Precision Agriculture Economics and Decision Making – Beyond Profitability

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The Site-Specific Nature of Precision Agriculture Economics

- What is profitable for me may NOT be profitable for my neighbor
- What is profitable on one parcel of land may NOT be profitable on another
- Just like your soils, there’s variability
Importance of Following A Decision Making Framework

- Does the precision technology support your goals and mission of the business?
- Many options to implementing precision agriculture
- Different levels of adoption

Smart Technologies

Data Driven Technologies

Big Data & Telematics
7 Steps to Decision Making
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1. Problem or Opportunity

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2. Alternative Solutions

7 Steps to Decision Making

1. Problem or Opportunity
2. Alternative Solutions
3. Collect Data

7 Steps to Decision Making

1. Problem or Opportunity
2. Alternative Solutions
3. Collect Data
4. Analyze Alternatives

7 Steps to Decision Making

1. Problem or Opportunity
2. Alternative Solutions
3. Collect Data
4. Analyze Alternatives
5. Implement Decision

7 Steps to Decision Making

1. Problem or Opportunity

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5. Implement Decision

6. Monitor Results

7 Steps to Decision Making

1. Problem or Opportunity
2. Alternative Solutions
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4. Analyze Alternatives
5. Implement Decision
6. Monitor Results
7. Accept Responsibility

7 Steps to Decision Making

3. Collect Data
4. Analyze Alternatives

3. Collecting Data and Information

- Economic Cost Considerations
  - Initial investment cost
  - Annual subscription(s)
  - Service and maintenance costs
  - Operating costs
  - Ownership costs

- Economic Benefit Considerations
  - Input savings
  - Yield/Quality increases
  - Value of better management decisions
3. Collecting Data and Information

Other Key Considerations

- Whole Farm Impacts
- Interaction with Other Technologies
- Topography
- How Precise?
- Impact on Machinery and Land Management
- Learning Curve
- Post Adoption Management
- Future Technology Adoption
- Support from Service Providers
- Quality Data Collection
3. Collecting Data and Information

Other Key Considerations
3. Collecting Data and Information

Beyond Profitability!!!
3. Collecting Data and Information

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3. Collecting Data and Information

Beyond Profitability!!!

Environmental Benefits
4. Analyze the Alternatives and Make a Decision

- Are you financially capable of making the investment?

- Tools for analyzing the alternative:
  - Investment analyses
    - Return on Investment (ROI)
    - Payback period
    - Net Present Value (NPV)
    - Internal Rate of Return (IRR)
  - Cost-benefit analysis
  - Partial Budgeting
  - Whole farm planning

- Guidance and section control profit calculator (Kansas State)
  
  http://www.agmanager.info/guidance-section-control-profit-calculator
“Precision” Economics Examples

- Automatic section control on sprayer
  - Smaller field size and irregular shaped fields proves more profitable
  - Field shape becomes less important as field area increases
  - ROI Range: -3% - 239%

- Guidance on sprayer
  - Large square fields more profitable
  - ROI Range: 43% - 66%

Sources:
“Precision” Economics Examples

- Automatic section control on sprayer
  - Diminishing returns as the number of nozzles controlled increases
  - 5 sections controlled
    - ROI Range: 15% - 206%  Average: 98%
- Individual nozzle control
  - ROI Range: -10% - 96%  Average: 38%

Source:
“Precision” Economics Examples

- The ability of auto-steer to increase machinery efficiency
  - Conduct field operations faster during optimal time
- Auto-steer with sub-meter GPS on sprayer
  - ROI: 83%
- Auto-steer with RTK GPS on planter
  - ROI: 11%

Source:
“Precision” Economics Examples

- Auto-steer increases machinery efficiency
- Can allow for the purchase of smaller machinery while increasing net returns and lowering machinery costs
- Can be purchased in lieu of larger machinery to support land expansion

Source:
“Precision” Economics Examples

- You can capture risk reduction in a whole farm planning model
- Research indicates auto-steer can reduce production risk
- Ability to plant more acres at the optimal time reduces production risk and income variability

Source:
“Precision” Economics Examples

- Reducing crop production inputs through precision technologies reduces your carbon footprint
- Use partial budgeting and break-even analysis to determine a break-even yield for CRP enrollment.
- Meld economics with yield maps to create a spatial CRP enrollment map

Source:
7 Steps to Decision Making

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2. Alternative Solutions
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6. Monitor Results
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Conclusion

- Does this decision support your mission and goals of the business?
- Follow the decision making process
- Think deeper than direct input savings and investment costs
- Consider factors beyond profitability
- Use all the tools at your disposal
- The economics of precision ag is site specific!!!
Thank You!

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