

## **19. Farmer Risk Perceptions and Conservation Practice Adoption**

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*Jason Bergtold is an associate professor with research focus in the areas of production economics, natural resource conservation and applied econometrics. His current research focus is on cellulosic biofuel feedstock production and markets; the adoption, intensification and retention of conservation practices and systems on-farm; the interface between on-farm biofuel feedstock production and conservation; and applied statistical theory concerning discrete choice modeling. Prior to coming to Kansas State University, Dr. Bergtold was employed by USDA-ARS National Soil Dynamics Laboratory in Auburn, AL as an ag economist working on the economics and adoption of conservation systems in the Southeast.*

### **Abstract/Summary**

*Agricultural producers' risk perceptions play an important part in their decisions. While various commercialized risk management tools exist to help farmers mitigate price and yield risks such as using futures, options, and/or crop insurance, other ways farmers can manage risk is through technology adoption and diversification. An important consideration for adoption as a risk response is to determine if farmers who adopt new technology do so for purely financial gain, or if other conservation or stewardship concerns play a role in their decisions.*

*Included in a survey to assess farmers' willingness to grow crops for biofuel is a section asking Kansas farmers to self-report their risk perceptions on how they manage financial and personal risk as they relate to their operations and families. The questions are on a six-point Likert scale from "strongly disagree" to "strongly agree" with statements eliciting their views on a number of personal risk-related issues. Another part of the survey asked them which conservation practices they use and whether they receive government incentives for participating in these programs. This analysis will show if farmers' risk perceptions affect their use of conservation practices.*


# Farmer Risk Perceptions and Conservation Practice Adoption

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## Outline

- ▶ Introduction
  - ▶ Objectives
  - ▶ Survey
  - ▶ Results
  - ▶ Conclusion
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## Introduction

- ▶ Risk and risk perceptions are important considerations for decision makers.
  - ▶ We consider risks in all decisions
  - ▶ Farm-level decisions are often made based on risk perceptions
  - ▶ Do risk perceptions play a role in conservation practice adoption?
  - ▶ Do farmers adopt conservation because of some environmental concern or for profit?
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## Introduction

- ▶ Why practice conservation?
    - Maintain soil
    - Improve water quality
    - Wildlife habitat
  - ▶ Seems like common sense today.
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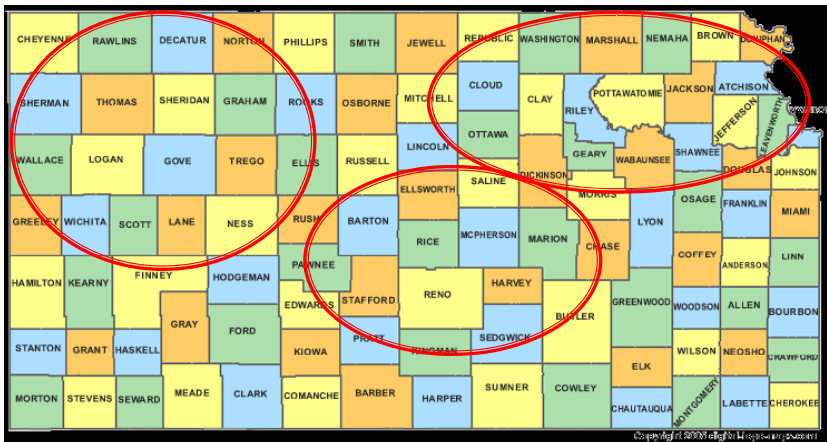
## Purpose and Objective

- ▶ **Purpose:** To study farmers' risk perceptions, assess different potential sources of risk, and how they influence adoption decisions, specifically conservation practice adoption.
- ▶ **Objective:** To determine whether risk characteristics related to management, finances, government policy affect farmers' conservation adoption practices.

## Survey

- ▶ An enumerated (face-to-face) survey was administered by USDA-NASS in Kansas from Nov. 2010 to Feb. 2011 to farms with at least 260 acres of cropland and \$50K in gross farm sales.
- ▶ A sample of 485 farms was selected, of which 290 completed the survey. (65% response)
- ▶ Questions were asked about the farming operation; cropping practices, biofuel perceptions and practices; conservation; risk and marketing; and willingness to grow cellulosic biofuel feedstocks.

## Survey Areas



## Survey Sample

Farm Operation Characteristics: Acres Operated

|           | Cropland | CRP Land | Total Land Operated | % Rented |
|-----------|----------|----------|---------------------|----------|
| Average   | 1595     | 125      | 2147                | 56.8     |
| Std. Dev. | 1395     | 177      | 1661                | 24.5     |
| Min       | 70       | 0        | 142                 | 0        |
| Max       | 8620     | 1200     | 9900                | 100      |

## Farmer Demographics



|                                  |            |
|----------------------------------|------------|
| Average Age                      | 55.9 years |
| White                            | 98.6 %     |
| Male                             | 95.9 %     |
| College Grad                     | 30.3 %     |
| Self-Identified as Risk-Averse   | 89.0 %     |
| Use Conservation Tillage Methods | 95.4 %     |
| Average Crop Acres:              |            |
| Corn                             | 439 acres  |
| Sorghum                          | 153 acres  |
| Wheat                            | 291 acres  |
| Soybean                          | 503 acres  |

## Modeling

- ▶ Assess farmers' willingness to adopt conservation practices subject to:
  - their perceptions of personal financial, and
  - operational risk factors.
- ▶ Use factor analysis to group farmers' risk attitudes, and include these in a multinomial regression.
  - Determine how farmers use conservation on their farms subject to financial, operational, and personal risk.

## Conservation Importance Question (strongly disagree to strongly agree)

- 1) I usually adopt new technology (e.g. no-till, new seed varieties, GPS, etc.) before my neighbors.
- 2) Conservation of soil and water resources is a top priority in the management of my farming operation.
- 3) Maximizing farm profit is more important than environmental stewardship

## Conservation Importance

| Question/Statement   | Number Responding | Count or Average | Percentage | St. Dev. | Median | Mode |
|--|-------------------|------------------|------------|----------|--------|------|
| Do you have a conservation plan for your farm?   | 277               | 227 <sup>a</sup> | 81.9%      | ---      | ---    | ---  |
| I usually adopt new technology (e.g. no-till, new seed varieties, GPS, etc.) before my neighbors. <sup>b</sup>     | 287               | 4.09             | ---        | 1.23     | 4      | 4    |
| Conservation of soil and water resources is a top priority in the management of my farming operation. <sup>b</sup> | 287               | 5.30             | ---        | 0.83     | 5      | 6    |
| Maximizing farm profit is more important than environmental stewardship. <sup>b</sup>                              | 287               | 3.31             | ---        | 1.18     | 3      | 4    |

<sup>a</sup> Number of "Yes" responses  
<sup>b</sup> 1 = Strongly Disagree to 6 = Strongly Agree

## Conservation Practices

- ▶ Conservation Tillage
- ▶ Cover Crops
- ▶ Variable Rate Technology
- ▶ Filter/buffer Strips
- ▶ Use of Manure
- ▶ About how often do you have your soils tested?  
(0 to 4+ years)

## Conservation Practice Statistics

| Conservation Practice  | Do you use this practice? |     |                  | Do you receive a cost-share incentive? |     |                  |
|--|---------------------------|-----|------------------|--|-----|------------------|
|  | Number of Responses       | Yes | Percent of Total | Number of Responses                    | Yes | Percent of Total |
| Conservation tillage (No-till, Strip-till, Reduced-till, Ridge-till) | 285                       | 272 | 95.4%            | 262                                    | 31  | 11.8%            |
| Cover Crops  | 285                       | 28  | 9.8%             | 28                                     | 2   | 7.1%             |
| Variable Rate Application/Field Mapping                              | 285                       | 65  | 22.8%            | 65                                     | 3   | 4.6%             |
| Filter or Buffer Strips  | 285                       | 62  | 21.8%            | 62                                     | 39  | 62.9%            |
| Use of Manure  | 285                       | 137 | 48.1%            | 130                                    | 4   | 3.1%             |
| Other  | 21                        | 20  | 95.2%            | 19                                     | 8   | 42.1%            |

## Soil Testing Frequency

| Frequency of Soil Testing | Number responding | Percentage of Total |
|---------------------------|-------------------|---------------------|
| Annually                  | 85                | 29.9%               |
| Every 2 Years             | 53                | 18.7%               |
| Every 3 Years             | 78                | 27.5%               |
| 4+ Years                  | 51                | 18.0%               |
| Never                     | 17                | 6.0%                |
| Total                     | 284               | 100.0%              |
| Max                       | 85                | 29.9%               |
| Min                       | 17                | 6.0%                |

## Risk perception questions

- ▶ In your farm/ranch management, how would your neighbors describe your risk taking behavior? (*Mark one*)
  - An extreme risk avoider
  - Cautious
  - Willing to take risks after adequate research
  - Not really concerned about risk
  - Enjoy taking risks in my business
  - A real gambler

## What did respondents say?

| Question                                      | Number | Percentage of Total |
|---|--------|---------------------|
| An extreme risk avoider                       | 5      | 1.8%                |
| Cautious                                      | 104    | 36.7%               |
| Willing to take risks after adequate research | 143    | 50.5%               |
| Not really concerned about risk               | 14     | 4.9%                |
| Enjoy taking risks in my business             | 16     | 5.7%                |
| A real gambler                                | 1      | 0.4%                |
|   |        |                     |
| Total   | 283    |                     |
| Max   | 143    | 50.5%               |
| Min   | 1      | 0.4%                |

## Binary risk perception questions

- 1) Do you purchase federal or private crop insurance?
- 2) Do you purchase insurance to cover hail damage for your cash crops?
- 3) Do you keep a line of credit open at your primary lender?

| Question | No. of Yes Responses | Percentage of Total | N   |
|----------|----------------------|---------------------|-----|
| FCIC     | 270                  | 94.1%               | 287 |
| HAIL     | 153                  | 53.5%               | 286 |
| CREDIT   | 215                  | 84.6%               | 254 |

## Risk Summary Statistics

| Statement  | N   | St.  |      |        |      |
|--|-----|------|------|--------|------|
|  |     | Mean | Dev. | Median | Mode |
| 1) I have enough cash on hand or assets that can be easily converted to cash to pay all my bills.  | 279 | 4.65 | 1.49 | 5      | 6    |
| 2) I rely heavily on market information (for example: government reports, private market news services, extension) in making my marketing decisions. | 281 | 4.37 | 1.21 | 4      | 5    |
| 3) I do have adequate life insurance.  | 278 | 4.34 | 1.63 | 5      | 5    |
| 4) I do have adequate health insurance.  | 280 | 5.10 | 0.99 | 5      | 5    |
| 5) My farming operation does have adequate liability insurance.  | 279 | 5.25 | 0.80 | 5      | 5    |
| 6) I spread the sale of my commodities over the year.  | 277 | 4.69 | 1.09 | 5      | 5    |
| 7) Off-farm income is important for the survival of my family.   | 279 | 3.53 | 1.81 | 4      | 5    |
| 8) Off-farm investments are important sources of income for my family.   | 277 | 2.81 | 1.52 | 2      | 2    |
| 9) Maintaining a low debt-to-asset ratio is important to me.   | 279 | 5.03 | 0.93 | 5      | 5    |
| 10) Most of my machinery is new and/or in good repair.   | 279 | 4.46 | 1.19 | 5      | 5    |
| 11) I have fields in different locations to reduce yield risk.   | 282 | 4.28 | 1.35 | 5      | 5    |
| 12) In case of emergency, I have sufficient back-up management and labor.  | 278 | 4.03 | 1.39 | 4      | 5    |
| 13) I see myself as a person who plans ahead.  | 281 | 4.73 | 0.87 | 5      | 5    |
| 14) I believe recent changes in government agricultural policy have substantially increased the risk of my farming operation.                        | 279 | 4.23 | 1.23 | 4      | 5    |
| 15) I consider myself to be a low cost producer.   | 280 | 4.36 | 1.04 | 5      | 5    |
| 16) I am prone to making last minute decisions.  | 279 | 3.38 | 1.23 | 3      | 4    |
| 17) I use financial information in decision-making about my farm.  | 280 | 4.71 | 0.95 | 5      | 5    |
| 18) Passing my land onto my children is important to me.   | 280 | 5.10 | 1.16 | 5      | 6    |

1 = Strongly Disagree to 6 = Strongly Agree

## Debt-to-Asset Ratio

| Category  | Number | Percentage of Total |
|-----------|--------|---------------------|
| 0%        | 49     | 17.9%               |
| 1 to 4%   | 15     | 5.5%                |
| 5 to 9%   | 21     | 7.7%                |
| 10 to 14% | 30     | 11.0%               |
| 15 to 19% | 31     | 11.4%               |
| 20 to 29% | 57     | 20.9%               |
| 30 to 49% | 47     | 17.2%               |
| 50 to 69% | 14     | 5.1%                |
| 70 to 89% | 9      | 3.3%                |
| > 90%     | 0      | 0.0%                |
| Total     | 273    |                     |

## 5 Risk “Factors”

- ▶ Management related
- ▶ Personal Insurance
- ▶ Off-farm income/investment
- ▶ Being a low cost producer/using low financing
- ▶ Government policy/crop/hail insurance



## Management related

| Statement   | Mgmt.  | Ins.    | Off-farm | Low-cost | Crop Ins/Govt |
|---|--------|---------|----------|----------|---------------|
| I see myself as a person who plans ahead.   | 0.6572 | 0.2428  | -0.0022  | 0.1144   | 0.0301        |
| In case of emergency, I have sufficient back-up management and labor.   | 0.6254 | 0.1290  | 0.0661   | 0.1079   | -0.0454       |
| I have fields in different locations to reduce yield risk.  | 0.5519 | 0.0623  | 0.1739   | -0.0219  | 0.0353        |
| Most of my machinery is new and/or in good repair.  | 0.5168 | 0.2476  | -0.0798  | 0.0189   | 0.0755        |
| I rely heavily on market information (for example: government reports, private market news services, extension) in making my marketing decisions. | 0.3860 | 0.1586  | -0.0863  | -0.0220  | 0.1997        |
| I use financial information in decision-making about my farm.   | 0.3428 | 0.0792  | -0.0103  | 0.0330   | 0.1966        |
| I have enough cash on hand or assets that can be easily converted to cash to pay all my bills.  | 0.2953 | 0.2037  | -0.2289  | 0.1817   | -0.3582       |
| I spread the sale of my commodities over the year.  | 0.2629 | -0.0324 | -0.0979  | 0.0349   | -0.1867       |

## Insurance

| Statement  | Mgmt.  | Ins.   | Off-farm | Low-cost | Crop Ins/Govt |
|--|--------|--------|----------|----------|---------------|
| I do have adequate health insurance.   | 0.2068 | 0.7185 | 0.2040   | -0.0176  | -0.1558       |
| My farming operation does have adequate liability insurance.                                 | 0.2382 | 0.6050 | 0.0409   | 0.0140   | 0.0586        |
| I do have adequate life insurance.   | 0.0817 | 0.5120 | -0.0240  | 0.1341   | 0.1317        |
| For your farm/ranch management, how would your neighbors describe your risk-taking behavior. | 0.0956 | 0.1008 | 0.0105   | -0.4471  | 0.0329        |

## Off-farm income/investments

| Statement   | Mgmt.   | Ins.   | Off-farm | Low-cost | Crop Ins/Govt |
|---|---------|--------|----------|----------|---------------|
| Off-farm income is important for the survival of my family.         | -0.1291 | 0.0284 | 0.7914   | -0.0166  | 0.1337        |
| Off-farm investments are important sources of income for my family. | 0.1668  | 0.1291 | 0.4384   | -0.0650  | -0.2084       |

## Low-cost/low financing

| Statement   | Mgmt.  | Ins.    | Off-farm | Low-cost | Crop Ins/ Govt |
|---|--------|---------|----------|----------|----------------|
| Maintaining a low debt-to-asset ratio is important to me. | 0.1613 | 0.1733  | 0.0015   | 0.4740   | -0.0304        |
| I consider myself to be a low cost producer.              | 0.0319 | 0.1867  | -0.0942  | 0.3950   | 0.0623         |
| Passing my land onto my children is important to me.      | 0.2952 | -0.0326 | 0.0479   | 0.3269   | 0.1039         |

## Government, Crop/Hail Insurance

| Statement   | Mgmt.   | Ins.    | Off-farm | Low-cost | Crop Ins/ Govt |
|---|---------|---------|----------|----------|----------------|
| Do you purchase insurance to cover hail damage to your crops?*  | 0.0901  | 0.0891  | -0.0952  | -0.0171  | 0.3679         |
| Do you keep a line of credit open at your primary lender?*  | 0.0373  | 0.0011  | 0.0271   | -0.2611  | 0.3577         |
| I believe recent changes in government agricultural policy have substantially increased the risk of my farming operation. | -0.0193 | 0.0355  | 0.0581   | 0.1794   | 0.2996         |
| I am prone to making last minute decisions.   | -0.3218 | -0.0211 | 0.0599   | 0.0344   | 0.2266         |
| Do you purchase federal or private crop insurance?*   | 0.1017  | -0.0421 | -0.0654  | 0.1608   | 0.2192         |

\* Indicates a Yes/No response

## Probability of Using Conservation Practices

|                        | C         | CV      | CF      | CM       | CVM      | CFM      | CC        |
|------------------------|-----------|---------|---------|----------|----------|----------|-----------|
| Crop acres             | 0.003%    | 0.0002% | -0.002% | 0.0004%  | -0.001%  | -0.003%  | 0.0003%** |
| CRP acres              | 0.08%     | -0.01%  | 0.04%** | -0.13%*  | -0.001%  | 0.007%   | 0.007%    |
| Percent cash rent      | -15.1%    | 0.5%    | -6.3%   | 8.8%     | 4.9%     | -0.13%   | 7.4%      |
| Livestock              | -39.1%*** | -2.9%   | -1.8%   | 27.8%*** | 5.2%*    | 12.4%*** | -1.5%     |
| Age                    | -0.3%     | -0.1%   | -0.05%  | 0.4%     | -0.03%   | -0.13%   | 0.22%     |
| First adopter          | -7.5%**   | 4.7%*** | 1.7%    | -4.0%    | 2.4%     | -1.9%    | 4.6%**    |
| Conservation Priority  | 2.5%      | -1.5%   | 3.8%    | -5.4%    | -0.6%    | 1.5%     | -0.3%     |
| Profit vs. Environment | 1.8%      | 0.8%    | -0.09%  | 2.2%     | 0.6%     | 0.06%    | -5.3%***  |
| Soil Testing           | 7.8%**    | 0.9%    | -3.3%** | -2.8%    | 0.2%     | -1.5%    | -1.4%     |
| Education              | 5.0%      | 1.3%    | -4.6%   | 4.5%     | -9.2%*** | 2.4%     | 0.6%      |

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## Probabilities of Using Conservation Practices

|                               | C        | CV    | CF    | CM      | CVM      | CFM   | CC    |
|-------------------------------|----------|-------|-------|---------|----------|-------|-------|
| Management risk factor        | -4.0%    | 0.3%  | -0.9% | 2.2%    | 2.5%**   | 0.4%  | -0.5% |
| Insurance risk factor         | 4.5%     | -0.5% | 0.4%  | -3.0%   | -3.6%*** | 1.4%  | 0.7%  |
| Off-farm risk factor          | -1.1%    | -0.1% | -0.9% | 3.7%    | -1.8%    | -0.6% | 0.8%  |
| Low-cost/low-financing factor | 18.1%*** | 0.9%  | 1.8%  | -9.7%   | -8.3%    | 0.5%  | -3.3% |
| Crop ins, Govt. risk factor   | -9.2%    | -1.6% | -2.9% | 10.6%** | 3.2%     | -1.1% | 1.0%  |

\*\*\* p<0.01, \*\* p<0.05, and \* p<0.1



## Conclusions

- ▶ Risk perceptions play little role in farmers' views about conservation.
- ▶ Farmers likely see the value of conservation and are willing to use conservation to preserve land for the next generation.
- ▶ Farmers engage in sustainable practices regardless of government incentives.



Questions?  
Comments?  
Discussion?

