

## **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**

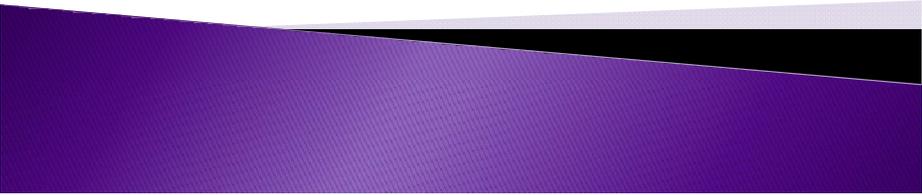
*Agricultural producers' risk perceptions play an important part in their decisions. While various commercialized risk management tools exist to help farmers mitigate price and yield risks such as using futures, options, and/or crop insurance, other ways farmers can manage risk is through technology 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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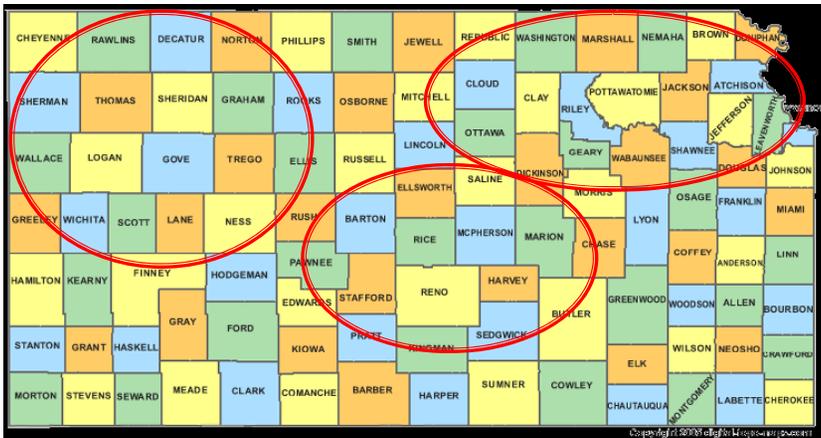
## Purpose and Objective

- ▶ **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	Mean	St. 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?

