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AGRICULTURAL ECONOMICS REPORT

Article title:	Indiana Farmland Prices Grow at Record Pace in 2022
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Indiana farmland prices grew at a record pace between June 2021 and June 2022, according to the recent *Indiana Farmland Value and Cash Rent Survey*. Statewide, the average per acre price for top quality farmland increased by 30.9% to \$12,808 (Table 1). The average per acre price of average quality farmland similarly increased by 30.1% to \$10,598. Poor quality farmland prices exhibited the largest increase of 34.0% to \$8,631. Across all quality grades, farmland prices exceeded the previous highs set in 2021. In addition, the price appreciation rates surpassed the previous record growth rates observed in 2011.

High farmland price growth was observed in almost all regions across Indiana (Figure 1). The average price for top quality farmland in the North region grew by 39.3%. In the Northeast region, average quality farmland prices increased by 38.5%, and in the Southeast region poor quality farmland prices increased by 41.9%. The highest average prices by land quality class included top quality land in the Southwest region (\$13,825 per acre), average quality land in the Central region (\$11,278 per acre), and poor quality land in the Northeast region (\$9,418 per acre).

Respondents generally expect continued price growth through the remainder of 2022 but at a more muted pace. Statewide, respondents expect prices to increase by 1.1 to 2.7% through December 2022. However, respondents expect prices to decline by about one percentage point across some regions and quality grades.

The survey also found very high appreciation rates for farmland transitioning out of agricultural production or sold for recreational purposes. Statewide, the average price of transitional land was up 36.5% from June 2021, with an average price per acre of \$24,240. Recreational land prices grew by 21.8% to an average per acre price of \$9,121. For the remainder of 2022, respondents expect transitional land to increase modestly by 2.3%, while the value of recreational land is expected to hold relatively stable.

Table 1: Average estimated Indiana land value per acre (tillable, bare land), per bushel of corn yield, and percentage change by geographic area and land class, selected time periods, Purdue Land Value Survey, June 2022¹

Area	Land Class	Corn Bu/A	Land Value						Land value/bu			Projected Land Value	
			Dollars per Acre			% Change							
			June 2021	Dec 2021	June 2022	6/21-6/22	6/21-12/21	12/21-6/22	Amount 2021	Amount 2022	% Change 6/20-6/21	Dec 2022	% Change 6/22-12/22
			\$/A	\$/A	\$/A	%	%	%	\$	\$	%	\$	%
North	Top	225	9,073	11,750	12,635	39.3	29.5	7.5	42.40	56.06	32.2	12,673	0.3
	Average	185	7,205	8,931	9,596	33.2	24.0	7.5	40.47	51.77	27.9	9,519	-0.8
	Poor	152	5,559	6,923	7,323	31.7	24.5	5.8	38.08	48.25	26.7	7,227	-1.3
Northeast	Top	215	9,481	11,621	12,878	35.8	22.6	10.8	46.25	59.84	29.4	13,485	4.7
	Average	187	8,083	9,963	11,195	38.5	23.3	12.4	45.41	59.74	31.6	11,748	4.9
	Poor	157	6,764	8,657	9,418	39.2	28.0	8.8	44.50	59.97	34.8	9,332	-0.9
W. Central	Top	229	10,970	12,063	13,050	19.0	10.0	8.2	50.56	56.99	12.7	13,293	1.9
	Average	200	9,382	10,107	10,914	16.3	7.7	8.0	48.61	54.47	12.1	11,081	1.5
	Poor	170	7,849	8,419	9,012	14.8	7.3	7.0	47.57	52.96	11.3	9,176	1.8
Central	Top	212	10,195	11,407	13,156	29.0	11.9	15.3	48.09	62.04	29.0	13,389	1.8
	Average	187	8,895	9,770	11,278	26.8	9.8	15.4	47.83	60.42	26.3	11,407	1.1
	Poor	162	7,414	8,083	9,270	25.0	9.0	14.7	46.34	57.08	23.2	9,363	1.0
Southwest	Top	236	11,696	13,300	13,825	18.2	13.7	3.9	53.41	58.67	9.9	14,500	4.9
	Average	199	8,546	9,833	10,222	19.6	15.1	4.0	47.48	51.27	8.0	10,639	4.1
	Poor	164	5,965	7,556	8,022	34.5	26.7	6.2	41.14	48.99	19.1	8,228	2.6
Southeast	Top	204	6,675	8,143	8,929	33.8	22.0	9.6	33.71	43.71	29.7	8,850	-0.9
	Average	179	5,025	6,257	6,900	37.3	24.5	10.3	30.09	38.64	28.4	7,058	2.3
	Poor	137	3,675	4,786	5,214	41.9	30.2	9.0	27.63	38.02	37.6	5,267	1.0
Indiana	Top	221	9,785	11,642	12,808	30.9	19.0	10.0	46.16	58.07	25.8	13,155	2.7
	Average	191	8,144	9,589	10,598	30.1	17.7	10.5	44.75	55.46	23.9	10,856	2.4
	Poor	161	6,441	8,565	8,631	34.0	33.0	0.8	42.10	53.73	27.6	8,724	1.1
	Transition ²		17,759	21,866	24,240	36.5	23.1	10.9				24,799	2.3
	Recreation ³		7,486	8,490	9,121	21.8	13.4	7.4				9,152	0.3

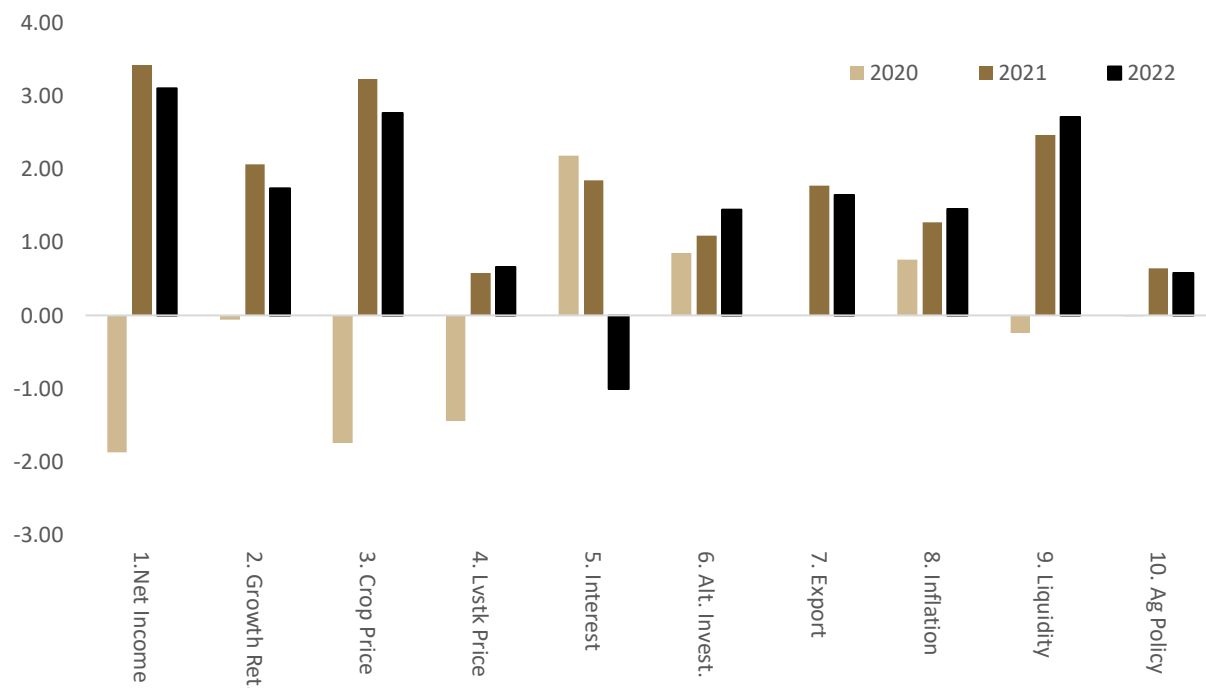
- ¹ The land values contained in this summary represent averages over several different locations and soil types. Determining the value for a specific property requires more information than is contained in this report and should include an evaluation by a professional appraiser.
- ² Transition land is land moving out of production agriculture into other, typically higher value, uses.
- ³ Recreation land is land located in rural areas used for hunting and other recreational uses.

Farmland Market Forces

Respondents were asked to evaluate the importance of ten market forces that may potentially influence the farmland market: (1) current net farm income, (2) expected growth rate in farm returns, (3) crop price level and outlook, (4) livestock price level and outlook, (5) current and expected interest rates, (6) returns to alternative investments, (7) outlook for U.S. agricultural export sales, (8) U.S. inflation rate, (9) cash liquidity of buyers, and (10) current U.S. agricultural policy. Respondents rate each market force on a scale of -5 to +5, with -5 being the strongest negative influence. A positive influence is given a value between 1 and 5, with 5 representing the strongest positive influence. A score of 0 indicates the force was not influential. An average for each item was calculated, and averages for 2020, 2021, and 2022 are included in Figure 2. The horizontal axis shows the item from the list above.

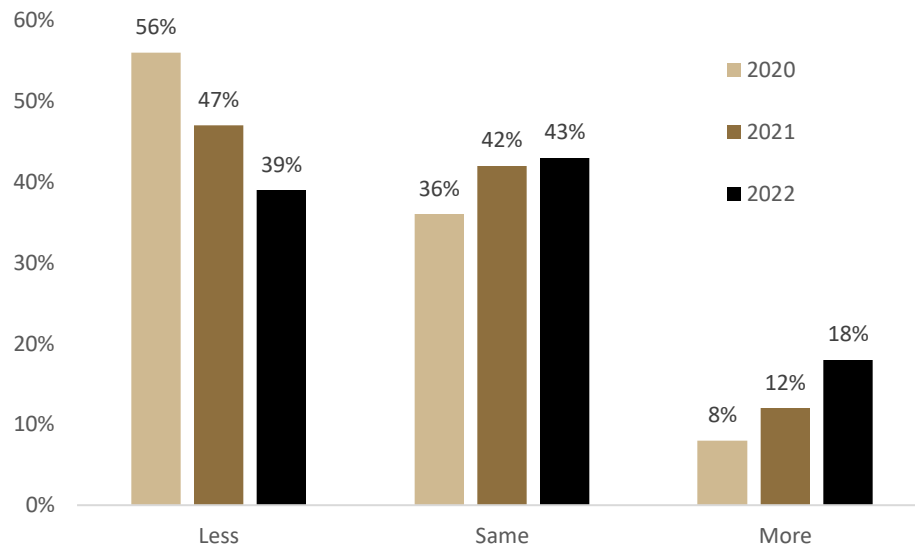
In 2021, all ten market forces placed upward pressure on farmland prices. In 2022, nine of the ten market forces exhibited upward pressure on farmland prices. In contrast to recent years, rising interest rates is putting downward pressure on farmland prices. As one respondent noted, “farmland prices are very high right now with a lot of cash to go around, but interest rates have people concerned.” Rising interest rates are associated with increased costs of borrowing which puts downward pressure on purchases financed through mortgages. The remaining factors all positively influence farmland prices: positive net farm incomes, relatively strong commodity prices, inflation, and high farmer liquidity.

Figure 2: Influence of drivers of Indiana farmland values



The higher prices are accompanied by increase in land available for sale, relative to 2021 (Figure 3). The share of respondents reporting more land for sale increased to 18%, while 39% reported a smaller amount of land on the market.

Figure 3: Percentage of respondents indicating less, same, or more farmland on the market than in the previous June



Five-Year Forecasts

Respondents were asked to forecast the five-year average corn price, soybean price, mortgage rate, and inflation rate (Table 2). Respondents project a five-year average per bushel average price of corn to be \$5.65, a \$0.99 per bushel increase from 2021. Respondents were equally optimistic about soybean prices, with an expected five-year average price of \$12.84, a \$1.69 increase from 2021.

Respondents, however, expect an increased cost of farm mortgages, with a five-year average of 6.4%, compared to 4.9% in 2021. Respondents also expect more inflation, with a five-year average of 5.8%, up from 3.4% in 2021. Farmland is sometimes promoted as a hedge against inflation, as an increase in prices across the economy generally supports high commodity prices. However, higher inflation also represents a potential increase costs for farm inputs. As one respondent notes, “the tradeoff between the influences from rising interest rates and rising inflation will be very interesting to observe.”

Table 2: Projected five-year average corn and soybean prices, mortgage interest, and inflation

Year	Price, \$/bu		Rate, % per year	
	Corn	Soybeans	Interest	Inflation
2018	3.97	9.99	5.5%	2.5%
2019	4.15	9.01	5.5%	2.4%
2020	3.77	9.07	3.9%	2.1%
2021	4.66	11.15	4.9%	3.4%
2022	5.65	12.84	6.4%	5.8%
Average	\$4.44	\$10.41	5.2%	3.2%

Cash Rents

Statewide, cash rental rates increased across all land quality classes in 2022. Statewide average cash rents increased by 11.5% for top quality land, 10.8% for average quality land, and 13.2% for poor quality land. The increases in cash rents were the highest observed since the 2011–2012 period. Across the three quality grades, cash rents also reached a new record high in 2022 at \$300 per acre for high quality farmland, \$252 for average quality, and \$207 for poor quality land. At the regional level, the largest cash rental rate increases for top and average quality land were in the Northeast (21.3% and 13.2%, respectively), and the largest increase for poor quality land was in the Southwest region (18.6%). Across all three quality grades, the highest per acre average cash rent was observed in the West Central region.

While rental rates in across all three quality grades increased in almost all regions, the cash rental rates grew at a slower rate than market prices. As a result, rent as a share of land value declined relative to 2021. Overall, respondents do not expect drastic changes to cash rental rates next year. As one respondent noted, “I fear that input prices will be slower to ‘return to normal’ than commodity prices will.” In other words, the threat of high input costs and modest returns may discourage renters from bidding rents higher in 2022.

Figure 1: County clusters used in Purdue Land Values survey to create geographic regions

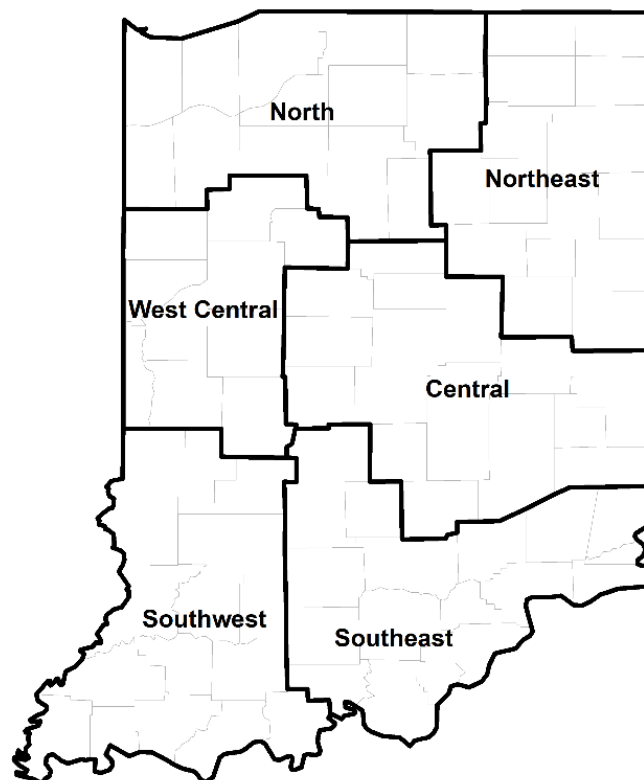


Table 3: Average estimated Indiana cash rent per acre, (tillable, bare land) 2021 and 2022, Purdue Land Value Survey, June 2022

Area	Land Class	Corn bu/A	Rent/Acre		Change 21-22 %	Rent/bu. of corn		Rent as % of June Land Value	
			2021 \$/A	2022 \$/A		2021 \$/bu	2022 \$/bu	2021 %	2022 %
North	Top	225	273	280	2.4	1.28	1.24	3.0	2.2
	Average	185	222	225	1.5	1.25	1.22	3.1	2.3
	Poor	152	174	179	3.0	1.19	1.18	3.1	2.4
Northeast	Top	215	242	293	21.3	1.18	1.36	2.6	2.3
	Average	187	211	239	13.2	1.19	1.27	2.6	2.1
	Poor	157	181	190	5.1	1.19	1.21	2.7	2.0
W. Central	Top	229	302	329	9.0	1.39	1.44	2.8	2.5
	Average	200	262	289	10.3	1.36	1.44	2.8	2.6
	Poor	170	222	247	11.4	1.35	1.45	2.8	2.7
Central	Top	212	272	295	8.4	1.28	1.39	2.7	2.2
	Average	187	235	249	6.1	1.26	1.34	2.6	2.2
	Poor	162	192	211	10.0	1.20	1.30	2.6	2.3
Southwest	Top	236	288	309	7.3	1.32	1.31	2.5	2.2
	Average	199	225	244	8.6	1.25	1.23	2.6	2.4
	Poor	164	164	194	18.6	1.13	1.19	2.7	2.4
Southeast	Top	204	223	225	0.9	1.13	1.10	3.3	2.5
	Average	179	182	179	-1.5	1.09	1.00	3.6	2.6
	Poor	137	133	141	6.3	1.00	1.03	3.6	2.7
Indiana	Top	221	269	300	11.5	1.27	1.36	2.7	2.3
	Average	191	227	252	10.8	1.25	1.32	2.8	2.4
	Poor	161	183	207	13.2	1.20	1.29	2.8	2.4

Looking Ahead

Statewide farmland prices have risen at an increasing rate over the last three years. In 2022, Indiana farmland prices recorded both record high levels and record high growth rates. The pronounced growth in farmland prices has been supported by a combination of high incomes and high farm liquidity. While respondents of the *Purdue Farmland Value and Cash Rent Survey* are optimistic for continued growth for the remainder of 2022, broader economic uncertainty dampens expectations for continued record growth. Respondents are particularly concerned with the potential for high inflation and high interest rates, and the two economic forces are not independent of one another.

Farmland market participants who experienced the 1980s Farm Financial Crisis are reminded of an era when the Federal Reserve increased interest rates rapidly to fight inflationary pressure. The rising interest rates coincided with decrease in commodity prices and farm returns. As one respondent notes, “as a lender in the 1970s, we thought we were making 50% loan to value mortgages which turned out to be 90% in short time because income fell and interest rates spiked.” The respondent adds, “Hold on to your hat!”

Purdue Farmland Value and Cash Rent Survey

The Purdue Farmland Value and Cash Rent Survey is conducted each June. The survey is possible through the cooperation and contribution of numerous professionals knowledgeable of Indiana’s farmland market. These professionals include farm managers, rural appraisers, land

brokers, agricultural loan officers, farmers, and Farm Service Agency (FSA) county office directors. These professionals were selected because their daily work requires they stay well informed about farmland values and cash rents.

These professionals provide an estimate of the market value for bare poor, average, and top quality farmland in December 2020, June 2021, and a forecast for December 2021. To assess productivity of the farmland, respondents provide an estimate of long-term corn yield for top, average, and poor productivity farmland. Respondents also provide a market value estimate for land transitioning out of agriculture and for recreational land.

The data reported here provide general guidelines regarding farmland values and cash rent. To obtain a more precise value of an individual tract, contact a professional appraiser or farm manager that has a good understanding of the local market.

Prior reports are located at: https://purdue.ag/paer_archive

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AGRICULTURAL ECONOMICS REPORT

Article title:	Trends in Farmland Price to Rent Ratios in Indiana
Author:	Michael Langemeier
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Farmland prices in west central Indiana increased by 16.3% in 2022, and are now 13.5% above the previous peak in 2014. Compared to the farmland price in 2007, current farmland prices in west central Indiana are 172% higher. Farmland prices are influenced by many factors including net income, the growth in earnings, crop and livestock prices, interest rates, alternative investment returns, inflation, liquidity, and agricultural policy. Cash rent, which is influenced by net return to land, along with interest rates, are often referred to as fundamental factors impacting farmland prices. Concerns are periodically expressed by many investment analysts that farmland prices are higher than justified by the fundamentals. One justification for this concern is that previous research has established the tendency of the farmland market to over-shoot its fundamental value.

A standard measure of financial performance most commonly used for stocks is the price to earnings ratio (P/E). A high P/E ratio sometimes indicates that investors think an investment has good growth opportunities, relatively safe earnings, a low capitalization rate, or a combination of these factors. However, a high P/E ratio may also indicate that an investment is less attractive because the price has already been bid up to reflect these positive attributes.

This paper computes a ratio equivalent to P/E ratio for farmland, the farmland price to

cash rent ratio (P/rent), and discusses trends in the P/rent ratio. We use land value and cash rent data for the 1960 to 2022 period for west central Indiana to illustrate the P/rent ratio. Data from 1975 to 2022 were obtained from the annual *Purdue Land Value and Cash Rent Survey*. For 1960 to 1974, the 1975 Purdue survey numbers were indexed backwards using the percentage change in USDA farmland value and cash rent data for the state of Indiana.

Price to Rent Ratio

The P/rent ratio for west central Indiana averaged 20.1 over the 62-year period from 1960 to 2022 (figure 1). The peak P/rent ratio before 1990 occurred during the 1977 to 1979 period. The P/rent dropped substantially from 1980 to 1986 reaching a low of 11.1 in 1986. The rise from around 15 in 1976 into the 20s and down to 11.1 in 1986 corresponds to what is viewed as the bubble in farmland prices that was followed by one of the most difficult periods in history for production agriculture (i.e., the early-to-mid 1980s).

The P/rent ratio has been above the long-run average since 2004. From 2004 to 2014, the P/rent ratio increased from 20.6 to 33.0. Since the peak in land values in 2014, the P/rent ratio has ranged from 31.7 in 2015 to 37.8 in 2021. The current value of 37.8 is relatively high compared to the historic average of 20.1 and a previous high of around 20, and thus at least raises concerns that current farmland prices are overvalued in relationship to returns. Having said that, one of the reasons often mentioned as a major explanatory factor associated with the recently high P/rent ratio is low interest rates. The average interest rate on 10-year treasuries from 1960 to 2022 was 6.0%. The interest rate on 10-year treasuries has been below its long-run average since 1998. Moreover, the rate has not been above 4% since 2008. Having said that, the 10-year treasury rate has been increasing this year, and was 2.9% in July.

Over the 62-year period from 1960 to 2022, the P/E ratio for stocks is 19.4, which is

similar to the long-run average P/rent ratio. Though the long-run averages are similar, the P/E and P/rent ratios do not necessarily track one another. The average correlation coefficient between these two measures is only 0.28. Though not the topic of this paper, diversification potential between the stock market and farmland is relatively high.

Cyclically Adjusted P/Rent

Shiller (2005; 2022) uses a 10-year moving average for earnings in the P/E ratio, often labeled either P/E10 or cyclically adjusted P/E (CAPE), to remove the effect of the economic cycle on the P/E ratio. When earnings collapse in recessions, stock prices often do not fall as much as earnings, and the P/E ratios based on the low current earnings sometimes become very large. Similarly, in good economic times P/E ratios can fall and stocks look cheap, simply because the very high current earnings are not expected to last, so stock prices do not increase as much as earnings. By using a 10-year moving average of earnings in the denominator of the P/E ratio, Shiller has smoothed out the business cycle by deflating both earnings and prices to remove the effects of inflation. Shiller also uses the P/E10 to gain insight into future rates of return. That is, if an investor buys an asset when its P/E10 is high, do subsequent returns from that investment turn out to be low, and vice versa?

The P/rent ratios reported thus far are the current year's farmland price divided by current year cash rent. Here we model our P/rent10 after Shiller's cyclically adjusted P/E ratio. Cash rent and farmland prices are deflated, and then 10-year moving averages of real cash rent are calculated. The P/rent10 ratio is computed by dividing the real farmland price by the 10-year moving average real cash rent. A similar computation is done for operator net returns (P/NR-10). We also compute a P/rent5 ratio by dividing real farmland price by a 5-year moving average of real cash rent.

Figure 2 compares the current P/rent ratio with the P/rent5 and P/rent10 ratios. From 2011 to 2015, the P/rent10 ratio was substantially higher than the P/rent ratio. Essentially, during this time period, current cash rent, used to compute the P/rent ratio, was higher than the 10-year average cash rent. The P/rent5 ratio was also higher than the P/rent ratio during this time period, however this ratio was not as high as the P/rent10 ratio. Assuming that cash rent and interest rates were primary drivers of farmland prices during this period, those purchasing farmland were likely using current cash rents rather than a longer run average of cash rents when evaluating the expected long-run returns from owning land.

The P/rent10, P/NR-10, and Shiller's P/E10 ratios are illustrated in figure 3. The P/rent10 ratio peaked in 2013 at 47.5. The ratio then steadily declined, reaching a low of 30.1 in 2019. The ratio increased from 30.4 in 2020 to 36.3 in 2022. The current P/rent10 ratio is still relatively high compared to the long-run average (using 1960 to 2022 data) of 22.3. Does the current P/rent10 ratio signify a bubble or is something else going on? With regard to this question, we would like to make two points. First, interest rates have been very low compared to the long-run averages since 2008. The rate on 10-year treasuries has averaged only 2.4% since 2008. Second, as we note below, the P/rent10 and P/NR-10 ratios appear to be equilibrium.

The P/NR-10 ratio fell through the first half of the 1970s when real returns grew faster than land values, increased from around 20 in the mid-1970s to 28.2 in 1977, and then fell to 6.8 in 1987. The P/NR-10 ratio then increased steadily until it reached a peak of 37.3 in 2014. The P/NR-10 ratio has ranged from 28.7 to 36.5 since 2014. From 2015 to 2018, the P/NR-10 ratio was smaller than the P/rent10 ratio, indicating that ten-year average cash

rents were smaller than ten-year average net returns to land. In 2019, the P/rent10 and P/NR-10 ratios were similar. For the last three years, the P/NR-00 ratios have been slightly higher than the P/rent10 ratio. In the long-run, you would expect the two ratios to be similar. In fact, the average P/rent10 and P/NR-10 ratios for the 1960 to 2022 period were 22.3 and 22.2, respectively. The current ratios (36.3 for P/rent10 and 36.5 for P/NR-10) are very close to equilibrium.

It is evident from figure 3 that there is not a close link between the P/E10 ratio and the P/rent10 ratio. The P/E10 ratio was much higher than the P/rent ratio from 1995 to 2002. In contrast, the P/E10 ratio was quite a bit lower than the P/rent ratio from 1976 to 1981 and from 2011 to 2015.

Buy at a High Ratio: Get a Low Future Return?

Shiller also discusses the relationship between the P/E10 ratio and the annualized rate of return from holding S&P 500 stocks for long periods. In general, his results show that the higher the P/E10 ratio at the time of purchase, the lower the resulting multiple year returns, like for the next 10 or 20 years. The west central Indiana farmland and cash rent data from 1960 to 2022 are used to compute 10-year and 20-year annualized rates of return. Returns are the sum of the average of cash rent as a fraction of the farmland price each year, plus the annualized price appreciation over the holding period.

The results for farmland show a negative relationship similar to that exhibited in Shiller's stock data. The 10-year holding period returns for farmland show a strong negative relationship (Figure 4). That is, if one purchased farmland when the P/rent10 ratio was very high, like now, they tended to have a low 10-year rate of return. Alternatively, if one purchased farmland when the P/rent10 was intermediate or low, they tended to have moderate to high 10-year returns. The

10-year returns ranged from a small negative to 20%. The 20-year holding period returns also exhibit a strong negative relationship with the P/rent10 ratio (figure 5). The 20-year holding returns range from 6 to 14%.

As noted above, figure 4 presents the ten-year rate of return for farmland and the P/rent10 ratio for land purchased in west central Indiana from 1960 to 2012. The P/rent10 ratio in 2012 (i.e., 42.3) was higher than any ratio experienced since 1960. Despite this fact, the ten-year rate of return for farmland purchased in 2012 was still 6.9%. The P/rent10 ratios for land purchased in 2013 and 2014 are literally off the chart (horizontal axis of Figure 4). P/rent10 ratios for 2013 and 2014 are 47.5 and 47.3, respectively. The P/rent10 ratio in 2015 is 41.2. From 2016 to 2022, the P/rent10 ratios range from 30 to 36. Will rates of return for land purchased since 2013 stay above 5%? The answer to this question depends on what happens to net returns to land and interest rates. If net returns remain strong and interest rates stay low, the answer to the question is probably yes.

The 20-year rate of return for land purchased in 2002 is 11.3 percent, which is in the middle of the range of 20-year rates of return illustrated in figure 5. It will be interesting to see if the 20-year rate of return declines as the P/rent10 ratio increases in the next few years. For land purchased in 2002 the P/rent10 is 19.2. In the next five years, this rate will increase to approximately 27, and then increase dramatically for land purchased in 2008 on.

Final Comments

Our analysis indicates that the P/rent ratio (price per acre divided by cash rent per acre) is substantially higher than historical values. In order to maintain the current high farmland values, cash rents would have to remain relatively high, and interest rates would also have to remain very low. Most agricultural economists expect crop returns to remain relatively strong in the

next couple of years, mitigating downward pressure on cash rents, and for interest rates to increase from the levels experienced during the last 10 years. This creates at least some downward pressure on the P/rent ratio. Downward pressure on the P/rent ratio, because it is the inverse of the capitalization ratio, corresponds with upward pressure on the capitalization rate.

We demonstrated that farmland values have tended to have a cyclical component in which farmland values move too high relative to the underlying fundamentals and then over time move too low relative to fundamentals. We use a cyclically adjusted P/rent ratio to show that a very high P/rent ratio, as we have now, tends to be associated with low subsequent returns. Simply stated this means that the historical relationships show that those who bought farmland when the P/rent ratio was high tended to have low subsequent returns. On the other hand, those who bought farmland when the P/rent ratio was intermediate or low, tended to have intermediate or high subsequent returns. The current record high P/rent ratio could be a warning to current farmland buyers that their odds of favorable returns on these purchases are probably not high.

Our reading from examining 62 years of history is that the current relationship between farmland prices and cash rents suggests that farmland prices are elevated. If we are correct, this means that those purchasing farmland at current prices may experience “buyer’s remorse” in coming years. But having said this, there remain some possible situations in which farmland values could be maintained or even increase. Positive influences on land include low interest rates, the relatively small percent of land currently on the market, the attractiveness of farmland to pension fund managers, and the fact that land is a good hedge against inflation.

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AGRICULTURAL ECONOMICS REPORT

Article title:	Farmer optimism about short-term US farmland values weakens
Author:	Chad Fiechter, Michael Langemeier, James Mintert
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Farmers purchase the majority of US farmland. The 2017 USDA Census of Agriculture reports more than 60% of farmland is owned by farmers. Farmers' farmland value expectations are an important driver of farmland prices. The *Purdue University-CME Group Ag Economy Barometer* provides a monthly indication of farmers' aggregate short-term and long-term US farmland value expectations. The monthly Ag Economy Barometer survey asks the 400 farmer respondents to provide their farmland value expectations. It's important to note that the barometer is not a panel survey, but instead gather's responses from a different set of farmers each month. Comparability across survey's is maintained by holding survey respondents' enterprise mix constant over time. Since January 2019, the following farmland value expectations questions have been posed monthly.

Short-Term Farmland Value Expectations

Compared to today, what are your expectations for **farmland prices in your area 12 months from now?**
Higher, Lower, or About the Same?

- ☐ Higher
- ☐ Lower
- ☐ About the same

Long-Term Farmland Value Expectations

Thinking long-term, what are your expectations for **farmland prices in your area 5 years from now?**
Higher, Lower, or About the Same?

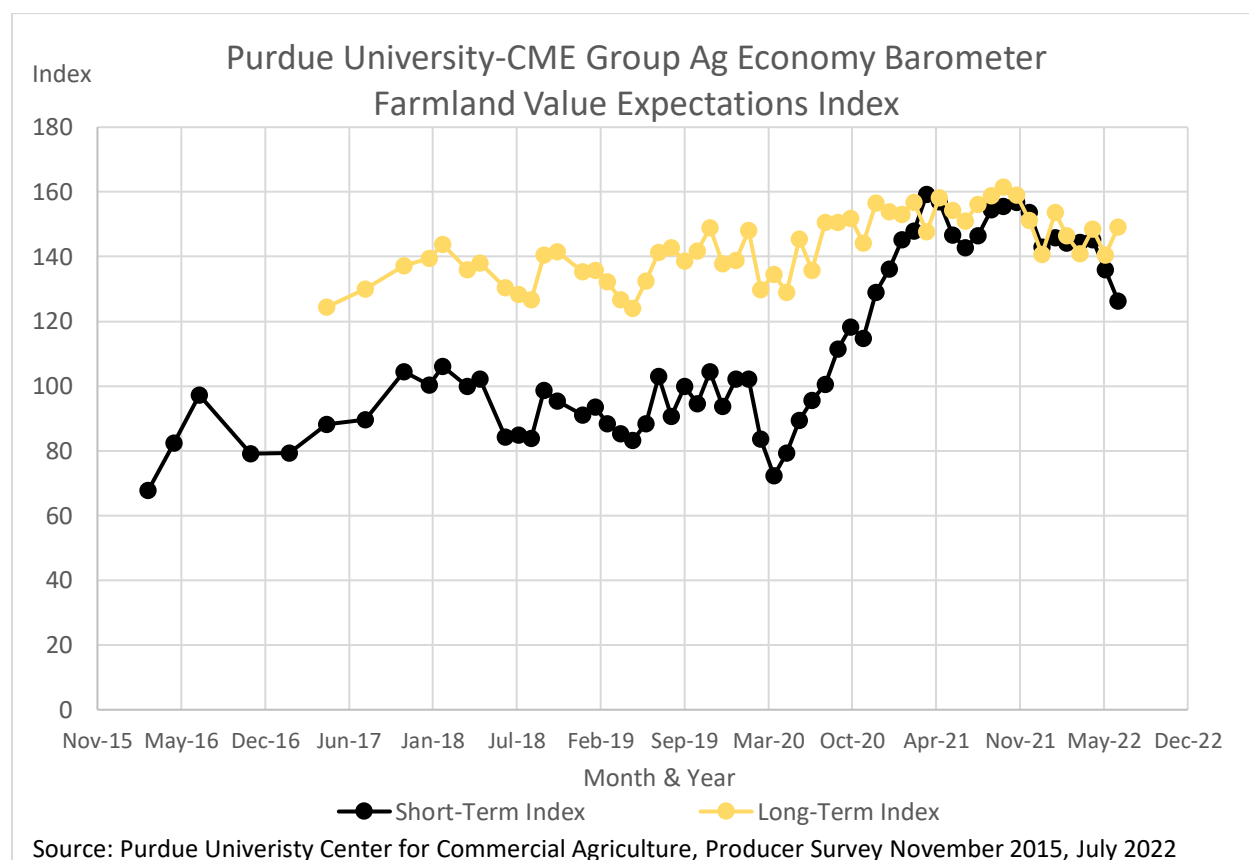
- ☐ Higher
- ☐ Lower
- ☐ About the same

Farmers' short-term farmland value expectations improved dramatically between March 2020 and February 2021 and a new level of optimism remained in place until this summer. Figure 1 presents the index of both short-term and long-term farmland value expectations from the *Ag Economy Barometer*. The index is calculated by subtracting the percentage of farmers indicating "Lower" from the percentage of farmers indicating "Higher" and then adding 100. The *Short-Term Farmland Value Expectations Index* tracked in a stable range from November 2015 until March 2020. In March 2020 there was a brief but steep decline in the short-term index, coinciding with the early part of the COVID-19 pandemic in the

US. A reversal in the index took place in June 2020 and optimism regarding short-term farmland value expectations increased over the following year. The short-term index peaked in fall 2021 and by July 2022 the index was nearly 20 percent below its peak value.

The increase in the *Short-Term Farmland Value Expectation Index* from 2020 into fall 2021 was largely due to farmer respondents shifting their opinions from the “About the same” category to the “Higher” category. The more recent decline in the index occurred primarily as a result of respondents shifting opinions from “Higher” to “About the same”. Figure 2 details the percentage of farmers with short-term farmland value expectations in each category. Note that the *Short-Term Farmland Value Expectation Index* only factors in the percentage of farmers responding either “Higher” or “Lower”. Figure 2 also reveals that there are always some farmers with a short-run negative outlook for farmland values. The share of farmers with pessimistic short-term expectations consistently fell below 10 percent from December 2020 through May 2022. However, the percentage of producers with a negative short-term farmland value outlook began to creep up this summer, rising to 10 percent in June and 12 percent in the July survey.

Figure 1. Purdue University Center for Commercial Agriculture, Producer Survey, Farmland Value Expectations Index



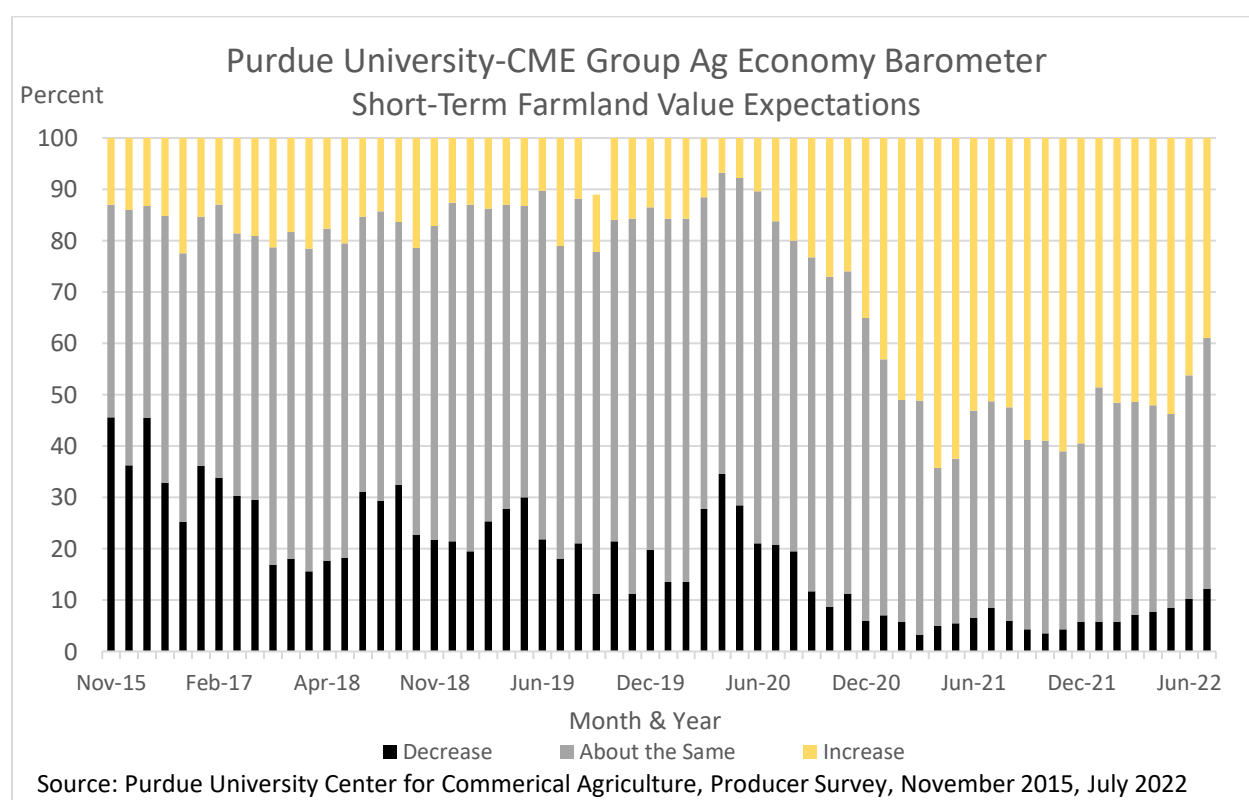
The *Long-Term Farmland Value Expectations Index* provided a much more optimistic view on farmland values than the short-term index from its launch in spring 2017 until fall 2020. However, in the fourth quarter of 2020 the spread between the two indices narrowed sharply as producers short-run outlook

became much more optimistic. The two indices tended to track each other through 2021 and the first half of 2022. However, due to the recent decline in the short-run index, the long-term index is once again at a large premium to the short-run index. The relative premium shifted from a 5 point spread in June to a 23 point spread in the July survey. Recent barometer surveys have posed a follow-up question to respondents who expect farmland values to rise over the next five years, asking them for the primary reason they think values will rise. Overwhelmingly, respondents have indicated they expect the two most important factors to be non-farm investor demand and inflation.

The monthly farmland value expectation index of the *Purdue University-CME Group Ag Economy Barometer* offers farmland stakeholders a frequent and interesting assessment of farmland value expectations. The relationship between farmers' short-term and long-term farmland value expectations could provide timely insights into developments in the US farmland market.

For monthly updates on the *Ag Economy Barometer* and the *Short-Term and Long-Term Farmland Value Expectations Index* visit: <https://ag.purdue.edu/commercialag/ageconomybarometer/>

Figure 2. Purdue University Center for Commercial Agriculture, Producer Survey, Short-Term Farmland Value Expectation Response Percentages



Reference

USDA National Agricultural Statistics Service, *2017 Census of Agriculture*. Complete data available at www.nass.usda.gov/AgCensus

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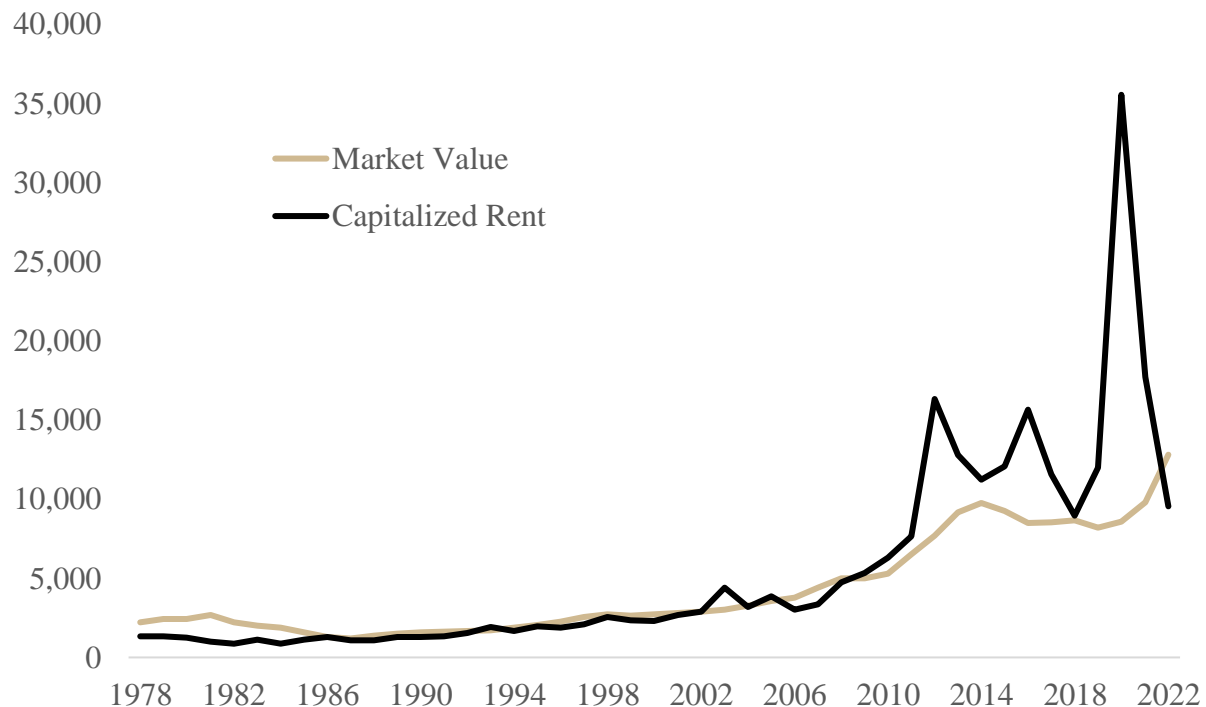
Article title:	Increasing Concern of a Bubble in Indiana Farmland Prices
Authors:	Todd H. Kuethe, Mohammad Haseeb Daudzai, and Pete Drost
Article ID:	PAER-2022-25
Publication date:	August 10, 2022
Summary:	The recent rise in farmland prices has many market participants concerned of a potential farmland price bubble, where the prices exceed the true value of the asset.

Indiana farmland prices grew at a record pace between 2021 and 2022 (Kuethe, 2022). Given recent experiences with fluctuations in the broader economy and prior farmland prices dynamics, many market participants express concern that the rapid increase in farmland prices is a signal of a speculative bubble. Economists define a speculative bubble as instances when an asset's market price is higher than the discounted value of all future payouts the asset is expected to generate. In other words, the market price of an asset exceeds a value that can be justified by the returns that accrue to owners.

Speculative bubbles can be harmful even before they burst. Bubbles can encourage reckless investing, pulling capital away from more productive uses. By artificially raising market prices, bubbles limit market entry. When a bubble bursts, it brings additional damage to an economy. A rapid price fall harms asset owners nearing retirement who cannot wait for a recovery. When a bubble bursts, lenders may respond to the increased risk by tightening the access to credit which may further reduce overall productivity.

While bubbles are a significant threat to market participants, they are difficult, in practice, to measure or observe. One way economists attempt to measure an asset price bubble is to examine the relationship between market prices and its discounted returns. For example, the gold line in Figure 1 plots the average price per acre for top quality Indiana farmland from 1978 to 2022. The black line represents the discounted returns to ownership as captured by the capitalized value of cash rents. The capitalized value of cash rents is obtained by dividing current cash rental rates by a discount rate, in this case the market yield on U.S. Treasury securities at a 10-year constant maturity. The relatively simple model suggests that farmland prices may be driven by a speculative bubble when the market value (gold line) exceeds the capitalized rent (black line).

Figure 1: Market Value and Capitalized Rent for Top Quality Indiana Farmland, 1978 – 2022



Many economists argue that the 1980s Farm Financial Crisis was driven, in large part, by a speculative bubble in farmland prices. For example, in 1981 the average cash rent per acre for top quality farmland in Indiana was \$137, and the market yield on the 10-year Treasury was 13.5%. Dividing 137 by 0.134, yields a capitalized rent of \$1,022 per acre. The average market price for an acre of top quality farmland in 1981, however, was \$2,679. Thus, the market values greatly exceeded a value that could be justified by a function of cash rent and discount rates. The same pattern was observed between 1978 and 1985.

This is contrasted by the relationship between market values and capitalized rents during the farmland price boom of the early 2000s. For example, in 2011, the average per acre cash rent for top quality Indiana farmland was \$230, and the market yield on the 10-year Treasury was 3.0%. This yields a capitalized rent of approximately \$7,557 per acre, which was above the average per acre market price of \$6,521. Thus, while farmland prices grew at an exceptionally high rate of 22.8% in 2011, the simple capitalization model suggested that investors could justify farmland prices that were even higher.

In 2022, the market value for top quality farmland again exceeds the value implied by capitalized rents. The average per acre cash rental rate for top quality farmland in 2022 is \$300. The market yield for the 10-year Treasury in June of 2022 averaged 3.1%. Thus, the capitalized rent is estimated at approximately \$9,677 per acre, well below the market average price of \$12,808 per acre.

It is important to note that it is difficult to conclude that Indiana farmland prices are currently in a bubble. It should be noted that, since 1978, the capitalized rental rate exceeded the market value roughly 60% of the time. There is an old adage that all models are wrong but some are useful. The model depicted in Figure 1 is subject to a number of important assumptions. First,

while cash rents are important source of returns to farmland ownership, there a number of other sources that the model ignores, such as development potential or recreational access. Second, there a number of candidate discount rates beyond the 10-year Treasury that would influence the capitalized value. Third, the rental rates and market values were obtained are *averages*, and both values may vary significantly across parcels. Thus, to conclude that farmland prices are currently in a bubble would require the strong assumption that this simple model accurately captures all of the relevant economic forces that drive the true discounted returns to farmland ownership. However, the simple model does suggest that if discount rates continue to increase, farmland prices should be expected to decline without marked increases in the returns to ownership.

Economists also define bubbles based on more subjective measures derived from market participants. Speculative bubbles can emerge when market participants have differing expectations of future asset values and returns, and market pessimists are prevented from tempering market prices. To capture the unseen expectations of market participants, Pesaran and Johnsson 2020 developed a bubble potential measure. The measure operates under the assumption that if market participants think current asset prices are too high, they should expect future prices to decline and vice versa. However, if the market participants think current asset prices are too high and they expect future prices to increase, this could be evidence of an asset price bubble. Synthesizing the above assumptions, Pesaran and Johnsson 2022 employed the use of a double-question survey. Survey participants were first asked if asset prices were too high, too low, or just right, and following this, were asked to give an expected future price for the same asset. If responses deviated from the original assumptions – asset prices were judged to be too high, but the participant expected a higher future price – the participant would be given a bubble indicator (the inverse of this scenario would apply for a crash indicator). Indicators would then be summed for the entire sample to measure the potential of a bubble or crash.

As shown in Figure 2, the share of *Purdue Farmland Value and Cash Rent* survey who thought top quality farmland prices were too high increased from 36% to 65% from 2021 to 2022. In addition, 27% of respondents thought current farmland prices were too high but expected prices to continue to increase over the next six months (through December 2022), the next eighteen months (December 2023), and five years (June of 2027). Thus, over a quarter of all respondents have expectations consistent with farmland price bubbles. Across all three horizons, concern for a potential bubble has increased between 2021 and 2022.

Figure 2:

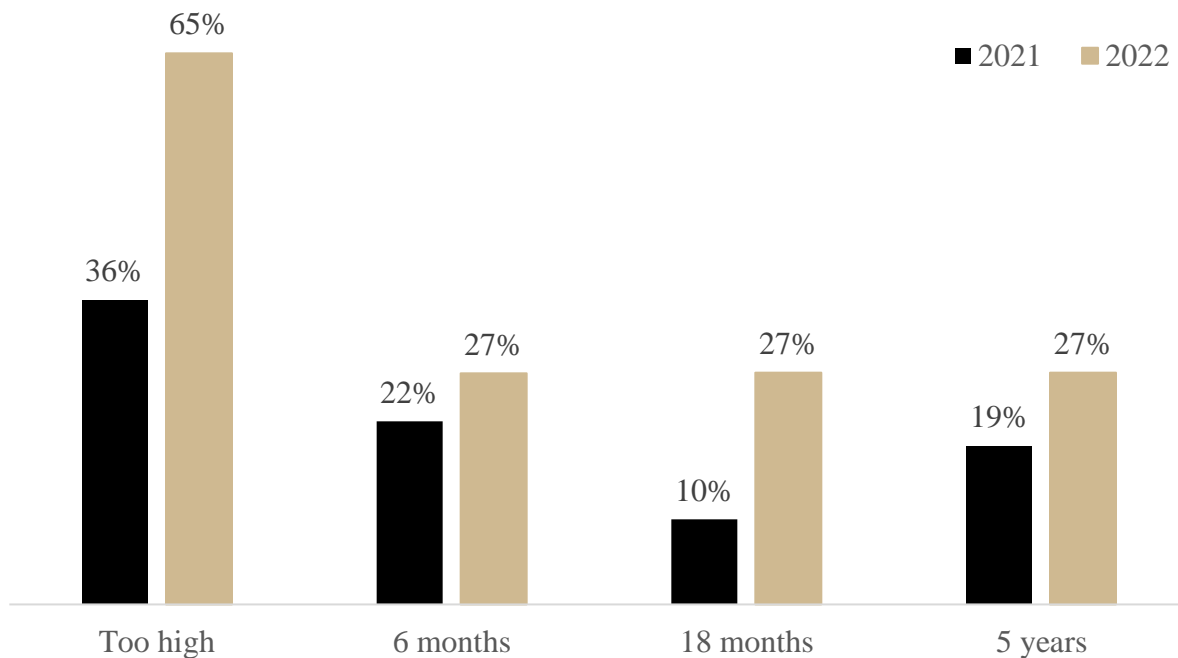


Table 1 shows that concern for a potential bubble in farmland prices varies by region, soil quality type, and expectation horizon. In 2022, the Central region had the largest share of respondents who think current farmland prices are too high, between 82% and 86% of respondents. Only 23% to 27% of Central region respondents thought prices were too high and expected prices to increase over the next six or eighteen months. However, 41% of Central region respondents felt that current prices are too high and expected prices to increase over the next five years. The Northeast region had the largest share of respondents who expect a farmland price bubble in 2022, with between 30% to 43% of respondents expecting a bubble over a six or eighteen month horizon.

Going Forward

Given the record appreciation in Indiana farmland prices in 2022, market participants may be concerned of a speculative bubble. A relatively simple model based on current discount rates and cash rents suggests that 2022 farmland prices are greater than can be justified by market fundamentals. A majority of respondents to the *Purdue Farmland Value and Cash Rent Survey* believe that current market prices are too high, and a modest share of respondents expect prices to continue to increase. For future increases to be justifiable, farmland returns would need to increase or discount rates would need to decline. Most economists expect interest rates to continue to increase as a result of inflationary pressure and economic uncertainty. Thus, for farmland prices to remain at record high levels, farmland returns would have to increase in tandem with interest rate increases.

Table 1: Bubble Expectations among *Purdue Farmland Value and Cash Rent Survey* Respondents, 2021 & 2022

		2021				2022			
			Horizon				Horizon		
Area	Land Class	% Too high	6 months	18 months	5 years	% Too high	6 months	18 months	5 years
Indiana	Top	36%	22%	10%	19%	65%	27%	27%	27%
	Average	43%	22%	14%	19%	65%	26%	25%	26%
	Poor	45%	18%	14%	21%	67%	23%	23%	25%
North	Top	26%	16%	11%	11%	41%	6%	6%	6%
	Average	21%	16%	5%	5%	41%	6%	6%	12%
	Poor	26%	11%	11%	11%	59%	6%	12%	18%
Northeast	Top	46%	21%	13%	33%	65%	39%	39%	30%
	Average	63%	29%	17%	38%	65%	39%	39%	22%
	Poor	63%	21%	13%	13%	70%	30%	43%	22%
W. Central	Top	39%	29%	11%	14%	75%	29%	39%	29%
	Average	50%	29%	18%	21%	64%	25%	32%	25%
	Poor	50%	21%	18%	25%	61%	25%	18%	21%
Central	Top	44%	30%	15%	26%	82%	27%	27%	41%
	Average	48%	26%	22%	22%	86%	27%	27%	41%
	Poor	44%	19%	19%	19%	82%	27%	23%	41%
Southwest	Top	33%	27%	13%	20%	38%	13%	13%	25%
	Average	47%	27%	20%	20%	75%	38%	25%	50%
	Poor	53%	33%	20%	20%	75%	13%	25%	38%
Southeast	Top	31%	6%	0%	13%	71%	29%	14%	29%
	Average	38%	6%	0%	13%	57%	14%	0%	14%
	Poor	44%	6%	6%	19%	57%	14%	0%	14%

References

- Kuethe, T.H. (2022) “Indiana Farmland Prices Grow at Record Pace in 2022” *Purdue Agricultural Economics Report*, August 2022.
- Pesaran, M.H. and I. Johnsson (2020) “Double-Question Survey Measures for the Analysis of Financial Bubbles and Crashes” *Journal of Business Economics and Statistics* 38 (2): 428-442.