbarometer](http://purdue.edu/agbarometer).

Figure 1 provides the Ag Economy Barometer results from October 2015 through March 2017. Note that the October 2015-March 2016 period is used to compute the Barometer's base. This means that when the Barometer values from October 2015 through March 2016 are summed and divided by six, the resulting average equals 100. Thus, all reported Barometer values are relative to the base period. Barometer values that exceed 100 indicate that sentiment during that particular month was more positive than during the October 2015-March 2016 and, conversely, Barometer values below 100 indicate sentiment was less positive than during the base period.

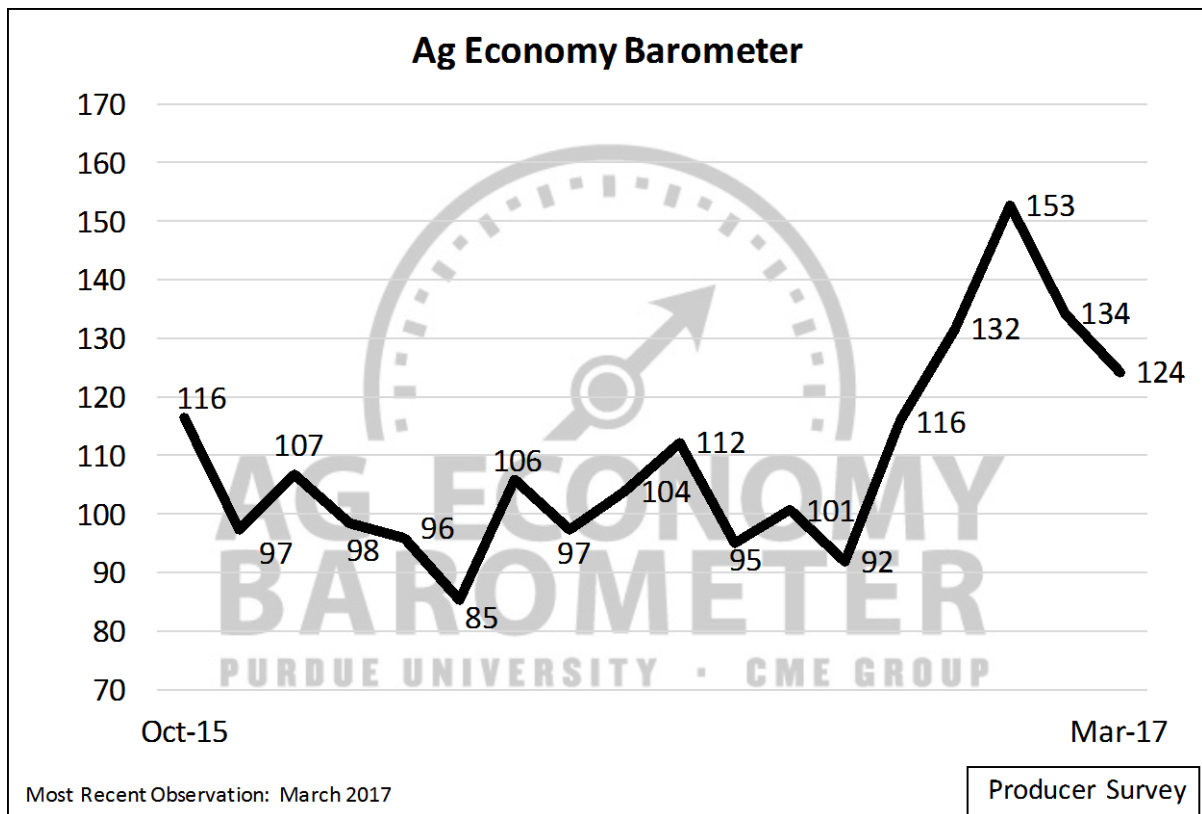


Figure 1. Purdue University-CME Group Ag Economy Barometer, October 2015-March 2017.

Sentiment among U.S. agricultural producers started off in October 2015 more positive than the average of the base period, but sentiment declined significantly during the remainder of the fall and winter of 2016. The decline in producer sentiment coincided with weakening prices for major commodities in the U.S. Sentiment among producers improved during the spring and early summer of 2016. Once again, the change in sentiment coincided with a shift in commodity prices, especially corn and soybeans. Prices for both of these important U.S. crops improved in spring 2016 based in part on smaller than expected South American production and concerns about dry weather in the U.S. Corn Belt. Barometer values weakened during the summer and early fall as yield prospects in the U.S. improved, helping to drive prices for key U.S. crops lower. Additionally, the U.S. livestock sector was also experiencing stress as both hog and cattle prices were below breakeven levels for many producers.

Notably, there was a marked change in sentiment that got underway in November 2016. The Barometer jumped from a reading of 92 in October to 116 in November. Sentiment among producers continued to improve in both December and in January 2017 reached its highest level to date of 153. The improvement in sentiment appears to mirror that observed in other sectors of the U.S. economy following the November 2016 elections. For example, U.S. stock market values increased sharply and consumer sentiment improved markedly according to the University of Michigan's Index of Consumer Sentiment. Michigan's Consumer Sentiment index rose 14 percent from October 2016 before reaching its near-term peak in January 2017. The improvement in agricultural producers' sentiment took place despite the fact there was little improvement in key commodity prices during this time frame, suggesting that changes in producer sentiment were motivated by more than just shifts in commodity prices and yields.

Figure 2 depicts both the Index of Current Conditions and the Index of Future Expectations from October 2015 through January 2017. These two component indexes can help provide context for changes observed in the Ag Economy Barometer. For example, from fall 2015 to late winter 2016, a decline in producer sentiment with respect to current conditions appears to be the biggest contributor to the decline in the Barometer that took place during that time period. Considering the improvement in the Barometer that took place in spring and early summer 2016, the primary driver was an improvement in producer's perspective regarding future conditions, both on their own farm and with respect to the agricultural economy. Finally, examining the sharp increase in sentiment that occurred among producers in late fall 2016 and early winter 2017 reveals that producers' perspective regarding both current conditions and future expectations improved, but the biggest increase was in expectations for the future.



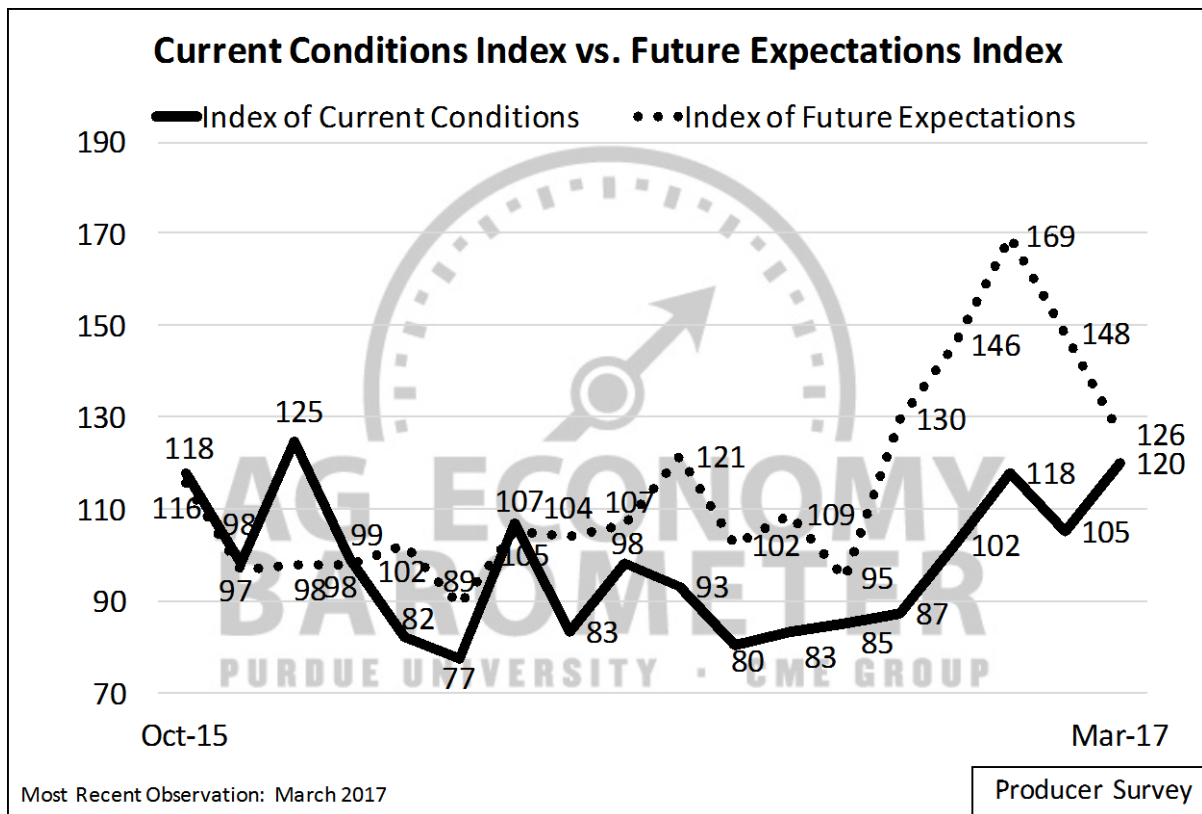


Figure 2. Purdue University-CME Group Index of Current Conditions and Index of Future Expectations, October 2015-March 2017.

Responses to the additional questions posed to producers provide interesting insights into producers’ perspective regarding the U.S. agricultural economy. For example, since the Ag Economy Barometer’s inception questions focused on expectations about future farmland values have been included periodically in the phone surveys. Two questions have been employed, the first asks respondents “Compared to today, what are your expectations for farmland prices in your area 12 months from now? Higher, Lower, or About the Same” (Figure 3), and the second question asks respondents “On a scale from 1 to 9, where 1 is extremely poor and 9 is extremely good, how would you rate farmland as an investment today?” (Figure 4). Responses to these two questions provide a more complete perspective with regard to producers’ attitude about the agricultural economy. Looking at responses to both of these questions, results suggest that producers in February 2017 were more optimistic about farmland as an investment than they were in November 2016, although their 12-month ahead outlook for farmland prices changed little over the same 3-month interval. These

results are consistent with the improvement in the Index of Future Expectations that took place from November 2016 to February 2017 and provide further confirmation that producers had a more optimistic view of the agricultural economy in early 2017 than in early fall 2016.

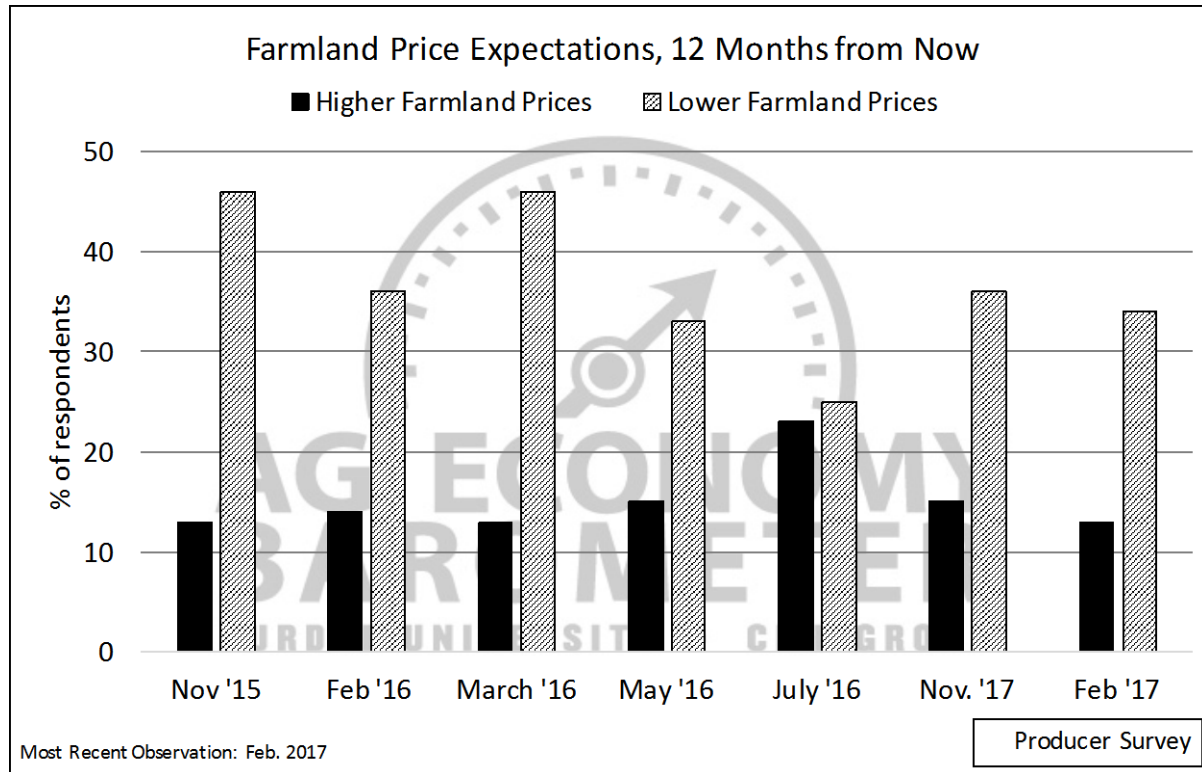


Figure 3. Producers' Farmland Price Expectations, 12 Months from Now, November 2015-February 2017.

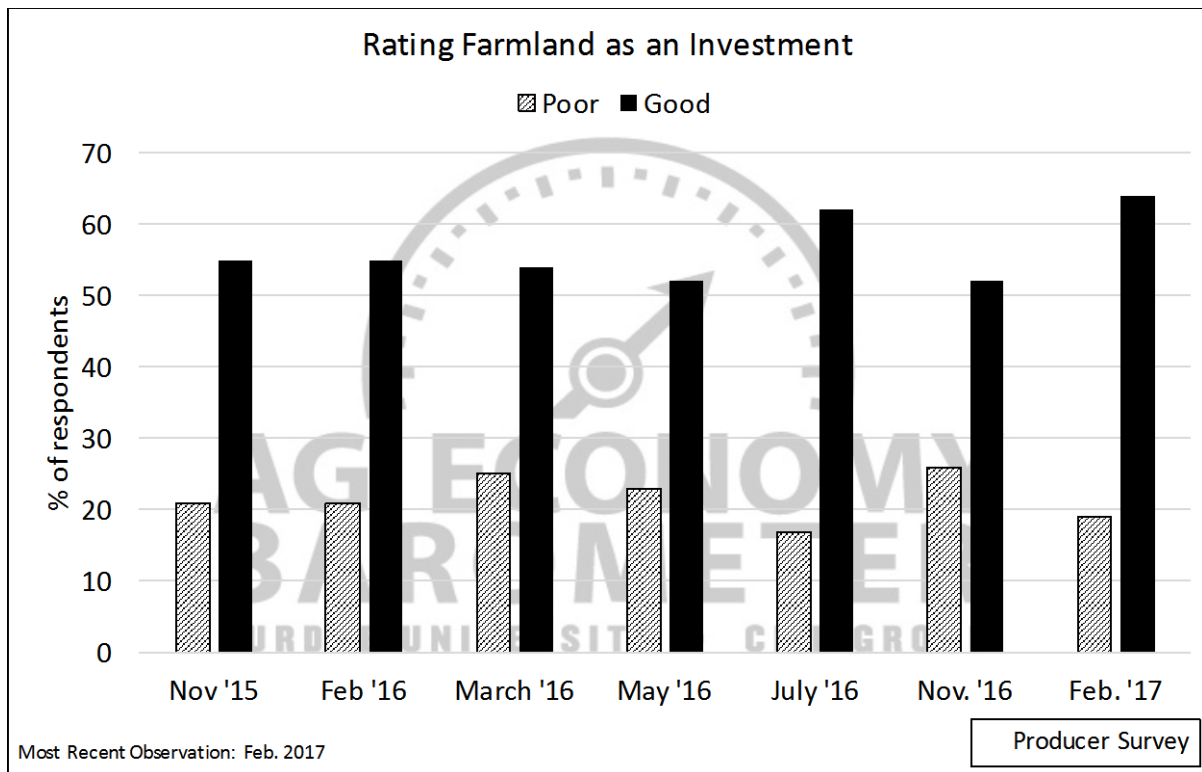


Figure 4. Producers' Rating of Farmland as an Investment, November 2015-February 2017.

In an attempt to learn more regarding the motivation behind the improvement in producer sentiment observed in November and December, the January 2017 survey included the following question; “Do you think regulations impacting agriculture will be more restrictive, less restrictive, or about the same 5 years from now?” (Figure 5). The question was motivated by the hypothesis that producers were more optimistic about the agricultural economy following the November 2016 election because of expectations for a more favorable regulatory environment. A large portion of the respondents (41 percent) indicated that they expect the regulatory environment in agriculture to be less restrictive five years into the future than it is today. Unfortunately, this question was not posed to producers prior to November 2016 so a direct comparison of producers' perspective before and after the November 2016 election is not possible. However, given that the long-term trend has been to increase regulations affecting agriculture in the U.S., responses to this question suggest that producers expectations about the future regulatory environment might have shifted following the U.S. November 2016 elections. Revisiting this question, and other factors that might

influence producers' attitudes, on future surveys will provide more information regarding drivers of producers' sentiment.

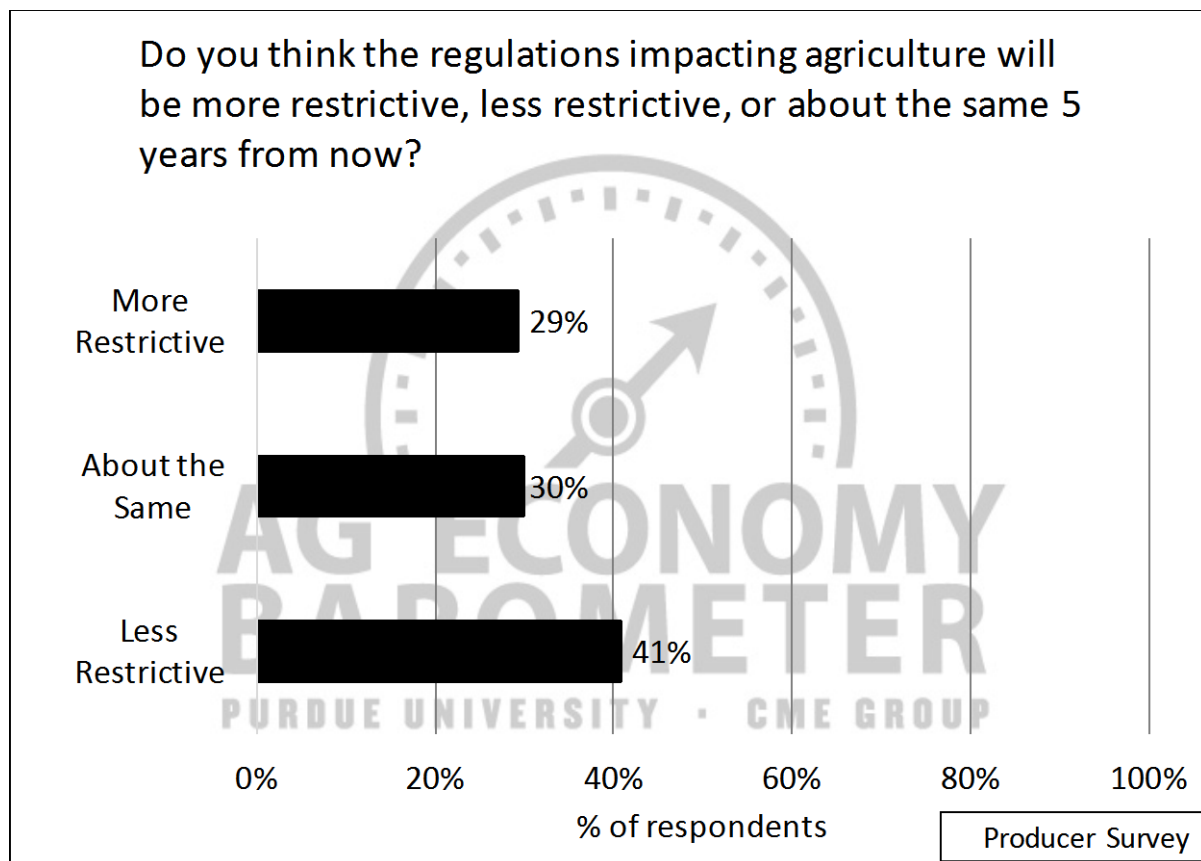


Figure 5. Producers' Expectations Regarding Regulations Impacting Agriculture 5 Years from Now, January 2017.

## Conclusions

The Purdue University-CME Group Ag Economy Barometer and related survey based information is a new source of information regarding producer's perspective of the U.S. production agriculture sector. Using a stratified sampling approach to surveying the larger U.S. producers on a monthly basis makes it possible to capture changes in overall sentiment regarding the production agriculture sector and also provide additional information regarding whether observed changes in sentiment are being motivated by changes in current economic conditions or expectations about the future. Continuation of the Ag Economy Barometer

surveys will provide a longer data series making it possible to examine the value of the Barometer and related sub-indexes as a leading indicator of U.S. producer decision making and investment behavior.

### **References**

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### **Acknowledgements:**

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