

2nd Quarter 2011 | 26(2)

THEME OVERVIEW: FARMLAND VALUES

Jason Henderson and Brent Gloy

JEL Classifications: Q14, Q15

Keywords: Farmland, Land Values, Farm Real Estate

Farmland values are often viewed as the bellwether for the U.S. farm sector. Historically, booming farm incomes have been quickly capitalized into farmland values. Over the past year, cropland values in the Corn Belt have jumped more than 25% above year ago levels according to various university and Federal Reserve surveys. Moreover, rangeland values are posting strong double-digit gains in some regions of the country.

Farmland values, however, are shaped by more than farm incomes. Interest rate shifts affect the rate at which income flows are capitalized into farmland values. Urbanization and recreation use for hunting, fishing, and wildlife watching have also transformed nonfarm demand for land in many parts of the nation. At the same time, the supply of U.S. farmland for sale remains limited. Together, strong farm and nonfarm demand and the relatively limited number of farm sales have propelled sharp increases in U.S. farmland values.

Despite rising farmland prices, risks remain. While inflation adjusted farmland values have reached record highs, what are the risks that they could retreat once again? Farmland values are capable of falling just as sharply as they have risen, as evidenced by the 1970s farm boom and the 1980s farm bust. The volatility in agricultural prices has increased and farm incomes have fluctuated widely over the past decade. Although the crisis of the 1980s is nearly 30 years behind us, memories of the financial hardship and personal loss that it caused remain and frequently cause people to question whether a repeat of the 1980s is in store for the agricultural sector.

This Choices theme explores recent farmland value trends and the risks to farmland markets. The issue is organized into two broad sections. The first consists of four articles selected to provide readers with background on farm and pasture land value trends, valuation basics, and the role of debt in farmland ownership. The second section includes two articles that examine how changes in factors such as income, interest rates, or urban pressures influence farmland values. It is our hope that readers of the issue will gain some perspective on farmland values, the factors that determine these values, and how values might change as economic conditions shift.

Jason Henderson (Jason.Henderson@kc.frb.org) is Vice President and Omaha Branch Executive, Federal Reserve Bank of Kansas City, Omaha, Nebraska. Brent Gloy (bgloy@purdue.edu) is Associate Professor and Director of the Center for Commercial Agriculture, Purdue University, West Lafayette, Indiana.

The views expressed are those of the authors and do not necessarily reflect the positions of the Federal Reserve Bank of Kansas City, the Federal Reserve System, or Purdue University.

© 1999-2011 Choices. All rights reserved. Articles may be reproduced or electronically distributed as long as attribution to Choices and the Agricultural & Applied Economics Association is maintained.

**The farmdoc project distributes Choices in partnership with
the Agricultural and Applied Economics Association.**

[click here to visit choicesmagazine.org >>](http://choicesmagazine.org)

2nd Quarter 2011 | 26(2)

THE CURRENT SITUATION ON FARMLAND VALUES AND OWNERSHIP

Michael Duffy

JEL Classification: Q15

Keywords: Farmland Values, Farmland Ownership, Speculative Bubble, Land Purchases

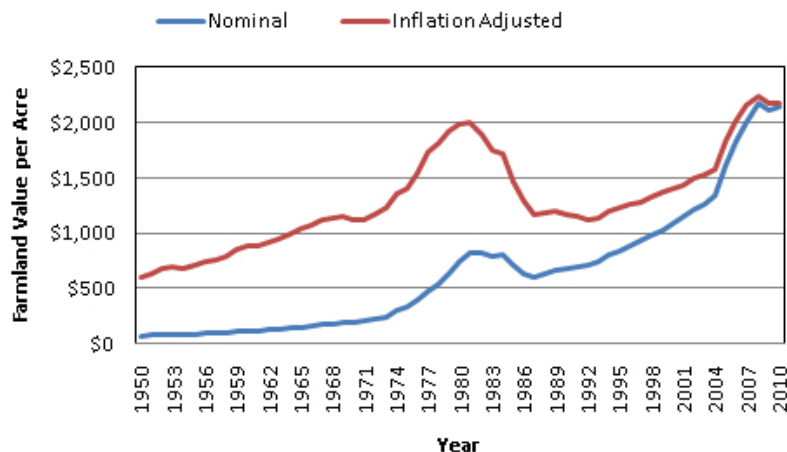
Farmland values are increasing at rates not seen since the 1970s. Two recent land value surveys reported a 22% increase in Nebraska from February 2010 to February 2011, and prices up 25% in Iowa from March 2010 to March 2011. (Johnson, Wilson, and Van Newkirk, 2011; Iowa Farm and Land, Chapter 2, 2011) Other surveys have reported double digit increases in farmland values throughout the Midwest and Great Plains states. (Federal Reserve Bank; Schnitkey, 2011)

Soaring farmland values have led many people to raise the question of whether or not farmland is on a speculative 'bubble' and due for a price correction. The rapid increases in land values during the 1970s were followed by considerable personal, financial and social disruption when the values collapsed in the early 1980s. The 1970s was a truly unique and unprecedented period in U.S. history. Starting in 1972, real farmland values in the United States rose more than 7% a year for 10 consecutive years. In comparison, real land values in the United States rose 3.2% annually from 2005 to 2010 as farmland values fell during the recession in 2009.

Over the past year, farmland values have rebounded, but questions regarding the sustainability of these elevated land values remain. This paper discusses current farmland value trends and the changes in farmland ownership. Strong economic fundamentals—rising incomes and a limited number of farms for sale—appear to be driving recent land price gains. In addition, much of the farmland is owned by older farmers with little intent to sell. Farmland values will be shaped by economic returns and the highly volatile markets make the future path of farmland values very uncertain.

Current Farmland Value Trends

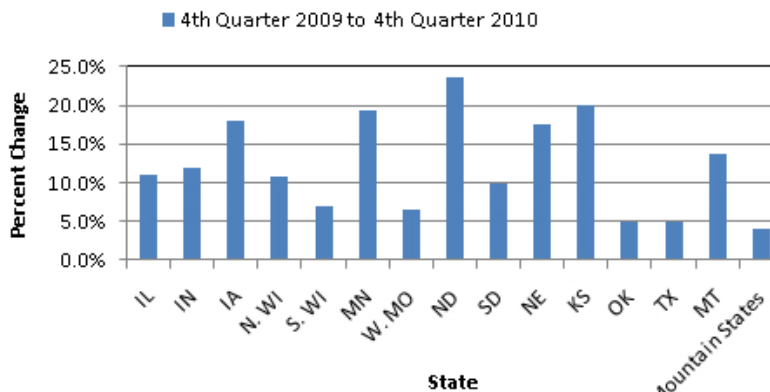
Figure 1: United States Nominal and Inflation Adjusted Land Values, 1950-2010



Source: USDA

Farmland values have fluctuated over time, especially during the 1970s, 1980s and the past five years. Based on USDA data reporting January 1 farmland values, from 1950 to 2010, after adjusting for inflation, U.S. farmland values reached a record high in 2006, with a nominal peak in 2007 (Figure 1).

Figure 2: Percent Change in Nonirrigated Cropland Values, Fourth Quarter 2009 to Fourth Quarter 2010



Source: Federal Reserve Bank of Kansas City

After easing in 2009, farmland values are again on the rise. Based on quarterly data from the Federal Reserve surveys of agricultural credit conditions, U.S. farmland values appreciated sharply in 2010. In fact, in some states, farmland values jumped more than 15% during the year (Figure 2).

The increase in land values is continuing in 2011 and in some states the rate of increase is even accelerating. Participants attending the 84th annual Soil Management and Land Valuation Conference held at Iowa State University May 11, 2011 projected that Iowa land values would increase 33% from November 2010 to November 2011. Since 1964, conference participants have accurately projected land values within 2% of Iowa State University's land value estimate, despite badly missed projections during the increases in the 1970s and the decreases in the 1980s.

Reasons for the Increasing Land Values

There are many reasons for today's rising land values. Most are based on sound economic fundamentals. Over the past decade, real net farm incomes have averaged almost \$70 billion per year, more than 10% above the 1990s average. The expectation is that farm incomes will remain high for at least the next year or so. In addition, farm wealth is on the rise as farmers appear to not be using as much debt as was used in the 1970s. In fact, it appears that farmers are using at least a portion of the new found income and wealth to pay off debt at a near record pace. Further evidence that market discipline still exists is that farmland values fell when farm incomes dropped in 2009. In the 1970s, farmland values continued to rise after contractions in farm income.

In addition, there has been a substantial decrease in farmland sales, which is attributable to the lack of farms being put on the market, not a lack of demand for farmland. Farmland owners are apparently not selling their farm real estate assets at least until their alternative investment options improve. Finally, farmers are the primary purchasers of farmland and they are buying the land for long-term ownership. Most farmers do not buy farmland with the intent to sell it in order to capture capital gains, and many hold onto land as long as they are financially able to own it.

Still, some of the recent increases may be due to more transitory factors that are not sustainable. For example, we are in unprecedented times with respect to the monetary and fiscal policies. These policy decisions were made as a result of the severe economic downturn. But, the policies encourage borrowing and they also increase the attractiveness of more risky investments. In the case of interest rates, in the fourth quarter of 2010, both the Chicago and the Kansas City Federal Reserve banks reported the lowest real estate interest rates in their data series. Lower interest rates make borrowing cheaper but also decrease the rate of return in alternative investments. Other things equal, lower returns elsewhere in the economy increase the demand for farmland.

In many states, farm income is projected to be strong and farmers are repaying their debts. In fact, USDA reports that inflation-adjusted farm real estate debt has declined since 2008. When farmers do take on new debt, there doesn't

appear to be an irrational exuberance. With interest rates low, the demand for farmland exceeding the supply of land for sale and with strong commodity prices, land values should continue to increase or at least maintain their current levels for the foreseeable future.

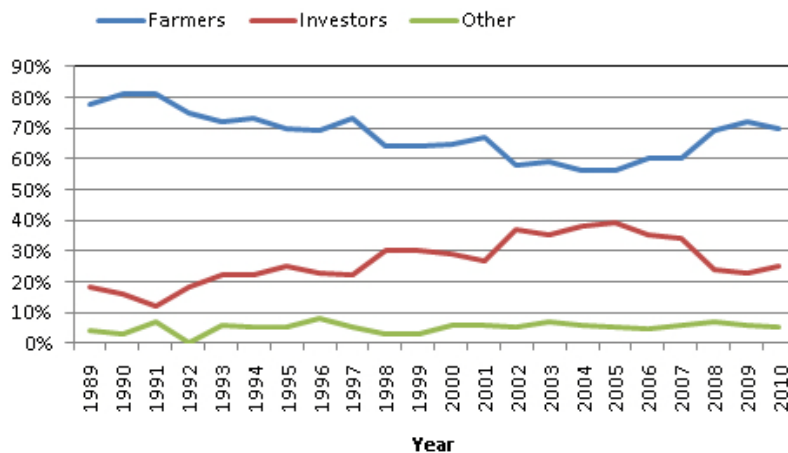
Who is Buying Farmland?

Another issue surrounding land values and the current situation is the changing nature of the land ownership. The changing demographics of land owners will have an influence on who will farm the land and how it will be farmed. There are two trends in land ownership that warrant consideration. One trend is who is buying the land and the other is the aging land owner population.

Who is buying farmland is a subject of much discussion. Anecdotal evidence suggests that there has been a significant increase in institutional and fund purchasing. Yet, data from the Midwest shows that existing farmers remain the primary purchasers of farmland. (Duffy, 2011b; Schnitkey, 2011) As a result, farmland is purchased primarily by existing farmers. In Iowa, during 2010, 70% of the land was purchased by existing farmers. In Illinois, 56% of the buyers were farmers. Other states show similar trends.

Moreover, who is allowed to buy farmland depends on the area of the country. In some areas, farmland ownership is restricted. For example, eight states have restrictions on corporate land ownership and 11 states have some level of restriction on foreign ownership.

Figure 3: Who Purchased Iowa Farmland: 1989 to 2010



Source: Iowa State University

Still, there has been a recent shift in who is purchasing farmland. Although farmers represent the majority of purchasers in many states, the relative percentage of land bought by farmers had decreased while investor purchases have increased. From 2000 to 2007, the percentage of Iowa farmland purchased by farmers fell below 60%, compared to 80% in the early 1990s (Figure 3). At the same time, the percentage of land purchased by what were classified as investors rose from less than 20% in the early 1990s to almost 40% in the mid 2000s. During the early part of the past decade many investors were using IRS 1031 like-kind tax exchanges in purchasing farmland. With the recent increase in income, farmers have become more aggressive in the farmland market, but so have investors. The collapse in the urban real estate market and the drop in interest rates caused many investor and fund groups to look to farmland as an alternative investment opportunity, increasing the demand for farmland.

Yet, when transferring farmland ownership, few owners expected to sell the land to nonfamily members. In 2008, only 8% of Iowa farmland owners indicated they intended to sell the land outside the family. The rest of the land was either going to be inherited, gifted, sold to the family, put into trust or disposed of in some other manner. Interestingly, in 1982, 13% of the land was going to be sold outside the family. (Duffy and Smith, 2008)

It is unclear, whether or not people will carry out their intentions regarding the disposition of their land. However, there does not appear to be any increase in the amount of land being sold on the market, at least not in Iowa. The

preliminary results of the study examining Iowa land sales data shows 1.5% of Iowa's cropland was sold in 1990, 1.9% was sold in 2005, 1.3% sold in 2009 and 1.4% sold in 2010.

Despite sharp land value increases in 2007, rising land values had little effect on Iowa landowner plans. When asked about the impact of rising land values, 80% of the owners said higher farmland values would have no impact on their plans regarding keeping or selling their land. Moreover, 54% said higher farmland values would have no impact on land purchase plans, while another 43% said they were less likely to buy land. (Duffy and Smith, 2008)

Who Owns Farmland?

A significant factor when considering the current increase in land values and future sales is the age of the landowner. Although national data has limitations, it provides ample evidence that the farmland owners are aging and that there is an increasing percentage of the land owned by people in the older age cohorts.

A 1999 national study, in conjunction with the 1997 Census of Agriculture, discussed the age structure of American farmland owners. The study found that 28% of the owners with 29% of the land were over 70 years of age (USDA, 1999). In comparison, a similar report in 1988 using 1987 Census data reported 25% of the owners were over 70 years of age. In just one decade there was a 3% increase in the percent of farmland owners over 70 years of age.

Since 1956, Iowa State University has conducted a land ownership survey every five years. These studies also find that the age of the farmland owner is increasing. In 1982, 12% of Iowa's farmland was owned by someone over 74 years of age. By 2007, 28% of the farmland was owned by someone over 74 years of age. Expanding the age brackets shows the percentage of Iowa farmland owned by someone over 65 years of age increased from 29% in 1982 to 55% in 2007 (Duffy and Smith, 2008). Moreover, the percent of land owned by people who did not live in Iowa or only lived there part-time increased from 6% in 1982 to 21% in 2007. (Duffy and Smith, 2008)

More recent studies in Iowa and elsewhere support the findings that farmland is increasingly being held in the hands of the elderly. (Abdulla, 2009; Liu, Fleming, Pagoulatos, and Hu, 2010; Arbuckle et al, 2008; Petrzalka, Bauman, and Ridgely, 2009). The literature also shows the aging land owner is not a new phenomenon. In 1949, Timmons and Barlowe reported that the percent of farmland owners over 65 years of age in the North Central region increased from 12% in 1900 to 26% in 1946 (Timmons and Barlowe, 1949).

Will this change of ownership increase the amount of land for sale and have a dampening impact on land values? No one knows for sure but the evidence suggests that there will not be a large increase in the amount of land for sale, at least not in the foreseeable future. It appears that the aging landowners will transfer the land primarily to their families and not go through the market. What is not known is what the next generation of owners will do with the land. The indications are that the first inheritors will keep the land but what the subsequent generations will do with the land remains to be seen.

Concluding Comments

Farmland values are rising at their fastest pace since the 1970s, raising questions about a speculative bubble with respect to farmland. Currently, the supply and demand fundamentals are supportive of today's rising land values. But, there are several factors to consider. The current land rent to land value for farmland is at the lowest level it has ever been. If this ratio returns to its historical levels, will the change be driven by an adjustment to land values or cash rents? A study comparing stock market returns, as measured by the Standard and Poor's 500 Index, to Iowa farmland shows that the only years returns on an investment in the stock market exceeded those on Iowa farmland was for farmland purchased during the 1970s and early 1980s (Duffy, 2011a), the last time we experienced such a rapid increase in farmland prices. Monetary and fiscal policies are other factors to consider because they will impact the health of the agricultural economy and land values.

Land is the residual claimant to income in agriculture. With the current and projected levels of income for the sector expected to remain high, land values could increase further. But, as has happened in the past, rising land values, cash rents, and the other costs of production could remove excess profits. As a result, farm analysts must remain vigilant in watching farmland value trends. The longer land values increase at current rates, the greater the tendency to think farmland values will always increase; an attitude which led to the unbridled exuberance in the farmland market of the 1970s and in the urban housing market in the recent time frame. With low interest rates and easy credit, the likelihood of assuming too much debt will increase as well.

Farmland values and issues surrounding farmland ownership have fluctuated over time. Concerns over soil conservation, absentee owners and the ability to start farming have also shifted over time. What has not changed is the increasing age of the farmland owners. Land is a unique asset. Once owned, most people want to keep it. Farmers buy land to own it, not to sell it. The land becomes part of their business, part of their retirement plan, and a part of their legacy. Yet, over time, farmland values and farmland ownership have shifted with changing economic fortunes on the farm. With increased volatility in crop markets, future shifts in farmland values and farm ownership trends are likely.

For More Information

Abdulla, M. (2009), *The Impact of Ownership on Iowa Land Owners' Decisions to Adopt Conservation Practices*, PhD Dissertation, Graduate Program in Sustainable Agriculture, Iowa State University, Ames, Iowa.

Arbuckle, J., Valdivia, C., Raedeke, A., Green, J., and Rikoon, S. (2008). Non-operator landowner interest in agroforestry practices in two Missouri watersheds in Agroforest Systems. Springer Science and Business Media, DOI 10.1007/s10457-008-9131-8

Briggeman, B. and Akers, M. (2011). *Farmland Values and Farm Income Soar*. Federal Reserve Bank of Kansas City. Available on line: <http://www.kansascityfed.org/agcrsurv/agcrmain>

Duffy, M. (2011a). Comparing the Stock Market and Iowa Land Values; A Question of Timing. *Iowa State University Agricultural Decision Maker Newsletter*, April 2011.

Duffy, M. (2011b). *2010 Iowa Land Value Survey*. Iowa State University Extension, FM 1825.

Duffy, M. and Smith, D. (2008). *Farmland Ownership and Tenure in Iowa 2007*. Iowa State University Extension, PM1983.

Federal Reserve Bank of Kansas City. (2011). National Trend in Farm Lending. *Agricultural Finance Databook*.

Iowa Farm and Land Chapter 2, Realtors Land Institute, (March 22, 2011) Iowa Land Values, Press Release, <http://www.rlifarmandranch.com>

Johnson, B., Wilson R., and VanNewkirk, S. (March 16, 2011). Nebraska Agricultural Land Markets Showing Strong Gains. *Cornhusker Economics*. University of Nebraska-Lincoln.

Liu, Z., Fleming, R., Pagoulatos, A., and Hu, W. (2010). The Supply of Private Acreage for Public Recreational Use in Southern and Central Appalachia. *Growth and Change*, 41 (4) 540-555.

Oppedahl, D. (2011). *Ag Letter*. Chicago Federal Reserve Board, Number 1951, Feb. 2011.

Petrzelka, P., Buman, T., and Ridgely, J. (2009). Engaging absentee landowners in conservation practice decisions: A descriptive study of an understudied group. *Journal of Soil and Water Conservation*, 64(3), 94A–99A.

Timmons, J.F. and Barlowe, R. (1949). *Farm Ownership in the Midwest*. North Central Region publication no. 13, Research Bulletin 361, Iowa State College, June 1949.

Schnitkey, G. (2011). Rapidly Increasing Farmland Prices, 2011. *Illinois Farmland Values and Lease Trends*. Illinois Society of Professional Farm Managers and Rural Appraisers.

United States Department of Agriculture National Agricultural Statistics Service. (2010). *Land Values and Cash Rents 2010 Summary*. Available on line: <http://usda.mannlib.cornell.edu/usda/current/AgriLandVa/AgriLandVa-08-04-2010.pdf>

United States Department of Agriculture National Agricultural Statistics Service. (1999). *Agricultural Economics and Landownership Survey*. Available on line: http://www.agcensus.usda.gov/Publications/1997/Agricultural_Economics_and_Land_Ownership/index.asp

Michael Duffy (mduffy@iastate.edu) is Professor in the Department of Economics, Iowa State University, Ames, Iowa.

© 1999-2011 Choices. All rights reserved. Articles may be reproduced or electronically distributed as long as attribution to Choices and the Agricultural & Applied Economics Association is maintained.

**The farmdoc project distributes Choices in partnership with
the Agricultural and Applied Economics Association.**

[click here to visit choicesmagazine.org >>](http://choicesmagazine.org)

2nd Quarter 2011 | 26(2)

PASTURE LAND VALUES: A "GREEN ACRES" EFFECT?

Damona Doye and B. Wade Brorsen

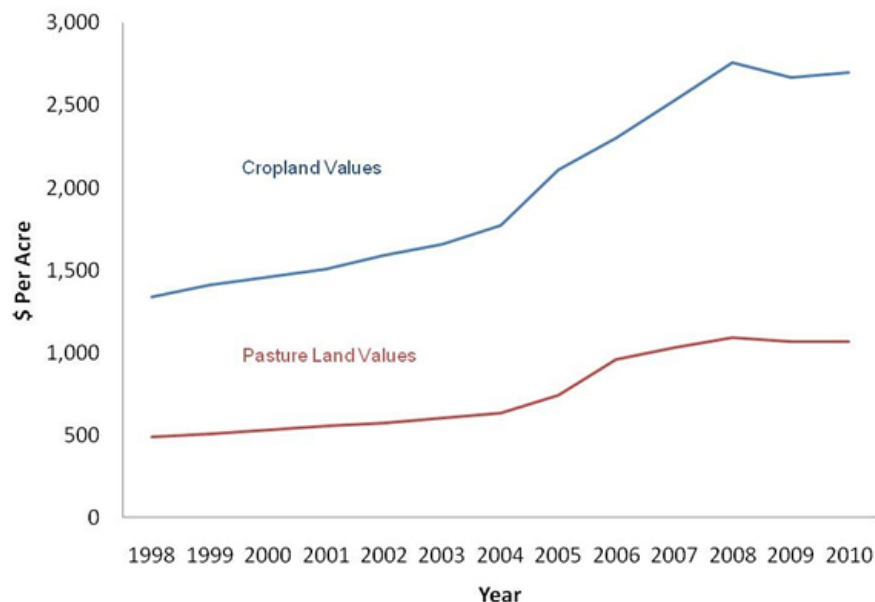
JEL Classification: Q13

Keywords: Pasture, Land Values, Rental Rates, Rent-to-Value

While cropland prices have received considerable attention in the popular press, pasture land prices have also increased significantly in recent years. The predominant forages on pasture land differ across the United States but regardless of the forage type, pasture land is primarily used for beef production. The factors contributing to agricultural returns to pasture are very different than for cropland and not just because cowboys are different than farmers. As in the old TV show "Green Acres", many urban dwellers have an affinity for country living. Pasture is also valued for recreational uses such as hunting.

The 2007 National Resources Inventory (NRI) reports 409 million acres of rangeland and 119 million acres of improved pastureland for the contiguous 48 states, which is 21% and 6%, respectively, of the 1.9 billion acres of land and water. In comparison, cropland accounts for 18% of the total with 2% in the Conservation Reserve Program. Rangeland is covered primarily by native grasses and plants while improved pastureland has introduced plants. The distribution of these two types of pasture is different from east to west in the United States. With the exception of Oklahoma and Florida, the land in pasture is more than 80% rangeland in states in the western half of the United States and 80% or more improved pastureland in the eastern half. Oklahoma's pasture is 63% rangeland and Florida's pasture is 58% improved pasture.

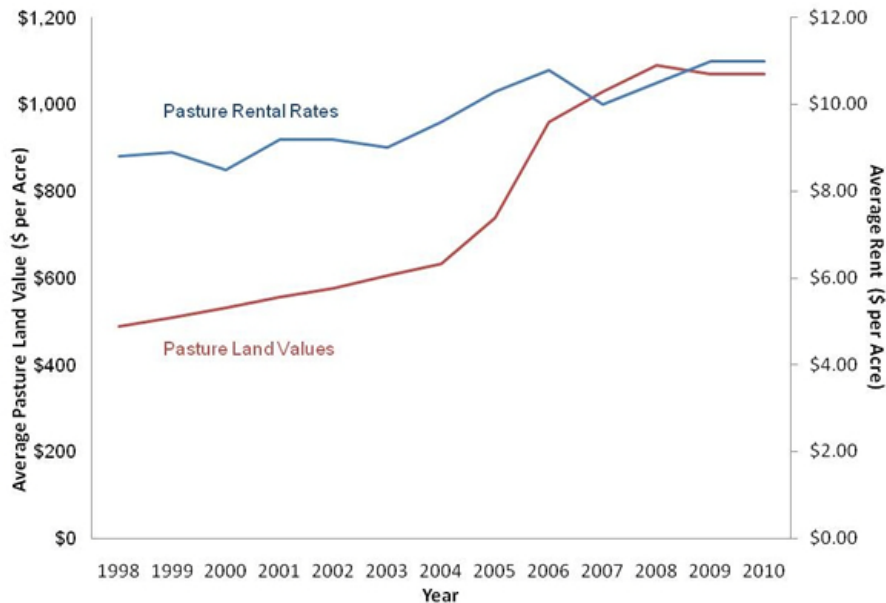
Figure 1: Average U.S. Pasture and Cropland Values, 1998-2010 (\$/acre)



Source: USDA Land Values and Cash Rents, Various Issues

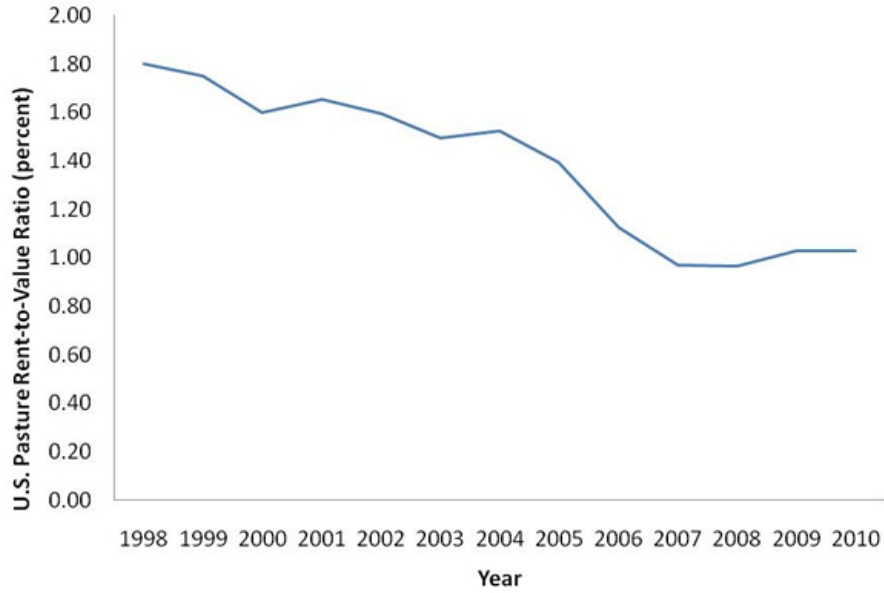
Like cropland, pasture land values which includes both improved pasture and rangeland have risen dramatically in recent years (Figure 1). While the average value has leveled off, U.S. pasture values have approximately doubled in the last ten years. Though USDA Agricultural Resource Management Survey data showed farm operator household farm income for beef cattle operations declined from 2005 through 2009, land values continued to go up. Over the last ten years, pasture rental rates have increased much less and when beef profitability slowed, rental rates adjusted more quickly (Figure 2).

Figure 2: Average U.S. Pasture Land Values and Rental Rates, 1998-2010 (\$/acre)



As shown in Figure 3, pasture rent-to-value ratios have been mostly decreasing since 1998 with a larger decrease from 2005 to 2007, now stabilized at about 1%. U.S. average pasture rent-to-value ratios, historically lower than those of cropland, averaged 1.28 for 2000 to 2010 compared to 3.87 for cropland. Part of the explanation for pasture land owners' historical acceptance of relatively low returns is that the livestock enterprises on pasture, particularly beef and horses, often include a lifestyle component for which people are willing to earn less. Pasture suffers less erosion and so it is losing little of its long term value while some cropland is losing value due to erosion and that may partly explain the higher rent-to-value ratios for cropland. But, clearly if the agricultural rental value were the only return from owning pasture, it would be a rather poor investment.

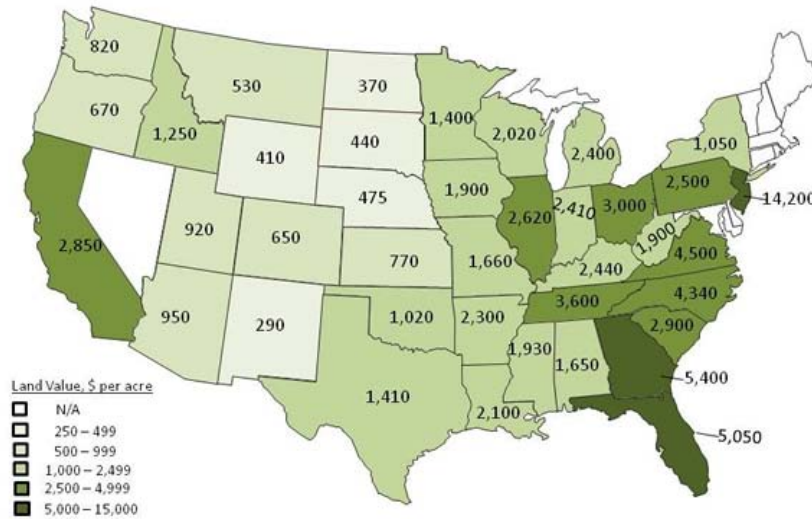
Figure 3: U.S. Pasture Rent to Value Ratio, 1998-2010 (percent)



Source: Calculated from USDA Land Values and Cash Rents, Various Issues

Figure 4 shows the variability across states in average pasture values. A comparison of Figure 4 with a population density map shows similarities in that East Coast states are densely populated and have high pasture land values, with values above the national average for both continuing west to the Missouri river. To the west, California has both high population density and high pasture land values.

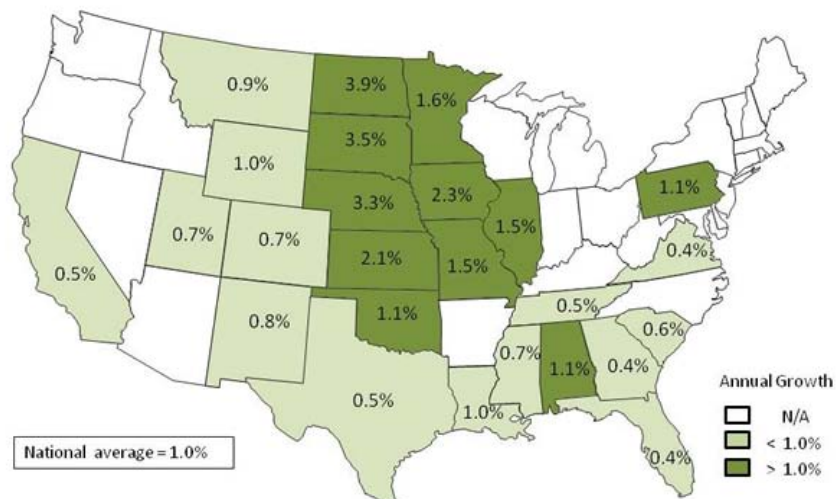
Figure 4: Average Pasture Land Value by State, 2010



Source: USDA Land Values and Cash Rents, 2010

Since 2005, pasture land values and rents in the central United States have grown faster than the national average (Figure 5). Factors contributing to the increase include factors that have impacted cropland values, but also others. With the exception of Texas, pasture rent-to-value ratios in the plains states have been above the national average.

Figure 5: Growth in Pasture Land Value by State, 2010



Source: Calculated from USDA Land Values and Cash Rents, Various Issues

In contrast to corn and soybean states, Oklahoma sales transaction data show pasture land average values exceed those of cropland (agecon.okstate.edu/oklandvalues). NRI data show that since 1987 Oklahoma cropland acreage has been decreasing while pasture land has been increasing, suggesting a conversion in use over time. While cropland has historically been worth more than pasture, pasture land began commanding a premium in eastern Oklahoma in the early 1990s. In western Oklahoma where agricultural land is predominantly cropland, cropland still commands a premium, but the gap is narrowing over time.

USDA survey data show that 2010 average pasture land values exceed average nonirrigated cropland values in many southeastern states—Arkansas, Louisiana, Mississippi, Georgia, North and South Carolina, Tennessee—and in New Jersey. In all of these states, the percentage of farms with sales less than \$50,000 is above the national average. Other factors contributing to the phenomena are likely varied. In each of the southeastern states, 2007 Census data indicates production of more than 36,000,000 broilers and having land available for application of poultry litter is important. Census data also indicates the number of horse farms exceeds the national average in Arkansas, Georgia, North Carolina, and Tennessee as well as Oklahoma.

Factors Driving Changes in Pasture Values

Economic theory suggests that the value of land is derived from the net present value of future returns, including agricultural uses, recreational uses, exurban low density residential uses, and the option to convert to urban uses. Agricultural characteristics such as soil productivity, land improvements, tract size, and rainfall are common factors used to explain differences in both pasture and cropland values across time and space. Government payments are relatively unimportant factors in explaining pasture values as farm programs are largely associated with crop production. For pasture land, agricultural returns are typically derived from livestock production, primarily cattle.

Pasture land has attributes that differentiate it from cropland for both recreational income and residential uses. Recreational income is primarily derived from leasing for hunting. Pasture land more often includes trees and shrubs which add value for wildlife habitat (especially deer) and recreational purposes. Trees together with the open space that pasture provides may also increase land's attractiveness for rural housing. A tract of land with a single house is still classified as agricultural land whereas if it were converted to a housing subdivision it then is classified as urban.

Agricultural Influences

The beef enterprises that dominate pasture acreage in the Plains States include both cow/calf production and grazing of weaned calves prior to placement in feedlots. Returns to the cow/calf enterprise have historically been cyclical as cow numbers and calf prices vary over time. Recurring droughts also impact cow numbers and pasture returns. In recent years, the cow herd has shrunk to historical lows. Higher costs of cattle feed ingredients, including corn and soybean meal, have increased the incentive to grow cattle for a relatively longer period on grass. High fertilizer prices lower returns on both cropland and improved pasture. In the Plains States, most pasture is rangeland which does not require fertilizer so returns to native pasture are less impacted by highly variable fertilizer prices. Thus, the factors leading to high prices for crops and cropland also indirectly affect the demand for pasture and the returns to pasture land and pasture values.

Pasture land also lends itself more readily to beginning, small, and part-time farms, which are common in the Southern Plains. While a quarter section of land is uneconomical for crop farming because of economies of size, a similar amount of pasture land can support a few cows and/or goats. Census of Agriculture data show that more than half of the farms with beef cattle have fewer than 20 cows. The number of farms with fewer than 10 head of cattle increased from 2002 to 2007. While small farms account for only 7% of the cow herd, small and part-time farmers have relatively more off-farm income and are willing and able to pay higher prices for pasture land than established producers, particularly for small parcels. Smaller parcels, especially those near urban areas, command higher per acre prices.

Recreational Value

Factors such as hunting lease rates, deer density, recreational income from agricultural uses, and acres of elk habitat have been used to explain differences in agricultural land values. U.S. Census of Agriculture data on recreational income showed an average growth of 180% from 2002 to 2007. In Oklahoma, deer hunting is the leading recreational use of agricultural land. Pasture offers year-round forage for deer and also often includes the woody cover required by deer. Oklahoma State University (OSU) rental rate survey data indicate that agricultural producers can earn approximately \$4 per acre through deer hunting leases. The 2006 National Survey of Fishing, Hunting and Wildlife-Associated Recreation shows that U.S. hunting participation rates range from 2% in the Pacific region to 12% in the central United States. Almost all (96%) big game hunters, including deer hunters, hunt within their resident state. The increase in the value of deer hunting is due directly to increased interest in and opportunities for hunting due to an explosion in deer numbers. A cultural shift to charging hunters and changes in liability laws also increased adoption of hunting as an alternative business enterprise. Also, many hunters are now more than one generation away from the farm and they no longer have access to family land. The increase in the popularity of deer hunting helps explain the increase in the value of pasture relative to cropland in Oklahoma.

Urban Conversion Options

A 2003 NRI study noted that between 1997 and 2001, the rate of rangeland conversion to developed uses continued on an upward trend whereas the conversion of cropland had slowed. A 2007 NRI study reported that 40 million acres of land were newly developed between 1982 and 2007, representing a 56% increase, and accounting for more than one-third of all developed land in the lower 48 states. Rangeland with mature trees is often preferred for housing development. Bottomland cropland often is in a flood zone and thus is less desirable for development. Changes in population density, population growth, per capita income, and distance to urban areas often help explain changes in agricultural land prices over time. Agricultural land value studies have historically shown that population density increases land values. Urban pressure increases all agricultural land values, but may be slightly more important for pasture than for cropland.

Other Factors

Bankers note that oil and gas royalty income helps support land prices in the Plains States. Anecdotal evidence in Oklahoma supports this notion as many heads will nod in agreement if you hypothesize in an Extension meeting that much farmland was paid for with oil and gas royalty income. Royalty income affects both crop and pasture land values but where pasture is valued lower, the impact on pasture values will be larger in percentage terms.

Tax policy and the related property tax assessments relative to agricultural land vary from state to state but often distinguish between cropland and noncropland. In Oklahoma, assessed values are a blend of market value and productive value, 25 and 75% respectively. Thus, the per acre taxes for pasture would be relatively lower than for

cropland. In local areas, IRS Sec. 1031 like-kind exchanges for tax purposes can be important factors in land markets. For instance, when Wal-Mart's world headquarters were established in northwest Arkansas, the urbanization of the surrounding area led to producers reinvesting proceeds from those sales in land in northeast Oklahoma.

Looking Ahead

As the prospects for forage-based biofuel crops appear limited in the near future, one of the key factors in the run-up of cropland prices does not directly apply to pasture. However, high corn and other feed ingredient prices increase the value of pasture for putting gain on cattle and this can be expected to continue while commodity prices are high. While demand for high end products slowed during the economic downturn, beef demand remained strong. Growing exports have also contributed to what are now record high beef prices. If world income continues to increase and with it, the demand for protein internationally, beef demand could increase, providing support for beef prices and pasture land values from an agricultural income perspective. Anecdotal evidence from agricultural lenders suggests that, during the national economic slowdown, the rate of growth in price increases for land purchased for recreational use slowed. Still, recreational use remains important and U.S. population continues to grow.

For More Information

Doye, D. and R. Sahs. (2010). "OSU Rental Rate Survey." Unpublished data.

Guling, P., Doye, D., and Brorsen, B.W. (2009). Why has the price of pasture increased relative to the price of cropland? *Journal of American Society of Farm Managers and Rural Appraisers*, 73, 99-111.

Briggeman, B. and Akers, M. (2010). "Farmland values and farm income soar." *Survey of Tenth District Agricultural Credit Conditions*. 4th Quarter. Federal Reserve Bank of Kansas City, Available online: <http://www.kansascityfed.org/publicat/research/indicatorsdata/agcredit/AGCR4Q10.pdf>

Peterson, W. (1986). "Land quality and prices." *American Journal of Agricultural Economics* 68(4), 812-819.

United States Census Bureau. (2009). *Population Estimates*. Available online: <http://www.census.gov/popest/gallery/maps/>

United States Department of Agriculture National Agricultural Statistics Service. (2007). *Census of Agriculture*. Available online: http://www.agcensus.usda.gov/Publications/2007/Full_Report/Volume_1_Chapter_1_US/index.asp.

United States Department of Agriculture National Agricultural Statistics Service. (2010). *Charts and Maps of Land Values and Rental Rates*. Available online: http://www.nass.usda.gov/Charts_and_Maps/Land_Values_and_Cash_Rents/index.asp

United States Department of Agriculture Natural Resources Conservation Service. (2009). *Summary Report, 2007 National Resources Inventory*. Natural Resources Conservation Service, Washington, DC, and Center for Survey Statistics and Methodology, Iowa State University, Ames, Iowa. http://www.nrcs.usda.gov/technical/NRI/2007/2007_NRI_Summary.pdf

United States Department of Agriculture Natural Resources Conservation Service. (2003). Urbanization and Development of Rural Land. *National Resources Inventory 2001*. Available online: <http://www.nrcs.usda.gov/technical/NRI/2001/nri01dev.html>

United States Department of Agriculture.(2010). *Land Values and Cash Rents 2010 Summary*. Available online: <http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1446>

United States Department of the Interior Fish and Wildlife Service and United States Department of Commerce Census Bureau. (2006). *2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*. Available online: <http://www.census.gov/prod/www/abs/fishing.html>

Damona Doye (damona.doye@okstate.edu) is Sarkeys Distinguished Professor, Regents Professor and Extension Economist and B. Wade Brorsen (wade.brorsen@okstate.edu) is Jean & Patsy Neustadt Chair and Regents Professor. Both are in the Department of Agricultural Economics at Oklahoma State University, Stillwater, Oklahoma.

© 1999-2011 Choices. All rights reserved. Articles may be reproduced or electronically distributed as long as attribution to Choices and the Agricultural & Applied Economics Association is maintained.

**The farmdoc project distributes Choices in partnership with
the Agricultural and Applied Economics Association.**

[click here to visit choicesmagazine.org >>](http://choicesmagazine.org)

2nd Quarter 2011 | 26(2)

ARE ECONOMIC FUNDAMENTALS DRIVING FARMLAND VALUES?

Brent A. Gloy, Michael D. Boehlje, Craig L. Dobbins, Christopher Hurt, and Timothy G. Baker

JEL Classifications: Q14, Q15

Keywords: Farmland, Land Value, Agricultural Finance

Farmland is a critical asset in the agricultural sector, comprising 85% of the assets in production agriculture. Soaring farmland values have generated considerable national news attention and given rise to questions about the factors driving farmland values higher and whether current farmland values are reasonable. Many in the agricultural sector are worried that the farm sector is headed for a repeat of the farmland value bubble that collapsed in the 1980s. From an economic perspective, the first of the above questions has a relatively straight-forward answer. The second question regarding the “reasonableness” of land values is much more difficult to answer.

To answer these questions, one must first realize that farmland is a capital asset that will produce earnings indefinitely into the future. Capital assets derive their economic value from these future earnings. For this reason, the value placed on farmland should reflect the market consensus of the present value of those future returns. Thus, to value farmland, market participants must forecast future earnings associated with farmland and what those earnings will be worth in today's dollars.

As a result, two fundamental drivers generally influence the value of any capital asset including farmland, future earnings and the expected opportunity cost of funds—the rate at which market participants discount future earnings. Expected future earnings are clearly an important driver of farmland value. Other things equal, the higher expected earnings, the more investors will pay for farmland. More subtle is the role played by opportunity costs. An opportunity cost is created because funds used to purchase farmland could be invested in other assets. Consequently, future earnings must be discounted. Factors such as expected future inflation, borrowing costs, and rates of return on alternative investments affect the expected opportunity cost of funds. Other things equal, higher discount rates will decrease farmland values. This article examines the role of expected earnings and opportunity costs on farmland values.

A Fundamental Approach to Valuation of Farmland

The traditional income capitalization model provides a straightforward approach with which to view the economic fundamentals of farmland values. This model simplifies the farmland valuation problem and expresses current farmland values as a function of current income produced by farmland, the opportunity cost of capital or discount rate, and the constant rate at which income is expected to grow in the future, as shown below:

$$\text{Farmland Value} = \frac{\text{Income}}{\text{Discount Rate} - \text{Income Growth Rate}}$$

This model argues that increases in farmland values can come from expectations of increases in income, decreases in the discount rate, or increases in the growth rate of income produced by farmland. The cash rental rate in \$'s per acre is frequently used as a proxy for the income produced by an acre of farmland. The discount rate represents the opportunity cost of invested funds or the rate of return that an investor would require in order to own this asset. This rate can be thought of as the rate of return on risk-free securities plus an upward adjustment for the risk associated with the farmland investment. The rate that could be earned on an investment of comparable risk is another way to think of the opportunity cost. The growth rate is the rate at which the returns to farmland are expected to grow. The model assumes the growth rate is constant into perpetuity. The difference between the discount rate and the growth rate is often referred to as the capitalization rate.

Although the income capitalization formula provides a mathematical relationship between expected income, expected income growth, and expected opportunity costs, it is a simplification of reality. Nonetheless, it can be used to provide useful insights about the impact of different economic conditions on farmland values. However, one must be aware that evaluating the “reasonableness” of various expectations is a very difficult task. Earnings from agricultural production can be quite volatile and difficult to predict. This is also true when considering the opportunity costs facing producers. Although the present opportunity cost is known at the time of investment, these costs will change in the future. Reasonable people can have very different views of the future prospects of these fundamental drivers of value. This is particularly true during periods of high volatility or rapid change in the forces that influence future returns and opportunity costs. When market participants underestimate the risk that the consensus view is overly optimistic or pessimistic, the market can become over or under priced.

Complicating this situation is the fact that the amount of farmland that is sold in a given year is a relatively small amount of the total quantity of farmland. Because there are relatively few transactions per year in farmland, a very limited number of buyers and sellers have a chance to express their forecasts of the future. A 2010 Nebraska survey indicated that farmland turnover—changes in ownership—which typically is 3-5% per year, is currently only about 1.5% per year, less than one-half the historical average (Johnson, 2010). Contrast this with ownership claims on a publicly traded company such as Microsoft where investors trade roughly 0.74% of the outstanding equity shares on a *daily* basis, based on the 50 day average daily trading volume and shares outstanding on March 29, 2011, as reported in a summary quote for Microsoft, (MSFT) on www.NASDAQ.Com.

So what is the present situation for farmland income, and interest rates, and what do current land values suggest about expectations for these drivers in the future? By understanding these drivers we can start to answer the second and much more difficult question as to whether current land values are “reasonable”.

Farmland Earnings

In the Corn Belt, increases in net farm income have been driven in large part by substantial corn and soybean price increases. Demand shifts including a rapidly growing soybean export market in China and the rapid growth of the U.S. ethanol industry have been major contributors to price increases. These two demands now account for roughly 20 million acres of U.S. soybean production and 20 million acres of U.S. corn production or roughly one-quarter of the 2010 harvested acres of each crop (Gloy, et al., 2011). These demand shifts combined with recent production shortfalls due to adverse weather have led to historically low projected ending inventories relative to utilization for the 2010-11 crops.

As a result of strong demand and tight commodity stocks-to-use ratios, current crop prices are relatively high and volatile. Although input costs have also risen, the net result has been a substantial increase in the profitability of row-crop production in the United States. This is illustrated in Figure 1 which shows the budgeted contribution margin and cash rental rate for average quality Indiana farmland for the years 1991-2011. The budgeted contribution margin is calculated by subtracting the variable costs of production from revenues and is what remains to cover all overhead costs including land, machinery replacement, family labor, and management. Today's contribution margin is at its most favorable level in recent times. The chart also shows that cash rental rates have risen steadily, but not as rapidly as contribution margins. Given the large increases in contribution margins, one would expect that rental rates will continue upward at least in the short-term. One of the most important considerations influencing land values is whether these higher contribution margins and cash rental rates will be maintained into the future.

The Relationship between Farmland Value and Earnings

The value-to-cash rent multiple is one of the most common metrics used to describe the relationship between land prices and income. The value-to-cash rent ratio describes how much buyers are willing to pay for each dollar of cash rental income—it is an analogous concept to the price to earnings (P/E) ratio commonly used in assessing values relative to earnings in the equity markets.

Figure 1: Budgeted Contribution Margin and Cash Rental Rate for Average Quality Indiana Farmland, 1991-2011

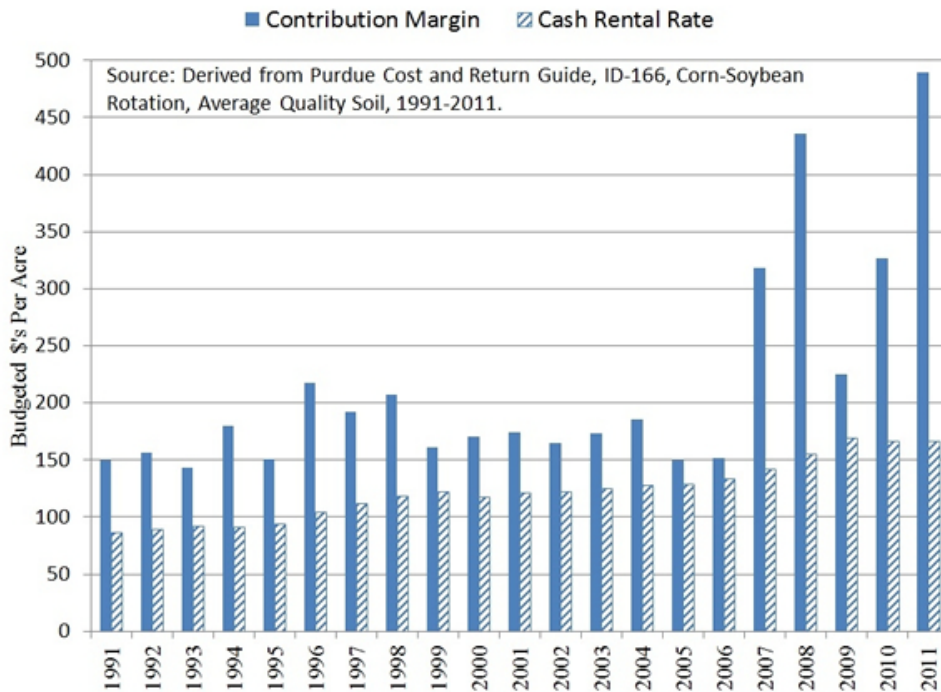
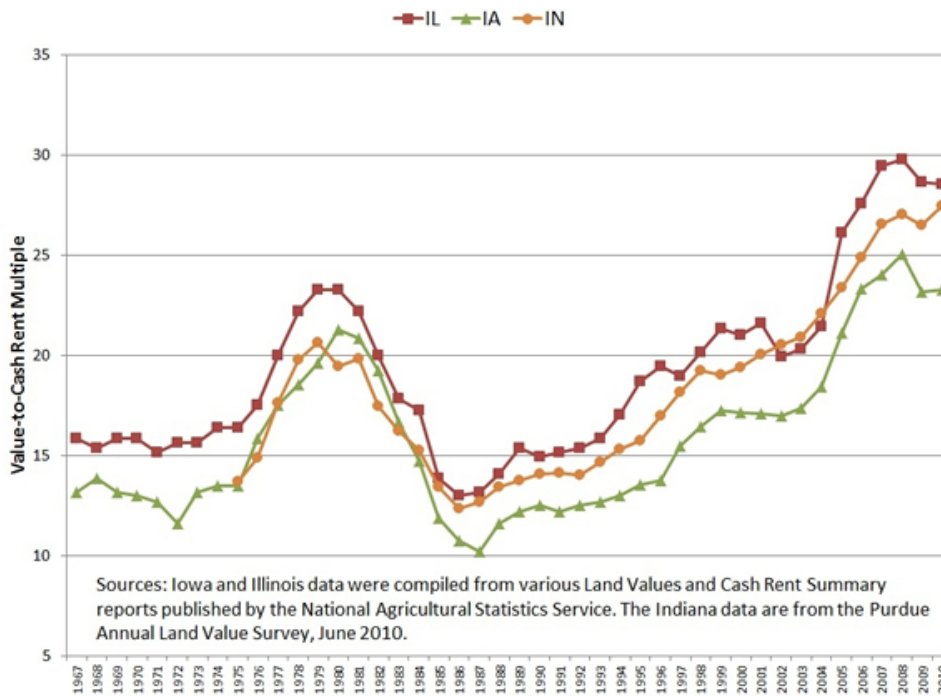


Figure 2: Value-to-Cash Rent Multiple for Illinois, Iowa, and Indiana Cropland, 1967-2010



The value-to-rent ratio for Illinois, Iowa and Indiana cropland is shown in Figure 2. Not only has income increased as discussed in the previous section, but investors are willing to pay more for that income stream as well. Even before budgeted returns started to increase in 2006-07, farmland values rose as investors were willing to pay more for each dollar of current earnings. In the case of Indiana, investors are currently willing to pay nearly \$28 for each dollar of cash rent produced by average quality Indiana farmland. This places the value to rent ratio at its highest point in modern times. While the ratio has recently experienced a slight decline in Illinois and Iowa, it is still near all-time highs in both states.

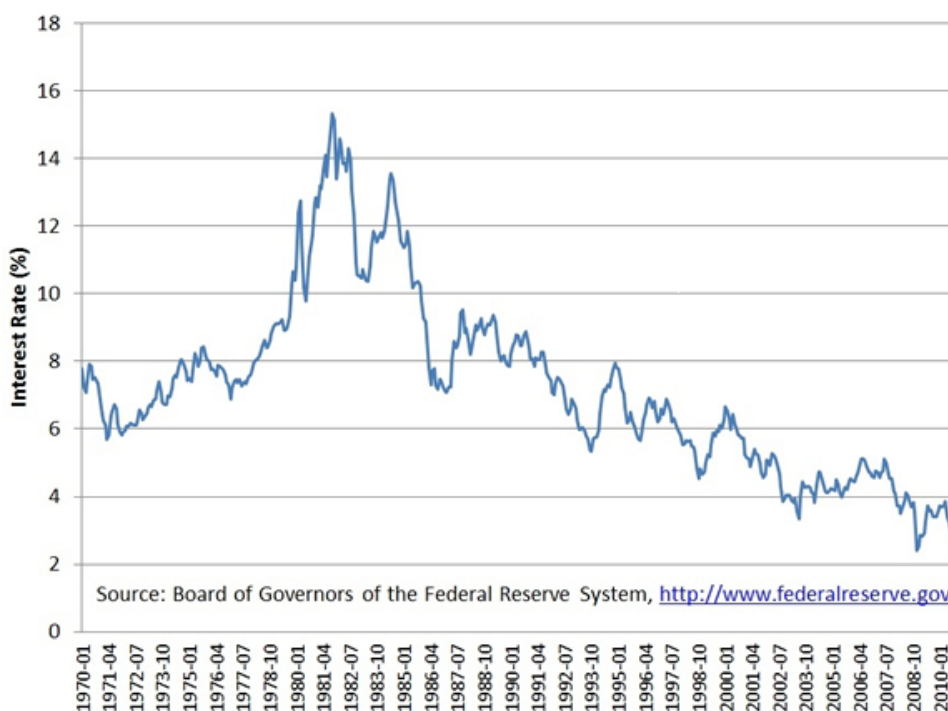
It is possible that cash rents have not fully adjusted to higher contribution margins and that future cash rental rate increases will bring the value-to-rent multiple down. Regardless, these value-to-rent multiple levels clearly indicate that investors have a very low opportunity cost for funds, they expect incomes to grow substantially in the future, or both.

When examining this chart it is tempting to argue that at present this multiple is abnormally high. However, one must be cautious about such conclusions based on this graph alone. The same argument could have been made in 1997. Why would an investor have paid \$18.20 for each dollar of cash rent in 1997 and only \$12.40 in 1986? Part of the answer is that investors likely had a more favorable future outlook in 1997 than in 1986. Whether those expectations materialize is another story. Another part of the story involves interest rates which were lower in 1997 than in 1986.

Interest Rates

As illustrated in the income capitalization model, interest rates play a role in determining the value of farmland as they are a fundamental determinant of the opportunity cost of capital and thus the capitalization rate. Lower interest rates reflect a lower opportunity cost of capital, reducing the discount applied to future earnings received from farmland, and increasing the farmland valuation multiple.

Figure 3: Monthly Average Interest Rate on 10-Year U.S. Treasury Bonds, 1970 to 2010



The interest rate on 10-year Treasury bond is often used to represent the risk-free interest rate on long term investments. Figure 3 shows the average interest rate paid on 10-year U.S. Treasury bonds from 1970 to 2010. Rates have fluctuated widely over this period. Starting in 1970, interest rates started to climb, almost doubling over

the next decade and reaching a peak of 15% in the early 1980s. Since then, interest rates have declined dramatically, falling to around 3% today. While the exact impact of interest rates on farmland prices is difficult to measure, the large increases of the early 1980s should have had a negative impact on farmland prices, and the large declines since the 1980s should support rising farmland prices.

Assuming that the risk premium and income growth rate remain constant, a decline in the risk-free component of the discount rate decreases the capitalization rate. At low capitalization rates, the impact on land values can be dramatic. For instance, a capitalization rate of 4% which is consistent with current economic conditions would result in an earnings multiple of 25 being applied to each dollar of current income, while a capitalization rate of 8% which was consistent with the late 1980's would produce a multiple of 12.5. When put into the context of actual land values, these changes are striking. Using the simple capitalization model, land that produces cash rent of \$200 per acre with capitalization rates of 8% and a multiple of 12.5 would be valued at \$2,500. In contrast, the same cash rent with capitalization rates of 4% and a multiple of 25 would be valued at \$5,000 per acre.

Current Farmland Values

The June 2010 survey of Indiana (Dobbins and Cook, 2010) shows a farmland price for average quality farmland of \$4,419 per acre, and the associated cash rental rate was \$161 per acre. These values produce a capitalization rate of 3.64%. With 10-year U.S. Treasury bonds at 3.25%, these values imply that investors were willing to accept rates of return only slightly higher than the yield on the 10-year Treasury bond for owning farmland, or that they expected substantial income growth from farmland (Gloy, et al., 2011).

If interest rates increase, it would likely put substantial pressure on cash rent multiples and farmland values. Holding other things equal, if capitalization rates would increase from 3.64% to 4.64%, the multiple would decrease from its current level of 27 to 21.5. In order to maintain land values, expectations of future income would need to rise and/or investors would have to accept a lower risk premium. For example, if the multiple decreased to 21.5, the current cash rent on average quality Indiana farmland would have to rise from \$161 per acre to nearly \$205 per acre to maintain land values.

While there are many factors which support the case for increased farmland income in the future, one must be very careful in assuming growth rates beyond the general rate of inflation and the rate of productivity growth in agriculture. Sustained growth beyond this level would require substantial demand growth that would manifest itself in continually higher agricultural product prices.

The Bottom Line

Farmland prices have undergone a significant increase in recent years. These increases have come in part, in response to increased farm earnings and low interest rates. Were these factors to reverse it would put downward pressure on land values. It is important for market participants to understand that earnings associated with farmland can be quite volatile. This is particularly true in the case of crop prices where recent price increases have boosted expected revenue several hundred dollars per acre for most Corn Belt farms. Had prices moved the other direction and investors felt that this was a more accurate representation of future income levels, it would be hard to make the economic case for significantly higher farmland values.

It is difficult to conclude at this time that current farmland market expectations regarding the economic fundamentals are misguided. Currently, one could make the case that average sale prices are reasonable and could even support higher prices; but one could also argue that, given the extreme price volatility in agricultural markets, moves to the downside are also quite likely.

For now, it appears that farmland values reflect investor's beliefs that farm incomes will remain high and capitalization rates will remain low. Will these expectations materialize? In truth, it will be very difficult to determine whether these expectations are correct until hindsight provides the luxury of 20/20 vision. At this point, it appears that investors are at least considering market fundamentals before making purchase decisions. One situation to be concerned about is when investors must use arguments unrelated to market fundamentals to justify prices. Such factors typically involve debates over the magnitude of capital gains that landowners can expect, arguments that conservative collateral and lending standards need to be scrapped for higher loan-to-value ratio loans, development of new credit instruments with flexible repayment schemes or balloon payments to give more farmers a better "chance" to buy land, suggestions that if one doesn't buy a farm today they'll never be able to afford one, false hopes that farmland prices can't go down because they aren't making any more of it, or that inflation will always carry land values higher. If these

discussions become common place, it is clearly time to assess whether the market has a sound view of realistic economic expectations. Let's hope that time doesn't come.

For More Information

Dobbins, C.L. and K. Cook. (2010, August). Indiana farmland values and cash rents: renewed strength in a weak economy. Purdue Agricultural Economics Report. Department of Agricultural Economics, Purdue University. West Lafayette, IN.

Gloy, B.A., C. Hurt, M.D. Boehlje, and C. Dobbins. (2011, March). Farmland values: current and future prospects. Center for Commercial Agriculture Staff Paper. Department of Agricultural Economics Purdue University. West Lafayette, IN. Available at: http://www.agecon.purdue.edu/commercialag/progevents/LandValuesWebinar/Farmland_Values_Current_Future_Prospects.pdf

Johnson, B. (2010, September 8). "A Thin Real-Estate Market Becomes Even Leaner." Cornhusker Economics, University of Nebraska-Lincoln.

Purdue University Department of Agricultural Economics. (2010, November). 2011 Purdue crop cost and return guide, October 2010 estimates. ID-166-W, Purdue University Extension. Available at: http://www.agecon.purdue.edu/extension/pubs/id166_2011_Nov_01_2010.pdf

Brent A. Gloy (bgloy@purdue.edu) is Associate Professor, Michael D. Boehlje (boehljem@purdue.edu) is Distinguished Professor, Craig L. Dobbins (cdobbins@purdue.edu) is Professor, Christopher Hurt (hurtc@purdue.edu) is Professor, and Timothy G. Baker (baker@purdue.edu) is Professor. All are in the Department of Agricultural Economics, Purdue University, West Lafayette, Indiana.

© 1999-2011 Choices. All rights reserved. Articles may be reproduced or electronically distributed as long as attribution to Choices and the Agricultural & Applied Economics Association is maintained.

The farmdoc project distributes Choices in partnership with the Agricultural and Applied Economics Association.

[click here to visit choicesmagazine.org >>](http://www.choicesmagazine.org)

2nd Quarter 2011 | 26(2)

THE ROLE OF DEBT IN FARMLAND OWNERSHIP

Brian C. Briggeman

JEL Classifications: Q14, Q15

Keywords: Agricultural Finance, Debt, Farmland

Farm real estate debt often plays a key role in farmland purchases. Without access to credit, many farmers and ranchers would find it difficult to buy land, especially with current values at historically high levels. Yet, extending too much debt could undermine the sustainability of lofty farmland values, and ultimately lead to a collapse in land markets—as occurred during the 1980s farm debt crisis.

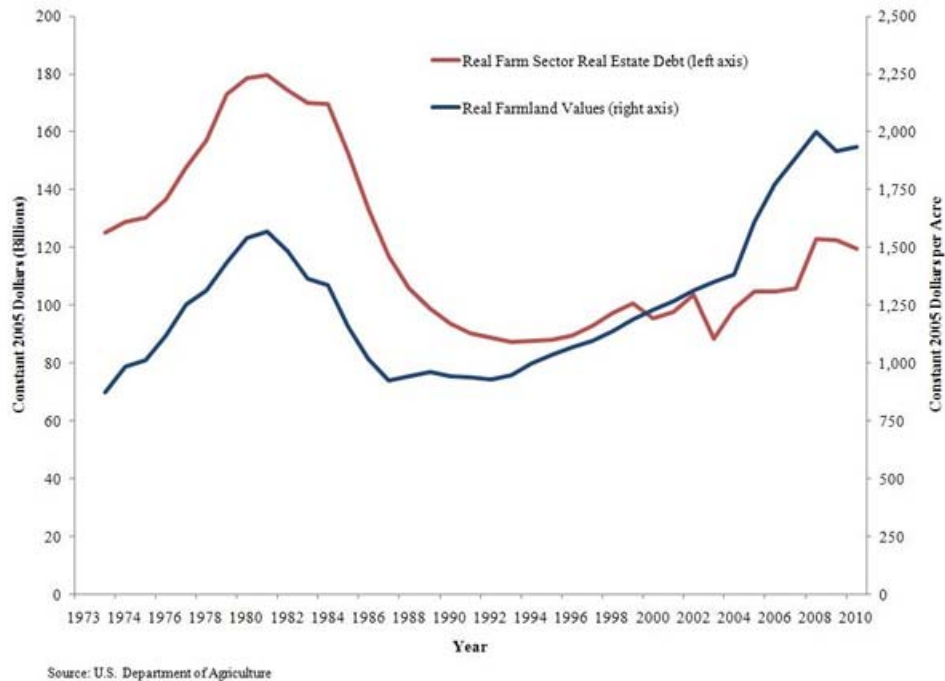
In some respects, farmland market conditions today are similar to the 1980s. Over the last decade, real farmland values have nearly doubled, eclipsing their 1981 high. While farm real estate debt gains have not been as strong as the prelude to the farm debt crisis, debt levels have risen since 2000. So, are today's lofty land values a debt inflated bubble?

While definitively answering this question is difficult, insights can be gained through assessing the role farm real estate debt has played in the recent surge in land values. This article explores the evolution of the farm real estate debt landscape. In addition, the ability of agricultural lenders to weather a potential downturn in land markets is assessed. The analysis finds that rising farm real estate debt is concentrated among a few lenders and borrowers. In addition, conflicting data from the U.S. Department of Agriculture (USDA) and lender reports raises questions on how much debt is actually in the farm sector today. Still, agricultural lenders are in a strong financial position today to withstand a rather large drop in farmland values.

The 1980s Farm Debt Crisis

In the past, farm real estate debt and farmland values followed each other closely. Research points to the farm real estate bubble of the 1980s and subsequent crash being related to and likely caused by too much debt (for a more extensive review of the farm debt crisis see Calomiris, Hubbard, and Stock, 1986; and Harl, 1990). Much of this debt was provided by the Farm Credit System, individuals selling land on contract and commercial banks.

Figure 1: Farm Sector Real Estate Debt and Farmland Values

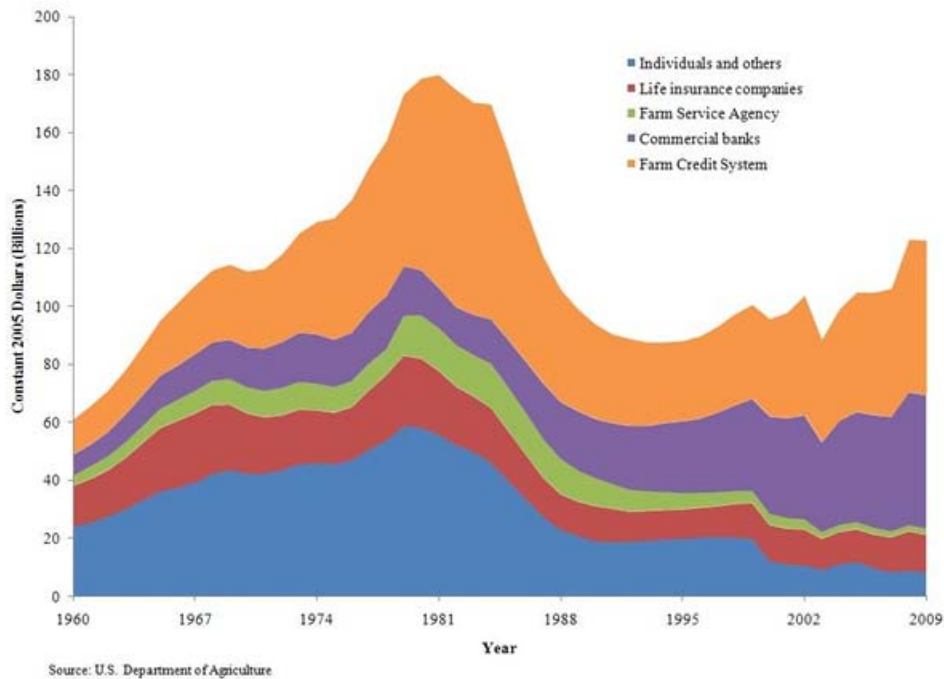


During the 1970s, farmland values surged with burgeoning farm incomes. Strong global economic growth of the 1970s spurred rising farmland values (Henderson, 2008). According to the International Monetary Fund, world GDP growth was around 4.5% annually during this time period. Higher incomes in developing countries spurred an increase in global food consumption, which occurred at a time when the value of the U.S. dollar was weak. With high demand and relatively cheap prices, U.S. agricultural exports surged, lifting farm incomes. Moreover, new export markets opened with the 1972 Russian grain deal, further boosting farm incomes and expectations for further income gains. These future gains were capitalized into the value of farmland as evident by real U.S. farmland values rising to a high of just over \$1,500 per acre, as measured in constant 2005 dollars (Figure 1).

Rising farmland values were also accompanied and fueled by increasing real estate debt levels. In fact, during the land value run up of the 1970s, the correlation between inflation adjusted farm real estate debt and real farmland values was near 1 (Figure 1). During this time period, the annual percent changes in real estate debt levels were on average more than 13%, the steepest rise on record (USDA). Furthermore, lenders relied on anticipated growth of collateral values to compensate for a drop in income and repayment rates (Harl, 1990). This collateral based lending helped fuel the surge in farmland values. As a result, by 1980, the farm sector's inflation adjusted real estate debt had swelled to a record high of \$180 billion.

When farmland values crashed in the 1980s, the pile of debt created a significant amount of stress for farmers. A global recession and a fight against rampant inflation in the 1980s slashed demand for agricultural products, raised the value of the dollar, and sent agricultural exports and incomes plummeting. As a result, real farmland values dropped more than 40%. This drop was fueled by forced land sales by farmers who could no longer afford to service high debt levels at extraordinarily high interest rates. Consequently, numerous farmers filed for bankruptcy. While farm bankruptcy data is unavailable from 1980 to 1986, by the end of 1987, the farmer bankruptcy rate was 23.05 per 10,000 farms, the highest annual bankruptcy rate on record (Stam and Dixon, 2004).

Figure 2: Farm Sector Inflation Adjusted Farm Real Estate Debt, by Lender



Many agricultural lenders also faced financial stress because rising farm foreclosures cancelled numerous debts secured by real estate. During the 1970s and 1980s, most real estate debt was concentrated among two primary lenders—the Farm Credit System and individuals selling land on contract (Figure 2). According to the USDA, throughout the 1970s, both lenders accounted for two-thirds of total farm sector real estate debt. Life insurance companies, commercial banks and the USDA Farm Service Agency each accounted for about 10% of real estate debt. Starting in 1980, the number of bad loans charged off lenders' loan portfolios skyrocketed as collateral values on foreclosed real estate loans sank. According to call report data, net loan charge offs at agricultural banks rose from a prefarmland boom of about 0.3% of total loans to over 2.5% in 1985. A comparable number for the Farm Credit System was over 10%. As a result, over 300 agricultural banks failed, the Agricultural Credit Act of 1987 provided the Farm Credit System \$4 billion of financial assistance, and individuals who sold land under contract also suffered numerous write-offs.

Today's Farm Real Estate Debt Landscape

Today, the farm real estate debt landscape has changed. Farm real estate debt is now heavily concentrated, about 80%, in the Farm Credit System and commercial banks as opposed to individuals (Figure 2). This shift is likely due to the hardships of the 1980s moving most real estate loans to institutions with a regulator. While inflation adjusted farm real estate debt has risen since 2000, its 25% increase is modest compared to the steep rise experienced during the 1970s.

However, the amount of farm debt may be understated. Reported data by the two biggest agricultural lending institutions suggests that real estate debt may be rising. According to the 2010 Farm Credit System's Annual Report and commercial banks' reports of condition and income, both lenders reported \$141 billion of outstanding farm real estate debt, while USDA reported \$132 billion. Explaining why lender reported debt levels are \$9 billion higher than USDA reported debt levels is beyond the scope of this paper. This finding does, however, imply that debt levels may be higher than what the USDA reports.

Even if debt levels are indeed lower than what Farm Credit and commercial bank data would suggest, risks still surround farm real estate debt because it is also concentrated among a few borrowers. According to the USDA's 2009 Agricultural Resource Management Survey (ARMS), about 33% of all producers reported some farm debt.

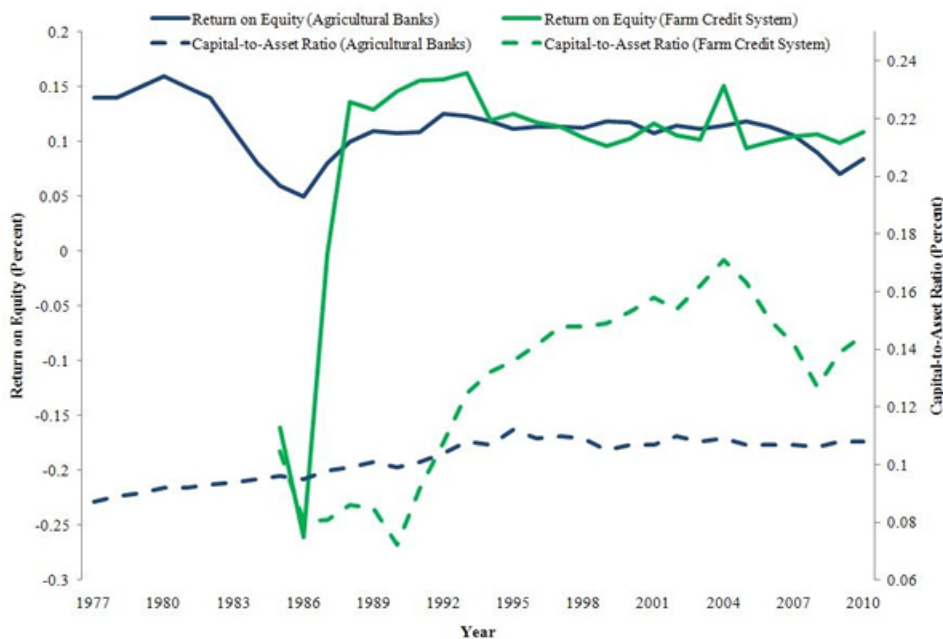
Of these producers, large farming operations and livestock producers pose significant risks to lenders. In particular, a small subgroup of agricultural borrowers holds a relatively large share of farm real estate debt. While large farming operations with more than \$1 million in farm sales only comprise 1.4% of the entire farm sector, they hold 20% of total farm real estate debt (2009 ARMS). Fortunately, these large farm borrowers—who also account for 30% of total agricultural production—have ample farm income with which to repay their sizable amount of farm debt (Briggeman, 2010).

Another group of producers that could be a potential risk to lenders are livestock producers. Lenders are more exposed to livestock operators because 52% of all farm real estate debt is held by livestock producers with crop producers holding the remaining 48%. Given this larger exposure, livestock losses leading to debt repayment stress could strain a lender's financial health.

Lenders' Ability to Absorb Farmland Value Shocks

If farm borrowers' debt repayment ability were to fall, agricultural lenders are well positioned to handle rising debt repayment stress. Since 2008, agricultural banks and the Farm Credit System's profitability and capital levels have increased. However, depressed incomes in the livestock and biofuel industries have increased the number of nonperforming loans or nonaccrual loans. In response, lenders increased their loan loss reserves, especially agricultural banks.

Figure 3: Profitability and Capital Position of Agricultural Banks and the Farm Credit System



Source: Agricultural Finance Databook and Farm Credit System Annual Reports

Starting in 2008, agricultural lenders' profitability fell. The global recession and financial crisis slashed demand for agricultural products. Falling demand reduced U.S. farm incomes as well as the profitability of agricultural lenders. While the Farm Credit System's return on equity (ROE) held steady, agricultural banks saw a persistent decline in their ROE (Figure 3). Banks had a larger ROE decline because of their exposure to the 2008 struggles of residential and commercial real estate. Even though ROEs were down, they did not come close to their 1980s lows, especially the extreme negative ROE of the Farm Credit System in 1986.

As the global economy started to recover from the steep recession, so did the financial position of agricultural lenders. From 2009 to 2010, agricultural banks and the Farm Credit System saw their ROE rise about one percentage point. Much of this rise is attributable to 2010 net farm incomes rising 31% (USDA).

In addition to improvements in profitability, a rising capital position has bolstered the financial position of agricultural banks and the Farm Credit System. Since 1990, agricultural banks' capital-to-asset ratio has been a fairly consistent 11% (Figure 3). The Farm Credit System's capital-to-asset ratio, however, has fluctuated significantly over the same time period. Coming off of the 1980s farm debt crisis, Farm Credit increased their capital position to a peak of nearly 18% in 2004. But the Farm Credit System also increased their loan volume over 40% from 2004 to 2008, which contributed to their capital-to-asset ratio falling to nearly 12%. Today, Farm Credit has increased their capital-to-asset ratio to just over 14%, which has improved their financial position.

Table 1

Loan Loss Reserves and Nonaccrual Loans for Agricultural Lenders (in millions)

Lender	Item	2003	2004	2005	2006	2007	2008	2009	2010
Agricultural Banks	Loan Loss Reserves	\$857	\$893	\$913	\$996	\$1,039	\$1,197	\$3,418	\$3,446
	Nonaccrual Loans	\$900	\$800	\$600	\$600	\$600	\$900	\$2,400	\$2,600
	Coverage Ratio	0.95	1.12	1.52	1.66	1.73	1.33	1.42	1.33
Farm Credit System	Loan Loss Reserves	\$2,075	\$792	\$755	\$734	\$781	\$936	\$1,359	\$1,447
	Nonaccrual Loans	\$1,049	\$646	\$524	\$533	\$512	\$839	\$3,093	\$3,451
	Coverage Ratio	1.98	1.23	1.44	1.38	1.53	1.12	0.44	0.42

Note: Data from the Agricultural Finance Databook for agricultural banks, and from annual reports for the Farm Credit System.

Coverage ratio is loan loss reserves divided by nonaccrual loans.

While Farm Credit and banks appear to be well capitalized, nonaccrual loans have increased, prompting lenders to increase liquidity levels. In 2009, nonaccrual loans rose over 40% (Table 1). This rise is largely attributable to falling livestock incomes, especially dairy and poultry incomes, as well as strained profits for ethanol related loans. If these rising nonaccrual loans eventually lift net charge offs, agricultural lenders could be stressed. One way to mitigate this stress is to increase liquidity levels. Farm Credit and agricultural banks have done so by raising their loan loss reserves—their provisions to cover potentially bad debts.

Compared to the Farm Credit System, agricultural banks appear to be in a stronger liquidity position to cover nonaccrual loans should these loans default. One way to assess if loan loss reserves are adequate to cover potentially bad debts is to calculate a coverage ratio. The coverage ratio divides loan loss reserves by nonaccrual loans. In general, a coverage ratio above one means the lender has adequate reserves to cover potential losses. Agricultural banks' coverage ratio is well above one, while the Farm Credit System's coverage ratio has dropped to 0.42. The Farm Credit System's coverage ratio fell below one because their nonaccrual loans are rising much faster than their provisions to cover the potential that these loans are charged off. While this could be problematic for the system, their increasing capital-to-asset ratio, as shown in Figure 3, provides cushion against nonaccrual loans that could be charged off.

In fact, agricultural lenders are well positioned financially to withstand a decline in farmland values today. Admittedly, trying to predict the impact of falling farmland values on a lender's farm loan portfolio is difficult (Gustafson, Pederson and Gloy, 2005). However, this does not mean stress testing lenders' farm loan portfolios is not worthwhile. In fact, economic models analyzing the relationship between net loan charge offs and farmland value declines find that if farmland values fell 3.5%, net loan charge offs could rise 0.2% (Briggeman, Gunderson, and Gloy, 2009). In turn, if net loan charge offs rose 0.2% at agricultural banks and the Farm Credit System, bad debts at both institutions would rise \$243 million and \$350 million, respectively. While both lenders have sufficient loan loss reserves to absorb this shock, agricultural banks have enough reserves that their coverage ratio would not fall below one.

Looking Ahead

Rising farmland values and debt levels over the last decade raise the question whether agriculture is heading for another 1980s type farm debt crisis. While trying to predict a “black swan” event like a debt crisis is nearly impossible, the agricultural sector appears to be well positioned to handle a potential downturn in farmland markets. According to the USDA, rising global demand and tight supplies are expected to boost 2011 net farm income 20%. With farm income expected to rise, agricultural lenders’ profitability will also likely rise. In addition, lenders appear to be well capitalized and, according to anecdotal reports, are now cash flow based lenders, not collateral based lenders.

While the outlook for agricultural lenders appears to be bright, they do face significant challenges. The concentration of farm real estate debt among a few borrowers could lead to significant stress in a lender’s farm loan portfolio. The impetus for this stress would likely be a rapid and sustained fall in farm income, which could come from myriad sources. Some of these sources include, domestic and international producers responding to high prices by sharply increasing agricultural production which could push prices down, falling global demand for products, commodity price volatility, a rise in U.S. exchange rates, changes in U.S. farm and energy policy, and global unrest from soaring food prices and inflation.

Managing these risks will be key to the future success of agricultural lenders and producers. A lesson of the 1980s was that low amounts of liquidity and capital can amplify the negative effects of a drop in farmland values. Managing future stress stemming from a farmland value drop may well depend on lenders and producers holding ample liquidity reserves and keeping debt levels low.

For More Information

Agricultural Finance Databook, Federal Reserve Bank of Kansas City. Available online:
<http://www.kansascityfed.org/research/indicatorsdata/agfinance/index.cfm>.

Briggeman, Brian C. (2010). Debt, Income and Farm Financial Stress. *The Main Street Economist*. Federal Reserve Bank of Kansas City, Issue 6.

Briggeman, Brian C., Michael A. Gunderson, and Brent A. Gloy. (2009). The Financial Health of Agricultural Lenders. *American Journal of Agricultural Economics*, 91(5), 1406-1413.

Calormiris, Charles W., R. Glenn Hubbard, and James H. Stock. (1986). *The Farm Debt Crisis and Public Policy*. Brookings Papers on Economic Activity, 2, 441-485.

Commercial Banks’ Reports of Condition and Income. Federal Reserve Bank of Chicago. Available online:
http://www.chicagofed.org/webpages/banking/financial_institution_reports/commercial_bank_data.cfm.

Farm Credit System Annual Reports. Federal Farm Credit Banks Funding Corporation. Available online:
<http://www.farmcredit-fcb.com/farmcredit/financials/statement.jsp;jsessionid=9D6ECC901D3808A1AD02F7FF0153886A?uniq=1306334305548>.

Gustafson, Cole R., Glynn D. Pederson, and Brent A. Gloy. (2005). Credit Risk Assessment. *Agricultural Finance Review*, 65(2), 201-218.

Harl, Neil E. (1990). *The Farm Debt Crisis of the 1980s*. Ames, IA: Iowa State University Press.

Henderson, Jason. (2008). Will Farmland Values Keep Booming? *Economic Review*. Federal Reserve Bank of Kansas City, 2, 81-104.

Stam, Jerome M. and Bruce L. Dixon. (2004). *Farmer Bankruptcies and Farm Exits in the United States, 1899-2002*. AIS-788. Washington, DC: U.S. Department of Agriculture, Economic Research Service.

U.S. Department of Agriculture. Farm Income and Costs Briefing Room. Available online:
<http://www.ers.usda.gov/Briefing/FarmIncome/>.

*Brian C. Briggeman, Economist, Federal Reserve Bank of Kansas City—Omaha Branch,
brian.briggeman@kc.frb.org.*

The views expressed are those of the author and do not necessarily reflect the positions of the Federal Reserve Bank of Kansas City or the Federal Reserve System.

© 1999-2011 Choices. All rights reserved. Articles may be reproduced or electronically distributed as long as attribution to Choices and the Agricultural & Applied Economics Association is maintained.

**The farmdoc project distributes Choices in partnership with
the Agricultural and Applied Economics Association.**

[click here to visit choicesmagazine.org >>](http://choicesmagazine.org)

2nd Quarter 2011 | 26(2)

INCOME AND CAPITALIZATION RATE RISK IN AGRICULTURAL REAL ESTATE MARKETS

Gary D. Schnitkey and Bruce J. Sherrick

JEL Classification: Q14

Keywords: Farmland Prices, Farmland Returns, Capitalization Rates, Risk, Asset Bubbles

Over much of the United States, agricultural farmland prices have increased dramatically since 2005. Between 2005 and 2010, annual cropland price increases in the lower 48 states averaged 5.6% (U.S.D.A. 2009, 2010). Higher rates occurred in the Corn Belt, where returns are more directly impacted by ethanol use. For example, both Iowa and Illinois cropland values increased 8.2% annually between 2005 and 2010 (U.S.D.A. 2009, 2010). More recent observations suggest farmland growth rates have accelerated. An Iowa State survey found increases of 10% from 2009 to 2010 in many counties (Duffy, 2010). The Illinois Society of Farm Managers and Rural Appraisers collected sales data on Illinois farmland and found that prices increased approximately 15% from the beginning to end of 2010.

Sharply increasing prices lead to concerns of a repeat of the experiences of the 1980s, where a rapid price increase was followed by the sharpest price decline in modern history. Sheila Bair, Chairperson of the Federal Deposit Insurance Corporation (FDIC), indicated that signs of instability exist in the farmland market similar to those that occurred before prices declined in the housing and stock markets (Gillam, 2010) and used the term "bubble" in her comments, setting off a chain of related investigations by farm lenders and policymakers. In March 2011, FDIC held a conference entitled "Don't Bet the Farm: Assessing the Boom in U.S. Farmland", at which the general impression was that a classic bubble is not imminent, but that significant concerns about valuation revisions exist. Noted economist Robert Shiller, recently indicated that farmland is his dark horse candidate for a bubble, again fanning the flames in the popular press over the possibility of a farmland price crash.

Is farmland at risk for a rapid and substantial price decline? Here we argue that the answer depends primarily on two factors. The first is the extent to which commodity prices have reached new, sustainably higher levels. Factors contributing to recent higher prices have been increased use of corn in producing ethanol and growing demands for meat and grains in developing countries. The second factor is whether historically low capitalization rates continue into the future. Currently, interest rates are at low levels, and returns on competing assets are viewed as low by historic standards. The resulting lower capitalization rates translate to higher farmland prices. However, if interest rates increase, downward pressure would be expected on farmland prices.

These factors are more fully discussed after describing the determinants of farmland prices. Then we examine the impacts that rising commodity prices have on farmland returns and prices, followed by an analysis of the impact of interest rates on farmland prices. Examples related to Illinois farmland are presented. While the examples are specific to Illinois, results of this analysis are generally applicable to the greater corn-belt.

Determinants of Farmland Prices

The general consensus of agricultural economists is that farmland prices equal their discounted future returns. Present value models based on this principle can be fairly simple including only the level of current farmland returns, an expected growth rate in returns, and a discount factor (see, for example, Melichar, 1979). Other models segregate return factors among transaction costs, capital gains rates, property taxes, and income tax rates (Lee and Rask, 1979), or account for spatial relationships to nonincome benefits of ownership (Huang, et.al, 2006). Whether simple or complex, the basics are the same: farmland price equals its discounted future returns. Increases in farmland

returns or growth rates in farmland returns will increase farmland prices. Decreases in the discount factor, usually represented by interest rates, result in increases in farmland prices.

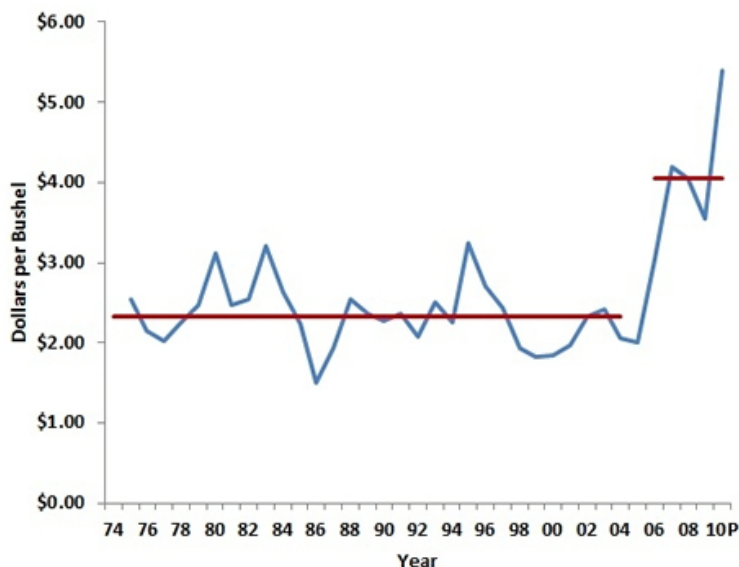
There is, however, one obvious problem with direct evaluation of the present value approach—expectations are not directly observable. Because expectations are not observable, investors are faced with evaluating factors influencing expectations, often relying on current return and interest rate levels as proxies for expectations. Burt established this linkage in a capitalization model econometrically estimated for central Illinois farmland. One important implication of Burt's research is that using a simple growth rate on future returns is not supported—expectations are formed in a more complicated way. Complex expectation formations can lead to lagged relationships between farmland returns and farmland prices, frustrating those looking for a simple explanation for the current prices of farmland.

In any case, it is not controversial that as expectations of farmland returns increase, farmland prices increase. A commodity price level increase that leads to higher farmland returns would thus cause higher farmland prices, most likely in a lagged fashion. It thus follows that an understanding of commodity price dynamics helps to establish an interpretation of the recent farmland price movements.

Higher Commodity Prices

Since the mid-2000s, rapidly increasing quantities of corn have been used in ethanol production, leading to the need for more corn acres, contributing to corn price increases. Illustrative of these increases are national, season-average prices (SAPs) for corn from 2005-09, as shown in Figure 1. Between 1975 through 2005, corn prices did not trend up or down, but varied around an average of \$2.33 per bushel. Since 2005, average corn prices have been much higher. Including the preliminary SAP of \$5.40 for 2010 results in a corn price average for 2006-10 of \$4.05, an increase of 73% over the \$2.33 per bushel average from 1975-2005. Furthermore, rising prices are not restricted to corn, as prices of other commodities also increase to maintain their acreage. Hence, corn use in ethanol also impacts returns to other crops.

Figure 1: National Season Average Prices for Corn, 1974–2010



A significant question for the future of farmland prices relates to long-term commodity prices. Given the large use of corn in ethanol, Irwin and Good suggest fundamental factors support a longer term corn price near \$4.60 per bushel. At a \$4.60 price, supply responses could be large leading to lower prices. Moreover, energy and ethanol policies could change. Babcock notes that plausible ethanol policy alternatives could have an impact of over \$2.00 per bushel on farm-level corn prices. Moreover, the impact of crude oil prices is more direct than in that past, as corn prices are now tied to crude oil prices through the ethanol market (Good and Irwin, 2009). These linkages introduce new risks to farmland values that reside entirely outside the food and feed sector and often are a byproduct of other political wrangling in energy and environmental debates that frame ethanol policy.

Higher Commodity Prices and Farmland Returns

All else constant, higher commodity prices lead to higher returns to farming. To illustrate, operator and farmland returns were computed to represent average returns to Illinois farmland from 2000 to 2010. Actual returns and costs for Illinois were used in computation (Schnitkey, 2010, October). This data originated from Illinois Farm Business Farm Management (FBFM), a farm accounting and financial consulting service operated as a cooperative in Illinois. Operator and farmland returns equal gross revenue minus non-land costs, and represent a return to both owning and operating the farmland. The return to farmland varies depending on whether the farmland is owned, share rented, or cash rented. If farmland is cash rented, subtracting the cash rent from operator and farmland returns yields the return to farming while the cash rent represents the return to the land ownership.

As shown in Figure 2, operator and farmland returns for Illinois have averaged higher since 2006, the period after which commodity prices rose. Between 2000 and 2005, returns averaged \$153 per acre. Since 2006, operator and farmland return averaged \$306 per acre, a doubling of operator and farmland return. During the 2006 period, corn prices averaged \$4.05, suggesting that a \$4 per bushel corn price is roughly consistent with a \$300 operator and farmland return.

Figure 2: Operator and Farmland Returns and Cash Rents, Illinois, 2000–2010



Higher operator and farmland returns, which provides a return to both operating and owning the farmland, then provides for higher returns to owning farmland. Indeed, farmland returns as measured by average Illinois cash rents reported by USDA have increased. USDA cash rents averaged \$126 per acre between 2000 and 2005 and \$153 per acres between 2006 and 2010. Note however that the 24% in cash rents lags the doubling of operator and farmland returns. This then caused cash rent to be a declining proportion of operator and farmland returns. From 2000 through 2005, cash rent averaged 82% of operator and farmland return from 2000 through 2005 compared to 55% between 2006 through 2009.

These proportional declines suggest lags in the cash rental market. Like lags observed by Burt in the farmland market, there likely are lags in the rental market, thus leading to a slower adjustment in cash rents than in operator and farmland returns. It is likely that if commodity prices continue to average around \$4 per bushel, cash rents will continue to increase. If cash rents equilibrate to 82% of operator and farmland price returns, average cash rents would average \$250 per acre, an increase of 47% from their \$169 per acre level in 2010.

Interest Rates

Nominal interest rates have experienced a general decline since the early 1980s, as illustrated by the yields on 10-year constant-maturity Treasury notes (CMT-10) shown in Figure 3. In 1981, the interest rate on CMT-10 was 13.9%. From this high, rates reached a low of 3.2% interest rate in 2010. As interest rates fall, asset prices increase as future cash are discounted at a lower rate. Farmland is a long-lived asset, having cash flows that often are modeled as

occurring into perpetuity. Because of its long life, farmland price is much more sensitive to interest rates than shorter lived assets.

The impacts of interest rate declines can be illustrated by calculating capitalized values. A capitalized value equals the discounted present value of all future cash flows. Assuming an asset with an infinite life and constant cash rents and discount rates, a capitalized value equals cash rent divided by interest rate—a constant growth rate on income can be assumed in the net capitalization rate for convenience. The \$169 per acre average Illinois cash rent from 2010 is used to illustrate. The capitalized value given the 1981 CMT-10 rate of 13.9% is \$1,215 per acre ($\$1,215 = \$169 \text{ per acre} / 13.9\% \text{ rate}$). The 2010 CMT-10 rate of 3.2% results in a capitalized value of \$5,281. The decline from a 13.5% CMT-10 rate to a 3.2% rate results in an increase of 343% in the capitalized value. As can be seen, declining interest rates have been a large factor in driving capitalized values higher. This increase in capitalized values likely then led to higher farmland prices.

Figure 3: Yields on 10-Year Treasury Notes, 1970–2010



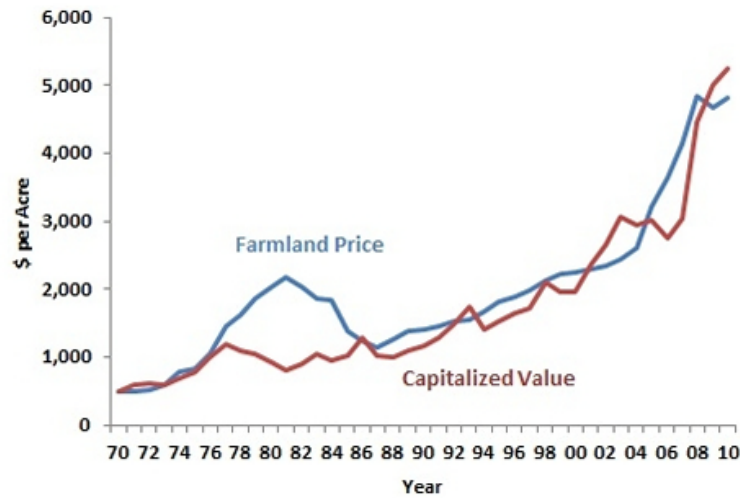
Capitalized Values and Farmland Prices

The simple capitalization model of cash rent divided by CMT-10 rates provides capitalized values that closely follow Illinois farmland prices, as can be seen in Figure 4. The last time farmland prices experienced major divergence from capitalized values was during the early and mid-1980s. At its largest divergence in 1981, the farmland price of \$2,188 per acre exceeded the capitalized value of \$818 per acre by a factor of 1.67. Between 1981 through 1986, farmland prices declined from \$2,188 per acre to \$1,232 per acre. The \$1,232 per acre value was slightly below the capitalized value of \$1,300 per acre. During the early 1980s, capitalized values suggested that prices were too high relative to underlying returns and interest rates. The farmland price adjustment during the mid-1980s brought prices and capitalized values into close alignment.

Since 1986, prices and capitalized values have tracked each other closely, with farmland prices averaging 5% higher than capitalized values from 1986 through 2010. Since the commodity price increase, farmland prices increased from \$3,210 per acre in 2005 up to \$4,820 per acre in 2010, an increase of 50%. During this same period, capitalized values increased at a faster rate than farmland prices. In 2010, capitalized value of \$5,258 per acre was above the farmland price of \$4,820 per acre, unusual given that farmland prices typically are higher than capitalized values.

While farmland prices have increased dramatically in recent years, underlying factors have contributed to this increase. Farmland returns have increased and interest rates have fallen. As of yet, farmland prices have not overshot capitalized values as occurred in the 1980s. Before farmland prices decline, first capitalized values likely have to decline. Capitalized values will fall if interest rates increase or farmland returns decrease.

Figure 4: Farmland Prices and Capitalized Values, Illinois, 1972–2010



Sensitivity to Interest Rates and Returns

Table 1 shows capitalized values for different cash rents and CMT-10 rates. The 2010 capitalized value of \$5,281 per acre associated with a \$169 per acre cash rent and 3.2% CMT-10 is used as a base. The percent changes in capitalized values are reported as a percent of the 2010 capitalized value.

A 0.5% increase results in a CMT-10 rate increase from 3.2% to 3.7%. This rate increase would cause a 13.5% decline in capitalized value from \$5,281 per acre to \$4,568 per acre. This is a fairly dramatic fall from what can be viewed as a modest rise in interest rates. A more pronounced rise to a 5.7% CMT-10 rate, near the average rate from 1990 through 2010, results in a 43.9% decrease in capitalized values. These large impacts occur because increasing interest rates have a much larger impact on capitalized values at lower interest rates than at higher interest rates. Hence, today's low interest rates could be a contributing cause to price declines when interest rates increase in the future.

A legitimate concern relates to the interest rate environment and impressions that recent Federal Reserve quantitative easing has resulted in excess short term liquidity, and hence capitalization rates that are "too low". Given current short term rates, it is unclear how they could go lower, and it is also unclear what form of an "exit strategy" could be employed by the Federal Reserve that would not result in higher rates. Resulting increases in interest rates would in turn place downward pressure on farmland prices, along with downward pressure on other assets as well. Importantly, the effects of a rate change of a given magnitude are amplified when the starting rates are lowest. Thus, even modest increases in interest rates would have a larger impact on farmland prices today than several years ago when interest rates were higher.

Heightening this interest rate concerns is an observation from the 1980s. A large reason for the divergence in capitalized values and prices in the early 1980s was because of a sharp rise in interest rates during the late 1970s and early 1980s. Relatively speaking, declines in farmland returns played a much smaller role in the divergence.

A decrease in cash rent also lowers capitalized values. For example, the \$5,281 per acre capitalized value for 2010 is associated with a \$169 per acre cash rent. From 2000 through 2005, cash rents averaged \$120 per acre. Capitalized values based on that average rent would decline by 29% to \$3,750 per acre. Developing scenarios where cash rents fall to the \$120 level likely would require corn prices to fall to the preethanol levels of \$2.30 per bushel and this in turn would likely require dramatic changes to ethanol policies, as well as reduction in crude oil prices.

Table 1**Capitalized Values Given Different Cash Rents and Interest Rates**

10-year Treasury Note Rate	Cash Rent Per Acre			
	\$120	\$145	\$169	\$195
3.2%	\$3,750	\$4,531	\$5,281	\$6,094
	-29.0%	-14.2%	0.0%	15.4%
3.7%	\$3,243	\$3,919	\$4,568	\$5,270
	-38.6%	-25.8%	-13.5%	-0.2%
4.2%	\$2,857	\$3,452	\$4,024	\$4,643
	-45.9%	-34.6%	-23.8%	-12.1%
4.7%	\$2,553	\$3,085	\$3,596	\$4,149
	-51.7%	-41.6%	-31.9%	-21.4%
5.2%	\$2,308	\$2,788	\$3,250	\$3,750
	-56.3%	-47.2%	-38.5%	-29.0%
5.7%	\$2,105	\$2,544	\$2,965	\$3,421
	-60.1%	-51.8%	-43.9%	-35.2%

Note: The dollar value in each cell is the capitalized value (cash rent / interest rate) for the cash rent and interest rate combination. Percentages give changes from the 2010 capitalized value of \$5,281 per acre (\$169 per acre cash rent and 3.2 percent Treasury note rate).

With regard to cash rents, it is important to note that there is considerable momentum for continued increases in cash rents in the future if corn prices continue to exceed \$4.00 per bushel. Currently, cash rents are a smaller portion of operator and farmland return than during the 2000 through 2005 period. Bidding among farmers likely will push up cash rents to higher levels unless corn prices fall below the \$4.00 per bushel price level that is implicitly justified in current rent levels and could be interpreted as a new norm.

What to Look for in the Future

Despite the large increases experienced recently, farmland prices appear to be supported by higher returns and lower interest rates. The two most likely candidates to cause a price decline are decreasing commodity prices or rising interest rates. The same could be said at any point in history, but what differs now is that Federal policy could be the trigger that causes a farmland price decline. Changes in ethanol policy could cause commodity price declines and changes in FED policy could lead to rising interest rates, ironically both sourced in Federal policy circles where much of the concern about farmland potential bubbles have emanated.

For More Information

Babcock, B.A. (2008). When will the bubble burst? *Iowa Ag Review*, 14(1), 1-3. Available online: http://www.card.iastate.edu/iowa_ag_review/winter_08/IAR.pdf.

Burt, O. (1986). Econometric modeling of the capitalization formula for farmland prices. *American Journal of Agricultural Economics*, 68(1), 10-26.

Duffy, M. (2010). *Iowa Land Value Survey Results in 2010*. Iowa State University. Available online: <http://www.extension.iastate.edu/landvalue/>.

Gillman, C. (2010, Oct. 18). FDIC chair warns of possible US farmland 'bubble'. *Reuters*. Available online: <http://www.reuters.com/article/2010/10/18/fdic-farmland-idUSN1828495320101018>.

Good, D. and Irwin, S. (2008). The new era of corn, soybean, and wheat prices. *Marketing Outlook Briefs*, MOBR 08-04. Department of Agricultural and Consumer Economics, University of Illinois. Available online: http://www.farmdoc.illinois.edu/marketing/mobr/mobr_08-04/mobr_08-04.html.

Huang, H., G. Miller, B. Sherrick, and Gomez, M. (2006). Factors influencing Illinois farmland values. *American Journal of Agricultural Economics*, 88(2), 458-470.

Irwin, S.H. and Good, D.L. (2009). Market instability in a new era of corn, soybean, and wheat prices. *Choices: The Magazine of Food, Farm, and Resource Issues*, 24(1). Available online: <http://www.choicesmagazine.org/magazine/article.php?article=56>.

Illinois Society of Professional Farm Managers and Rural Appraisers. (2011). *ISPFMRA annual farmland values and lease trends*, Publication, 2011. Available online: <http://www.ispfmra.org/land-values.html>.

Lee, W.F. and Rask, N. (1976). Inflation and crop profitability: How much can farmers pay for land? *American Journal of Agricultural Economics*, 58(5), 984-990.

Melichar, E. (1979). Capital gains versus current income in the farming sector. *American Journal of Agricultural Economics*, 61(5), 1085-1092.

Schnitkey, G. (2010). Farmland price outlook: Are farmland prices too high relative to returns and interest rates. *Illinois Farm Economics: Facts and Opinions*, FEFO 10-17. Department of Agricultural and Consumer Economics, University of Illinois. Available online: http://www.farmdoc.illinois.edu/manage/newsletters/fefo10_17/fefo10_17.html.

Schnitkey, G. (2010, October). Revenue and Costs for Corn, Soybeans, Wheat, and Double Crop Soybeans, actual for 2004 through 2009, projected for 2010 and 2011. Department of Agricultural and Consumer Economics, University of Illinois. Available online: http://www.farmdoc.illinois.edu/manage/actual_projected_costs.pdf

Shiller, R.J. (2011, March 22). Bubble spotting. *Project Syndicate: A World of Ideas*. Available online: <http://www.project-syndicate.org/commentary/shiller76/English>.

United States Department of Agriculture National Agricultural Statistical Service. (2009). Land values and cash rent 2009 summary. ISSN: 1949-1867. Available online: <http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1446>

United States Department of Agriculture National Agricultural Statistical Service. (2010). Land values and cash rent 2010 summary. ISSN: 1949-1867. Available online: <http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1446>

Gary Schnitkey (schnitke@illinois.edu) and Bruce Sherrick (sherrick@illinois.edu) are Professors in the Department of Agricultural and Consumer Economics, University of Illinois, Urbana, Illinois.

© 1999-2011 Choices. All rights reserved. Articles may be reproduced or electronically distributed as long as attribution to Choices and the Agricultural & Applied Economics Association is maintained.

**The farmdoc project distributes Choices in partnership with
the Agricultural and Applied Economics Association.**

[click here to visit choicesmagazine.org >>](http://www.choicesmagazine.org)

2nd Quarter 2011 | 26(2)

THE INFLUENCE OF URBAN AREAS ON FARMLAND VALUES

Todd H. Kuethe, Jennifer Ifft, and Mitch Morehart

JEL Classifications: Q15, R30

Keywords: Farmland Values, Urban-Influence

There are a number of reasons to expect farmland values to be higher near urban areas. Many urban centers initially grew among particularly fertile soils so farmland near these areas tends to be quite productive. Farms near urban areas have greater access to markets and ports and therefore lower transportation costs. As a result, these farms may generate economic profits above comparable lands further from the urban center. In addition, at the urban fringe, farmland offers recreational opportunities and lifestyle amenities which serve the nearby population. Farms near urban areas are also more susceptible to development pressures. Their values may be "bid up" by competing land use activities, including commercial and residential uses. It is not surprising then that the existing literature suggests urban influence is a dominant factor in the determination of agricultural land values (Blank, 2007).

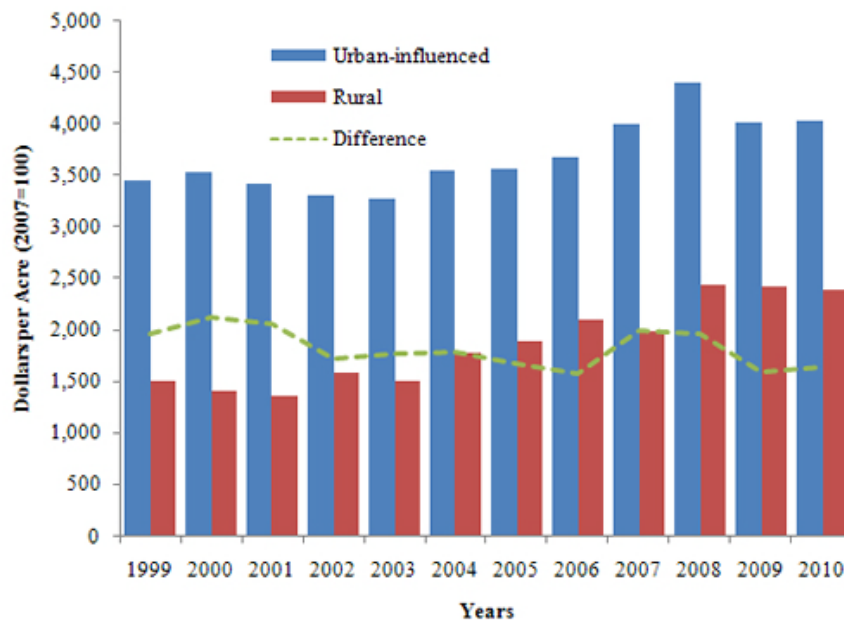
This article examines the role of urban influence on U.S. cropland values. Based on farmer-reported data from USDA/NASS June Area Survey (JAS), urban pressures exhibited significant influence on U.S. cropland values during the 1999 through 2010, a period of significant volatility in urban real estate markets, as well as increasing farm incomes and record high commodity prices.

Measuring Urban Influence

The Economic Research Service developed the Population Interaction Zones for Agriculture (PIZA) in order to better understand the economic relationship between urban and agricultural areas. Here, regions are identified as "rural" or "urban-influenced" based on the potential population interaction between nearby urban-related population and agricultural production activities. Figure 1 shows the median, inflation-adjusted value per acre of cropland identified for rural and urban-influenced parcels from 1999 to 2010. Median values in urban-influenced areas are consistently above those in rural areas throughout the observation period.

The difference between urban-influenced and rural values ranges from \$1,576 in 2006 to \$2,122 in 2000, with an average difference of \$1,820 per acre. However, the average annual inflation-adjusted growth rate for rural cropland values is greater than that of urban-influenced areas at 4.8% compared to 1.5%. This suggests the difference between urban-influenced and rural cropland values is narrowing which can be observed by the dashed line in Figure 1. In addition, the median values for rural and urban-influenced cropland values do not appear to move together. The median value of urban-influenced cropland was at its lowest point at the beginning of 2003 and peaked at of \$4,400 at the end of 2007. This mirrors the changes in urban housing values over the same period. In contrast, the median value of rural cropland was at its lowest point at the beginning of 2001 and has exhibited a less pronounced decline following a high of \$2,447 at the end of 2007.

Figure 1: Urban-Influence on Median per Acre Cropland Values



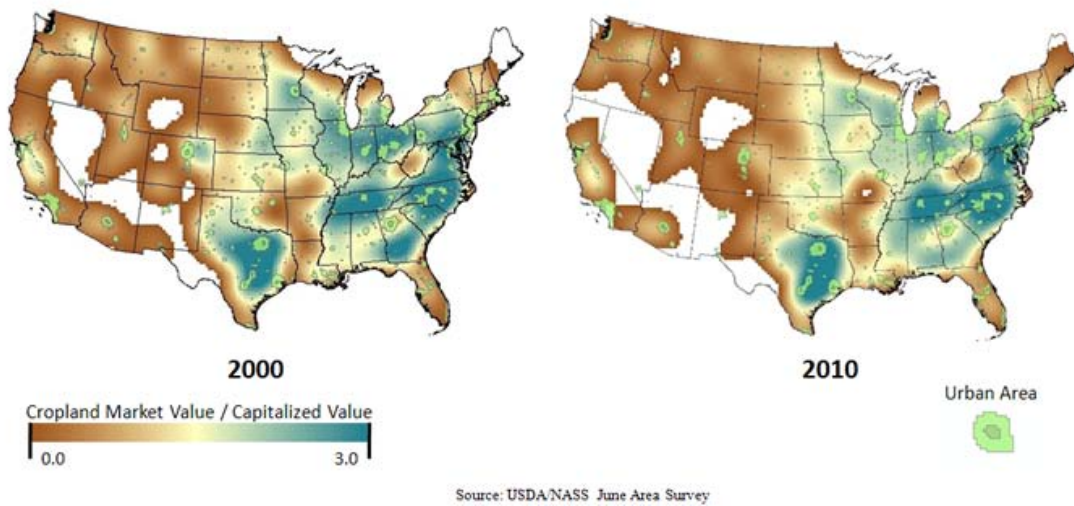
Source: USDA/NASS June Area Survey

Measuring Agricultural Value

While cropland values are higher in urban-influenced areas, the price premium is not necessarily driven by urban pressure alone. In order to better understand this price premium, an analysis was conducted to derive the portion of cropland value that was directly attributable to agricultural use. The value of agricultural use was calculated by capitalizing the value of expected returns to agricultural production. This was accomplished by dividing farmer-reported rent by a discount factor—in this case, the 10-year U.S. Treasury note interest rate. This provides an estimate of the agricultural value of farmland assuming that rents and interest rates remain at current levels. Next, these values were compared to farmer-reported land values by calculating the ratio of farmer-reported land values to capitalized rents. When the ratio equals 1.0, it suggests that survey respondents' estimate of market value is equal to the implied agricultural use value based on cash rent divided by the 10-year U.S. Treasury rate.

Figure 2 shows the changes in the ratio across the continental United States over the period 1999 – 2008 based on the JAS respondent locations. The whitespace indicates that no data were available or an insufficient sample size for disclosure. The highest values of the rate tend to be located in the Eastern United States and near urban areas. Consistent with expectations, the map suggests that cropland values deviate from their agricultural use values near urban areas. The areas of greatest deviation are found throughout the Eastern United States, as well as Eastern Texas and parts of the Upper Midwest.

Figure 2: Urban-Influence on Cropland Values, 2000 and 2010



Urban Influence Varies by Location

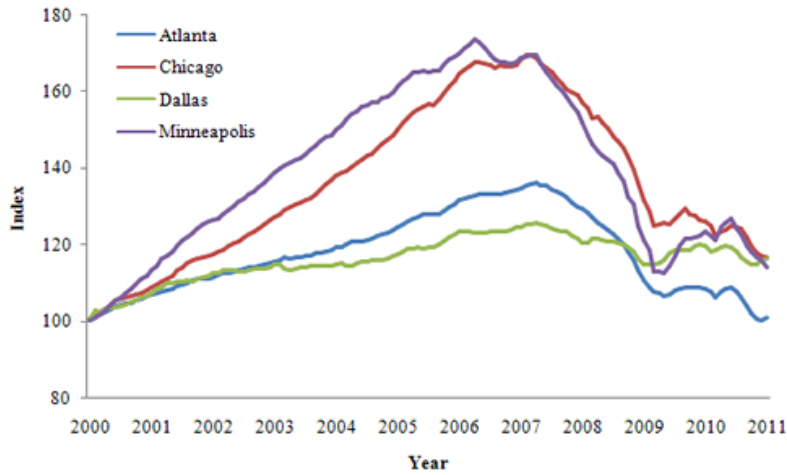
The degree of urban influence is expected to vary according to the characteristics of the urban area, including population density, as well as the characteristics of the surrounding agricultural lands, such as recreation potential or production intensity. As a result, urban-influence is not expected to be uniform across the United States, but to vary by location. While urban influence is an important factor nationally, the impact of urban pressure may be larger (or smaller) in some areas. This can be illustrated by considering how urban influence impacts cropland values in Atlanta, Ga.; Chicago, Ill.; Dallas, Tex.; and Minneapolis, Minn. This illustration (Figure 2) highlights the differing price impacts in these markets, as well as one potential driver of nonagricultural land values—urban development.

The four metropolitan areas were selected based on the observed deviation between cropland values and their implied agricultural use in surrounding rural areas. Each metropolitan area is surrounded by agricultural lands, yet the agricultural production varies across locations. For example, the areas surrounding Chicago are principally devoted to row crop production, yet in Dallas, the surrounding agricultural lands consist of a greater share of livestock production.

The cities also vary in terms of urban characteristics. The Atlanta metropolitan area is a major economic hub for the Southeastern United States and home to 5.2 million inhabitants. The city has grown rapidly in recent decades due in part to the growth of the city's major industries: financial services, media, and transportation. Similarly, Chicago, with 9.6 million inhabitants, is the largest economy in the Midwest, and its economy centers around financial and other high-value services. Minneapolis, also located in the Midwest, is home to approximately 3.5 million people, and its economy is principally comprised of financial institutions and transportation industries. Dallas, on the other hand, is the third largest city in Texas, with a metropolitan area population of 1.2 million, and the city's rapid economic growth is attributed to high-tech companies, as well as manufacturing and services.

One factor potentially contributing to higher land values in urban influenced areas is urban land use "bidding up" the market value of land. The Case-Shiller Home Price Indices (Figure 3) for each of these metropolitan areas can be used to help illustrate this potential in each of the markets from 2000 to 2011 (Standard & Poor's). All of the metropolitan areas exhibited a period of positive price appreciation over the period 2001 – 2006 and a price decline in the remaining years. The declines were most pronounced in the Minneapolis and Chicago metropolitan areas. The Minneapolis price index fell from a peak value of 174 in April 2006 to January 2011 value of 114. The Chicago price index fell from a record high of 169 in April 2007 to a current value of 117. Although the appreciation through 2007 is less pronounced in Atlanta, the metropolitan area experienced a significant reduction in home prices that are currently below 2000 reported values.

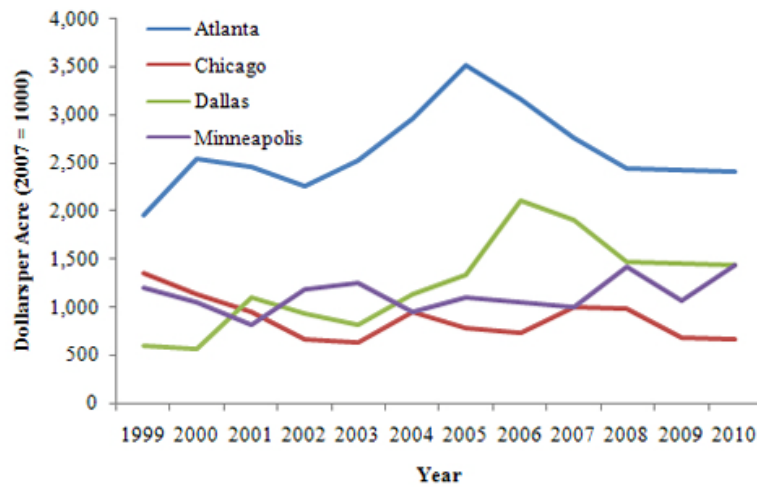
Figure 3: Housing Prices in Selected Metro Areas, 2000–2011



Source: Standard & Poor's Case-Shiller Home Price Index

To examine the potential bidding up of farmland prices in these areas, the ratio of cropland value to its implied agricultural use value at the farm level were calculated for both rural and urban-influenced farms within 300 miles of each city. The differences between farmer reported land values and implied agricultural use values were greatest in the area surrounding Atlanta, at a range of \$1,957 (1999) to \$3,509 (2005). Although median prices were much lower, the difference between cropland values and their implied agricultural use values for Dallas exhibited a similar range of \$1,535. The range is much lower in Chicago (\$723) and Minneapolis (\$621). The figure also suggests a narrowing of the difference between urban-influenced and rural cropland values in Atlanta, Chicago, and Dallas following the housing decline.

Figure 4: Difference Between Urban-Influenced and Rural Cropland Values

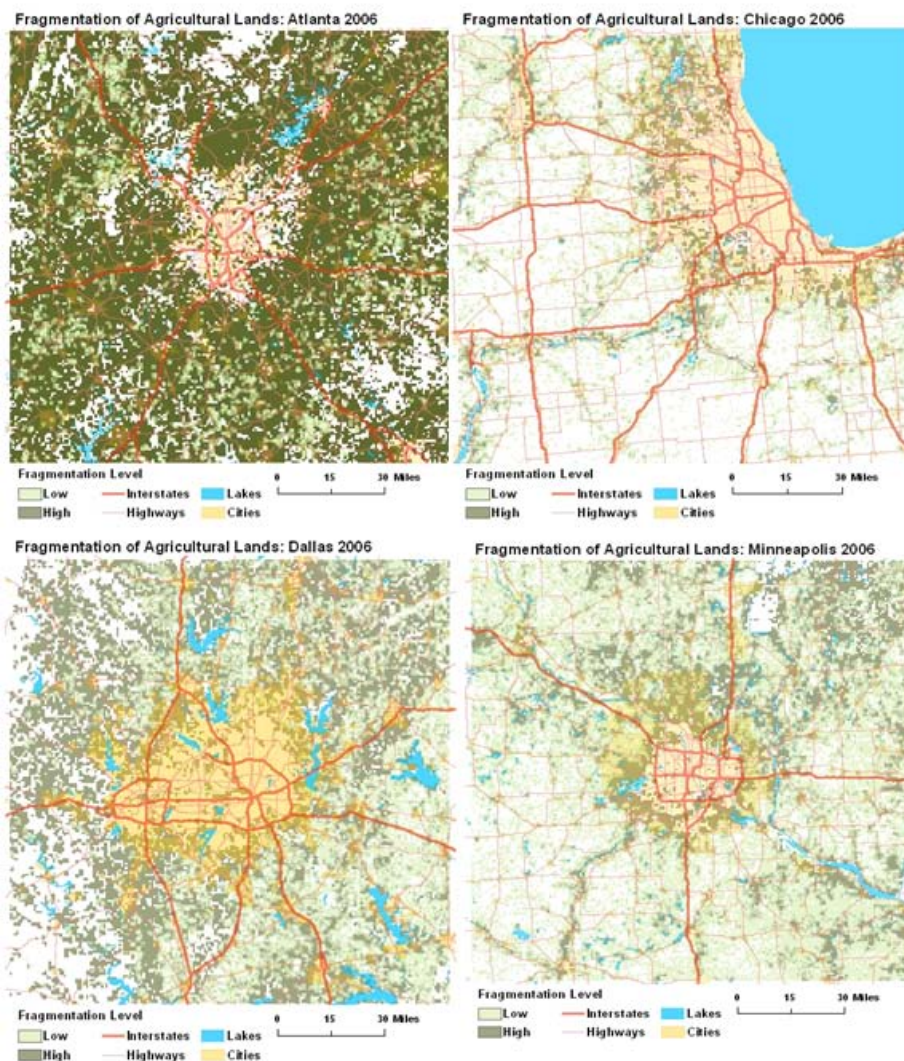


Source: USDA/NASS June Area Survey

Urban Influence Alters Land Use Patterns

One of the primary drivers of farmland values near the urban fringe is the potential for conversion to residential or commercial use. Throughout recent decades, a number of U.S. cities have expanded through what is generally referred to as "urban sprawl." Irwin and Bockstael (2007) show that urban sprawl alters, not only the value of land, but the pattern of land use activities. The authors demonstrate that land parcels near the urban fringe are more likely to be divided into smaller pieces and surrounded by other land uses, or fragmented. The degree of fragmentation rises and then falls as distance from the urban center increases. That is, at the urban core, one observes large continuous patterns of urban land use activities, such as commercial and residential areas, yet at the urban fringe, land uses are divided into smaller patches which may consist of residential, commercial, industrial, and natural resource based activities, including agricultural production. Past the urban fringe, agriculture becomes the dominating land use activity. This pattern of development effects agricultural production practices, as well as the quantity and quality of nonmonetary benefits of agricultural land use (Barnard, 2000).

Figure 5: Spatial Fragmentation Varies by Location



Source: National Land Cover Database

Figure 5 shows the fragmentation of agricultural lands at the urban fringe of the four selected metropolitan areas. The fragmentation measure is calculated through geographic imaging systems (GIS) using the 2006 National Land Cover Database. The fragmentation measure examines the size and shape of contiguous agricultural parcels. Highly

fragmented parcels are shown in dark green. The greatest degree of spatial fragmentation occurs in the Atlanta metropolitan area, and the urban fringe near Chicago exhibits the least pronounced fragmentation. Part of this difference may be attributed to the nature of the agricultural production in the surrounding areas. The area around Atlanta contains a greater proportion of specialty crops and poultry which can be profitably raised on smaller tracts, yet near Chicago larger tracts of land are required for row crop production. However, similar crops are grown near Minneapolis which exhibits a higher degree of fragmentation. The difference between Chicago and Minneapolis, therefore, may be more directly attributable to differences in urban characteristics.

It is also important to note that land use patterns are not symmetric around the urban core. Thus, even within a particular metropolitan area, the degree of urban influence is not uniform across space. For example, the degree of fragmentation is greater west of Dallas than east.

Going Forward

In sum, farmland values are higher near urban areas. Urban influence is associated with land values being "bid up" by competing land use activities, including residential and commercial development. The June Area Survey data support this notion as cropland values are shown to be higher in urban-influenced areas with an expected premium at the median of about \$2,000 per acre. The pattern of influence, however, has not changed substantially at a national level in recent years, even given the significant volatility in the residential land market. Price impacts are shown to vary by metropolitan area, however, altering both the value of lands and the pattern of land use activities.

The natural question then arises, "What is the likely impact of urban influence in future years?" The ratio of cropland values to capitalized rents, which measures the influence of nonagricultural factors, can change in at least two ways. First, the agricultural value of land may increase as the result of rising commodity prices. Second, a further decline in the housing market may reduce urban development. Deferred futures contracts suggest that commodity prices are expected to remain high, and USDA farm income forecasts suggest increasing returns to agricultural production. In addition, recently released Case-Shiller Home Price Indices suggest a continued decline in housing values.

This study suggests urban influence has exhibited little variation nationally over the preceding decade. The difference between median values for rural and urban-influenced acreage remained relatively consistent both ahead of the housing price bubble and after its burst. Therefore, if recent strong commodity prices and farm earnings continue in the agricultural sector, it is unlikely that changes in U.S. farmland values in the future will be a direct result of urban influence. The distribution of commodity production and differential housing market outcomes, however, will contribute to varied outcomes across major metropolitan areas.

For More Information

Barnard, C.H. (2000). "Urbanization Affects a Large Share of Farmland." *Agriculture and the Rural Economy*, 10 (2): 57–63.

Blank, S.C. (2007). "Farmland Values as an Indicator of Regional Economic Performance?" *Agricultural and Resource Economics Update*, University of California.

Irwin, E.G. and N.E. Bockstael. (2007). "The Evolution of Urban Sprawl: Evidence of Spatial Heterogeneity and Increasing Land Fragmentation." *Proceedings of the National Academy of Sciences*, 104 (52): 20,672–20,677.

United States Department of Agriculture National Agricultural Statistics Service. (1999-2010). *June Area Survey*. Available online: http://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/June_Area/index.asp

United States Department of the Interior.(2006-2010). *National Land Cover Database*. Available online: <http://www.mrlc.gov/>

United States Department of Agriculture, Economic Research Service. (2005). *Population Interaction Zones for Agriculture*. Available online:<http://www.ers.usda.gov/data/populationinteractionzones/discussion.htm>

Standard & Poor's Case-Shiller Home Price Indices. (2011). Available online: <http://www.standardandpoors.com/indices/sp-case-shiller-home-price-indices/en/us/?indexId=spusa-cashpidff--p-us-->

Todd H. Kuethe (tkuethe@ers.usda.gov) is an Economist, Economic Research Service, United States Department of Agriculture, Washington, DC. Jennifer Ifft (jiff@berkeley.edu) is a PhD Candidate, Agricultural & Resource Economics, University of California–Berkeley, Berkeley, California and an Economist, Economic Research Service, United States Department of Agriculture, Washington, DC. Mitch Morehart (morehart@ers.usda.gov) is a Senior Agricultural Economist, Economic Research Service, United States Department of Agriculture, Washington, DC.

The views expressed are those of the author(s) and should not be attributed to ERS or USDA. The authors wish to thank Kevin Barnes, Kevin Hintzman, and Scott Shimmin of NASS for helpful review and assistance with data.

© 1999-2011 Choices. All rights reserved. Articles may be reproduced or electronically distributed as long as attribution to Choices and the Agricultural & Applied Economics Association is maintained.

**The farmdoc project distributes Choices in partnership with
the Agricultural and Applied Economics Association.**

[click here to visit choicesmagazine.org >>](http://choicesmagazine.org)