Introduction to Farmland Market: Iowa and Beyond

Wendong Zhang
Assistant Professor of Economics and Extension Economist
wdzhang@iastate.edu
515-294-2536
Econ 235, Feb 7, 2017
The new Mike Duffy
A Quick Introduction: Dr. Wendong Zhang

– Grown up in a rural county in NE China
– Attended college in Shanghai and Hong Kong
– Ph.D. in Ag Econ in 2015 from Ohio State
– 2012 summer intern at USDA-ERS on farm economy and farmland values
– Research and extension interests: land value, land ownership, agriculture and the environment, China Ag
My Hometown: Shenxian, Shandong Province
Intensification of Land-Use in China

Greenhouse – plastic film - Shandong Province
Why Care About Farmland Market?

Distribution of U.S. Farm Assets

- Real estate
- Livestock and poultry
- Machinery and motor vehicles
- Crops stored
- Purchased inputs
- Financial assets

Source: USDA ERS
What is the price of corn per bushel now? 2012?

• $ 2.0
• $ 7.0
• $ 3.5
• $ 4
• $ 5
The percentage change in Iowa farmland values since Nov 2014?

- Increased 5%
- Increased 10%
- Did not change
- Decreased 5%
- Decreased 10%
$7,183
As of Nov 16
-5.9%
% Change in Nominal Iowa Farmland Values 1942-2016
Farmland Values are driven by agricultural market fundamentals

Iowa Farmland Values vs. Commodity Prices 1972-2015

Farmland Values are driven by agricultural market fundamentals.
US Farm Income 1990-2025

Source: USDA OCE
David Ricardo was an English political economist. He was one of the most influential of the classical economists, along with Thomas Malthus, Adam Smith, and James Mill.
Ricardo model

“A” land has lowest production costs = highest rents

“C” land’s rent is 0 because costs are greater than revenue

On fertile land, a farmer can produce same amount of corn with fewer inputs
Market Value of Land – Capitalization Formula

\[ PV = \sum_{t=0}^{n} \frac{R}{(1+i)^t} \]

- For simplicity, you could think of land value as the present value of all future annual land rental payments a landowner could charge.
- \( PV = \frac{R}{i} \)
## Land Values by District and Land Quality, Nov 2016

<table>
<thead>
<tr>
<th>District</th>
<th>Average Value</th>
<th>% Change</th>
<th>High Quality</th>
<th>% Change</th>
<th>Medium Quality</th>
<th>% Change</th>
<th>Low Quality</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northwest</td>
<td>$9,243</td>
<td>-4.6%</td>
<td>$10,650</td>
<td>-5.2%</td>
<td>$8,468</td>
<td>-4.1%</td>
<td>$6,019</td>
<td>-3.7%</td>
</tr>
<tr>
<td>North Central</td>
<td>$7,562</td>
<td>-5.0%</td>
<td>$8,442</td>
<td>-5.9%</td>
<td>$6,992</td>
<td>-4.9%</td>
<td>$5,164</td>
<td>-3.9%</td>
</tr>
<tr>
<td>Northeast</td>
<td>$7,313</td>
<td>-7.0%</td>
<td>$8,892</td>
<td>-7.1%</td>
<td>$6,994</td>
<td>-6.2%</td>
<td>$4,847</td>
<td>-7.5%</td>
</tr>
<tr>
<td>West Central</td>
<td>$7,358</td>
<td>-8.7%</td>
<td>$8,874</td>
<td>-8.4%</td>
<td>$6,870</td>
<td>-9.4%</td>
<td>$4,577</td>
<td>-9.9%</td>
</tr>
<tr>
<td>Central</td>
<td>$7,841</td>
<td>-7.8%</td>
<td>$9,299</td>
<td>-7.8%</td>
<td>$7,186</td>
<td>-7.4%</td>
<td>$5,158</td>
<td>-2.5%</td>
</tr>
<tr>
<td>East Central</td>
<td>$7,917</td>
<td>-6.9%</td>
<td>$9,502</td>
<td>-7.6%</td>
<td>$7,396</td>
<td>-6.8%</td>
<td>$5,153</td>
<td>-4.0%</td>
</tr>
<tr>
<td>Southwest</td>
<td>$6,060</td>
<td>-4.9%</td>
<td>$7,527</td>
<td>-6.3%</td>
<td>$5,683</td>
<td>-5.9%</td>
<td>$4,189</td>
<td>2.9%</td>
</tr>
<tr>
<td>South Central</td>
<td>$4,241</td>
<td>-3.6%</td>
<td>$5,980</td>
<td>-7.2%</td>
<td>$4,128</td>
<td>-3.6%</td>
<td>$2,892</td>
<td>5.2%</td>
</tr>
<tr>
<td>Southeast</td>
<td>$6,716</td>
<td>-2.6%</td>
<td>$9,265</td>
<td>-2.8%</td>
<td>$6,283</td>
<td>-3.7%</td>
<td>$3,783</td>
<td>-0.4%</td>
</tr>
<tr>
<td>Iowa Avg.</td>
<td>$7,183</td>
<td>-5.9%</td>
<td>$8,758</td>
<td>-6.5%</td>
<td>$6,705</td>
<td>-5.9%</td>
<td>$4,665</td>
<td>-3.5%</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------</td>
<td>-----------</td>
<td>----------------</td>
<td>--------------</td>
<td>----------------</td>
<td>---------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northwest</td>
<td>30%</td>
<td>26%</td>
<td>29%</td>
<td>22%</td>
<td>20.4 million</td>
<td>15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>North Central</td>
<td>64%</td>
<td>16%</td>
<td>4%</td>
<td>6%</td>
<td>20.4 million</td>
<td>14%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>1%</td>
<td>12%</td>
<td>51%</td>
<td>16%</td>
<td>0.17 million</td>
<td>12%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>West Central</td>
<td>0%</td>
<td>13%</td>
<td>1%</td>
<td>13%</td>
<td>0.17 million</td>
<td>15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central</td>
<td>3%</td>
<td>13%</td>
<td>1%</td>
<td>7%</td>
<td>2.34 million</td>
<td>15%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>East Central</td>
<td>1%</td>
<td>5%</td>
<td>10%</td>
<td>11%</td>
<td>2.34 million</td>
<td>10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southwest</td>
<td>0%</td>
<td>2%</td>
<td>0%</td>
<td>9%</td>
<td>0.17 million</td>
<td>7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Central</td>
<td>0%</td>
<td>2%</td>
<td>1%</td>
<td>9%</td>
<td>13.2 million</td>
<td>4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southeast</td>
<td>1%</td>
<td>11%</td>
<td>3%</td>
<td>6%</td>
<td>13.2 million</td>
<td>7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Inventory</td>
<td>20.4 million</td>
<td>20.4 million</td>
<td>0.17 million</td>
<td>2.34 million</td>
<td>13.2 million</td>
<td>9.8 million</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Percent Changes in Land Values from Nov 2015

- Lyon: -6.31%
- Osceola: -6.31%
- Dickinson: -6.31%
- Emmet: -5.97%
- Kossuth: -5.97%
- Winnebago: -5.56%
- Worth: -5.89%
- Mitchell: -6.21%
- Howard: -6.38%
- Winneshiek: -6.55%
- Allamakee: -6.71%

- Sioux: -6.91%
- O’Brien: -6.31%
- Clay: -5.99%
- Palo Alto: -5.63%
- Hancock: -5.56%
- Cerro Gordo: -5.89%
- Floyd: -6.21%
- Chickasaw: -6.38%
- Clayton: -6.71%

- Plymouth: -7.62%
- Cherokee: -6.96%
- Buena Vista: -5.99%
- Pocahontas: -5.80%
- Humboldt: -5.69%
- Wright: -5.91%
- Franklin: -5.69%
- Butler: -6.24%
- Bremer: -6.37%

- Douglas: -6.54%
- Cedar: -6.54%
- Cherokee: -6.56%
- Hamilton: -6.57%
- Hardin: -6.88%
- Grundy: -6.52%
- Black Hawk: -6.52%
- Buchanan: -6.32%
- Delaware: -6.42%
- DeKalb: -6.59%

- Woodbury: -8.32%
- Winneshiek: -8.32%
- Ida: -7.61%
- Sac: -6.78%
- Calhoun: -6.76%
- Webster: -6.54%
- Hamilton: -6.56%
- Hardin: -6.57%
- Grundy: -6.88%

- Monona: -8.37%
- Crawford: -7.59%
- Carroll: -6.78%
- Greene: -7.16%
- Boone: -7.18%
- Story: -7.15%
- Marshall: -6.52%
- Tama: -6.64%
- Benton: -6.64%
- Linn: -5.66%

- Jones: -5.80%
- Jackson: -6.19%
- Clinton: -5.73%
- Scott: -5.34%
- Muscatine: -5.26%

- Pottawattamie: -5.87%
- Cass: -6.12%
- Adair: -5.48%
- Madison: -4.56%
- Warren: -4.56%
- Marion: -4.56%
- Mahaska: -4.36%
- Keokuk: -5.20%
- Washington: -5.20%

- Mills: -4.72%
- Montgomery: -4.72%
- Adams: -3.85%
- Union: -3.00%
- Clarke: -2.20%
- Lucas: -2.00%
- Monroe: -3.47%
- Wapello: -4.43%
- Jefferson: -4.34%
- Henry: -4.33%

- Fremont: -4.72%
- Page: -4.72%
- Taylor: -3.93%
- Ringgold: -3.03%
- Decatur: -2.00%
- Wayne: -2.00%
- Appanoose: -2.00%
- Davis: -2.00%
- Van Buren: -3.32%

- Lee: -3.25%

- State Average: -5.89%

Percentage Change:
- Decreased 7% or more
- Decreased 6 to 7%
- Decreased 5 to 6%
- Decreased 2 to 5%
- Decreased less than 2%

IOWA STATE UNIVERSITY
Extension and Outreach
CARD
Center for Agricultural and Rural Development
Farmland Market is Very Thin!

→ Few Observations

Annual Agricultural turnover ratio 2001 - 2010

Legend

Blue: <0.5%
Red: 1.5-2%

Illinois <0-3%>
Iowa Farmland Sale Activity Relative to Last Year 1985-2016

Iowa Farmland Sale Activity Change 1989-2016

More  Less  Same
Farmland supply tends to be tighter in down years

ISU sale activity index and percent change in Iowa land value, 1986-2016
(% reported more sales - % reported less sales) + 100

Sale activity index (% reported more - % reported less)*100

Land Value % Change

Sale Activity Index

0% 10% 20% 30% 40%

-10% -20%


IOWA STATE UNIVERSITY
Extension and Outreach

Center for Agricultural and Rural Development
Limited farmland supply tends to bolster land values

Number of Public Auctions by Month 2011-2016

Farm Credit Service of America
Looking Ahead
Major Positive Factors Affecting Iowa Farmland Market, 2016

Positive Factors, 2016 (Percent)

- Favorable Interest Rates
- Strong Yields
- Land Availability (Limited Supply)
- Strong Demand (Many Buyers)

Iowa State University Extension and Outreach
Center for Agricultural and Rural Development
Major Negative Factors Affecting Iowa Farmland Market, 2016

Negative Factors, 2016 (Percent)

- Commodity Prices (Lower)
- Input Costs (Higher)
- Cash Rent Rates (Weak)
- Livestock Losses
- Stock Market / Economy/Global
Iowa Farmland Purchases by Buyer Types 1989-2016

- Existing Farmers
- Investors
- New Farmers
- Other
Iowa Landowners tend to hold the farmland

<table>
<thead>
<tr>
<th>Years of ownership</th>
<th>% of Iowa Farmland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 10 years</td>
<td>24%</td>
</tr>
<tr>
<td>10-20 Years</td>
<td>21%</td>
</tr>
<tr>
<td>20-30 Years</td>
<td>19%</td>
</tr>
<tr>
<td>30-40 Years</td>
<td>15%</td>
</tr>
<tr>
<td>&gt; 40 Years</td>
<td>20%</td>
</tr>
</tbody>
</table>

Source: Ag DM PM1980 2012 Iowa Farmland Ownership and Tenure Survey
## Iowa Farmland Purchases by Seller Types, 2016

<table>
<thead>
<tr>
<th>Region</th>
<th>Active Farmers</th>
<th>Retired Farmers</th>
<th>Estate Sales</th>
<th>Investors</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PERCENT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northwest</td>
<td>12</td>
<td>17</td>
<td>64</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>North Central</td>
<td>8</td>
<td>17</td>
<td>61</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>Northeast</td>
<td>14</td>
<td>34</td>
<td>43</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>West Central</td>
<td>12</td>
<td>25</td>
<td>57</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Central</td>
<td>13</td>
<td>22</td>
<td>53</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>East Central</td>
<td>11</td>
<td>24</td>
<td>53</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Southwest</td>
<td>15</td>
<td>24</td>
<td>47</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>South Central</td>
<td>17</td>
<td>24</td>
<td>37</td>
<td>19</td>
<td>3</td>
</tr>
<tr>
<td>Southeast</td>
<td>11</td>
<td>24</td>
<td>57</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td><strong>STATE</strong></td>
<td><strong>12</strong></td>
<td><strong>23</strong></td>
<td><strong>53</strong></td>
<td><strong>9</strong></td>
<td><strong>3</strong></td>
</tr>
</tbody>
</table>

*Source: Iowa State University Extension and Outreach, Center for Agricultural and Rural Development (CARD)*
# Cash Crop Price Predictions for Nov 2017, 2018, 2020

<table>
<thead>
<tr>
<th></th>
<th>Cash Corn Prices</th>
<th>Cash Soybean Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Northwest</strong></td>
<td>$3.34</td>
<td>$3.65</td>
</tr>
<tr>
<td><strong>North Central</strong></td>
<td>$3.42</td>
<td>$3.59</td>
</tr>
<tr>
<td><strong>Northeast</strong></td>
<td>$3.41</td>
<td>$3.59</td>
</tr>
<tr>
<td><strong>West Central</strong></td>
<td>$3.34</td>
<td>$3.59</td>
</tr>
<tr>
<td><strong>Central</strong></td>
<td>$3.36</td>
<td>$3.50</td>
</tr>
<tr>
<td><strong>East Central</strong></td>
<td>$3.42</td>
<td>$3.58</td>
</tr>
<tr>
<td><strong>Southwest</strong></td>
<td>$3.31</td>
<td>$3.56</td>
</tr>
<tr>
<td><strong>South Central</strong></td>
<td>$3.36</td>
<td>$3.59</td>
</tr>
<tr>
<td><strong>Southeast</strong></td>
<td>$3.50</td>
<td>$3.83</td>
</tr>
<tr>
<td><strong>STATE</strong></td>
<td>$3.38</td>
<td>$3.60</td>
</tr>
</tbody>
</table>
### 2016 Estimated Land and Commodity Prices

#### Land

<table>
<thead>
<tr>
<th></th>
<th>NW</th>
<th>NE</th>
<th>SW</th>
<th>SE</th>
<th>STATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov 2016</td>
<td>$ 8,358</td>
<td>$ 8,191</td>
<td>$ 6,958</td>
<td>$ 7,320</td>
<td>$ 7,776</td>
</tr>
<tr>
<td>Nov 2017</td>
<td>$ 8,137</td>
<td>$ 7,991</td>
<td>$ 6,991</td>
<td>$ 6,869</td>
<td>$ 7,572</td>
</tr>
<tr>
<td>Nov 2020</td>
<td>$ 8,884</td>
<td>$ 8,758</td>
<td>$ 7,698</td>
<td>$ 7,614</td>
<td>$ 8,303</td>
</tr>
<tr>
<td>Nov 2025</td>
<td>$ 10,199</td>
<td>$ 9,756</td>
<td>$ 8,834</td>
<td>$ 8,681</td>
<td>$ 9,446</td>
</tr>
<tr>
<td>Nov 2040</td>
<td>$ 14,487</td>
<td>$ 12,818</td>
<td>$ 11,833</td>
<td>$ 11,988</td>
<td>$ 12,866</td>
</tr>
</tbody>
</table>

#### Commodity Prices

<table>
<thead>
<tr>
<th></th>
<th>CORN</th>
<th>SOYBEAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov 2016</td>
<td>$3.75</td>
<td>$9.44</td>
</tr>
<tr>
<td>Nov 2017</td>
<td>$3.73</td>
<td>$10.12</td>
</tr>
<tr>
<td>Nov 2020</td>
<td>$4.32</td>
<td>$10.78</td>
</tr>
</tbody>
</table>
A replay of 1920s or 1980s farm crisis?

<table>
<thead>
<tr>
<th>Golden Eras</th>
<th>Land</th>
<th>Gross Income</th>
<th>Net Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>1910-1920</td>
<td>1.2%</td>
<td>0.8%</td>
<td>0.2%</td>
</tr>
<tr>
<td>1973-1981</td>
<td>9.7%</td>
<td>0.9%</td>
<td>-3.2%</td>
</tr>
<tr>
<td>2003-2013</td>
<td>11.1%</td>
<td>4.5%</td>
<td>8.1%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Crises and Declines</th>
<th>Land</th>
<th>Gross Income</th>
<th>Net Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>1921-1933</td>
<td>-5.8%</td>
<td>-1.9%</td>
<td>-1.0%</td>
</tr>
<tr>
<td>1981-1987</td>
<td>-15.0%</td>
<td>-2.5%</td>
<td>2.6%</td>
</tr>
<tr>
<td>2013-2016</td>
<td>-6.0%*</td>
<td>-2.7%</td>
<td>-9.5%</td>
</tr>
</tbody>
</table>

Source: USDA-ERS, Ag DM C2-70, Zhang and Beek (2016) Farm Policy Journal
Key Indicators to Watch

Land Value = net income / interest rate

– USDA Farm Income Forecast
  • Price Outlook
  • Ag Exports / Exchange Rate
  • China
  • Ethanol, E-85, RFS
– Fed’s move on Interest Rate
– Ag Loan Delinquency; Vendor Credit
US Farm Income 1990-2025

Source: USDA OCE
Federal Reserve raises interest rates for second time in a decade, expects 3 hikes in 2017

By Jim Tankersley  December 14 at 3:30 PM

The Washington Post
Impact of Trade War w China and Mexico

45% tariff on China, 35% on Mexico
Aborted in one year

Source: Peterson Institute
S&P 500 vs. Farmland Values: A Question of Timing

Value of $1,000 invested in 1960 in thousand dollars

Year

1960

Source: Mike Duffy
Ag DM Newsletter June 2014
S&P 500 vs. Farmland Values: A Question of Timing

Source: Zhang and Duffy
Ag DM Newsletter April 2016

Return to S & P Investment Relative to Iowa Farmland Investment

Source: Zhang and Duffy
Ag DM Newsletter April 2016
A New, Interactive Iowa Farmland Value Portal

http://card.iastate.edu/farmland/
Iowa Farmland Value Portal

BETA

Your One-Stop Web-Portal for Everything You Need to Know about Iowa’s Farmland Value

2015 Results  Charts  Interactive County Maps  Downloads  Resources  Archive

Select a county or district:  State of Iowa

Select result format:  ☐ dollar value  ☐ annual percentage change  ☐ farmland value indexes (state only)

Select data sources:  ☑ ISU Iowa Land Value Survey  ☐ USDA National Agricultural Statistics Service  ☐ REALTORS Land Institute  ☐ Federal Reserve Bank of Chicago

Years:  1951 through  2014

☐ Show Values

☐ Show Iowa Average  ☐ Show District Average
Iowa Farmland Value Portal

twitter #ISUmland value

http://card.iastate.edu/farmland
Iowa Farmland Value Portal
www.card.iastate.edu/farmland

twitter #ISUlandvalue
Zillow for Farmers: Acre Value

Report Preview

Select a plot to view the report preview and order a report.

ACREVALUE

$9,814/ac

AVG SLOPE

1.9%

AVG CSR2

83

STATE

Iowa

COUNTY

Pocahontas

TOWNSHIP/SECTION

90N 34W - 5

ACRES

58.7

CROPS

- 95.5% Soybeans
- 3.4% Grass/Pasture
- 0.9% Corn
- 0.1% Non-Agricultural

2014

Get Report
WHAT'S MY FARM WORTH?

Zillow for Farmers

Source: Peoples Company

IOWA STATE UNIVERSITY
Extension and Outreach
CARD
Center for Agricultural and Rural Development
Find land to farm

IOWA STATE UNIVERSITY
Extension and Outreach
Thank You!

Wendong Zhang
Assistant Professor and Extension Economist
478C Heady Hall
Iowa State University
515-294-2536
wdzhang@iastate.edu
http://www2.econ.iastate.edu/faculty/zhang