



# Importance and Determinants of Perceived Farm Risks: Evidence from the Rural Western United States

Tauhidur Rahman and Trent Teegerstrom

Department of Agricultural and Resource Economics  
The University of Arizona



## Introduction

We know a great deal about the role of risks and uncertainty in agriculture in the West and other regions. Much less is known about producers' perceived importance and causes of various farm risks in the U.S. Patrick et al. (1985) indicated that perceptions of sources of and responses to risk varied across geographic regions and by farm type. Boggess et al. (1985) and Wilson et al. (1988) found that perceptions varied so much among individuals that a risk classification based on socioeconomic variables was not possible. Patrick and Musser (1997) concluded that, besides geographic location and farm type, institutional structures and other factors affecting the operating environment of producers were also likely to influence farmers' perceptions of sources of and responses to risk.

However, these studies were for producers of a specific agricultural crop or livestock. Therefore, results derived from these studies neither can be generalized nor are applicable to all agricultural operations. Moreover, it is small farms that are increasingly at greater risks due to new global markets, industrialization of agriculture, tremendous demographic shifts, vertical integration, and increasing competition for farm land for non-agricultural uses. The long term viability of these farms is critical to the prosperity of rural people and places as these farms account for a significant percentage of all farms in the United States. Within this context there is a need to understand the importance and determinants of the various farm risks perceived by small producers in the West. Such knowledge is an important precondition for devising risk reducing strategies and education.

## Objective

In this project, we address the following questions: How do smallholders in the rural West perceive sources of risks? Are there differences in perceived risks among various social groups in the rural West? Which risks are most prominent in different social groups? What are the determinants of perceived risks (production, financial, marketing, legal/institutional, and human) in the rural West?

## Data

We use Household Survey Data of 2,645 farm operators (with annual sales of less than \$50,000) in three Western states of the U.S. (Arizona, Colorado, and Wyoming). A total of 4,939 survey instruments were mailed to small farm operators in these states. In order to ensure a representative sample from each state, the numbers of survey instruments mailed to states were allocated based on the population of small farm operators in each state. The total response rate was 53.6%. A total 2,645 surveys were completed, which constitutes the sample size of our empirical analyses. Data were collected on small operators' demographics, reasons for involvement in the rural family ventures, sources of risks, vulnerability factors, information sources and preferences, resource management, and income status, and thus enabling us to empirically examine the role of Extension education and other variables in perceived farm risks in the West.

## Method

The dependent variables of interest are measures of perceived farm risks. The explanatory variables include demographic variables, income status, reasons for involvement in farm operation, information sources and preferences, resource management, and many others.

The USDA has identified five primary sources of risk for agricultural operations: production, financial, marketing, legal/institutional, and human. To measure perceived farm risks of producers, using a Likert scale of 1 to 5, the survey respondents were asked to evaluate each of the five risks in terms of its importance to their operation, with 1 being the most important or critical to the operation and 5 being the least important. The nature of the perceived risk rating variable is of the "ordered discrete" type, and it takes ordered discrete values from 1 to 5. For "ordered discrete" data, the suitable probability model is an ordered probit model. Since there are five types of risks, the empirical model is essentially a multivariate (five-variate) ordered probit model, estimated by using a simulated maximum likelihood procedure.

## Results

Table 1 presents the estimated results for the determinants of perceived farm risks. Column 1 contains the results for the determinants of production risk, and columns 2, 3, 4, and 5 show the results for the determinants of financial, marketing, human, and legal risks respectively. The following results can be inferred from Table 1.

- Production risk is determined by factors such as internet as the source of information for production risk management, Extension education, wells and rural water system as the sources of water on the land, total acres of land managed, enrollment in Conservation Reserve Program (CRP), income from agricultural operation, and if property managed is completely rural.
- Financial risk is determined by factors such as supplementing family income as the motive for farming, trade magazine as the source of information, enrollment in CRP, income from agricultural operation, if operation is financed by off-farm income, diversification of income source as measured by whether a farmer holds an off-property job, age of the farm operator, and educational achievement of producers.

- Marketing risk is determined by factors such as profit and supplementing of family income as the motives for farming, internet as the source of information, income from agricultural operation, diversification of income source as measured by whether a farmer holds an off-property job, and age of the operator.
  - Human risk is determined by factors such as profit and supplementing family income as the motives for farming, internet and trade magazines as the sources for information, and production of specialty agri-products.
  - Legal risk is determined by factors such as profit and family income supplementing as motives for farming, internet as the source of information, enrollment in CRP, if the business type is sole proprietorship, income from agricultural operation, whether farm has paid employees, and whether property is completely rural.
- Tables 2 and 3 show the marginal effects of explanatory variables on perceived production and legal risks. Similar marginal effects were calculated for marketing, human, and financial risks. The results from these tables confirm the findings we noted from Table 1.

**Table 1. Determinants of Perceived Farm Production Risk**

Explanatory Variables	Production Risk		Financial Risk		Marketing Risk		Human Risk		Legal Risk	
	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.	Coeff	S.E.
To make a profit	-0.089	0.058	-0.042	0.060	-0.099**	0.058	0.179*	0.060	0.115*	0.059
To supplement family income	-0.081	0.057	-0.104**	0.058	-0.178*	0.056	0.108**	0.058	0.152*	0.058
Working close to nature is rewarding	-0.065	0.055	0.057	0.056	0.070	0.055	-0.020	0.056	-0.028	0.056
Source of information: Internet	0.166*	0.056	0.002	0.057	0.176*	0.056	-0.111*	0.057	-0.168*	0.057
Information preference: Peer/Support Group or network	0.024	0.054	-0.032	0.055	0.027	0.053	-0.013	0.055	-0.056	0.055
Source of information: Trade Magazine	0.040	0.055	-0.243*	0.056	-0.008	0.054	0.108*	0.056	-0.014	0.056
Received information from Cooperative Extension or not	-0.131*	0.067	0.027	0.069	-0.040	0.067	0.087	0.068	0.105	0.068
Source of water on the land: Surface Water	0.035	0.057	0.000	0.058	-0.029	0.056	-0.008	0.058	0.020	0.058
Source of water on the land: Wells	0.166*	0.057	-0.062	0.058	0.024	0.057	-0.026	0.059	0.029	0.058
Source of water on the land: Rural Water System	0.135**	0.071	-0.043	0.073	-0.042	0.071	-0.070	0.073	0.074	0.073
Total acres of land managed in thousands	0.003**	0.002	-0.001	0.006	-0.001	0.001	-0.000	0.001	-0.001	0.001
Producing commodities indicating a specialty market	0.091	0.079	0.043	0.081	-0.021	0.079	-0.158*	0.080	-0.008	0.081
Land enrolled in Conservation Reserve Program	-0.180**	0.099	-0.196**	0.102	0.082	0.098	0.085	0.100	0.262*	0.103
Business type: Sole Proprietorship	0.031	0.022	-0.029	0.023	-0.002	0.022	0.030	0.023	-0.056*	0.023
Income coming from Agricultural Operation	-0.002**	0.001	-0.003*	0.001	-0.002**	0.001	0.002	0.001	0.002**	0.001
Whether they have paid employees or not	0.083	0.074	0.042	0.076	0.092	0.074	-0.032	0.076	-0.134**	0.076
Operation financed by Personal Savings	0.002	0.061	-0.044	0.063	0.079	0.061	0.055	0.063	-0.034	0.063
Operation financed by off-farm Income	0.040	0.060	-0.110**	0.061	-0.078	0.059	0.107*	0.061	0.038	0.061
Operation financed by Cash Flows from product sales	-0.093	0.060	-0.029	0.061	-0.067	0.059	0.011	0.061	0.096	0.061
Property managed is completely rural	0.086*	0.031	-0.005	0.032	0.042	0.031	-0.023	0.031	-0.066*	0.031
Whether they hold an off-property job or not	0.030	0.069	-0.128**	0.070	0.122**	0.068	-0.097	0.070	-0.002	0.070
Number of operators associated with the operation	0.043	0.040	-0.002	0.041	0.015	0.040	-0.047	0.041	-0.035	0.041
Gender of operator	-0.061	0.064	0.071	0.065	0.050	0.063	-0.029	0.064	-0.009	0.065
Age of operator	-0.013	0.027	0.0808*	0.028	-0.075*	0.027	-0.000	0.028	0.011	0.028
Level of education	-0.005	0.017	0.039*	0.017	0.016	0.017	-0.020	0.017	-0.023	0.017
Intercept 1	-0.506	0.213	-0.209	0.218	-1.372	0.213	-0.971	0.219	-1.399	0.220
Intercept 2	0.213	0.213	0.396	0.219	-0.582	0.212	-0.518	0.218	-0.874	0.219
Intercept 3	0.824	0.214	1.121	0.220	0.110	0.211	-0.132	0.218	-0.457	0.218
Intercept 4	1.435	0.215	1.732	0.222	0.762	0.212	0.433	0.218	0.325	0.218
Number of obs	1641.000		1638.000		1633.000		1631.000		1628.000	
LR chi2(25)	74.760		80.480		73.860		50.870		75.930	
Prob >chi2	0.000		0.000		0.000		0.002		0.000	
Log likelihood	-2513.320		-2338.883		-2539.888		-2510.300		-2394.059	

## Conclusions

- Relative importance of various factors in determining alternative farm risks varies significantly.
- Different farmers perceive sources of farm risks differently.
- The most effective mediums for delivering Extension education to targeted audiences are through internet and trade magazines, which is contrary to current emphasis of outreach educators on workshops.
- Diversification of income sources for small farmers in the rural West holds the key to their long-run sustainability.
- One way of promoting risk diversification could be through improving the skill base of households and development of the rural non-farm sector.

## Acknowledgments

We thank the Western Center for Risk Management Education for providing us with financial support to carry out this project. The survey data for this research was originally collected as a part of a multi-state Extension project in collaboration with John P. Hewlett and Randolph R. Weigel (University of Wyoming), and Jeff Tranel (Colorado State University). We have benefited from working with them. Finally, thanks are due to Ms. Pinar Gunes for excellent research assistance.

**Table 2. Determinants of Production Risk: Marginal Effects\*\*\*  
Most Important (Y = 1) to Least Important (Y = 5)**

Explanatory Variables	Prob(Y=1)	Prob(Y=2)	Prob(Y=3)	Prob(Y=4)	Prob(Y=5)
Source of information: Internet	-0.054* (0.018)	-0.013* (0.005)	0.013* (0.005)	0.024* (0.008)	0.029* (0.01)
Received information from Cooperative Extension or not	0.041* (0.021)	0.011** (0.006)	-0.01* (0.005)	-0.019** (0.01)	-0.024** (0.013)
Source of water on the land: Wells	-0.054* (0.019)	-0.012* (0.004)	0.014* (0.005)	0.024* (0.008)	0.029* (0.01)
Source of water on the land: Rural Water System	-0.042** (0.022)	-0.011** (0.007)	0.01* (0.005)	0.019** (0.01)	0.025** (0.014)
Total acres of land managed in thousands	-0.001** (0.001)	0.0** (0.0)	0.0** (0.0)	0.0** (0.0)	0.001** (0.0)
Land enrolled in Conservation Reserve Program	0.061** (0.035)	0.01* (0.004)	-0.017 (0.011)	-0.026** (0.014)	-0.028* (0.014)
Income coming from Agricultural Operation	0.001** (0.0)	0.0** (0.0)	0.0** (0.0)	0.0** (0.0)	-0.0** (0.0)
Property managed is completely rural	-0.028* (0.01)	-0.006* (0.002)	0.007* (0.003)	0.012* (0.004)	0.015* (0.005)

Note: \* Significant at 5%; \*\* Significant at 10%;  
\*\*\* Marginal Effects of only statistically significant variables are presented here due to space limitation

**Table 3. Determinants of Legal Risk: Marginal Effects\*\*\*  
Most Important (Y = 1) to Least Important (Y = 5)**

Explanatory Variables	Prob(Y=1)	Prob(Y=2)	Prob(Y=3)	Prob(Y=4)	Prob(Y=5)
To make a profit	-0.02** (0.01)	-0.014** (0.007)	-0.01** (0.0)	0.001 (0.001)	0.042** (0.022)
To supplement family income	-0.026* (0.01)	-0.019* (0.007)	-0.01* (0.0)	0.001 (0.001)	0.056* (0.021)
Source of information: Internet	0.029* (0.01)	0.021* (0.007)	0.01* (0.0)	-0.002 (0.002)	-0.061* (0.021)
Land enrolled in Conservation Reserve Program	-0.039* (0.013)	-0.032* (0.012)	-0.02* (0.01)	-0.005 (0.006)	0.099* (0.04)
Business type: Sole Proprietorship	0.01* (0.004)	0.007* (0.003)	0.0* (0.0)	-0.001 (0.001)	-0.02* (0.008)
Income coming from Agricultural Operation	0.0** (0.0)	0.0** (0.0)	0.0** (0.0)	0.0 (0.0)	0.001** (0.0)
Whether they have paid employees or not	0.025** (0.015)	0.017** (0.009)	0.01** (0.01)	-0.003 (0.003)	-0.048** (0.026)
Property managed is completely rural	0.011* (0.005)	0.008* (0.004)	0.01* (0.005)	-0.001 (0.001)	-0.024* (0.012)

Note: \* Significant at 5%; \*\* Significant at 10%;  
\*\*\* Marginal Effects of only statistically significant variables are present here due of space limitation