PURDUE AGRICULTURAL ECONOMICS REPORT

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NEWS STRAIGHT FROM THE EXPERTS

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WHERE'S THE INFLATION?

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The United States economy is at capacity, with an unemployment rate near 50-year lows. In the past such low unemployment resulted in rising inflation. In our time, though, the inflation rate has remained near 2%. It has not increased. So, "Where's the inflation?"

Why should we expect inflation?

Resources are limited. There are only so many people available to work, so much land available to plant, so many minerals available to mine and so many machines available to run. Sometimes the economy does so well that all of our resources are in use. The economy is at capacity. We're producing at "potential output."

Now, suppose we try to produce more anyway. Suppose spending by consumers, businesses or the government increases beyond the economy's potential output. Businesses see the opportunity and try to respond by using resources that they would not ordinarily use. They plant crops on less productive land, or bring obsolete machinery back into production.

They try to out-bid their competitors for land, minerals or equipment.

Businesses hire less qualified or inexperienced workers that they would not ordinarily hire. They tell their HR departments to make extraordinary efforts to find workers. They offer training, moving expenses, or transportation. They raise wages and offer better benefits. They try to attract workers from competitors, or entice them out of school, retirement or the home.

All of these efforts raise the costs of resources. Businesses pass at least some of these higher costs to their customers in higher prices. That's inflation. Inflation results when we try to produce beyond capacity.

We can measure capacity with the unemployment rate. The unemployment rate is the number of people without jobs but who are searching for work, as a percentage of the labor force, which is the sum of employed and unemployed people. The "natural rate" of unemployment is the rate when the economy is at capacity. The natural rate of unemployment is usually thought to be in the neighborhood of 5 percent. It's greater than zero because it takes time for job seekers to find open jobs and employers with open jobs to find job seekers. They will find each other, though, because at capacity there's a job opening for every employee.

Let's measure inflation using the Consumer Price Index without food and energy, to take out the fluctuations from food and oil prices. That's called the "core" inflation rate. Figure 1 shows the annual unemployment and core inflation rates. The solid red line is the unemployment rate, and the dotted blue line is the core inflation rate. The gray bars mark recessions from beginning to end (peak to trough).

When the unemployment rate rises, the inflation rate tends to fall. You can mark those events with the gray bars, which show the recessions. The core inflation rate fell during or immediately after every recession since 1958.

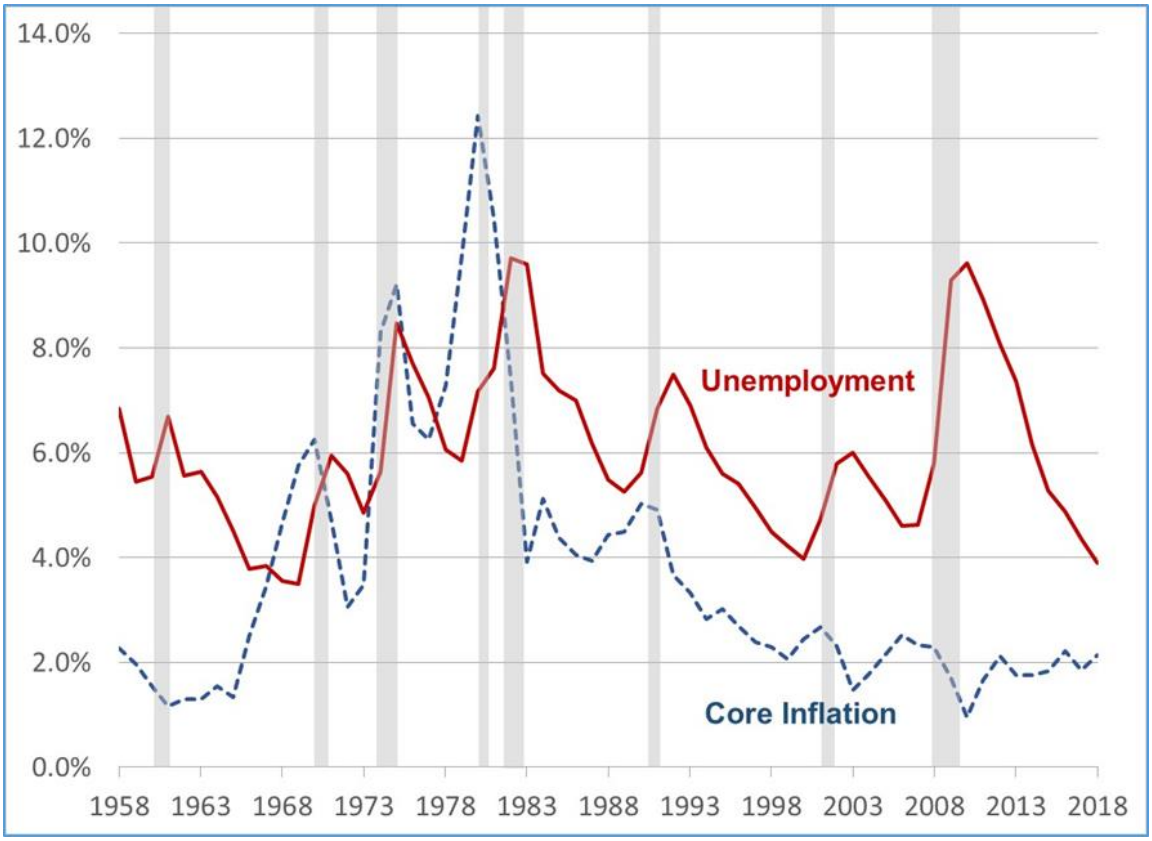

Figure 1. Unemployment Rate and Core Inflation Rate, annual, 1958-2018

Expansions are the periods between recessions. The unemployment rate falls during expansions. Inflation tends to rise, especially towards the end of expansions, when the unemployment rate gets low.

Table 1 uses this same data on a monthly basis. It shows the level of the unemployment rate in the columns, and the average change in the core inflation rate for different time periods in the rows. Core inflation is measured as the percent change in the price index over the previous 12 months, and the averages are multiplied by 12, to show what would happen if the unemployment rate remained at a particular level for a year.

Table 1. Average Change in Core Inflation over One Year, at Various Unemployment Rates (Monthly Data at Yearly Rates)

	Above 6%	6% or Less	5% or Less	4% or Less
1958-2019	-0.6%	0.4%	0.4%	0.9%
1958-1994	-0.8%	0.7%	0.9%	1.2%
1995-2007	-0.5%	0%	0%	0.4%
2008-2019	-0.1%	0%	0%	0.2%

Over the whole 1958-2019 period, when the unemployment rate was above 6%, the inflation rate went down. When the unemployment rate was below 6%, the inflation rate went up. When the unemployment rate was below 4%, the inflation rate went up more. When labor is plentiful, prices rise more slowly; when labor is scarce, prices rise more quickly. Inflation rises when the economy is above potential output.

The unemployment rate has been at or below 5% since December 2015. That's 40 months, 3 and one-third years. Based on the 62-year average, the core inflation rate should have increased 0.4% per year, from 2.1% in December 2015, to 3.4% in April 2019.

Why has inflation remained low?

But it didn't. The 12-month core inflation rate was 2.1% in December 2015, and 2.0% in April 2019. The economy is at capacity or beyond, and inflation has remained stable. Why has inflation not increased? Here are some possible reasons.

Maybe the "Phillips Curve" is dead?

"Phillips" was A.W. Phillips, a New Zealand-born economist who famously plotted the relationship between the unemployment rate and the inflation rate of wages in 1958. The plot had a downward slope. Lower unemployment made for higher wage increases. Then the U.S. economy traced out a perfect Phillips relationship from 1961 to 1969 (Figure 2), plotted with price inflation instead of wage inflation. After that the Phillips Curve didn't turn out to be so stable, but the downward slope remained.

The data in Table 1 for 1958 through 1994 are evidence for the downward slope of the Phillips Curve. During those years unemployment rate above 6% caused relatively large declines in inflation, and lower unemployment rates caused increasing inflation, more-so when the unemployment rate was really low.

However, since 1995 there has been little response of inflation to low unemployment, except at the very lowest unemployment rates. Declines of inflation during high unemployment have been less marked as well. The Phillips Curve has flattened. Maybe it's dead. Maybe the old relationship between unemployment and inflation is no more.

Recent research suggests that the Phillips Curve isn't dead, it's just hibernating. Economists Hooper, Mishkin and Sufi think that stabilizing policies by the Federal Reserve have held inflation in check, masking the underlying Phillips Curve inflation response to unemployment. They examined state and local data on inflation and unemployment, and found evidence for the downward slope.

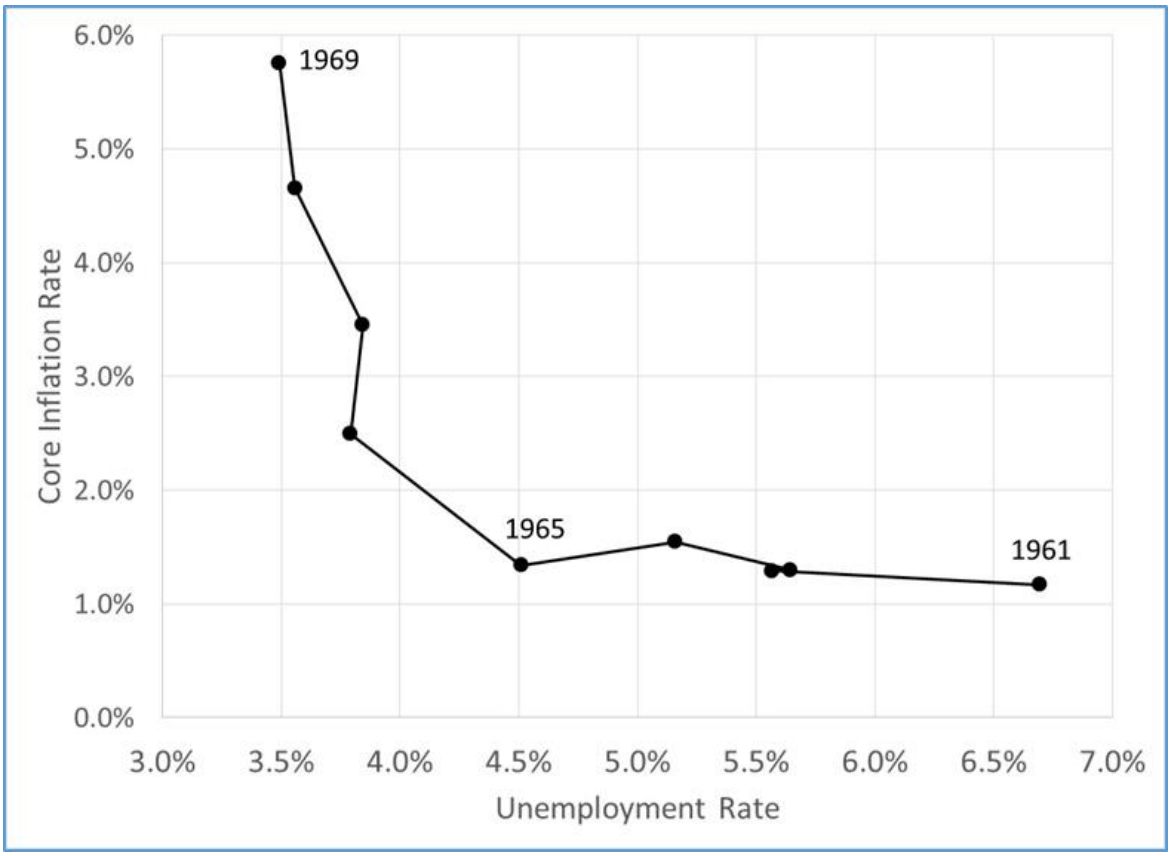

Figure 2. Phillips Curve: Unemployment Rate and Core Inflation Rate, 1961-1969

If the Phillips Curve is alive and well, though, why has low unemployment not caused rising inflation?

Maybe we're not at capacity?

There may be more employees available to hire, even with the unemployment rate at 3.6%. If so, businesses could find more employees without extraordinary and costly efforts, and without having to raise pay. There would be no higher costs to pass on in higher prices. Inflation would not increase.

Labor force participation measures the percentage of the employable population who are working or looking for work. If more workers returned to the labor force and got jobs, the number of unemployed people would remain the same, but the labor force would increase. Since the unemployment rate is the number of unemployed people as a percentage of the labor force, the unemployment rate would go down. Lower unemployment would not be associated with higher inflation.

Labor force participation is much lower now than it was before the Great Recession of 2007-2009. It was 62.8% in April 2019. At the end of the last expansion, in December 2007, it was 66.0%. There seem to be workers on the sidelines who could come back to work.

In December 2015, when the unemployment rate hit 5%, the labor force participation rate was 62.7%. The rate has edged up by a tenth. That's not enough to explain stable inflation.

Besides, wages are rising faster. Average hourly earnings were increasing 2.5% per year in December 2015. As of April 2019, they had risen 3.4% from a year before. This is just what we'd expect if labor was scarce. A.W. Phillips' original curve, which plotted unemployment with wage inflation, is alive and well. This is evidence that the economy is at capacity and thus it does not explain why inflation has remained low.

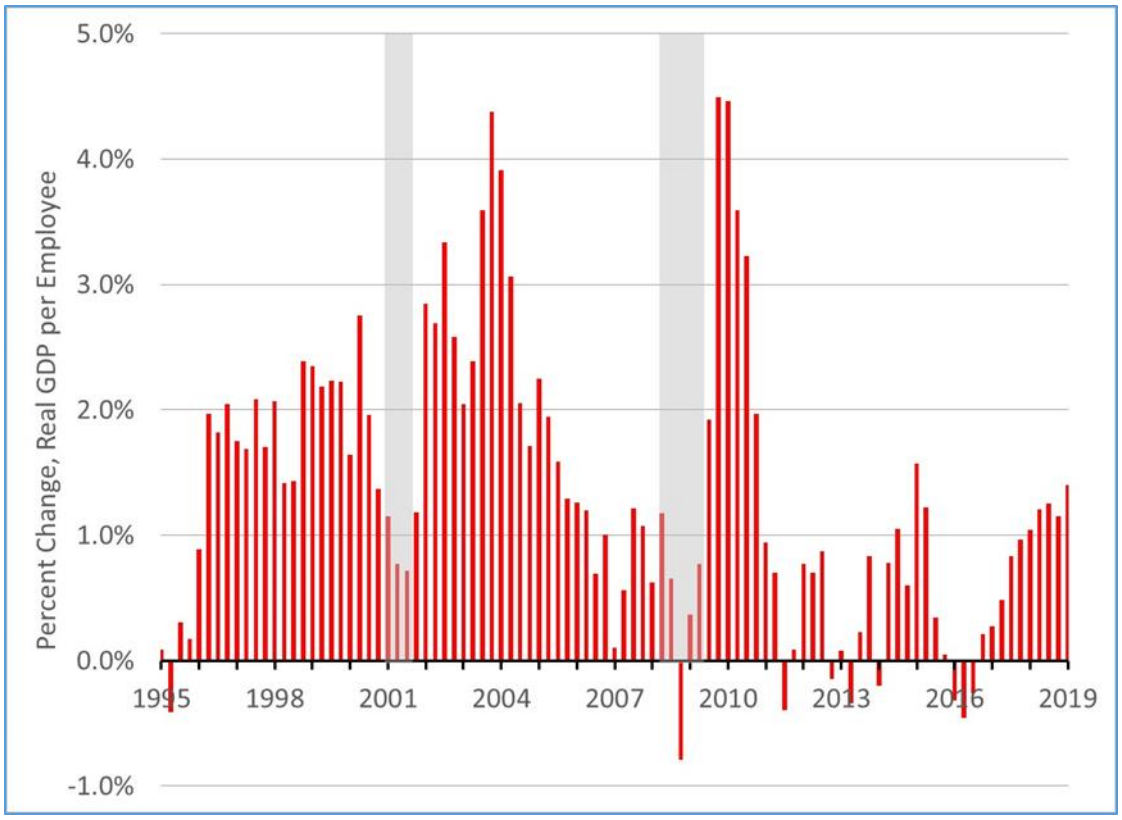

Figure 3. Productivity Growth. Percent Change in Real GDP per Employee, Annual Rate.

Maybe productivity is rising?

Labor is scarce and becoming more expensive. Businesses might respond by adopting labor-saving technology, to maintain or increase production with their existing employees. Automation would increase productivity, which is a rise in output per employee. With rising productivity businesses would not have to raise prices to cover higher labor costs. Sales of added output would generate the needed revenue. Rising productivity would hold inflation down.

This happened in the second half of the 1990's. Unemployment was below 5%, wages were rising by 4% per year, but inflation continued to fall until late in the decade (Figure 1). The information technology revolution caused an increase in output per worker. Wages rose more rapidly, but inflation remained low.

Figure 3 shows the percentage change in real gross domestic product per employee, quarterly at annual rates from 1995 to 2019. Productivity growth averaged 2% per year from 1995 to 2006, but since then has averaged only 0.9% per year. In the past two-and-a-half years, however, productivity growth has been increasing. As the unemployment rate dropped under 5%, and wage growth increased, productivity also began to grow faster. So, rising productivity growth may be one reason why inflation has not increased.

Maybe profits are lower?

Resource costs are rising. Businesses could hold inflation down if they are willing to take lower profits rather than raise prices.

One measure of profit margins is corporate profits before tax as a share of corporate value added, from the Gross Domestic Product accounts. It fell from 2014 to 2015, but since then has remained relatively stable. Profits do not appear to have dropped since unemployment fell below 5% and wage growth picked up. But, profits after taxes rose considerably after the December 2017 tax cut, however.

Maybe imports are up?

Imported goods compete with domestically produced goods. If the prices of domestic goods began to rise, perhaps businesses and consumers would turn to less expensive imported goods. Consumers would pay lower prices, both because imports themselves were cheaper, and because import competition would discourage domestic businesses from raising prices. Either way, inflation would be lower.

Imports as a share of GDP grew rapidly during the 1990's and 2000's. Perhaps this contributed to the low inflation after the mid-1990's. But imports were 14.9% of GDP in the fourth quarter of 2015, and are 14.9% in the first quarter of 2019. Imports have not risen above the overall growth rate since the unemployment rate dropped below 5%.

Imports are affected by trade disputes and tariffs. Prices of domestic goods may play a small part in fluctuations of trade. Still, there's no evidence in these numbers that rising imports have held inflation down in recent years.

Maybe it's stable inflationary expectations?

The Federal Open Market Committee's policy statement usually includes a phrase like this one from May 1, 2019:

On balance, market-based measures of inflation compensation have remained low in recent months, and survey-based measures of longer-term inflation expectations are little changed.

Concern about inflationary expectations goes back to the "wage-price spiral" of the 1970's. Businesses anticipated that inflation would raise costs, so they raised their prices. Workers and other resource suppliers anticipated higher prices, so they raised their wage and resource costs. Everyone's expectations were confirmed. Business costs did rise, consumer prices rose too. Expectations of inflation continued, and were themselves a cause of actual inflation.

As of 2019 inflation has been low and stable for a long time. Annual core inflation rates have been within one percentage point of 2% in all but one year since 1996, a two decade run of stable inflation. As a result, people expect stable inflation to continue at a rate near 2% per year.

Inflationary expectations can be measured by comparing the Treasury bond yields to inflation-indexed Treasury bond yields. The difference between the two is the inflation rate that bond holders expect. Expected inflation has varied within seven-tenths of 2% every month since the end of the recession.

The University of Michigan surveys consumers about their expectations every month. This measure shows more variation, but expected inflation was 2.6% in December 2015, and 2.5% in March 2019.

There is no evidence that people are expecting higher inflation with the economy at capacity. This eliminates a possible source of inflation.

OK, Why Does Inflation Matter?

It matters to the Federal Reserve. The Federal Reserve has a dual mission, to keep inflation and unemployment low. The Fed's inflation target is 2%. If they expect inflation to rise much above 2%, they will act to restrain borrowing and spending by raising interest rates. Since it takes 6 months to a year for higher interest rates to slow the economy, they must act in ad-

vance. They need to know when to anticipate rising inflation.

The Fed estimates the natural rate of unemployment for this reason. If the actual unemployment rate falls below the natural rate, then rising inflation is to be expected, and interest rates should be raised. The Fed's estimate of the natural rate was 4.5% in mid-2018 (Bernstein). The unemployment rate is now well below that rate, and inflation has not increased. In an April 22, 2019 interview with the Wall Street Journal, Chicago Federal Reserve Bank president Charles Evans said the low inflation made him "wonder if the natural rate of unemployment might be even lower than my current assessment of 4.3%. At 3.8%, we're running just a little bit below that but it's not causing any difficulties." Since inflation has not appeared, Fed officials appear to be reducing their estimates of the natural rate.

During the low unemployment in the second half of the 1990's, Alan Greenspan's Fed famously did not increase interest rates as unemployment fell. They gambled that more rapid productivity growth would keep inflation low. It did.

Now the Fed appears willing to make a similar gamble. Unemployment is 3.6%, below any estimate of the natural rate of unemployment. Chairman Powell has said that the Fed does not intend to increase interest rates in 2019.

If productivity growth and stable inflationary expectations hold inflation down despite low unemployment and rising wages, we're right to keep interest rates low. We can have low unemployment and low inflation at the same time. But if we're wrong, and low unemployment does cause rising inflation, we may need higher interest rates and much slower growth to bring it down.

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INDIANA FARMLAND VALUES & RENTS: OPINIONS FROM THE INDIANA CHAPTER OF FARM MANAGERS & RURAL APPRAISERS FROM FEBRUARY 2019 [1]

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In the upcoming August issue of this publication I plan to release the results of our 2019 Indiana Farmland and Cash Rent Survey. Here I am providing summaries from the Chicago Fed and a February 2019 survey of Indiana Farm Managers and Rural Appraisers.

In the January 2019 issue of the AgLetter, the Federal Reserve Bank of Chicago reported District farmland values remained the same from January 1, 2018 to January 1, 2019. The most recent May 2019 issue reported only a 1% increase from April 1, 2018 to April 1, 2019. For the last quarter of 2018, Indiana farmland values increased 3%. For the first quarter of 2019, an increase of 2% was reported. These two increases were the largest quarterly increases in a District containing Iowa, Illinois, and parts of Indiana, Michigan, and Wisconsin. These data seem to indicate continued strength in Indiana farmland values.

To ascertain if Indiana's professional farm managers and rural appraisers held a similar view of Indiana's farmland market, members of the Indiana Chapter of Farm Managers & Rural Appraisers were surveyed during their winter meeting on February 6, 2019. Members were asked questions about the current and expected future market values for the following farmland:

"80 acres or more, all tillable, no buildings, capable of averaging 195 bushels of corn per year and 60 bushels of soybeans in a corn/bean rotation under typical management and not having special non-farm uses."

Where are Farmland Values Headed?

Responses from people representing 19 different counties were received. The average estimated price of farmland was $8,225 per acre. Fifty-three percent of the respondents indicated no change in farmland values when compared to values in February 2018. Sixteen percent of the respondents indicated the estimated price was higher by an average of 7% compared to the value in February 2018. Thirty-two percent indicated the estimated price was lower by an average of 4% compared to the value in February 2018. The overall average percentage change in farmland values for the year were 0.7%. This "no change" result for the year is consistent with the Chicago Federal Reserve surveys for the last quarter of 2018 and the first quarter of 2019.

The group was asked to provide two forecasts of future farmland values. One was farmland values in one year. The second was farmland values in five years. When asked about land values in one year, 42% of the respondents indicated that values would be the same. Twenty-one percent indicated farmland values would

[1]A special thanks is expressed to the Indianan Chapter of Farm Managers and Rural Appraisers that participated in the survey. The Indiana Chapter of Farm Managers and Rural Appraisers is an organization of rural land experts located in Indiana and promotes the professions of farm management, agricultural consulting, and rural appraisal. Without their assistance it would not be possible to take the pulse of Indiana's farmland market.

be up an average of 3%. The remaining 37% indicated a decline in farmland values averaging 3.7%. Across all responses, the expected change in farmland values for the coming year was -0.7%. In the short run, these respondents had a strong consensus that farmland values will not increase.

However, there was optimism for an increase in farmland values over the next five years. In this case, 83% of the respondents indicated farmland values would be higher by an average of 10%. Six percent of the respondents expect farmland values to the same in five years and 11% expect farmland values to decline by an average of 7.5%. Across all responses, farmland values are expected to increase by 7.3%. A 7.3% to 10% increase over five years is modest by historical standards.

Cash Rents Not Much Change

Attendees were also asked to specify the cash rent for 2019. The average cash rent for the example parcel was estimated to be $238 per acre. The estimated cash rents varied from $115 to $300 per acre, a difference of $185 per acre. Eighty-four percent of the respondents indicated cash rent remained the same as in 2018. Five percent of the respondents indicated cash rents had risen and 11% indicated cash rents declined between 2018 and 2019.

As with farmland values, the respondents were asked to forecast cash rents one-year and five-years into the future. When asked what cash rent would be in 2019, 72% of the respondents indicated they would be the same as 2018. Eleven percent expect cash rents to increase and 20% expected them to decline. The overall average change in cash rents was 0.7%, almost no change

There was a little less agreement about the five-year projection. A majority of 63% of the respondents indicated cash rents would exceed the 2019 level by an average of 8.5%. Thirteen percent thought cash rents would be the same and 24% thought cash rents would be lower by an average of 5.5%. While there is a strong expectation cash rents will change, the amount of change, both up and down, is small. Historically it is common for changes of the magnitude expected here over five years to be associated with a period of one or two years.

Final Thoughts

These results indicate Indiana's farmland market has been in a period of relative stability. While markets are seldom perfectly stable, these February expectations are for relatively small future changes at least by historical standards. But there are lots of uncertainties that could change these expectations. Tariffs and trade uncertainty remain highly uncertain. The U.S. agricultural economy is heavily dependent on exports. If the ultimate result is lower commodity prices for farmers, as many seem to expect, this means lower margins and increased downward pressure on farmland values and cash rents. The size of future grain price declines and the size of government payments provided to offset price declines will be important influences in Indiana's future farmland and cash rent market.

Look for our 2019 Indiana Farmland and Rents Survey results in this publication in early August.

COMPARING CROP COSTS AND RETURNS ACROSS THE GLOBE

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Examining the competitiveness of crop production in different regions of the world is difficult due to lack of comparable data and agreement regarding what needs to be measured. To be useful, international data needs to be expressed in common production units and converted to a common currency. Also, production and cost measures need to be consistently defined across production regions.

This paper examines the competitiveness of crop production from 2013 to 2017 using data from the *agri benchmark* network. The *agri benchmark* network collects data on beef, cash crops, dairy, pigs and poultry, horticulture, and organic products. There are 40 countries represented in the cash crop network. The *agri benchmark* concept of typical farms was developed to understand and compare current farm production systems around the world. Participant countries follow a standard procedure to create typical farms that are representative of national farm output shares and categorized by production systems or a combination of enterprises and structural features.

Eight farms in the dataset produced corn, soybeans, and wheat every year between 2013 and 2017. These farms are listed in Table 1 and are typical farms used in the *agri benchmark* network. Two of the eight farms are from the United States (a southern Indiana farm and a North Dakota farm). Purdy (2019) provides a more detailed analysis of international crop production using *agri benchmark* data.

Due to differences in technology adoption, input prices, land fertility levels, efficiency of farm operators, trade policy restrictions, exchange rate effects, and labor and capital market constraints input use varies across farms. In addition to presenting information pertaining to gross revenue and cost per ton, this paper discusses input cost shares.

Costs were broken down into three major categories: direct costs, operating costs, and overhead costs. Direct costs included seed, fertilizer, crop protection, crop insurance, and interest on these cost items. Operating cost included labor, machinery depreciation and interest, fuel, and repairs. Overhead cost includ-

Table 1: Typical Farms, Size, and Location

Country	Hectares	Region
Argentina	300	North Buenos Aires
Argentina	700	South East of Buenos Aires
Argentina	900	West of Buenos Aires
Brazil	65	Parana, Cascavel
Romania	6500	Lalomitia county, S.E. Romania
United States (Southern Indiana)	1215	Southern Indiana
United States (North Dakota)	1300	Barnes County, North Dakota
South Africa	1600	Eastern Free State

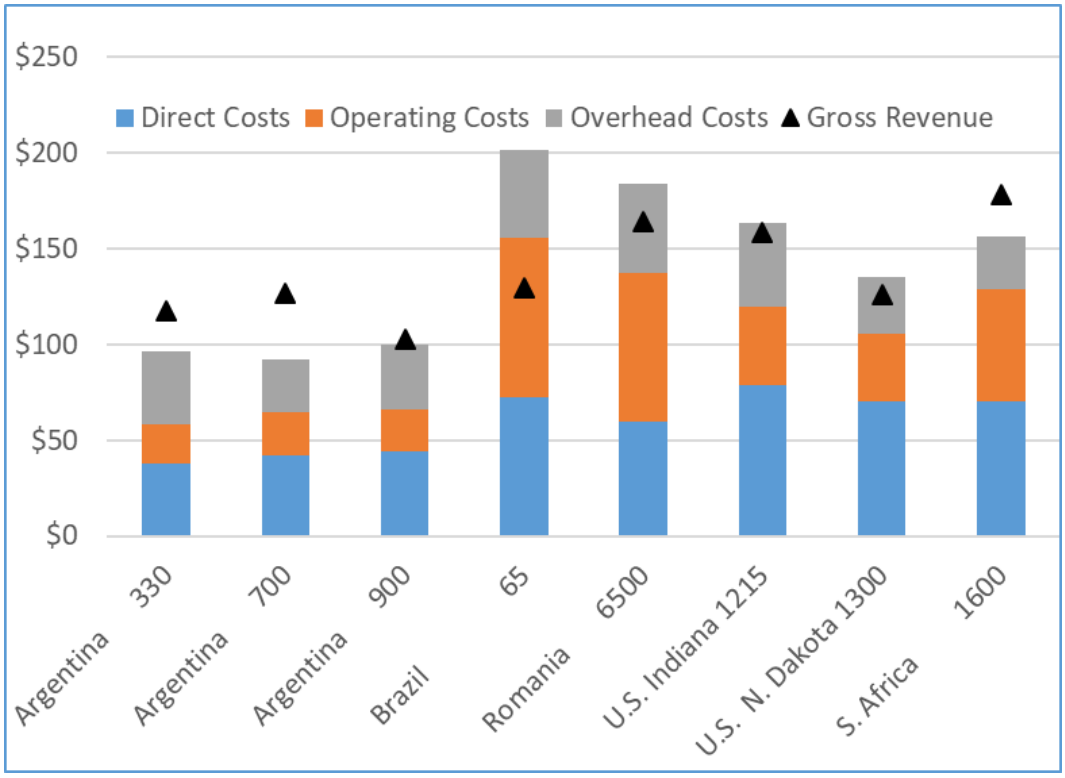

Figure 1. Average Gross Revenue and Cost for Corn ($ per ton)

ed land, building depreciation and interest, property taxes, general insurance, and miscellaneous cost.

Corn: Argentina Farms Had Low Costs

Figure 1 presents average gross revenue and cost per ton for each typical farm for the 2013 to 2017 period. Gross revenue and cost are reported in U.S. dollars for each typical farm. Gross revenue was highest for the South African farm, and lowest for the large Argentinian farm ($178 and $103 per ton, respectively). Gross revenue and cost per ton for the southern Indiana farm were $158 and $163 per ton, resulting in an economic loss of $5 per ton.

The typical farms from South Africa and Argentina exhibited economic profits during the five-year period, earning an average of $20 per ton. Average losses for the remaining typical farms were $27 per ton, during the five-year period. On average, economic loss per ton was $3 per ton.

The average input cost shares were 42.8% for direct cost, 29.9% for operating cost, and 27.3 % for overhead cost. The North Dakota farm had the largest cost share for average direct cost, at 52.2%. The Romanian farm had the lowest cost share for average direct cost at 32.5%. Operating cost shares ranged from 21.0% on the smallest Argentinian farm to 42.0% on the Romanian farm. Overhead costs ranged from 17.2% on the South African farm to 39.9% on the smallest Argentinian farm. The average cost shares for the southern Indiana farm were 48.0%, 25.1%, and 26.9% for direct, operating, and overhead costs, respectively.

Soybeans: U.S. Farms had Positive Margins

Figure 2 presents average gross revenue and cost per ton for each typical farm. Gross revenue and cost are reported as U.S. dollars per ton. Total cost of soybean production was lowest for the typical farms in Argentina, and highest for the South African farm. Gross revenue and cost per ton for the southern Indiana farm were $385 and $368 per ton, resulting in an economic profit of $17 per ton. The Brazilian and South African farms did not earn an economic profit producing soybeans during the 2013 to 2017 period. Losses per ton were $13 per ton for the Brazilian farm and $139 per ton for the South African farm. On average, economic

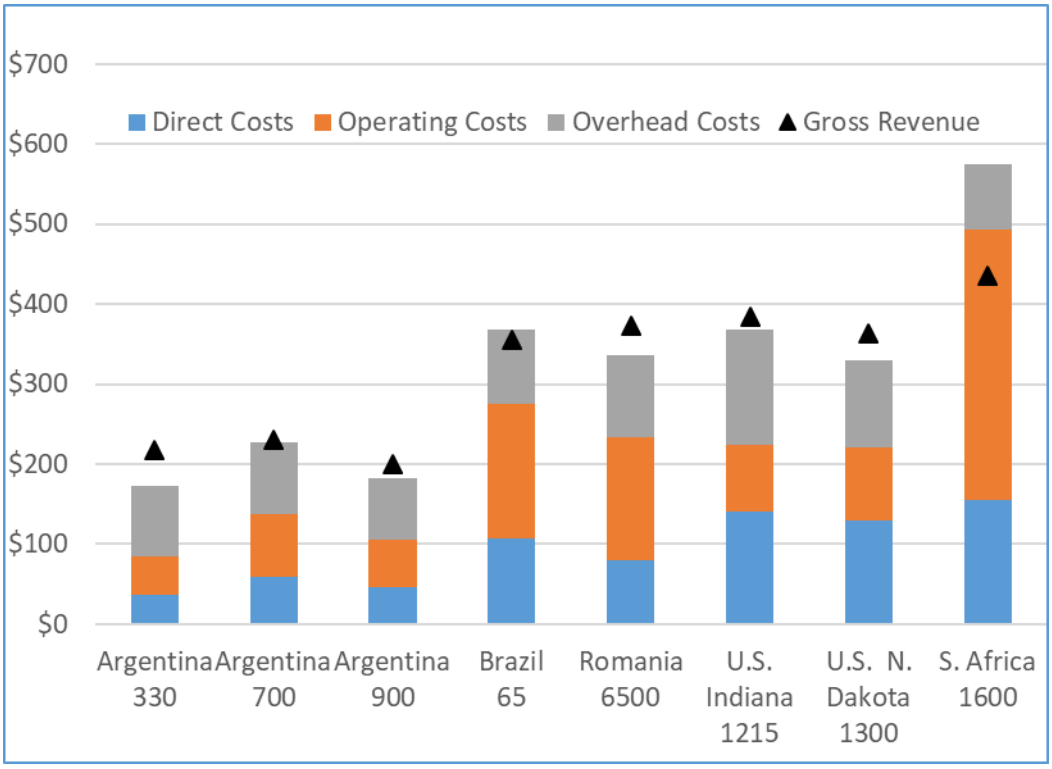

Figure 2. Average Gross Revenue and Cost for Soybeans ($ per ton)

profit was less than $1 per ton for the eight farms examined in this study.

The average input cost shares were 28.6% for direct cost, 37.0% for operating cost, and 34.3% for overhead cost. The North Dakota farm had the highest cost share for direct costs, at 39.6%. The smallest Argentinian farm had the lowest cost share for direct costs at 20.9%. Operating costs ranged from 22.9% on the Southern Indiana farm to 58.8% on the South African farm. Overhead costs ranged from 14.2% on the South African farm to 51.3% on the smallest Argentinian farm. The average cost shares for the southern Indiana farm were 38.1%, 22.9%, and 39.0% for direct, operating, and overhead costs, respectively.

Wheat: Wide Differences by Country

Figure 3 presents average gross revenue and cost per ton for each typical farm. Gross revenue and cost are reported as U.S. dollars per ton. Wheat was a minor enterprise for the southern Indiana farm. The primary reason for growing wheat on this farm was to facilitate the production of double-crop soybeans. The total cost of wheat production, on a per ton basis, was highest on the Brazilian typical farm. The Brazilian typical farm also had the highest economic loss during this time period, at $220 per ton.

The only typical farm in this sample to earn a positive economic profit in wheat production was the North Dakota farm, earning less than $1 per ton over the five -year period. The average economic loss was $55 per ton for the eight farms in the sample. Given that the average gross revenue was only $175 per ton, the average loss for the eight farms included in this paper was extremely large. Many of the primary wheat producing countries were not included in this paper. For more information pertaining to the efficiency of typical farms with wheat from Australia, Canada, the European Union, Ukraine, and Russia see Purdy (2019).

The average input cost shares were 35.5% for direct cost, 31.8% for operating cost, and 32.7% for overhead cost. Average direct cost share ranged from 26.0% on the Romanian farm to 46.9% on Argentina 700. The southern Indiana farm had the lowest operating cost share, at 18.2%. The South African farm had the highest operating cost share at 56.0%. Due to relatively high land costs, the southern Indiana farm had the highest overhead cost share at 45.3%. The lowest

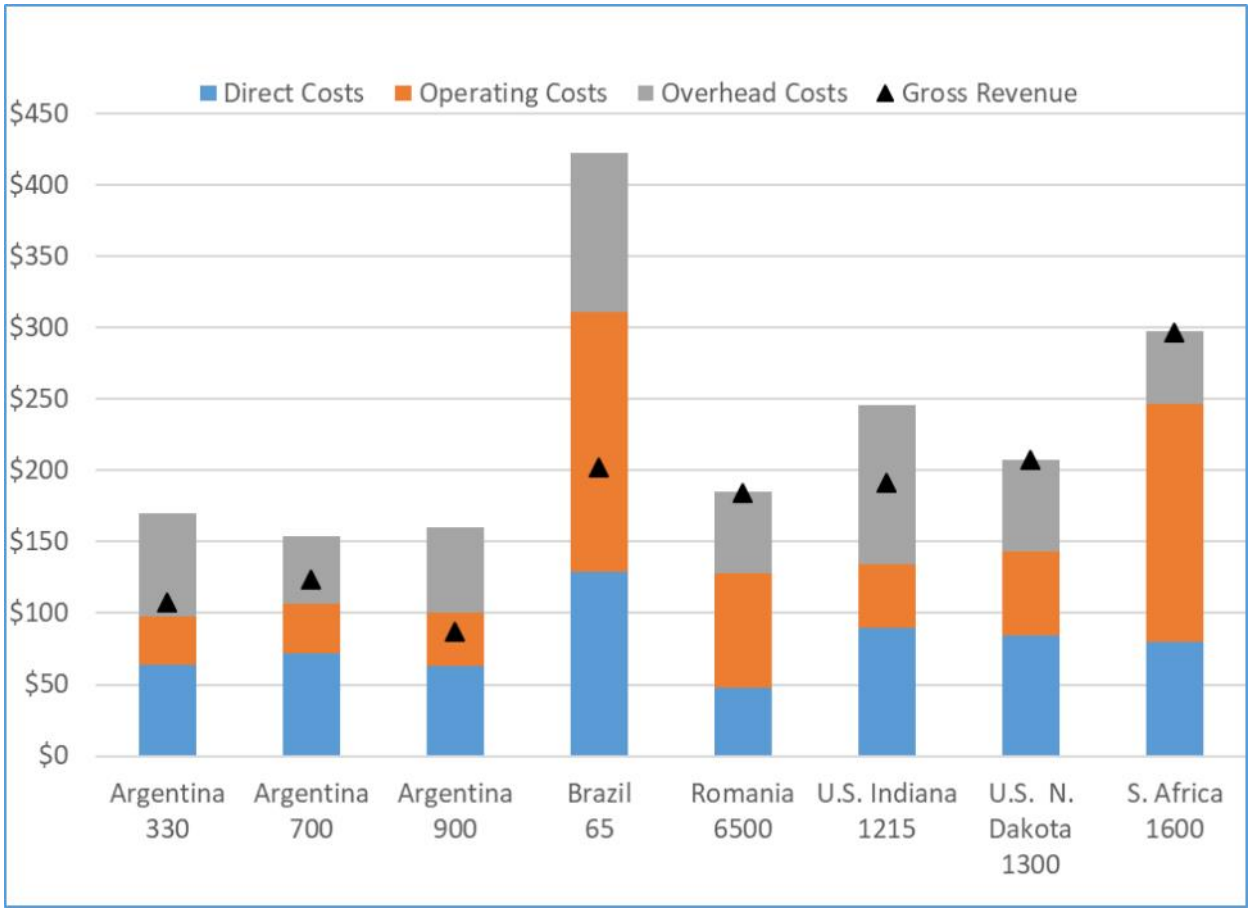

Figure 3. Average Gross Revenue and Cost for Wheat ($ per ton)

overhead cost share was 17.3% on the South African farm.

Conclusions

This paper examined gross revenue and cost for eight corn, soybean, and wheat producing farms in the *agri benchmark* network from Argentina, Brazil, Romania, the United States, and South Africa for the years 2013 to 2017. The average economic profit was -$3, $0, and -$55 per ton for corn, soybeans, and wheat, respectively. The range of economic profits was highest for wheat production ($221 per ton, compared to $184 per ton for soybeans and $107 per ton for corn). Only one of the wheat farms and four of the corn farms exhibited a positive economic profit over the study period. In contrast, six of the soybean farms had a positive economic profit.

In addition to examining gross revenue and cost per ton, Purdy (2019) examined the cost efficiency of corn, soybean, and wheat production during the 2013 to 2017 period. Of the farms that had corn, soybeans, and wheat, the farms in Argentina and the United States tended to have the highest levels of cost efficiency. In terms of just corn and soybeans, the farms in Argentina, Brazil, and the United States tended to have the highest levels of efficiency.

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SMALL BUSINESS RECOVERY FOLLOWING A NATURAL DISASTER?

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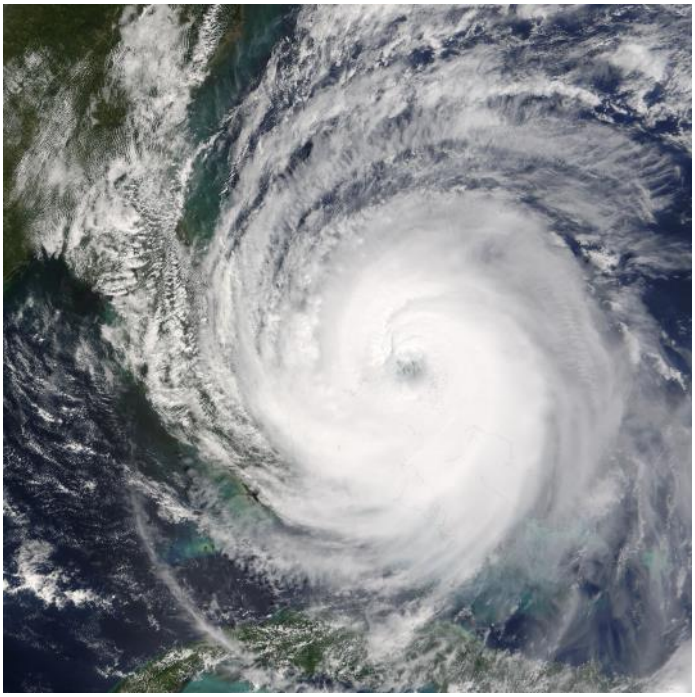
Small businesses may sometime face extremely difficult situations that can jeopardize survival. In this article we report on some of the characteristics of firms that have survived a natural disaster. The intent is to illustrate management decisions that can assistant any business in getting through the trauma.

After a disaster strikes, insurance is often the first way to obtain funds for recovery costs. Businesses can buy a variety of insurance policies. Policies can include flood insurance, business interruption insurance, business recovery insurance, casualty and property insurance, and other policies specific to the businesses' needs like inventory insurance. For home-based business, there is also coverage for homeowner insurance including flood insurance, property and casualty insurance.

For this case study, we investigated small businesses in a 10-county area in southeastern Mississippi after Hurricane Katrina in 2005. Of the 347 businesses in this area that survived Katrina, roughly 46% sustained major damage during the hurricane. Of the 116 businesses that closed since Katrina, roughly 63% sustained major damage during the storm.

Results from our research show that small businesses were more likely be operational if the business had property insurance in place before the disaster. Those businesses who sustained major damage from Hurricane Katrina were more likely to go out of business. Although damage from a natural disaster is unavoidable, having insurance in place is within a business owner's control. Other factors that tended to have a positive association with business survival after the storm included: have been in business for a longer period of time, having a male owner, an owner with a postsecondary education, and having a larger number of employees.

We also examined business "resilience" which we defined as firms that actually grew revenues after the disaster compared to pre-storm levels. Small businesses were more likely to be resilient after Katrina if they had adjusted their insurance policy elections post-Katrina. These adjustments would assure that the business would be better protected in the event of another disruption. Some of the businesses that experienced Katrina were unlucky enough to be hit with an oil spill or Hurricane Isaac less than ten years following Katrina. Other factors that had a positive impact on resiliency included: having a formal legal structure (i.e. corporation or partnership), being married, being male, and having a larger number of employees.



Also, businesses were more likely to achieve higher success after Hurricane Katrina if they owned the property where the business operated and had property insurance in effect before Katrina.

Businesses were less likely to have higher perceived success after Katrina if insurance was unaffordable after the natural disaster. Unfortunately, about 25% of small business owners could not get affordable insurance coverage following Hurricane Katrina. Being

married and having more education were also positively related to business resiliency. But, older businesses were less likely to experience higher perceived success after Katrina.

The goal for small business owners should be to have the correct safeguards in place to be able to survive a disaster, to adapt and recover, and to come out other side even better than before. We call this being resilient. Insurance is not the only step that should be taken to protect small businesses, but it is an important one. Having the correct insurance coverage in place can be the difference between survival and demise for a small business.

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Acknowledgement:

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Learn about innovative management strategies, new technologies for improving efficiency and productivity, and ways to help ensure a successful transition of the family farm to the next generation, at the 87th Annual Purdue Farm Management Tour, June 27-28.

Purdue's Center for Commercial Agriculture and Purdue Extension sponsor the tour, which includes stops at four farms in Huntington and Wabash counties. Farms are chosen based on their successful business management practices or unique perspective on farm business management.

"This two-day event is a great opportunity for farmers to learn directly from the experiences of Indiana's best farm business managers and apply those principles to their own farms," said James Mintert, director of Purdue University's Center for Commercial Agriculture.

Each tour includes an interview session where farm operators provide an overview of the farm, followed by three mini-tour sessions focusing on specific aspects of the farm's operation. During the mini-sessions, host farmers share successful farm management tips and explain how the management of their operations is changing in response to the agricultural economy and evolving family circumstances. They also share reasons behind recent innovations in production practices and adoption of new technology.

The tour is free and open to the public but registration is required by June 15 at purdue.edu/farmtour or by calling 765-494-7004.

CORN STORAGE RETURNS: IMPLICATIONS FOR STORAGE AND PRICING DECISIONS

CHRIS HURT, PROFESSOR OF AGRICULTURAL ECONOMICS

Grain storage is an important marketing function that provides "time value" to the grain. Grain production occurs at harvest time, but usage is spread throughout the marketing year. Thus storage is required to remove the harvest surplus and then to allocate that surplus to users in an orderly manner until the next harvest.

Corn producers want to know how much return they might get from storing corn and when is the best time to price corn to give the highest storage returns. To examine these important questions we look at the historical storage returns based on cash bids each week at a central Indiana unit-train loading facility. These weekly cash bids are the Wednesday (mid-week) closing bid quoted publically by the facility

First, we will explain how on-farm corn storage returns are estimated and then move on to commercial storage returns. On-farm storage is the largest portion of the state's grain storage. USDA reports that 61% of the total storage space in Indiana is on-farm storage (see USDA: *Grain Stocks* report for December 1 data). The remaining 39% is off-farm storage at locations like grain elevators, processing plants, warehouses, and terminals that store grain for their own use and/or for a storage fee for customers.

For this study we assume the farmer puts the grain in the bin at harvest and takes the cash price bid the week they decide to price and deliver the grain. They are speculating on the cash price. Of course they hope the cash bid goes up after harvest by enough to give positive returns. The corn harvest value was assumed to be the average cash bid for the last-two weeks of October.

For on-farm storage, only weekly interest costs are subtracted as a cost of storage. The structure of interest rates has changed over the 30 years in this study so prior to the 2001 crop, the 6 month certificate of deposit interest rate was used. Starting with the 2001 crop the prime interest rate was used. Individual farmers may use considerably different interest rates in their personal storage decisions.

For on-farm storage, if the cash bid rises by enough to cover the interest cost after harvest, then there was a positive return for that week. Of course those who have on-farm storage know there are substantial costs to owning and operating those facilities. Since the on-farm returns in this study only consider interest as a cost, this means that the returns reported here represent the $ per bushel left to cover ownership and operating costs for the on-farm storage.

Returns in three time periods are reported. Those are: the most recent 10 crop years representing the corn crops harvested in 2008 to 2017. Those are the 2008/2009 to 2017/2018 marketing years. Note that at the time of this publication, the 2018/2019 marketing year was not complete and thus is not included. The second time period is the most recent 20 years representing the crops from 1998 to 2017; and a 30 period for crops harvested in 1988 to 2017.

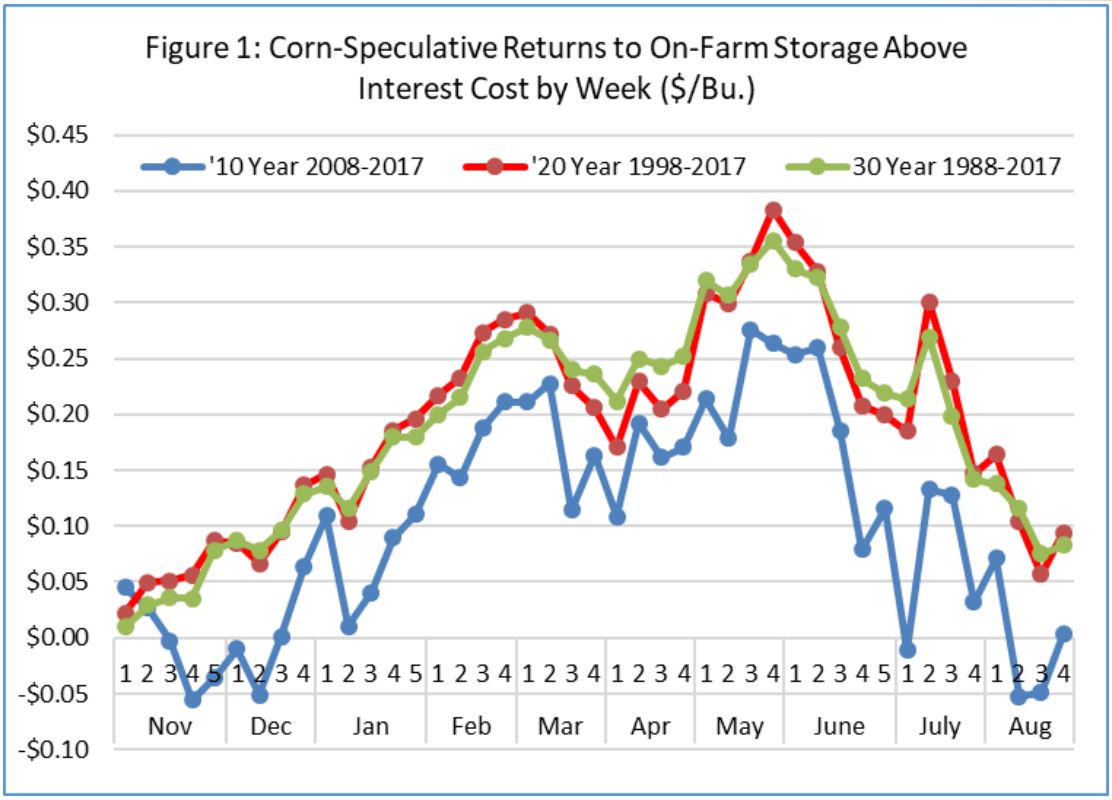

Figure 1: Corn-Speculative Returns to On-Farm Storage Above Interest Cost by Week ($/Bu.)

Returns to Speculative On-Farm Corn Storage

Figure 1 shows returns to on-farm storage above interest cost by week in $ per bushel. The horizontal scale is weekly. Remember, harvest is the last two weeks of October so the storage returns begin in November and run through the following August. The numbers 1-2-3-4 represent the weeks of each month. These are the estimated returns per bushel available to cover the ownership and operating costs of on-farm storage as defined by the assumptions in this study. Remember they are averages of weekly returns for the multiple years in each of the periods.

For the three time periods note the consistent seasonal pattern of these returns throughout the storage season. Returns tend to rise from harvest into early-March. Then weaken in later-March and April, before peaking in May and early-June. Finally note the rapid decline in storage returns into the late-spring and summer.

What drives this seasonal pattern of returns? It is primarily the seasonal cash price pattern that has a tendency to reach peaks (on average over a series of years) in the spring. Cash prices have a tendency to decline into the summer, especially the mid-to-late summer and accumulating interest costs also contribute somewhat to lower summer storage returns.

How much return has there been to cover the costs of ownership and operating costs for on-farm corn storage above interest costs? Over the long run, that has been in the range of $.25 to $.40 per bushel when viewed as simply taking the cash price offered each week (speculative returns) and pricing in the near optimum time periods in late-February and early-March or late-May and early-June. Also recognize that the assumptions in this study may not be accurate for an individual situation.

Average returns in the most recent period representing the 2008 to 2017 crops have been lower than the longer periods. Does this say that returns to speculative corn storage are decreasing over time? My answer would be No! When we look at returns in this manner the overall multi-year trends in prices over time can

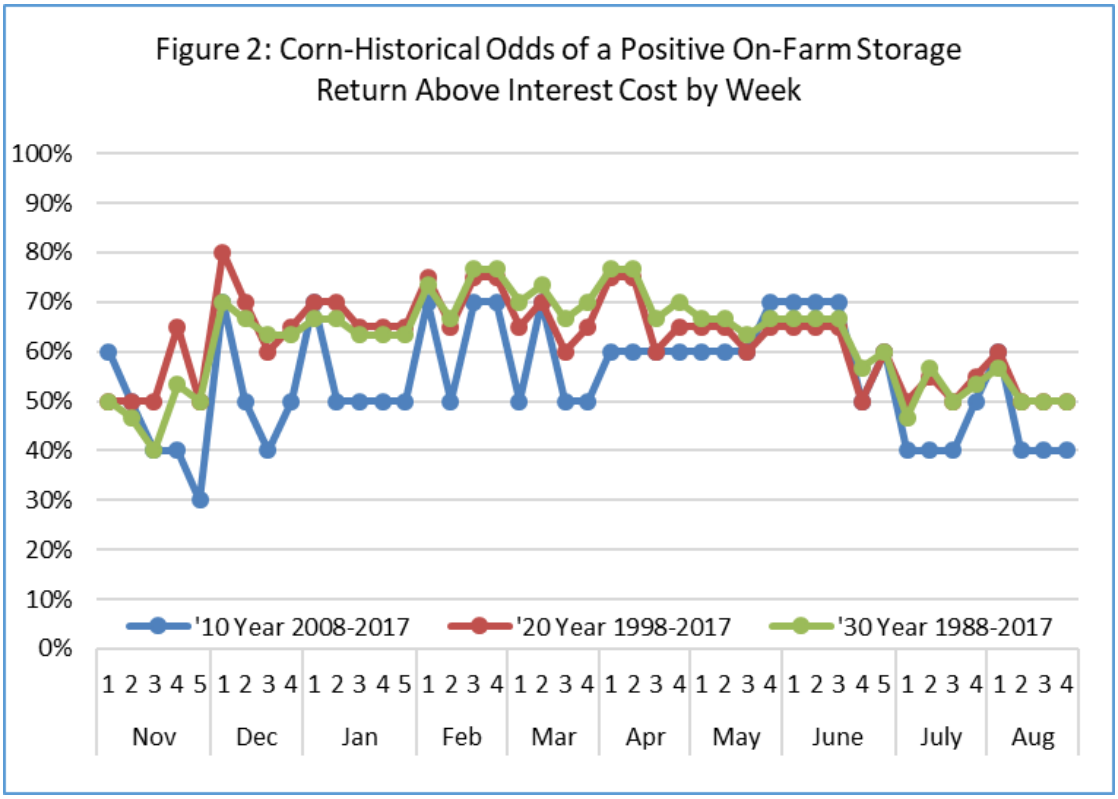

Figure 2: Corn-Historical Odds of a Positive On-Farm Storage Return Above Interest Cost by Week

have a big impact on these storage returns. As an example, if prices are overall going up, like during the ethanol build-up this tends to make storage returns look strong as prices overall are rising.

The opposite has been true for periods of overall decreasing prices-and there is plenty of this direction in the most recent 10 years. Three negative storage return years are noted among the last 10. Those are the 2009 crop as the great recession in 2009 caused weak demand and lower corn prices. The second year of poor storage returns among the past ten was in the drought of 2012 when cash corn prices started at record highs near harvest and then generally dropped through the storage season. The third major negative storage return year was the 2015 crop when corn surpluses were growing and the reality of lower prices was setting in. As a general statement, corn prices were overall trending lower from the 2012 crop to the 2017 crop and thus setting the stage for the "lower than normal" period of speculative storage returns shown here.

When speculating for higher prices to give a positive return to storage there can be a wide range of outcomes primarily driven by the forces of supply and demand that determine prices. Harmful weather in South America can increase Indiana corn prices in our spring. A summer dry spell in the Midwest can boost summer prices, just as much as a near-perfect growing season can depress them. For this reason there is a lot of variation from year-to-year in these weekly returns. (See the next article for some of those dynamics.)

Those storing on-farm would also like to know the odds of having a positive storage return in each of the periods. In Figure 2 we count the number of years in each of the three periods that there was a positive return to on-farm storage above interest cost. Looking at the 20 and 30 year periods, in roughly 60% to 80% of the years there was a positive return to on-farm storage during the peak return periods in February to early -June. However the odds decrease somewhat into the summer. Why? As the spring approaches the new crop situation begins to influence old crop prices. That information can increase or decrease old-crop prices.

Therefore storage into the late-spring and summer is more risky depending on what happens to the new-crop growing conditions.

Returns to Speculative Commercial Corn Storage

What are the historic returns for storage at a commercial facility like the local grain elevator? In this case, the elevator is a licensed warehouse and has charges for their storage services. In this study there was a flat charge per bushel for storage until December 31 and then a monthly charge for each month of storage beginning in January. The monthly charge was pro-rated by week. Of course over 30 years these storage rates have changed, but the study reflects charges at the time. For the 2017 crop which represents the most recent year in the study, the charges were a $.18 per bushel flat charge until December 31 and then $.03 each month beginning in January, and pro-rated weekly. So, storage charges until the end of February were $.24 per bushel, and storage until the end of May were $.33 per bushel.

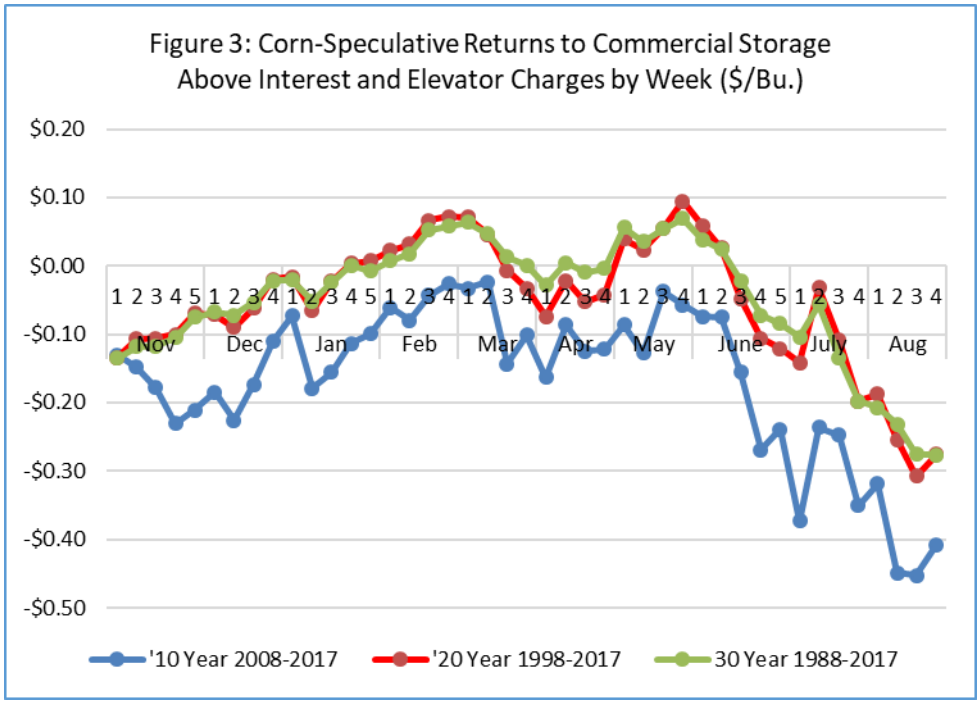

Figure 3: Corn-Speculative Returns to Commercial Storage Above Interest and Elevator Charges by Week ($/Bu.)

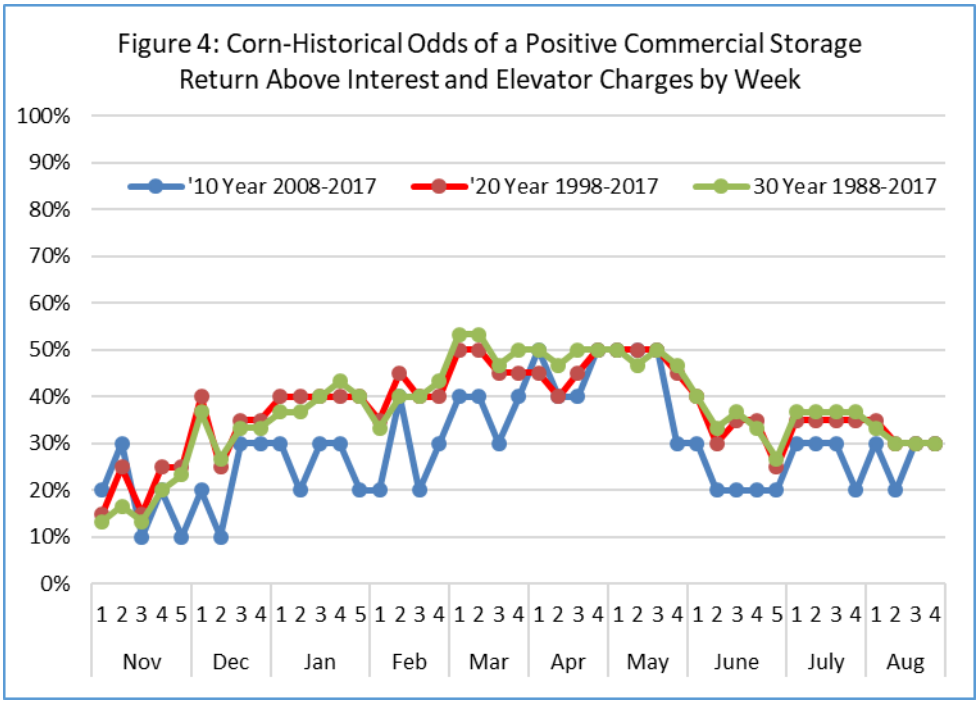

Figure 4: Corn-Historical Odds of a Positive Commercial Storage Return Above Interest and Elevator Charges by Week

Estimated speculative storage returns above interest and storage charges are shown in Figure 3 for the three time periods. The best time to price out of commercial storage was in late-February and early-March. But also note that pricing in May and early-June gave speculative returns that were roughly equivalent, but likely with somewhat higher risk. So, this shifts my preference a bit more in favor of late-winter pricing, but others may decide to store into the spring because of their personal situation or because of their price outlook.

Historic returns above costs for corn storage have been in the range of $.00 to $.10 per bushel on average for pricing at the historical optimal weeks. While this seems small, it is a positive return above all costs. Commercial storage facilities have substantial costs and do protect the quality of the grain for their storage customers. Those customers often have other im-

portant motivations for storing corn such as rolling income tax liabilities from the harvest year into the next tax year.

Another important observation is to recognize how sharply storage returns drop into the summer for commercial storage. The reason is three fold: cash prices tend to drop; storage charges keep piling up; and interest costs continue to grow as well.

Figure 4 shows that the historic odds of a positive return to storage have been about 50% for the longer run periods for the optimum pricing weeks. Or, in the past 20 or 30 years, about 50% of the years had positive commercial storage returns as calculated in this study in the optimal pricing weeks.

Implications for Storage and Pricing Decisions

Does corn storage pay? How much? When is the best time to price corn that is in storage? Are the conclusions different for on-farm stored corn compared to corn stored at an elevator? These are some of the key questions that producers who store corn may have.

This study attempts to shed light on these questions by looking at what has happened to Indiana corn storage returns in the past 10, 20, and 30 year time periods. The way these returns are calculated is outlined and those methods are important to the results. Interest costs were subtracted for both on-farm and commercial storage. Commercial storage fees were also subtracted from commercial storage returns.

Over the long run periods representing the last 20 and 30 years, estimated returns to cover the ownership and operating costs of on-farm storage averaged $.25 to $.40 per bushel per year if one priced during the near optimum weeks.

There were two pricing windows for on-farm storage returns that stood out as averages across these multi-year periods. The first was in late February and early March, but the highest returns came from pricing in May and early-June.

Returns for commercially stored corn averaged $.00 to $.10 per bushel per year over the longer time periods for corn priced in the near optimal time windows. Remember that commercial returns also subtracted the storage fees charged by the elevator as well as interest costs.

The near optimal windows for commercially stored corn were in late February and early-March or in May and early-June. But in contrast to on-farm storage, these two windows were roughly equivalent for commercial storage while May and early-June was superior for on-farm storage.

Another important observation from this historical record is that storage returns on average across these years tended to drop sharply after early-June with a tendency to fall further as the summer progressed. This was true for both on-farm and especially commercial storage. This is driven by the average seasonal cash price pattern in which summer cash corn prices tend to fall as the new crop develops.

Returns calculated in this manner are called speculative returns to storage. This is because one is mixing storage returns with speculation on price changes.

Corn storage returns were lower in the most recent 10 year period, but this is likely due to the unique period of years as explained in the article.

Finally, these are results from history and that does not mean the results will be the same in the future. There is much variation from year to year and this

means those making storage and pricing decisions will want to consider at least three factors in their decisions: the overall storage situation in each year; the price outlook in each year; and personal economic factors that impact their family or business. Cash flow needs and income tax management would be two examples of how family or business needs often impact storage and pricing decisions.

A CLOSER LOOK AT RECENT VARIABILITY IN ON-FARM CORN STORAGE RETURNS

CHRIS HURT, PROFESSOR OF AGRICULTURAL ECONOMICS

The corn and soybeans storage returns articles examine long run averages. These can be somewhat misleading when there is a lot of variation from year to year. For this reason we are providing a peek at the weekly speculative on-farm corn returns data for the last ten years.

One reason returns to speculative on-farm corn storage are often highly variable is because one is mixing the returns to storage with returns to speculation on cash corn prices. Yet, it is the most common strategy among farmers and that is to put corn in the bin at harvest and hope prices rise through the storage season.

There are ways to separate out the returns to storage from returns to speculation. For example if a farmer puts corn in the bin at a cash harvest value of $3.50 a bushel and stores that until May when a huge South American drought causes overall prices to rise to $5.50 they might say, “storage really paid this year.” In reality it was their speculation for higher prices that really paid. We know this because they could have earned much of the $2 increase by selling the grain at harvest and replacing with futures.

Table 1 shows the weekly returns to speculative on-farm corn storage above interest costs as outlined in the previous article. The marketing years are shown on the top row of the table. Numbers in red are negative returns for that week. It may be a surprise to see how many of the weeks had a negative return. At the bottom of the table is the average of the weekly returns for the year. The three bad years to store corn in this period for speculative storage were the crops harvested in 2009, the 2012 drought and the crop harvested in 2015. The average return for storing the 2012 drought crop was a negative $.81 per bushel as an example.

In addition, the week of each year that was optimal for pricing is shown as a yellow shaded cell along with the returns per bushel above the harvest price and interest costs for that week. For these years there was a dominance for the optimum pricing week to be in May through the first two weeks of June with six of the ten years having peak returns in that period, but which specific week varied.

What do these speculative storage returns look like for the 2018 corn crop? Those results have been added on the right hand side for results available at publication time. So far the best storage returns for the 2018 corn crop were back in the second week of December (+$.27). Cash corn prices eroded in the early spring with continued trade conflicts, higher corn stocks, and weak demand. Wet weather and delayed planting in May 2019 began recovery in cash corn prices and thus began to elevate speculative storage returns.

One unique year can have a big influence on the longer run averages. As an example look at the 2010/2011 marketing year. This was the year nearing the final corn demand surge of the biofuels boom and the world economy recovered from the 2009 global recession. As a result corn prices surged upward. Much higher corn prices into the summer of 2011 drove the

storage returns to reach $2.30 per bushel by June. This one unique year can have a large influence on a ten year average. Will a similar unique year occur in the next ten???

Table 1: Estimated Returns to Speculative On-Farm Storage by Week

		08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19
Nov	1	0.39	(0.27)	0.07	0.10	0.08	(0.05)	0.20	0.08	(0.12)	(0.02)	(0.07)
	2	0.17	(0.15)	0.25	0.26	(0.04)	(0.19)	0.18	(0.11)	(0.12)	0.01	0.04
	3	0.05	(0.09)	0.13	0.15	(0.23)	(0.06)	0.35	(0.15)	(0.12)	(0.07)	0.02
	4	0.18	(0.08)	(0.25)	(0.39)	(0.08)	(0.19)	0.24	(0.07)	0.06	0.04	0.07
	5	(0.05)	(0.21)	(0.10)	(0.30)	0.10	(0.18)	0.46	(0.03)	(0.07)	0.02	0.09
Dec	1	0.17	(0.44)	0.07	(0.49)	0.03	0.03	0.46	(0.04)	0.05	0.05	0.25
	2	(0.29)	(0.12)	0.17	(0.61)	(0.31)	0.04	0.60	(0.08)	0.09	0.01	0.27
	3	0.18	(0.12)	0.24	(0.27)	(0.52)	(0.06)	0.73	(0.13)	(0.06)	0.03	0.24
	4	0.25	0.01	0.53	(0.01)	(0.63)	(0.07)	0.73	(0.19)	(0.05)	0.07	0.15
Jan	1	0.44	0.09	0.68	0.14	(0.63)	(0.14)	0.62	(0.26)	0.08	0.06	0.18
	2	(0.03)	(0.29)	0.60	0.07	(0.57)	(0.17)	0.61	(0.21)	0.05	0.04	0.24
	3	0.25	(0.40)	0.67	(0.50)	(0.16)	(0.08)	0.49	(0.10)	0.15	0.10	0.15
	4	0.18	(0.49)	0.77	(0.06)	(0.27)	(0.08)	0.57	(0.10)	0.24	0.13	0.22
	5	(0.01)	(0.49)	0.96	0.06	(0.05)	(0.06)	0.42	(0.09)	0.17	0.18	0.25
Feb	1	0.13	(0.37)	1.09	0.07	(0.24)	0.10	0.57	(0.20)	0.18	0.22	0.23
	2	(0.01)	(0.37)	1.35	(0.08)	(0.47)	0.07	0.61	(0.13)	0.24	0.23	0.25
	3	0.13	(0.16)	1.31	0.03	(0.43)	0.21	0.65	(0.23)	0.16	0.22	0.17
	4	0.11	(0.12)	1.33	0.20	(0.34)	0.21	0.52	(0.24)	0.11	0.32	0.13
Mar	1	(0.00)	(0.16)	1.54	(0.01)	(0.53)	0.39	0.63	(0.31)	0.19	0.36	0.13
	2	0.21	(0.40)	1.32	0.17	(0.31)	0.45	0.65	(0.28)	0.09	0.38	0.08
	3	0.17	(0.31)	0.47	(0.01)	(0.17)	0.44	0.51	(0.19)	(0.00)	0.24	0.11
	4	0.29	(0.56)	1.16	(0.22)	(0.16)	0.40	0.71	(0.20)	(0.01)	0.22	0.15
Apr	1	0.30	(0.43)	0.99	0.16	(1.11)	0.50	0.57	(0.21)	(0.01)	0.31	0.04
	2	0.17	(0.37)	1.99	(0.06)	(1.06)	0.59	0.54	(0.30)	0.06	0.38	0.05
	3	0.03	(0.33)	1.90	(0.35)	(0.95)	0.53	0.51	(0.17)	0.10	0.35	(0.10)
	4	0.32	(0.33)	1.68	(0.27)	(1.17)	0.59	0.49	(0.02)	0.03	0.37	(0.08)
May	1	0.36	(0.25)	1.67	(0.18)	(0.90)	0.67	0.42	(0.22)	0.10	0.48	0.05
	2	0.55	(0.18)	1.17	(0.14)	(1.01)	0.67	0.36	(0.22)	0.11	0.48	0.03
	3	0.57	(0.36)	2.02	(0.01)	(0.85)	0.47	0.34	(0.00)	0.12	0.46	0.10
	4	0.59	(0.24)	2.00	(0.19)	(0.79)	0.26	0.23	0.05	0.15	0.56	
June	1	0.66	(0.45)	2.16	(0.58)	(0.72)	0.29	0.33	0.14	0.29	0.42	
	2	0.76	(0.55)	2.30	(0.29)	(0.77)	0.14	0.29	0.27	0.21	0.26	
	3	0.49	(0.35)	1.87	(0.24)	(0.87)	0.01	0.30	0.24	0.17	0.23	
	4	0.29	(0.45)	1.34	(0.07)	(0.60)	0.01	0.37	(0.12)	(0.02)	0.03	
	5	(0.06)	(0.35)	1.54	0.13	(0.99)	0.03	0.86	(0.27)	0.24	0.03	
July	1	(0.35)	(0.18)	1.12	0.50	(1.37)	(0.26)	0.90	(0.64)	0.24	(0.07)	
	2	(0.32)	(0.12)	1.84	0.80	(0.95)	(0.49)	0.94	(0.41)	0.21	(0.17)	
	3	(0.50)	(0.16)	1.87	1.70	(1.12)	(0.65)	0.70	(0.62)	0.14	(0.09)	
	4	(0.36)	(0.19)	1.90	1.59	(1.57)	(0.81)	0.36	(0.63)	0.01	0.03	
Aug	1	(0.10)	0.01	1.85	1.59	(1.77)	(0.80)	0.49	(0.74)	0.09	0.08	
	2	(0.23)	(0.08)	1.46	1.70	(2.18)	(0.79)	0.37	(0.78)	(0.09)	0.10	
	3	(0.35)	0.15	1.67	1.53	(2.22)	(0.79)	0.51	(0.75)	(0.20)	(0.03)	
	4	(0.36)	0.01	1.85	1.90	(1.89)	(0.72)	0.46	(0.78)	(0.33)	(0.12)	
Avg by Year		0.12	(0.26)	1.33	0.20	(0.81)	0.03	0.54	(0.24)	0.09	0.18	0.14

SOYBEAN STORAGE RETURNS: IMPLICATIONS FOR STORAGE AND PRICING DECISIONS

CHRIS HURT, PROFESSOR OF AGRICULTURAL ECONOMICS

Soybean storage returns are examined in this article. The method of measuring those returns is similar to corn. Please read the corn storage return article in this publication for that information. One difference is that the harvest price for soybeans was assumed to be the cash prices in the first two weeks of October, while the corn harvest price was assumed to be the last two weeks of October.

The weekly cash prices used were from a central Indiana elevator that loaded unit-trains. While both corn and soybean data is from central Indiana, it is likely that the overall conclusions would hold for a broader geographic area including central and northern Illinois, Indiana, Ohio and southern Michigan in the Eastern Corn Belt. Ohio and Illinois River markets may have some differences in patterns due to their unique shipping seasons.

As a brief summary, it is assumed the grain is placed in storage at harvest time. The question then is, "do cash price bids move above the harvest price during the storage season by enough to cover interest costs for on-farm storage?" For commercial storage the question is, "do cash price bids move above the harvest price by enough to cover interest costs and commercial storage charges?"

For on-farm storage, these results can be viewed as an estimate of the returns per bushel to cover the ownership and operating costs of on-farm storage.

While putting soybeans in the bin at harvest and then pricing later is the most common farmer marketing strategy we call these speculative returns to storage. This is because returns measured this way are mixing the returns to storage and returns to speculating on the price. As an example, if one stores soybeans at harvest with a value of $9.00 per bushel, and by the following May a South American drought causes prices to rise to $12.00 most would declare this to be a high return to storage. In reality most of this high return was due to prices being driven up by the drought. As a price speculator, the farmer would receive this higher value, but the biggest part of the gain was due to price speculation.

Strong Speculative Soybean Storage Returns

Our historical record suggest that those who stored soybeans at harvest and then priced them later at the cash bid have had strong positive returns on average over the periods represented as the last 10 years, the last 20 years, and the last 30 years.

Returns above interest costs for on-farm storage for these three time periods are shown in Figure 1. Farmers and landlords who store soybeans are interested in knowing what weeks of the marketing year were best to be pricing in the past. That was late-April-May and early-June. All three time periods exhibited this spring pricing preference. We also observe in Figure 1 that the returns to speculative on-farm storage tended to rise consistently from harvest until the following spring on average.

You may also note that the 30 year time period which covers the crop harvested in 1988 to 2017 had lower overall returns to on-farm storage than the nearest 10 and nearest 20 year periods. This is due to some of the unique events for the crops harvested in 1988 to 1997. That starts with the 1988 drought, and drought years generally have high prices at harvest with cash bids dropping throughout the storage season. In addition after 1995 the Asian financial crisis resulted in generally falling soybeans prices. Again it is hard to get a positive speculative return to storage when overall prices are generally going down.

How much return per bushel was there for on-farm storage? The returns calculated in this manner can be viewed as an estimate of the returns above interest costs to cover the ownership and operating costs of on-farm storage. That estimate suggest the returns have been $.80 to $1.30 per bushel per year on average over the three time periods for beans priced during the optimum historic time periods in the spring.

Finally, as with corn the potential penalty for waiting to price soybeans into the following summer has been large on average in the past.

Figure 2 shows the historic odds of a positive storage return above interest costs for on-farm storage. That reached 70% to 90% of the years by the spring for each of the periods.

Results for speculative returns to commercial soybean storage are shown in Figure 3. Here, both interest costs and the commercial storage charges are subtracted from returns. This historical record shows that spring pricing was the most favorable on average over these periods and that speculative storage returns above interest and commercial storage charges averaged $.60 to $1.00 a bushel per year for the optimum spring pricing.

The historical odds of a positive storage return to commercial storage were about 60% to 80% of the years in each period for pricing in the spring as seen in Figure 4.

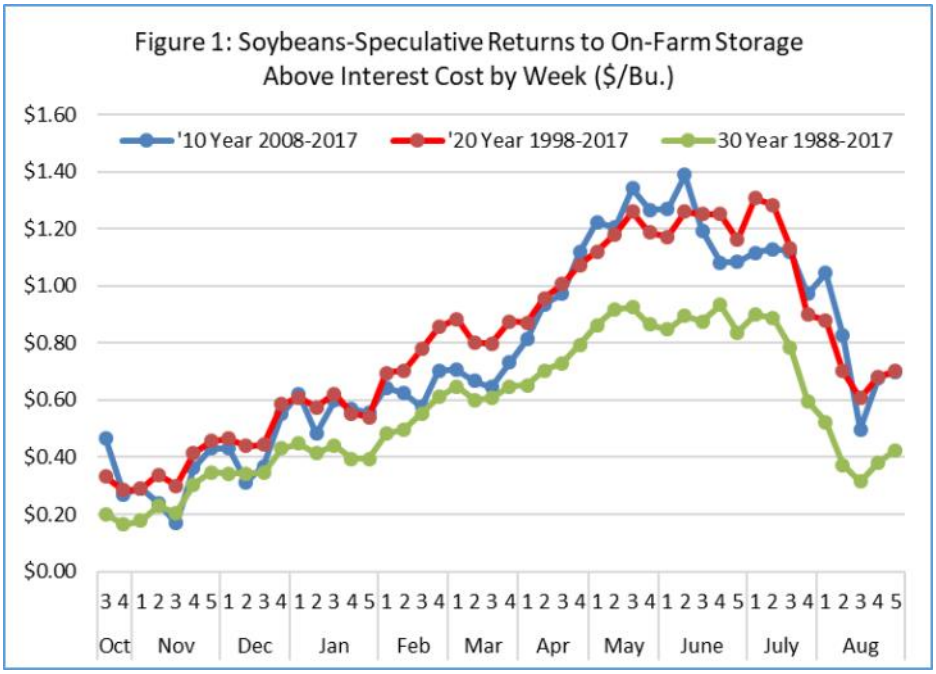

Figure 1: Soybeans-Speculative Returns to On-Farm Storage Above Interest Cost by Week ($/Bu.)

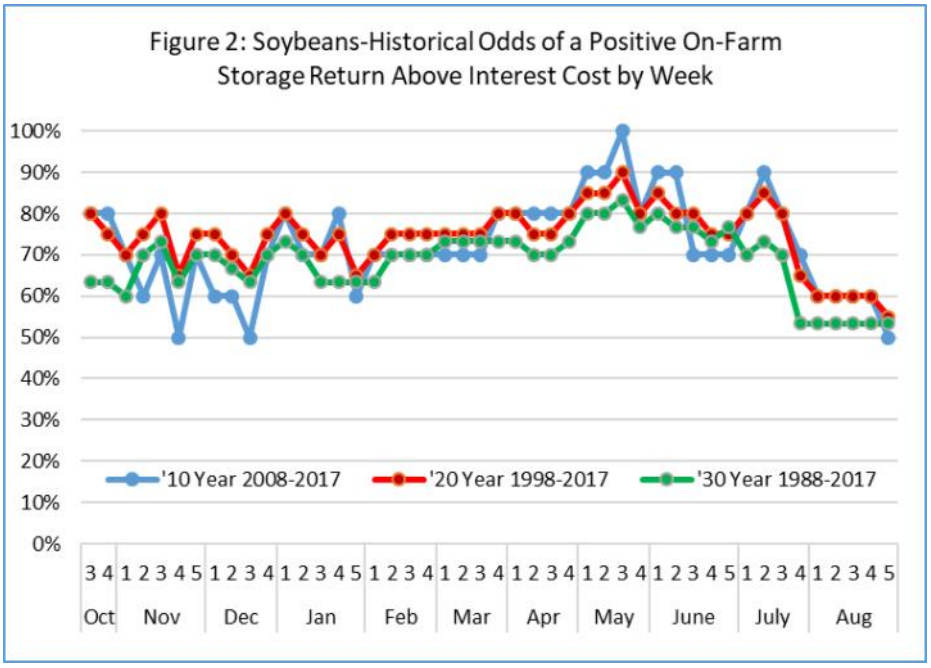

Figure 2: Soybeans-Historical Odds of a Positive On-Farm Storage Return Above Interest Cost by Week

Summary Thoughts for Storage Decision Makers

Returns to speculative soybean storage have been strong in Indiana over the past decades on average as measured by this methodology. Those were $.80 to $1.30 per bushel for on-farm storage as an estimated return to cover the ownership and costs of operating on-farm storage. Commercial storage returns averaged $.60 to $1.00 a bushel above all estimated costs.

We call this speculative storage returns because it mixes the returns to storage and returns to speculating on higher prices. The strong returns are likely related to the huge growth of Chinese usage in the past 25 years. In addition, as the South American crop has now become larger than the U.S. crop, growing seasons with reduced yields there have enabled U.S. spring bean prices to rally by several dol-

lars per bushel. These years have been very influential in the results in this study.

While this study helps identify timing of pricing down to the week on average, there is a considerable amount of variation from year to year. This means there is value in learning about storage returns and in considering the price outlook when making storage and pricing decisions. Farmers and landlords who store soybeans can start their storage and pricing strategies based upon these historic guidelines, but since each year can be different from the long term norm it is a good idea to make some potential adjustments based on three factors: the storage situation for each year; the current price outlook; and for the particular economic situation of your business like cash flow needs and income tax management.

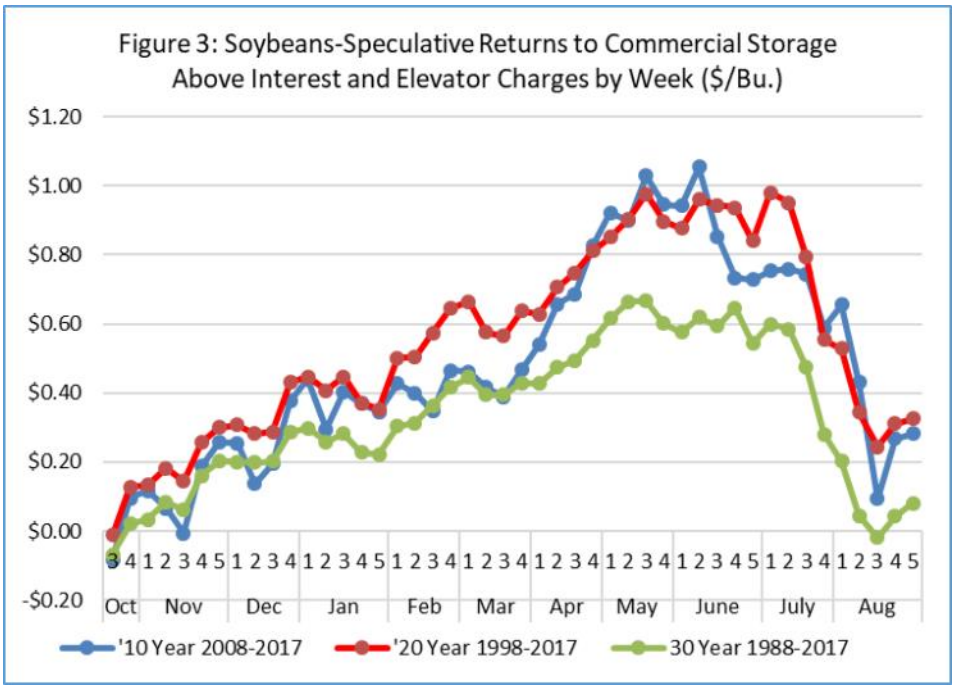

Figure 3: Soybeans-Speculative Returns to Commercial Storage Above Interest and Elevator Charges by Week ($/Bu.)

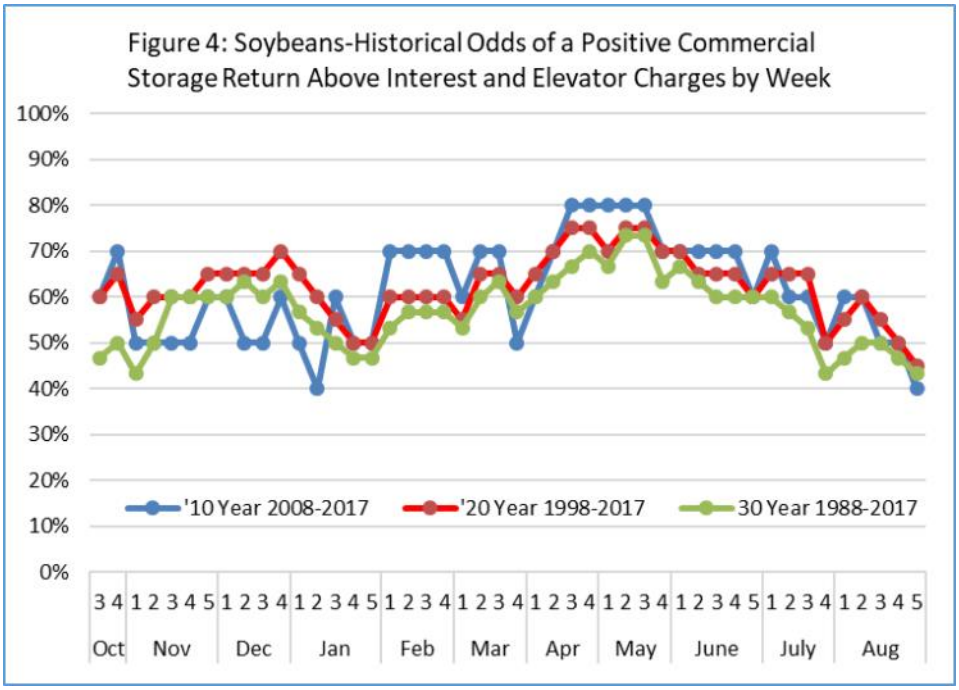

Figure 4: Soybeans-Historical Odds of a Positive Commercial Storage Return Above Interest and Elevator Charges by Week

One filter that has meaningful impacts on these results is to consider not storing in years when production is very low. Low production years, like the 2012 drought, have a strong tendency toward high prices at harvest with declining prices through the storage season. Markets generally send price signals in these years not to store. These signals are likely to be in both the futures market and in the grain buyer's cash bids. In the futures markets the harvest futures (November for soybeans) will be higher priced than the futures during the storage season like the following March-May-July futures (an inverted futures market). Secondly in the cash market, the grain bids may be higher for harvest delivery than they are for delivery through the winter and spring.

Finally, the results in this study are historical, and we all know that history is not an assurance that the same results will apply to the future. This means you need to stay aware of economic forces that are different from year to year in making storage and pricing decisions. One current example is the unusual use of tariffs by the U.S. in 2018 and 2019.

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