Farmland Prices in the Midwest: A Regional Economic Perspective

An Honors Thesis (HONR 499)

by

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Farmland Prices in the Midwest

Abstract
Agriculture is a significant industry within the United States. This paper will start by providing an overview of agriculture in the United States. General information will then be provided about farmland in the Midwest. Third, supply and demand will be explained in terms relative to these markets. Finally, the supply and demand tools will be used to analyze various factors affecting farmland prices in the Midwest. Overall, a more complete understanding of these markets will be possible as conclusions are drawn at the end of this paper.

Acknowledgements
Foremost, I would like to express my sincere gratitude to my thesis advisor, Dr. Lee Spector. Dr. Spector’s support, encouragement, and immense knowledge have helped me to complete a quality final product. Additionally, Dr. Spector has encouraged me to think about the various components of this thesis in a truly unique light. I could not imagine having a better, more qualified advisor.

Besides my thesis advisor, I would like to thank Dr. Brent Blackwell. Dr. Blackwell helped to review and finalize the thesis prior to submittal. It was this revision that allowed for a quality, polished final product.

Finally, I would like to thank my family for their support and encouragement. My parents, Jim and Clara Fry have always encouraged me to pursue further education and knowledge. I would like to especially recognize my father who has helped cultivate my interest in agriculture. It is this interest that served for the basis of my entire thesis. I find it necessary to recognize all previously mentioned parties as the completion of this thesis would not have been possible without them.

Jason R. Fry
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Introduction/Overview

Agriculture is a significant industry within the United States. An important resource for modern agriculture is farmland. With an estimated 914 million acres of fertile land producing over $225 billion of revenue, it is no surprise that agriculture has become a cornerstone for the U.S. economy (National Agriculture Statistics Service, 2013). This asset, fertile land, is an important input to any crop farm operation. According to the United States Department of Agriculture, “[f]arm real estate (land and structures) is [a] major asset on the farm sector balance sheet, accounting for 84 percent of the total value of U.S. farm assets in 2009” (National Agricultural Statistics Service, 2013). Even with the numerous acres of farmland, there is a competitive market for this essential asset. Over the past few years, farmland values have increased at a significant rate. The Farms, Land in Farms, and Livestock Operation Summary of the National Agricultural Statistics Service (2013) states:

Since the farm crisis of the mid-1980s, farm real estate values (including land and buildings) have been rising in both nominal and real (i.e., inflation-adjusted) terms. Between 1994 and 2004, real values increased between 2 and 4 percent annually. In 2005 and 2006, values jumped 16 percent and 11 percent, before slowing to 6-7 percent in 2007 and 2008.

The increase in farmland values has not taken place without critics. Many analysts believe that farmland values could plummet overnight and are comparing the current state of the farmland market to that just prior to the agriculture crash of the 1980s. During the ‘80s, there were low interest rates and the value of farmland rapidly increased. As a result, farmers and investors justified their investment by buying land assuming that the value would continue to increase more than the cost of interest. Farmland values eventually stopped increasing and
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actually fell in most parts of the country. As a result, many farmers and investors across the nation were left in a very challenging position. Many Farmers found themselves owing more than their farm was worth and were thus in serious financial trouble.

Crop farming is by no means limited to a specific region of the United States, but the Midwest is unquestionably home to a significant portion of crop production. In fact, the Midwest can be tied to the production of corn, soybeans, hay, as well as numerous other crops. Midwest farmland markets are worthy of significant analysis as they impact so many industries and, ultimately, consumers. It is possible to analyze the current state of the farmland market by looking at the factors that most drastically affect farmland values. These factors include interest rates, productivity, net income, government policy, and land availability. Along with determining which factors are influential, it is important to analyze the extent to which these factors play a role in the price of farmland.

Supply and demand tools will be used to analyze the factors affecting farmland markets. The basic principles of supply and demand will be explained and eventually applied to the farmland markets. The supply and demand tools will be applied to the farmland markets to help analyze the various factors which affect these markets. After these factors are analyzed, a complete understanding of the supply and demand tools will allow for further analysis of additional markets and factors.

This information about farmland markets will be of interest to several groups of individuals. First, this analysis will help those who are thinking about entering the agriculture industry. This could include individuals looking for investment opportunities, beginning farmers, corporate farmers, small farmers, and family members who might have inherited a piece of land. All of these individuals have the opportunity to benefit from this analysis as it offers an entry-
level consideration of the various factors affecting farmland markets. With farmland being such a significant cost to farmers in the Midwest, as well as the rest of the United States, the success of farmland owners could ultimately be determined by a better understanding of these markets.

This paper will start by providing an overview of agriculture in the United States. General information will then be provided about farmland in the Midwest. Third, supply and demand will be explained in terms relative to these markets. Finally, the supply and demand tools will be used to analyze various factors affecting farmland prices in the Midwest. Overall, a more complete understanding of these markets will be possible as conclusions are drawn at the end of this paper.

U.S. Agriculture

The United States is known by the rest of the world as a booming agriculture machine capable of hosting millions of acres of crops. These crops are used to support and feed people, not only in the United States, but all around the world. With farmland being such a significant determinant of crop production, it is essential that U.S. farmland markets be examined. Over the last decade alone U.S. farmland values have experienced a significant increase of 116 percent, from $1,340 per acre in 2004 to $2,900 per acre in 2013 (Schober, 2013).

It is not only important to realize that land prices are rising, but they are rising faster than inflation. (See Figure 1) According to the USDA, “Since the farm crisis of the mid-1980s, farm real estate values (including land and buildings) have been rising in both nominal and real terms” (Nickerson et al., 2012). It is also important to note that the land prices have been rising on average, although not all areas of the United States experience similar farmland value increases.
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Figure 1

With land prices increasing rapidly over the past several years, many question if farmland is a good investment. The answer relies on a comparison to other investment options, known as the opportunity cost. The risk of farmland must also be compared to that of other investments. To allow for this comparison, the sustainability of farmland prices must be considered. Several indicators suggest that these prices are sustainable, but future growth is not guaranteed. “These comparisons also reveal that the recent high farmland prices are not occurring under the same conditions that contributed to the farm crisis of the 1980s, at least for the farm sector as a whole” (Nickerson et al., 2012).

Another important trait related to farmland is the amount of farmland for sale. “Farmland markets have historically been very thin, with some estimates indicating about 0.5 percent of U.S. farmland is sold annually” (Nickerson et al., 2012). With fewer farms on the market, it makes it more difficult for buyers to purchase farmland. Land is not as easy to buy and sell in comparison to many other investment opportunities. At the same time, with so few sales, the marketplace can become very competitive when multiple buyers are determined to buy land.
Affordability is another metric used to analyze land in the U.S. Affordibility is the ability of a farmer to justify the price of land by the return that can be gained from crops planted on the land. Through this metric, it is possible for farmers to justify the high prices they pay for land. Figure 2 outlines how this metric correlates with actual farmland real estate values. This metric can also help with the identification of the factors affecting farmland values. If farmland values are being driven mainly by crop prices, crop yields, and interest rates, then the maximum affordable value will often be greater than if other factors are involved.

![Figure 2](image)

Source: Nickerson et al., 2012

When looking at farmland markets, one must have a basic understanding of the changes that have taken place in the agriculture industry over the past several years. First, farming is becoming more scientific. Farmers are no longer forcing seed in the ground and waiting to see if it will grow. Instead, they are testing the soil and taking an active role to ensure a successful crop. Furthermore, farmers are investing in systems that help reduce the risk of a failed crop. These modern farmers are tiling fields and installing irrigation systems to help ensure crops have the proper environment to reach their potential. Other forms of technology are also changing the
crop yields experienced by farmers. This includes the use of biotechnology which allows for improved yields and even heartier crops. Technology is also being used to improve the machinery used on farms. Farm equipment is integrating numerous forms of technology ranging from GPS control to farm management software. Overall, the agriculture industry is changing at a rapid pace due to the implementation of technology and modern farming practices. As a result, farmers are capable of producing crops more efficiently than ever before.

Realizing how agriculture has changed over the past several years, it is possible to identify several trends within this industry. These trends include size and number of farms, ownership of land, and the overall amount of farmland in use. After a thorough understanding of each trend, it is possible to analyze why the trend is taking place. But recognizing what is happening is only part of the analysis process. It is far more important to understand why something is happening so that more informed purchasing decisions can be made. More detail is available about why these factors take place, but first one should consider the trends being realized in U.S. agriculture as a whole.

The first trend in U.S. agriculture is related to the average farm size and number of farms. Looking at Figure 3 it becomes evident that the average farm size increased from less than 200 acres in 1940 to over 400 acres in 2000. This indicates that the average size of farms has been increasing over the past 50 to 60 years. Furthermore, this graph shows information related to the total number of farms in the United States. This trend is inversely correlated with the first trend of average farm size. As a result, while average farm size has been increasing, the number of farms in the U.S. has been decreasing.
The second trend being realized within this industry is related to farmland purchasing as an investment. Interestingly, more non-farming investors are beginning to buy farmland. These investors often purchase farmland as they expect a financial return on their purchase, although they rarely are interested in personally farming the land. According to *Choices* Magazine, “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” (Duffy, 2011). Additionally, “three of the top four regions in terms of land in agriculture (Northern and Southern Plains and the Corn Belt) have non-operating owners owning more than 30 percent of the land” (Nickerson et al., 2012). *Choice* Magazine goes on to say, “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” (Duffy, 2011). Interestingly, this trend holds true even though foreign ownership is restricted in some states. In fact, “eight states have restrictions on
corporate land ownership and 11 states have some level of restriction on foreign ownership” (Duffy, 2011). Trends in foreign holdings of U.S. farmland are outlined in Figure 4.

Finally, trends related to the amount of farmland being used are also prevalent within the agriculture industry. “In 2012 the total land in farms, at 914 million acres, decreased 3 million acres from 2011” (National Agriculture Statistics Service, 2013). With crop production still thriving, it is possible that increased productivity is leading farmers to utilize only slightly less land. (See Figure 5) Investors may also be holding land, allowing it remain idle to avoid the hassle of renting it for farming purposes. Regardless, the amount of farmland being used is decreasing while the price of land continues to climb.

1 It is likely that restriction on foreign ownership has relatively little effect on the market considering foreign ownership of farmland is still not very common. (See Figure 4)
Now that farmland markets have been analyzed on a national level, it is possible to break down the analysis into more specific regions. All of the major regions have different climates and are capable of producing different crops. As a result, these various areas experience different trends, so they must be analyzed separately for the most accurate interpretation. It is through this more specific focus that valuable details and insights can be attained.

**Farmland in the Midwest**

After analyzing agriculture and farmland prices on a national scale, it is possible to focus in on a specific region of the United States. One particular region that is gaining significant attention is the Midwest. As defined by the United States Census Bureau, the Midwest consists of eleven states including North Dakota, South Dakota, Nebraska, Kansas, Missouri, Iowa, Minnesota, Wisconsin, Illinois, Indiana, Michigan, and Ohio (U.S. Department of Commerce, n.d.) The Midwest, previously known as the North Central Region, has received particular
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attention because of rapidly increasing farmland prices as well as the role agriculture plays in this region.

The Midwest consists of three more specific regions known as the Lake States, Corn Belt, and Northern Plains (National Agricultural Statistics Service, Land Values 2013 Summary, 2013). These three regions are outlined in Figure 6 which also contains information about average cropland value per acre for the states within each region.

Figure 6

<table>
<thead>
<tr>
<th>Region and state</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>Change 2012-2013</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(dollars)</td>
<td>(dollars)</td>
<td>(dollars)</td>
<td>(dollars)</td>
<td>(dollars)</td>
<td>(percent)</td>
</tr>
<tr>
<td>Northeast</td>
<td>5,340</td>
<td>5,260</td>
<td>5,190</td>
<td>5,260</td>
<td>5,280</td>
<td>0.4</td>
</tr>
<tr>
<td>Delaware</td>
<td>8,500</td>
<td>7,900</td>
<td>7,800</td>
<td>7,800</td>
<td>7,800</td>
<td>-</td>
</tr>
<tr>
<td>Maryland</td>
<td>7,300</td>
<td>7,000</td>
<td>7,000</td>
<td>7,000</td>
<td>7,000</td>
<td>-</td>
</tr>
<tr>
<td>New Jersey</td>
<td>14,000</td>
<td>13,300</td>
<td>12,800</td>
<td>12,300</td>
<td>12,800</td>
<td>4.1</td>
</tr>
<tr>
<td>New York</td>
<td>2,200</td>
<td>2,400</td>
<td>2,400</td>
<td>2,600</td>
<td>2,550</td>
<td>-1.9</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>5,700</td>
<td>5,650</td>
<td>5,550</td>
<td>5,650</td>
<td>5,700</td>
<td>0.9</td>
</tr>
<tr>
<td>Other States</td>
<td>7,570</td>
<td>7,150</td>
<td>7,040</td>
<td>6,940</td>
<td>6,950</td>
<td>0.1</td>
</tr>
</tbody>
</table>

| Lake             | 3,020 | 3,120 | 3,500 | 4,090 | 4,680 | 13.9 |
| Michigan         | 3,370 | 3,300 | 3,600 | 4,000 | 4,600 | 15.0 |
| Minnesota        | 2,610 | 2,620 | 2,350 | 4,050 | 4,850 | 19.8 |
| Wisconsin        | 3,650 | 3,650 | 3,950 | 4,230 | 4,300 | 1.7 |

| Corn Belt        | 3,910 | 4,240 | 5,070 | 6,010 | 6,960 | 16.1 |
| Illinois         | 4,670 | 4,900 | 5,800 | 6,800 | 7,900 | 16.2 |
| Indiana          | 3,950 | 4,400 | 5,300 | 6,200 | 7,100 | 14.5 |
| Iowa             | 4,050 | 4,600 | 5,900 | 7,300 | 8,000 | 17.8 |
| Missouri         | 2,540 | 2,690 | 2,940 | 3,340 | 3,800 | 13.8 |
| Ohio             | 3,900 | 4,050 | 4,400 | 5,000 | 5,700 | 14.0 |

| Northern Plains  | 1,300 | 1,450 | 1,810 | 2,360 | 2,950 | 25.0 |
| Kansas           | 1,050 | 1,150 | 1,400 | 1,770 | 2,100 | 16.6 |
| Nebraska         | 2,180 | 2,510 | 3,300 | 4,480 | 5,330 | 19.0 |
| North Dakota     | 680   | 780   | 1,040 | 1,350 | 1,910 | 41.5 |
| South Dakota     | 1,460 | 1,560 | 1,880 | 2,320 | 3,020 | 30.2 |

| Appalachian      | 3,600 | 3,590 | 3,590 | 3,750 | 3,930 | 4.8 |
| Kentucky         | 3,150 | 3,180 | 3,250 | 3,450 | 3,750 | 8.7 |
| North Carolina   | 3,770 | 3,720 | 3,720 | 4,000 | 4,250 | 6.3 |
| Tennessee        | 3,270 | 3,400 | 3,400 | 3,430 | 3,550 | 3.5 |
| Virginia         | 5,060 | 4,700 | 4,950 | 4,700 | 4,700 | - |
| West Virginia    | 3,500 | 3,400 | 3,500 | 3,450 | 3,450 | - |


Midwest Farmland Trends

Over the past several years, Midwest farmland prices have been increasing rather quickly as shown in Figure 6. According to Peters, federal data shows that Midwest cropland values have shown nearly an 80 percent gain in the Midwest over the last four years (2013). This can be seen precisely in Figure 6. With the Midwest being divided into three major regions, it is possible to
see how cropland values have changed and differ throughout the Midwest. The National Agriculture Statistic Service notes that the highest farm real estate values were realized in the Corn Belt region at $6,400 per acre (Land Values 2013 Summary, 2013). Furthermore, with the use of Figure 6, it is possible to realize how values have changed and differ within each specific state. Finally, the National Agriculture Statistic Service has put together a geographical representation, shown in Figure 7, which represents the 2013 cropland value by state. This Figure displays both the dollars per acre and the percent change from 2012. Figure 6 and Figure 7 make it possible to quickly identify which states experienced the most rapid cropland value increases within the past year. The variation of cropland value increases can be noticed as North Dakota experienced a cropland value increase of approximately 41.5 percent while Wisconsin experienced a cropland value increase of only 1.7 percent.

Figure 7

2013 Cropland Value by State
Dollars per Acre and Percent Change from 2012

Use of Midwest Land

When focusing on a particular area of the United States such as the Midwest, it is important to realize how much of the land in the area is being used in farms. Specifically, a large percentage of land in the Northern Plains and Corn Belt is used for farming (Shown in Figure 8 and Figure 9). This is especially true in comparison with the rest of the United States. Nickerson et al. highlights this fact by mentioning that regions, such as the Corn Belt, are heavily dominated by agriculture (2012).

Figure 8

Source: Nickerson et al., 2012
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Figure 9

Table 5
Major land uses, by region, 2007

<table>
<thead>
<tr>
<th>Region</th>
<th>Cropland</th>
<th>Grassland pasture and range</th>
<th>Forest-use land</th>
<th>Special and miscellaneous land</th>
<th>Urban</th>
<th>Total land</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Million acres</td>
<td>Percent</td>
<td>Million acres</td>
<td>Percent</td>
<td>Million acres</td>
<td>Percent</td>
</tr>
<tr>
<td>Northeast</td>
<td>13.0</td>
<td>11.6</td>
<td>4.6</td>
<td>4.2</td>
<td>66.8</td>
<td>60.0</td>
</tr>
<tr>
<td>Lake States</td>
<td>40.6</td>
<td>33.2</td>
<td>7.5</td>
<td>6.1</td>
<td>50.8</td>
<td>41.6</td>
</tr>
<tr>
<td>Corn Belt</td>
<td>91.0</td>
<td>55.3</td>
<td>16.4</td>
<td>10.0</td>
<td>34.3</td>
<td>20.8</td>
</tr>
<tr>
<td>Northern Plains</td>
<td>97.7</td>
<td>50.3</td>
<td>74.8</td>
<td>38.5</td>
<td>5.7</td>
<td>2.9</td>
</tr>
<tr>
<td>Appalachian</td>
<td>22.7</td>
<td>18.3</td>
<td>10.6</td>
<td>8.5</td>
<td>70.8</td>
<td>57.2</td>
</tr>
<tr>
<td>Southeast</td>
<td>12.5</td>
<td>10.1</td>
<td>10.3</td>
<td>8.3</td>
<td>75.1</td>
<td>60.9</td>
</tr>
<tr>
<td>Delta States</td>
<td>18.2</td>
<td>20.0</td>
<td>7.2</td>
<td>7.9</td>
<td>52.3</td>
<td>57.4</td>
</tr>
<tr>
<td>Southern Plains</td>
<td>47.0</td>
<td>22.2</td>
<td>120.4</td>
<td>56.9</td>
<td>24.8</td>
<td>11.7</td>
</tr>
<tr>
<td>Mountain</td>
<td>43.2</td>
<td>7.9</td>
<td>303.4</td>
<td>55.4</td>
<td>121.5</td>
<td>22.2</td>
</tr>
<tr>
<td>Pacific</td>
<td>22.1</td>
<td>10.8</td>
<td>57.0</td>
<td>28.0</td>
<td>74.0</td>
<td>36.3</td>
</tr>
<tr>
<td>48 States</td>
<td>407.9</td>
<td>21.5</td>
<td>612.3</td>
<td>32.3</td>
<td>576.0</td>
<td>30.4</td>
</tr>
<tr>
<td>Alaska</td>
<td>0.1</td>
<td>0.0</td>
<td>0.7</td>
<td>0.2</td>
<td>93.8</td>
<td>25.6</td>
</tr>
<tr>
<td>Hawaii</td>
<td>0.1</td>
<td>3.5</td>
<td>0.7</td>
<td>18.0</td>
<td>1.6</td>
<td>37.8</td>
</tr>
<tr>
<td>United States</td>
<td>408.1</td>
<td>18.0</td>
<td>613.7</td>
<td>27.1</td>
<td>671.4</td>
<td>29.7</td>
</tr>
</tbody>
</table>

Source: Nickerson, Ebel, Borchers, & Carriazo, 2011

Midwest Farmland Characteristics

When looking at the value of farmland in the Midwest it is also important to understand the characteristics of the land and what makes it appealing to farmers. The Midwest, especially the Corn Belt and Northern Plains, is home to many acres of fertile ground. In fact, Figure 10 displays that the Midwest accounted for 341 million of the 914 million acres being farmed in 2012 (National Agriculture Statistics Service, 2013). The land in the Midwest is also very rich in Nitrogen, Potassium, and Phosphorus, which are important for growing many kinds of crops. Most of the land in this region once consisted of acres of untamed grasslands. Topsoil in this area holds critical nutrients that many plants need. This land is also flat and open, making it fairly easy to farm and ideal for today’s modern machinery. Because of the climate, corn, wheat, and soybeans have become popular crops in the Midwest. In fact, these crops are becoming so
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popular that farmers are beginning to plow up established grasslands in order to make space for more profitable corn and soybeans. Researchers from South Dakota State University found that 1.3 million acres of grassland was converted from grassland to farmland in North Dakota, South Dakota, Nebraska, Iowa, and Minnesota accounting for as much as 5 percent of grassland being converted annually (Walsh, 2013). Overall, farmland in the Midwest is well suited for many of today’s high demand crops, possibly explaining the increasing demand for farmland in this area.

Figure 10

Land In Farms by Economic Sales Class – Region, States, and United States: 2011 and 2012

<table>
<thead>
<tr>
<th>Region and state</th>
<th>Economic sales class</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$250,000-$499,999</td>
</tr>
<tr>
<td></td>
<td>2011 (1,000 acres)</td>
</tr>
<tr>
<td>Northeast</td>
<td></td>
</tr>
<tr>
<td>Connecticut</td>
<td>(NA)</td>
</tr>
<tr>
<td>Maine</td>
<td>(NA)</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>(NA)</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>(NA)</td>
</tr>
<tr>
<td>New Jersey</td>
<td>(NA)</td>
</tr>
<tr>
<td>New York</td>
<td>700</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>900</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>(NA)</td>
</tr>
<tr>
<td>Vermont</td>
<td>(NA)</td>
</tr>
<tr>
<td>Other States</td>
<td>445</td>
</tr>
<tr>
<td>Total</td>
<td>2,045</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Region and state</th>
<th>Economic sales class</th>
</tr>
</thead>
<tbody>
<tr>
<td>North Central</td>
<td></td>
</tr>
<tr>
<td>Illinois</td>
<td>4,900</td>
</tr>
<tr>
<td>Indiana</td>
<td>2,500</td>
</tr>
<tr>
<td>Iowa</td>
<td>6,700</td>
</tr>
<tr>
<td>Kansas</td>
<td>8,000</td>
</tr>
<tr>
<td>Michigan</td>
<td>1,500</td>
</tr>
<tr>
<td>Minnesota</td>
<td>4,900</td>
</tr>
<tr>
<td>Missouri</td>
<td>3,200</td>
</tr>
<tr>
<td>Nebraska</td>
<td>9,300</td>
</tr>
<tr>
<td>North Dakota</td>
<td>8,600</td>
</tr>
<tr>
<td>Ohio</td>
<td>2,450</td>
</tr>
<tr>
<td>South Dakota</td>
<td>9,800</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>2,600</td>
</tr>
<tr>
<td>Total</td>
<td>64,450</td>
</tr>
</tbody>
</table>

Source: National Agriculture Statistics Service, 2013

Now that basic information has been made available about farmland in the Midwest, it is possible to start analyzing the trends being realized in the farmland market. The information about farmland price increases, farmland values, and characteristics of this region will serve as a baseline for this analysis. This knowledge, combined with the analysis of various factors, will
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allow for a more complete understanding. In order analyze the factors that affect farmland prices, it is important to understand how to utilize tools such as supply and demand graphs.

Supply and Demand

Farmland prices are similar to that of any other good or service as an economic approach can be used to analyze the market. Specifically, supply and demand curves can be used to analyze these markets which ultimately help explain which factors contribute to the price of farmland.

Market

Markets occur when buyers and sellers get together to exchange things, generally money, for goods and/or services. Markets can be understood through the preferences of both buyers and sellers. Buyers are called demanders in these markets, and their preferences determine the characteristics of the demand curve. Sellers, on the other hand, are suppliers in these markets; their preferences determine the characteristics of the supply curve. Through these two curves, it is possible to evaluate and understand markets and the factors which affect them. In doing so, the price and quantity of farmland bought and sold can be analyzed.

Supply and Demand Curves

In the simplest terms, supply and demand curves reflect the willingness of either party to participate in the buying or selling of goods. The supply and demand curves are used to relate the price per unit of a good or service with quantity of units. The price per unit is often represented by the vertical axis while quantity of units would be represented by the horizontal axis. In the farmland market it is likely that dollars per acre and the number of acres would be acceptable axis labels. With these axes labeled as mentioned, the supply curve would be upward sloping as
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shown in Figure 1.1. With the same axis labeling method, the demand curve will be downward sloping as shown in Figure 1.2.

![Figure 1.1](image1)

![Figure 1.2](image2)

The supply curve indicates the quantity of units current landowners are willing to sell at a given price, *ceteris paribus*. Generally, as the price of land increases, it is reasonable that

\[\text{\textsuperscript{2}}\text{Ceteris paribus means other conditions remaining the same.}\]

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landowners are willing to sell more units of land. The inverse of this statement is also generally true, concluding that as the price of land decreases, landowners are willing to sell fewer units of land. On the other side of the market, the demand curve represents the amount of land that buyers are willing to buy at a given price, *ceteris paribus*. Most of the time as land prices increase, buyers are willing to purchase fewer units of land. The inverse of this concept also often holds true. This means that as the land prices decrease, buyers are willing to purchase more units of land. Substitutes help determine the supply curve as consumers realize they have purchasing options. An example of this can be realized through various forms of cattle feed. As the price of corn silage goes up, the farmer might find it less expensive to feed the livestock hay instead. This outline is a simple explanation for supply and demand curves that will be expanded later in this paper.3

Supply and Demand Together

Once supply and demand curves are understood on an individual basis, it is possible to put them together on the same graph to help better understand a particular market. Both the price of farmland and the quantity available can be better explained by aggregating supply and demand curves. Obviously not all factors can be accounted for to perfectly explain the farmland market. At the same time, the farmland market is constantly changing. As a result, a perfect analysis is not possible, but great insights can still be realized through the use of this tool.

When analyzing how supply and demand curves interact, it is important to understand the concept of equilibrium. The equilibrium is located at the place where the supply and demand curves intersect. The equilibrium price is the price that is recognized at this point and the equilibrium quantity is the quantity realized at this point. The equilibrium, equilibrium price, and

3 Supply and demand curves are not necessarily linear in real world applications.
equilibrium quantity are displayed in Figure 1.3. There should only be one equilibrium for any given market. 4

The concepts of surplus and shortage must also be understood as they determine the equilibrium price and equilibrium quantity. A surplus exists when, at a given price, a larger quantity is being supplied than is being demanded (Shown in Figure 1.3). In this example, the surplus experienced at the surplus price is equal to Quantity 2 minus Quantity 1. When looking at supply and demand curves, this would occur at a price above the equilibrium. Shortages are the opposite of surpluses. A shortage occurs, at a given price, when a larger quantity is demanded than is being supplied (Shown in Figure 1.3). In this example, the shortage experienced at the shortage price is Quantity 1 minus Quantity 2. This can be realized at any price below the equilibrium. Both situations will result in the market moving toward the equilibrium price and quantity. An example of this might be realized as a store has too many apples, a surplus. To sell all of the apples, the store lowers the price on the apples at which point more apples are sold. This is an example of movement toward equilibrium.

4 Equilibriums are the prices realized in perfect markets.
More than just price affects the way the curves interact. There are numerous factors that affect the shape of supply and demand curves and how they interact. Since the world is constantly changing, it is important to realize that these curves, too, will be changing constantly to some extent. For example, weather constantly affects the supply curve of crops such as corn. As bad weather is experienced, the suppliers are likely going to plan on selling their corn quite differently than if they had experienced a bumper crop. On the other hand, release of information related to health risks associated with the consumption of preserved tomatoes is likely to change the characteristics of the demand curve for these tomatoes. Overall, more than just price affects the desires of those participating on both sides of the market.

**Curve Shifts**

For simplicity's sake, it is best to view supply and demand curve shifts horizontally. This means that a supply or demand increase will be represented by shifting either curve to the right, while a supply or demand decrease can be represented by shifting either curve to the left.
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The Supply Side

When an increase in supply is being realized, the supply curve will shift to the right (as shown in Figure 1.4). This shift will result in a lower equilibrium price and a greater equilibrium quantity. An example of a supply increase could include clearing more land to make it farmable. On the other hand, a decrease in supply can be represented by shifting the curve to the left (as shown in Figure 1.5). This shift will result in a higher equilibrium price and a lower equilibrium quantity. An example of supply decrease might include land being submerged by water due to the melting of ice from global warming. The steepness of both curves will affect the amount the equilibrium price change and equilibrium quantity change.

Figure 1.4
The Demand Side

When an increase in demand is being realized, the demand curve will shift to the right (as shown in Figure 1.6). This shift will result in a higher equilibrium price and a greater equilibrium quantity. An example of an increase in demand can be realized indirectly as the world population grows, demanding more food and more land to produce that food. This same concept can be applied to a farm crop such as corn. As demand increases, a higher equilibrium price is realized. When there is a higher market price, less efficient farmers will start entering the market because the new market price will allow them to make a profit when they might have been losing money at the previous market price. On the other hand, a decrease in demand can be represented by shifting the curve to the left (as shown in Figure 1.7). This shift will result in a lower equilibrium price and lower equilibrium quantity. An example of decreasing demand could be realized as technology increases crop yields, which require less land to grow the same or possibly larger...
quantities of food. Similar to supply curve shifts, the steepness of both curves will affect the
amount of the equilibrium price and equilibrium quantity change.

Figure 1.6

Figure 1.7
Steepness affects Equilibrium Price Change and Equilibrium Quantity Change

When analyzing supply and demand shifts it is important to realize how the steepness of the curves ultimately affects the equilibrium price change and equilibrium quantity change. Four examples can be used to understand how the steepness of each curve affects the equilibrium price change and the equilibrium quantity change.

In the first example, the supply curve is relatively steep while the demand curve is neither steep nor flat as shown in Figure 1.8. In this example the demand increases, and the demand curve shifts to the right. This might be caused when research indicates a particular food can be associated with increased life expectancy. For this example, a relatively large change is realized in the equilibrium price while a relatively small change is realized in equilibrium quantity.

In the second example, the supply curve is relatively flat while the demand curve is neither steep nor flat as shown in Figure 1.9. Again, demand increases and the demand curve
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shifts to the right. In this example, a relatively small change is realized in equilibrium price while a relatively large change is recognized in equilibrium quantity.

Figure 1.9

In the third example, the supply curve is neither steep nor flat while the demand curve is relatively steep as shown in Figure 2.0. In this example, supply increases and the supply curve shifts to the right. This could be realized as a new technology, such as better fertilizer, allows for more corn to be produced at the same price. As a result, a relatively large change is realized in equilibrium price while a small change is realized in equilibrium quantity.
In the fourth example, the supply curve is neither steep nor flat while the demand curve is relatively flat as shown in Figure 2.1. In this example, supply increases, and the supply curve shifts to the right. As a result, a relatively small change is realized in equilibrium price while a large change is realized in equilibrium quantity. All of these examples help explain the overarching concept that the steepness of the curves can affect the amount of equilibrium price change and equilibrium quantity change as curves are shifted. Overall, to analyze how change in demand or supply affects the price and quantity realized in the market, one must understand what determines the steepness of the curves.
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Figure 2.1
Farmland Prices in the Midwest

Factors Affecting Farmland Prices

Economists and industry experts have identified similar factors that are believed to significantly affect land prices. These factors include interest rates, productivity, net income, government policy, and land availability. These various factors are obviously not the only factors that affect farmland prices; the extent to which each factor affects the price of farmland in a specific area differs. Regardless, this list serves as a starting point to understand how some of the more common and influential factors might affect the price of farmland.

Interest Rates

The first factor that economists and industry experts believe to affect the price of farmland is the interest rate. It is possible to understand how interest rates might affect the farmland market by utilizing the supply and demand tools which were introduced earlier. When relatively low interest rates are being experienced, as they have been in the past several years, farmers are more likely to borrow money to buy farmland as it is less expensive to do so. As a result, the demand for farmland increases, as more farmers borrow money, and the equilibrium price of farmland increases. Overall, low interest rates help improve the affordability of farmland (Nickerson et al., 2012). Figure 2.1 shows that in recent years the price-to-value ratio is less than one or the value is greater than the price given the low interest rates.
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Figure 2.1

**Cropland price-to-value ratio varies under alternative interest rates**

![Graph showing cropland price-to-value ratio under constant and prevailing interest rates.](image)

Source: Nickerson et al., 2012

**Productivity**

Next, economists and industry experts believe that productivity can be correlated with the price of farmland. Although the amount of land being used for agricultural production has not changed significantly in the past few decades, production has increased by a considerable amount. This is due to various improvements in technology. These advancements include developments in farming methods and machinery as well as biotechnology. These advancements are leading to an overall increase in efficiency. Efficiency can be realized in either greater production or lower input costs. As farmers are able to recognize increased yields or lower costs, the result is increased revenue. This increased revenue allows farmers to justify paying higher prices for farmland. In terms of supply and demand, this means that the demand for farmland is increasing, and the equilibrium price of farmland would also increase. Production increases are shown in Figure 2.2; increases in contribution margins are shown in Figure 2.3.
Figure 2.2

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Source: Gloy, Hurt, Boehlje, & Dobbins, 2012

Figure 2.3

Source: Gloy et al., 2012
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Farm Earnings

Yet another factor affecting farmland prices is said to be net income. Looking back at the previous example, if productivity or the supply of crops were to increase while the demand for these crops remained the same, the equilibrium price of the crops would decrease. However, the recent demand for crops for food and as an energy source keeps commodity stocks tight and export demand strong (Nickerson et al., 2012). This increase in demand offsets the increase in supply and allows for the same, if not increased, crop prices. The increase in demand can been seen in Figure 2.2 as the use of grains increases. As productivity increases and the crop prices remain the same or increase, overall farm earnings also increase. Furthermore, the amount of earnings realized from a given portion of land also increases.

Government Policy

The fourth factor that affects farmland prices is government policy. In the United States many farm operators receive government agricultural payments which support farmer income (Ciaian, Kanes, Swinnen, Van Herck, & Vranken, 2012). This form of income, in addition to crop sales, also supports farmers and increases the demand for farmland. In a similar nature to many of the other factors, increased demand results in the increased equilibrium price of farmland. There is currently much debate over these support programs including price support, production subsidies, and factor subsidies just to name a few. The possibility of partial or complete program removal with the implementation of new farm bills could substantially affect farmer income and ultimately, farmland values. Research has shown that these payments have increased farmland values, so if these programs are abruptly terminated and not replaced with programs that provide similar levels of payments, farmland values could decline (Nickerson et al., 2012).
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Land Availability

The next factor that is believed to affect farmland prices is farmland availability. Historically, relatively little farmland has been available for purchase, with some estimates indicating about 0.5 percent of U.S. farmland sold annually (Nickerson et al., 2012). Location is a limiting factor as land is not an asset like that of equipment that can be easily relocated to a desired location for production. It can become very difficult and expensive to manage a farm operation that is spread over a large area. Additionally, farmland located at the rural-urban fringe is being used as cities continue to expand into the countryside (Gardner, & Nuckton, 1979). Overall, “farmland owners have been reluctant to part with this valuable asset and may be seeking the ‘top’ in the market” (Gloy et al., 2012). With the previously mentioned factors resulting in an increased demand for farmland and decreased supply of farmland, a higher equilibrium farmland price is being realized.

Other Major Considerations

Besides the various factors mentioned above, several considerations must also be taken into account. First, speculation is a major factor in the farmland market. Speculation is taking into account an expected future state. Before any actual change takes place, speculation related to crop prices, government policies, interest rates and many other elements often affect the price of farmland. An example of how speculation affects markets can be seen in the commodity crop markets. If the amount of corn is expected to decrease next year as a result of a nationwide drought, the current price of corn is likely to increase. This increase is experienced as farmers may be trying to stock up on corn for future use or investors buy corn to sell when the price increases next year. Regardless, the price increase is being experienced in the current market even though the current crop has not been harvested, and there is no guarantee that the price will
increase. Just like the commodity crop market, the impact of potential changes also affects how buyers and sellers act in the farmland market.

In addition to speculation, the alternative uses of farmland must also be considered. This is especially true for farmland located near high population areas. This correlation can be seen in Figure 2.4. Land within five miles of a city can be more than twice as expensive as land at least 15 miles from a city.

Figure 2.4

Farm real estate values are highest close to population centers

$1,000 per acre

Source: Nickerson et al., 2012

The third consideration that must be taken into account is how other markets affect the farmland market. It is not uncommon for investors to buy farmland simply as an investment. As a result, all other alternative investment options can affect the farmland market. One well-known alternate investment is the Treasury bond market which has been studied alongside the price of farmland. The interest rates on 10-year Treasury bonds are shown in Figure 2.5. As the interest rates on 10-year treasury bonds have decreased, investors have found other investment alternatives. Among these alternatives is farmland real estate, resulting in increased demand.
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Figure 2.5

Interest Rate on 10-Year Treasury Bonds, 1970 to 2010

Source: Gloy et al., 2012

Overall, the farmland market is complex, and proper analysis requires the careful consideration of numerous factors. The factors outlined previously are a starting place for such analysis as they are likely to affect the price of U.S. farmland. According to Gloy et al. "The key to understanding land values and their possible directions won’t be just to listen to one or two experts tell you which direction the land market is going. Instead, this understanding will hinge on your knowledge of how these key factors and others will affect farmland values" (2012).
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Extrapolations

This paper has provided an overview of the main areas of interest when looking at farmland prices in the Midwest. First, an overview of the U.S. agriculture and agriculture in the Midwest made understanding this market possible. Next, analysis using supply and demand tools was introduced. Finally, the major factors affecting farmland prices were introduced and analyzed using supply and demand tools. With all of this information, it is now possible to draw several conclusions about farmland prices in the Midwest.

First Extrapolation

The first conclusion that can extracted from the information provided is that the limited availability of land is likely to gradually have a positive effect on the price of farmland. Since farmland is a limited natural resource, it cannot be increased indefinitely. The fact that farmland is a limited resource is more of a concern in the long-term, macroeconomic perspective.

The limited amount of farmland is a major concern considering projections from University of Minnesota professors, Tilman and Hill, indicating that global food demand will double by the year 2050 (2011). Without drastic innovations to increase crop productivity, the increased demand for products raised on the farm will significantly boost demand for farmland. The questions at this point are how much will technology increase crop productivity, and will the increase in productivity keep up with the increase in demand for these products?

Second Extrapolation

The second conclusion that can be drawn from the provided information is that interest rates are likely to negatively affect the price of farmland in the near future. Recently the economy has been experiencing positive growth which is known to result in increased interest rates. The growth of the economy is evident as the Dow Jones Industrial Average closed at a
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record high in 2013 (Farrell, 2013) and the national unemployment rate dropped to its lowest point in five years (Crutsinger, 2013). With this economic growth, interest rates are likely to rise, resulting in less farmers borrowing money to buy farmland. Furthermore, as the economy grows, investors who were once purchasing farmland will begin investing in various alternatives such as the stock market. As these investors leave the farmland market, the demand for farmland will further decrease, driving down the price.

Third Extrapolation

The third conclusion that can be reached is that future crop commodity prices could either positively or negatively affect land prices in the near future. The crop commodity market is very difficult to predict as the national productivity levels affect the price of many crops. These levels can be affected significantly by weather, government policies, and other various factors. Many economists, such as Crutchfield, believe that the U.S drought experienced in 2012 allowed crop prices to reach “record or near-record levels during the summer months leading up to the 2012 harvest, and remain at historically high levels” (2013). In the next few years it is very possible that normal crop production levels will bring the crop commodity prices down from these record prices experienced, as a result of the drought. Alternatively, if similar conditions are experienced crop prices may remain high or even continue to increase. As crop commodity prices continue to change, it will ultimately affect the extent to which farmers can justify high farmland prices.

Low interest rates may be the result of various circumstances, so it is important to understand what determines this interest rate.
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Conclusion

All in all, it is very difficult to predict what will happen to Midwest farmland prices in both the immediate future and long-term. Considering the factors mentioned above, it is reasonable to conclude that farmland prices might decrease in the next few years but increase gradually over the next few decades. Regardless, it is now possible to realize just how sensitive the farmland market is and how various factors can drastically affect the price of farmland. These price changes are driven by the factors which are in some way related to the supply and/or demand of farmland. Although it may not be possible to precisely predict the price of farmland, the knowledge gained through analyzing this market allows for a better understanding of where the market might be headed. At the same time, methods used to analyze the numerous factors affecting farmland prices can be applied in various settings to understand how farmland prices might be affected. The application of knowledge, additional research, and detailed analysis will allow for a more comprehensive understanding of the U.S. farmland markets, including the farmland located in the Midwest.
References


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