Improving Environmental Performance through Precision Business Planning

January 19th 2017

David Muth Jr., PhD
Andrew Baskin
Dan Bahe
Emerging Ag Information Services

Components

Turning data into decisions for agriculture
Precision Business Planning

- Certification
- Agronomic
- Conservation
- Risk Management
- Marketing
- Operational
- Real Estate
- Financial
Precision Business Planning Services

Agronomic Planning

Financial Planning

Precision Conservation Business Planning

turning data into decisions for agriculture™
Subfield Variability
Understanding Subfield Profit and ROI

turning data into decisions for agriculture
Environmental Performance and Economic Performance are driven by the same goal:

Maximize the output per unit of input
ROI Focused Agronomic Management

Expense Limited Zone

No Cost Zone

Revenue Zone
Precision Business Planning Workflow

- Intelligence Gathering
- Business Performance Review
- Opportunity Ratio Analysis
- Negative Return Assessment
- Opportunity Ratio Business Planning
- In-season Plan Adjustments

Workflow
Precision Business Planning Workflow – Intelligence Gathering

- **Intelligence Gathering**
- **Business Performance Review**
- **Opportunity Ratio Analysis**
- **Negative Return Assessment**
- **Opportunity Ratio Business Planning**
- **In-season Plan Adjustments**

- 10 ft resolution business performance
- **Three Steps**
  1. Define field boundaries
  2. Upload machine data
  3. Set crop budget – 5 min or less

turning data into decisions for agriculture™
Precision Business Planning Workflow – Business Performance Review

Intelligence Gathering

Business Performance Review

Opportunity Ratio Analysis

Negative Return Assessment

Opportunity Ratio Business Planning

In-season Plan Adjustments

Preston Hog Building: Actual Production: 2015

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Acreage</td>
<td>150.59 ac</td>
</tr>
<tr>
<td>Average Yield</td>
<td>2,060.73 bu/ac</td>
</tr>
<tr>
<td>Profit</td>
<td>$50.43/acre</td>
</tr>
<tr>
<td>ROI</td>
<td>18.28 %</td>
</tr>
<tr>
<td>Total Field Expenses</td>
<td>$126,632.41</td>
</tr>
<tr>
<td>Total Field Revenue</td>
<td>$148,506.81</td>
</tr>
<tr>
<td>Total Field Profit</td>
<td>$21,874.39</td>
</tr>
</tbody>
</table>

2015 Enterprise Performance

<table>
<thead>
<tr>
<th>Field</th>
<th>Acreage</th>
<th>Revenue</th>
<th>Expenses</th>
<th>Profit</th>
<th>Profit/Acre</th>
<th>ROI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>2056.36</td>
<td>$1,620,431.49</td>
<td>$1,623,926.08</td>
<td>$196,505.41</td>
<td>$95.61</td>
<td>12.10 %</td>
</tr>
<tr>
<td>Preston Hog Building</td>
<td>52.56</td>
<td>$148,511.96</td>
<td>$125,563.39</td>
<td>$22,948.57</td>
<td>$160.43</td>
<td>18.28 %</td>
</tr>
<tr>
<td>Lakin Fox East</td>
<td>41.14</td>
<td>$39,946.07</td>
<td>$33,856.95</td>
<td>$6,087.11</td>
<td>$117.98</td>
<td>17.96 %</td>
</tr>
<tr>
<td>Preston 60</td>
<td>54.58</td>
<td>$52,915.95</td>
<td>$44,922.72</td>
<td>$8,993.23</td>
<td>$146.46</td>
<td>17.78 %</td>
</tr>
<tr>
<td>Building Site</td>
<td>71.28</td>
<td>$67,697.71</td>
<td>$68,687.19</td>
<td>$9,030.62</td>
<td>$126.70</td>
<td>15.39 %</td>
</tr>
<tr>
<td>Preston Wright 80</td>
<td>79.22</td>
<td>$51,050.85</td>
<td>$44,269.65</td>
<td>$6,781.21</td>
<td>$85.60</td>
<td>15.32 %</td>
</tr>
<tr>
<td>Preston Porterfield</td>
<td>149.30</td>
<td>$141,559.81</td>
<td>$122,866.84</td>
<td>$18,692.96</td>
<td>$125.07</td>
<td>15.20 %</td>
</tr>
<tr>
<td>Lakin Frankie</td>
<td>398.31</td>
<td>$248,566.89</td>
<td>$304,443.16</td>
<td>$44,876.34</td>
<td>$111.31</td>
<td>14.49 %</td>
</tr>
<tr>
<td>Hanson West</td>
<td>30.61</td>
<td>$19,523.86</td>
<td>$17,107.60</td>
<td>$2,416.26</td>
<td>$78.92</td>
<td>14.12 %</td>
</tr>
<tr>
<td>West 40</td>
<td>44.14</td>
<td>$41,282.68</td>
<td>$36,334.93</td>
<td>$4,947.76</td>
<td>$112.08</td>
<td>13.62 %</td>
</tr>
<tr>
<td>Lakin Siepke North</td>
<td>32.78</td>
<td>$30,526.73</td>
<td>$26,982.18</td>
<td>$3,543.56</td>
<td>$108.10</td>
<td>13.13 %</td>
</tr>
<tr>
<td>Brandt West</td>
<td>69.24</td>
<td>$64,178.59</td>
<td>$56,594.24</td>
<td>$7,184.35</td>
<td>$103.76</td>
<td>12.61 %</td>
</tr>
<tr>
<td>Freverts</td>
<td>37.59</td>
<td>$54,336.45</td>
<td>$30,943.81</td>
<td>$3,394.64</td>
<td>$90.30</td>
<td>10.97 %</td>
</tr>
<tr>
<td>Preston Home</td>
<td>71.90</td>
<td>$65,638.76</td>
<td>$59,177.30</td>
<td>$6,461.46</td>
<td>$89.87</td>
<td>10.92 %</td>
</tr>
</tbody>
</table>

Turning data into decisions for agriculture™
Precision Business Planning Workflow – Opportunity Ratio Analysis

- Intelligence Gathering
- Business Performance Review
- Opportunity Ratio Analysis
- Negative Return Assessment
- Opportunity Ratio Business Planning
- In-season Plan Adjustments

- Field Acreage: 143.26 ac
- Average Yield: 170.4 bu/ac
- Profit: $53.56/bu
- ROI: 6.69%
- Production Efficiency: 213.37 bu/$1000
- Loss Ratio - Land: 0.23
- Loss Ratio - Capital: $26,083.98
- Total Field Expenses: $114,766.44
- Total Field Revenue: $122,439.50
- Total Field Profit: $7,673.06

Turning data into decisions for agriculture™
Precision Business Planning Workflow – Negative Return Assessment

Intelligence Gathering

Business Performance Review

Opportunity Ratio Analysis

Negative Return Assessment

Opportunity Ratio Business Planning

In-season Plan Adjustments

Agronomic Issues

Land Improvement

Working Capital Allocation
Precision Business Planning Workflow – Negative Return Assessment

- Intelligence Gathering
- Business Performance Review
- Opportunity Ratio Analysis
- Negative Return Assessment
- Opportunity Ratio Business Planning
- In-season Plan Adjustments

turning data into decisions for agriculture™
Precision Business Planning Workflow
– Opportunity Ratio Business Planning

- Intelligence Gathering
- Business Performance Review
- Opportunity Ratio Analysis
- Negative Return Assessment
- Opportunity Ratio Business Planning
- In-season Plan Adjustments

Agronomic Decisions
Land Improvement

Precision Management
Alternative Low Cost Revenue

turning data into decisions for agriculture™
Precision Business Planning Workflow – Opportunity Ratio Business Planning

Intelligence Gathering

Business Performance Review

Opportunity Ratio Analysis

Negative Return Assessment

Opportunity Ratio Business Planning

In-season Plan Adjustments

Scenario: Actual Production

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Acreage</td>
<td>143.3 ac</td>
</tr>
<tr>
<td>Average Yield</td>
<td>170.2 bu/ac</td>
</tr>
<tr>
<td>Profit</td>
<td>$49.63/acre</td>
</tr>
<tr>
<td>ROI</td>
<td>6.2 %</td>
</tr>
<tr>
<td>Production Efficiency</td>
<td>212.4 bu/$1000</td>
</tr>
<tr>
<td>Acreage Opportunity Ratio</td>
<td>23 %</td>
</tr>
<tr>
<td>Working Capital Opportunity</td>
<td>$25,973.83</td>
</tr>
<tr>
<td>Total Field Expenses</td>
<td>$114,800.50</td>
</tr>
<tr>
<td>Total Field Revenue</td>
<td>$121,912.06</td>
</tr>
<tr>
<td>Total Field Profit</td>
<td>$7,111.56</td>
</tr>
</tbody>
</table>

Scenario: Conservation-Final

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Acreage</td>
<td>143.3 ac</td>
</tr>
<tr>
<td>Average Yield</td>
<td>179.2 bu/ac</td>
</tr>
<tr>
<td>Profit</td>
<td>$93.85/acre</td>
</tr>
<tr>
<td>ROI</td>
<td>12.6 %</td>
</tr>
<tr>
<td>Production Efficiency</td>
<td>239.7 bu/$1000</td>
</tr>
<tr>
<td>Acreage Opportunity Ratio</td>
<td>22 %</td>
</tr>
<tr>
<td>Working Capital Opportunity</td>
<td>$19,494.23</td>
</tr>
<tr>
<td>Total Field Expenses</td>
<td>$107,086.95</td>
</tr>
<tr>
<td>Total Field Revenue</td>
<td>$120,534.89</td>
</tr>
<tr>
<td>Total Field Profit</td>
<td>$13,449.04</td>
</tr>
</tbody>
</table>
Precision Business Planning Workflow – Management Zone Development

- Intelligence Gathering
- Business Performance Review
- Opportunity Ratio Analysis
- Negative Return Assessment
- Opportunity Ratio Business Planning
- In-season Plan Adjustments
Adding Context to Environmental Performance Impacts

<table>
<thead>
<tr>
<th>Scenario: Conservation-Final</th>
<th>Conventional Management</th>
<th>Advanced Management</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field Acreage</strong></td>
<td>143.3 ac</td>
<td></td>
</tr>
<tr>
<td><strong>Average Yield</strong></td>
<td>179.2 bu/ ac</td>
<td></td>
</tr>
<tr>
<td><strong>Profit</strong></td>
<td>$53.65/acre</td>
<td></td>
</tr>
<tr>
<td><strong>ROI</strong></td>
<td>12.6 %</td>
<td></td>
</tr>
<tr>
<td><strong>Production Efficiency</strong></td>
<td>239.7 bu/$1000</td>
<td></td>
</tr>
<tr>
<td><strong>Acreage Opportunity Ratio</strong></td>
<td>22.2 %</td>
<td></td>
</tr>
<tr>
<td><strong>Working Capital Opportunity</strong></td>
<td>$19,494.23</td>
<td></td>
</tr>
<tr>
<td><strong>Total Field Expenses</strong></td>
<td>$107,085.95</td>
<td></td>
</tr>
<tr>
<td><strong>Total Field Revenue</strong></td>
<td>$120,534.99</td>
<td></td>
</tr>
<tr>
<td><strong>Total Field Profit</strong></td>
<td>$13,449.04</td>
<td></td>
</tr>
</tbody>
</table>

| Annual Soil Loss (tons of soil)                     | 204                     | 69                  |
| Annual Soil Carbon Change (lbs C)                   | 8,137                   | 44,341              |
| Annual Nitrate Loss (lbs NO3)                       | 7,779                   | 3,442               |
| Annual CO2 Loss (lbs CO2)                           | 751,311                 | 717,169             |

**Soil Erosion**

**Soil Carbon**

**CO₂ Gas Flux**

Conventional - Advanced =
How Does Soil Health Focused Management Pay?

Profit vs NO3 leaching

Ibm NO3-N/acre vs $/acre

turning data into decisions for agriculture™
Quantifying the Business Case for Soil Health
Focused Management
Identifying the Opportunities

- Between 2-3 million acres annually at an expected loss
- Over $1B annually in misallocated working capital
Management Zone Development

Field Report Card

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Acreage</td>
<td>143.3 ac</td>
</tr>
<tr>
<td>Average Yield</td>
<td>1705 bu/ac</td>
</tr>
<tr>
<td>ROI</td>
<td>6.4 %</td>
</tr>
<tr>
<td>Production Efficiency</td>
<td>212.8 bu/$5,000</td>
</tr>
<tr>
<td>Acreage Opportunity Ratio</td>
<td>22 %</td>
</tr>
<tr>
<td>Working Capital Opportunity</td>
<td>$25,655.23</td>
</tr>
<tr>
<td>Total Expenses</td>
<td>$114,800.50</td>
</tr>
<tr>
<td>Total Revenue</td>
<td>$122,137.83</td>
</tr>
<tr>
<td>Total Profit</td>
<td>$7,337.33</td>
</tr>
<tr>
<td>Profit</td>
<td>$61.20/ac</td>
</tr>
</tbody>
</table>

ROI Zones

Prepared by AgSolver, Inc. 2015-02-15

turning data into decisions for agriculture
Precision Conservation Business Planning

ROI Zones

NO$_3$ Leaching for ROI Zones

Erosion Assessment for ROI Zones

SOC 10 yr change for ROI Zones

turning data into decisions for agriculture
Questions?
Introduction to on the ground projects
Simply stated, a Precision Conservation Business Plan does the following:

1. Identifies land areas where conservation resource concerns align with poor financial performance
2. Evaluates the financial outcomes of conservation practice options at a high resolution on the landscape

**Profitability and Conservation Are Synergistic**

1. Increased Profit/Acre $43.03
2. Increased ROI by 6.2%
3. Reduced Breakeven Price $0.53
4. Spent $7,714.55
5. Made $6,165.67
Our Role in Delivering Precision Business Planning

Pheasants Forever has a 30 plus year tradition of providing technical and financial assistance to farmers and other landowners. Precision Business Planning simply continues this commitment to working side by side with farmers and doing so with 21st century cutting-edge technology. Through both Pheasants Forever chapter contributions as well as through outside grants, Pheasants Forever secures additional resources to reduce the cost of the Profit Zone Manager product subscriptions to farmers. Pheasants Forever hire and train Precision Business Planning Specialists to increase the technical capacity to deliver the consultations. Their talented team of Farm Bill Wildlife Biologists provide the insights and recommendations on voluntary local, state, and federal programs to assist farmers in increasing their profitability and sustainability.
What is the project? Encouraging producers to adopt conservations practices to reduce nutrient loss, increase the overall productivity of the field, and improve soil health on side hills all while increasing profitability.

Project Scope:
- 25 growers over 3 years
  - 15 Growers in process
  - 44 interested

By the Numbers

60%
Total county acres in row crop

47%
County row crop acres unsuitable for production

18%
County row crop acres not turning a profit

Project Incentives
- Crop to Pasture/Hay: $250/acre, 5 year agreement
- Soil Builder: $60/acre
- Terraces: 50-75% Cost Share
- Free AgSolver 1 year subscription
NRCS – Precision Conservation Business Planning

- Increased to 11 states
- Project initiated in all states

Sign Up Progress
- 67 growers in process
  - 23 – data received
  - 52 – contracts received
  - 15 – contracts in process

<table>
<thead>
<tr>
<th>State</th>
<th>Current Participants</th>
<th>Target Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delaware</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Idaho</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>Illinois</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>Iowa</td>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td>Michigan</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Ohio</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Washington</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Indiana</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>Oregon</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>-</td>
<td>6</td>
</tr>
</tbody>
</table>
Minnesota Department of Agriculture

- **Regulatory certainty**: certified producers are deemed to be in compliance with any new water quality rules or laws during the period of certification
- **Recognition**: certified producers may use their status to promote their business as protective of water quality
- **Priority for technical assistance**: producers seeking certification can obtain specially designated technical and financial assistance to implement practices that promote water quality

- Initiated 1/15/2017
- 5 growers pilot project
Sauk Center Watershed District – Stearns County

5 grower project
• Initiated 1/15/2017
A New Way of Thinking

Using the Profit Zone Manager software app, the Pheasants Forever Farm Bill Wildlife Biologist and the OSU farm managers were able to identify the “negative return” acres (acres farmed unprofitably) and validate their initial concerns. They were also able to identify additional areas that could be enrolled in conservation reserve programs to increase profitability. The majority of these acres were located around the perimeters of the fields adjacent to the woodlots and fencerows.

- A total of 35.5 acres were enrolled into CRP quail buffer (CP33).
- A total of 19.96 acres were enrolled into CRP (CP38E) State Acres for Wildlife Enhancement (SAFE). These areas will be planted during spring 2017 to a Nativo Warm Season Grass and Pollinator mix containing species that are beneficial not only to pheasants but also to pollinators.

“The zone (8.9 acres) in one of the analyzed fields used to create the boundary for the conservation plan.”

We were able to extrapolate the footages by utilizing the PZM technology of creating fields and exporting these shapefiles. The local USDA, NRCS, and FSA offices were able to use these shapefiles to create boundaries for the areas being enrolled into CP33 and provide a revenue projection down to the penny accuracy.

“During these tight-margin years, Profit Zone Manager is an essential tool in helping us make money-saving decisions.”

– Tim Recker, Arlington, IA

“We” are able to take my ROI and see it mapped out over 18 years of my GPS data was a huge benefit to my operation.”

– Adam Chipman, Harlan, IA

turning data into decisions for agriculture™
Questions?