Assessing the Profitability & Return on Investment for Precision Ag Technologies

James Mintert, Professor of Agricultural Economics & Director, Center for Commercial Agriculture
Ag Economy Barometer

Most Recent Observation: July 2016

Producers’ sentiment about ag. economy improved

Producer Survey
Most Recent Observation: July 2016

Producer Survey

Current and Future

Index of Current Conditions
Index of Future Expectations

But more optimistic about the future in July

Became less optimistic about current situation in July
Would you say that your farm operation today is financially better off, worse off, or about the same compared to a year ago?

Most Recent Observation: July 2016

Producer Survey
Do you think that a year from now your farm operation will be better off financially, worse off, or just about the same as now?

Most Recent Observation: July 2016

A bit more optimism in July than last winter

Most Recent Observation: July 2016

Producer Survey
Do you think that a year from now your farm operation will be better off financially, worse off, or just about the same as now?

Less pessimistic about the future in July

Most Recent Observation: July 2016

Producer Survey
Turning to the general agricultural economy as a whole, do you think that during the next twelve months there will be good times financially, or bad times?

2/3 to 3/4 of respondents expect bad times in the year ahead.
Looking ahead, do you think it is more likely that US agriculture during the next five years will have widespread good times or widespread bad times?

But decreasing concern about ag’s long-run future

Most Recent Observation: July 2016
Over the next five years, are widespread good times or bad times more likely? (% Good Times)

Long-run optimism improved among both crop & livestock producers

Most Recent Observation: July 2016

Producer Survey
Thinking about large farm investments – like buildings and machinery -- generally speaking, do you think now is a good time or bad time to buy such items?

About 2/3 of producers view now as a bad time for large investments.

Most Recent Observation: July 2016

Producer Survey
Precision Ag Services Offered Over Time By Retailers

Automated and Sensing Technologies

- Soil sampling with GPS: 33% in '97 to 67% in '15
- Field mapping with GIS: 29% in '97 to 57% in '15
- Yield monitor data analysis: 24% in '97 to 51% in '15

Source: Widmar & Erickson, 2015

Note: 2018 is predicted use.
Precision Ag Services Offered Over Time By Retailers

Site Specific Technologies

Source: Widmar & Erickson, 2015

Note: 2018 is predicted use
How does this compare to adoption rates for other agricultural technologies?
Hybrid Corn Adoption...

Source: USDA-NASS, Agricultural Statistics, various years
Adoption of genetically engineered crops in the United States, 1996-2015

Precision Ag crop technology adoption rates have been uneven...Why?

• Technology adoption is driven by profitability
• As profit potential goes up, adoption rate goes up
• Two issues:
  1. potential gain(s) and
  2. probability of realizing the gain
    ✓ this is key when examining yield enhancing vs. cost reducing technologies
Precision Ag’s Impact on Profitability

• Profitability increases result from reducing cost per unit of output...e.g., reducing cost per bushel

• Lower cost per unit of output is attributable to

  1) reduction in input usage, total production unchanged or

  2) increase in total production, input usage unchanged or

  3) increase in total production & reduced input usage

• Which of these can be anticipated with more certainty?
What’s Needed to Estimate Return on Investment?

1. change(s) in input usage & production attributable to precision technology
2. output & input prices
3. investment required for technology
4. useful life of technology
5. cost of capital
6. operational cost of technology
Estimating Net Present Value & ROI

1. know “additional” cost of technology
2. be realistic about technology life & terminal value of technology
3. interest rate at which you borrow money
4. what’s incremental cost of using precision technology vs. conventional technology
5. estimate income &/or cost reduction stream
   - need prices & yield changes
   - use scenario analysis to address uncertainty
Let’s look at an example...

New 16-row, 30-inch corn planter
• compare base planter
  vs.
• variable rate planter with clutches for row group shutoff
• additional cost for variable rate w/shutoff’s
  —approximately $11,000
• How can we approach this decision?
What other information do we need?

- Operation size: 2,000 acres of corn
- Estimated Useful Life: 5 Years
- Salvage or terminal value: $1,000
- Interest rate: 4%/year
- Extra cost of using technology: $1,000/year
- Cost reduction: Assume 2% seed savings
  \[(0.02 \times 125/acre) \times 2,000 = 5,000\]
- Yield gain: Unknown, omitted from analysis
What’s Net Present Value of Investment?

- Discounted value of 5-year net revenue stream (seed cost savings-cost of using tech.)
  - equals $4,000/year, that we must discount to account for time value of money @ 4% cap. rate

<table>
<thead>
<tr>
<th>Year</th>
<th>Discounted Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$3,846</td>
</tr>
<tr>
<td>2</td>
<td>$3,698</td>
</tr>
<tr>
<td>3</td>
<td>$3,556</td>
</tr>
<tr>
<td>4</td>
<td>$3,419</td>
</tr>
<tr>
<td>5</td>
<td>$3,287</td>
</tr>
<tr>
<td>Total</td>
<td>$17,807</td>
</tr>
</tbody>
</table>
What’s Net Present Value of Investment?

- Discounted Value of Net Revenue Stream
  - $17,807
- Plus, Discounted Value of Terminal Value
  - $822
- So, Net Present Value (NPV) = $18,629
- NPV Decision Rule:
  - If NPV > Initial Cost, Make the Investment
    - NPV ($18,629) > Initial Cost ($11,000)
- What’s the annual ROI? Approximately 32%
Challenges to Evaluating ROI for Precision Ag Investments

1. Reductions in input usage easier to reliably estimate
2. Anticipating yield increases are much more difficult
3. Changes in yield distributions are important
   ✓ not just change in the mean yield
4. Rely on multiple scenario analysis to evaluate profitability and ROI of Precision Ag investments