Farmers' VEG Risk Perceptions and Adoption of VEG Crop Insurance

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Abstract

Producer survey results are analyzed to determine factors influencing value-enhanced grain (VEG) risk perceptions and VEG crop insurance adoption. VEG production is perceived to be riskier than commodity production. VEG types, input costs, and production problems affect risk perceptions. Factors including previous insurance use impact VEG crop insurance adoption.

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Introduction

Production of value-enhanced grains (VEG) in the Midwest is expanding rapidly due to technological advances, changing consumer preferences, and access to a global agricultural market. Producers are growing VEG because of the possibility of a higher profit and a greater access to markets (Bard, et al.). However, VEG production introduces risks not normally associated with commodity grain production such as loss of price premium and failure to meet quality specifications. Traditional risk management tools such as crop insurance, which mitigates yield and price risks, may not be an appropriate method for managing risks unique to VEG.

Changes in contractual arrangements, vertical coordination, and patterns of ownership may have created new scenarios in which insurance policies and other risk management tools may not be appropriate for VEG production. In order to assist producers in developing appropriate risk management strategies, it is important to understand the different perceptions of risks held by producers and their evaluation of available risk shifting strategies. All of these perceptions and strategies differ among producers depending on the crops involved and the characteristics of the managers.

Producer characteristics and experience affect perceptions of the risks involved in agricultural production. Characteristics such as age, education, tenure, and farm size may influence one's perception of risk. In addition, factors involved in the production of VEG may also affect a producer's attitude towards risk. These factors may include 1) the VEG types

grown (e.g., organic soybeans, non-GMO soybeans, high oil corn, or food grade yellow corn); 2) whether or not the VEG is produced under contract; and 3) if the producer has experienced problems with VEG production (e.g., rejection of crop due to quality; unexpected yield drag).

Crop insurance is utilized as a risk management tool if the producer believes that risk exists and that insurance is an effective and economical tool for managing risks. Traditional crop insurance such as multiple peril or revenue-based policies helps producers manage yield, price and/or overall revenue risk for crop production. However, the traditional policies set guarantee levels and payment rates based on commodity grain prices and crop yields. VEG crops, due to the price premium, have a higher expected value per bushel than commodity grains. If a loss occurs for a VEG with a significant premium level over commodity grain, the indemnity payment may not cover the actual value of the loss. In addition, actual production history (APH) for traditional crop insurance policies is based on commodity grain yields, not on VEG yields. Insuring VEG with traditional insurance policies without adjusting APH could result in higher than expected yield losses on the part of the insurance company.

Risk perceptions and attitudes toward risk influence risk management tools and selection of crops. Besides risk perception, adoption of crop insurance policies designed for VEG may be influenced by factors such as previous experience with crop insurance, demographic characteristics, VEG types grown and previous problems with VEG production. Little research has been conducted on the factors influencing producers' perceptions of VEG risk, or on producer characteristics affecting adoption of crop insurance tools designed for value-enhanced corn and soybeans

The first objective of this study is to evaluate factors such as producer demographics and production experience that may influence perceptions of VEG risk. The second objective is to

assess what producer characteristics affect interest in VEG crop insurance. Insight into these issues will assist policy-makers, educators, and crop insurance providers when developing policies, educational programs, and crop insurance products for VEG.

Literature Review

Producer Perceptions of VEG Risk

Research on risk perceptions of value-enhanced grain producers is limited. Many extension-related activities acknowledge that some of the production risks may increase, such as price premium, yield or quality, but little has been done in the way of a formal study that examines these perceptions from producer to processor.

However, there is a related study on risks to agriculture from biotechnology (Makki, Somwaru, and Harwood, 2001). This study identified producer risks associated with the adoption of biotech crops and discussed the implications for risk management at the farm level. An analytical framework was developed to illustrate risks generated by the adoption of biotech crops. Price uncertainty generated by consumer concerns is the major risk facing biotech producers, while cross-pollination with biotech crops, and preservation of non-biotech status are major concerns for non-biotech farmers.

These risks create new challenges in managing production and marketing risks in agriculture. The Makki, Somwaru, and Harwood study stated that increased farm-level risks from biotech products could be reduced through improved market handling, testing and information systems, and through modification of current risk management tools. Examples include adjustments in yield and revenue insurance contracts, as well as futures contracts, to account for new production practices. Increased diversification among crops and production

practices may also reduce risk caused by changing consumer preferences. Production and marketing contracts could address the risks associated with the production and marketing of biotech and non-biotech crops. The ability to segregate crops by their end-use characteristics, and efficient testing and certification would benefit all stakeholders in agriculture.

Producer Use of Crop Insurance

Producer use of crop insurance has been a concern since its inception in 1938. Creating the right incentives to increase producers' participation in crop insurance has been one of the major goals of U.S. farm policy. Although insured acres increased in the 1990s, only about one-third of farm producers participated in the crop insurance program while about 75 percent of major field crop acres are insured. Also, a large variation exists in the growth of insured acres and availability of crop insurance products among crops and geographical areas. Specifically, revenue insurance products have grown rapidly and as a consequence, conventional yield insurance products are no longer the predominant type of risk management tool in many areas.

Past studies on producer participation in crop insurance markets focused on single yield insurance products using cross-sectional data (Knight and Coble). In a recent study, Makki and Somwaru analyzed producer's decisions to participate in crop insurance markets and their choice of insurance contracts over time using longitudinal data for 1995-99. Choice of insurance contracts made by the same producers through this period was tracked, and factors were identified that influenced their choice of contracts.

Their study found that choice of an insurance contract depends on risk level, cost of the contract, level of federal subsidy, expected indemnity payoffs, availability of alternative insurance products, and the nature and scope of insurance contracts. The authors suggest that

interest in the program can be sustained by offering more products in more areas to meet the needs of different farmers, setting premium rates commensurate with risk, and using premium subsidies judiciously.

Hypothesized Relationships

Producer Perceptions of VEG Risk

Risk perceptions can be assessed from two approaches. The first approach considers factors that directly impact risk perceptions such as personal characteristics (e.g., age or wealth level), and previous experience with or hearsay about the event for which risk is being assessed. In the case of VEG production, the producer's perception of the risk associated with its production may vary by VEG type. For example, a producer may believe that risk differs between high oil and seed corn. In another instance, a VEG producer may have experienced greater than expected yield drag with a VEG crop and thus perceives VEG risk to be greater than commodity risk.

The other approach considers factors that may impact the overall riskiness of the event. If a producer feels that VEG production is risky, he may utilize risk management tools such as contracting or crop insurance to help mitigate the risk. Thus, methods to mitigate the risk associated with VEG production may be a reflection of the producer's perception of risk.

Producer Interest in VEG Crop Insurance

Crop insurance is a tool commonly used to manage price and yield risk in soybeans and corn production. Bard, et al. identified unique VEG risks associated with price and yield. Therefore, there may be a need for modified crop insurance that addresses these unique VEG risks. However, since adoption of traditional crop insurance products has been slow and

inconsistent, adoption of VEG crop insurance may be even slower. Thus, understanding of characteristics of the producers interested in VEG crop insurance would assist in the development and marketing of the policies.

Adoption of VEG crop insurance is thought to be influenced by the producer's risk perception of VEG, previous use of crop insurance, the extent to which VEG production is part of the overall farm production, and whether or not production problems with VEG have been experienced in the past.

Analytical Framework

Data

The data used for this study were collected for a project assessing the risks unique to the production of value-enhanced corn and soybeans in Illinois, and the role crop insurance could play in helping mitigate the risks (Bard, et al.). The study collected two sources of primary data – results from producer focus groups and a mail survey.

The focus groups explored many topics of VEG production including risk perceptions of VEG compared to commodity corn and soybean production, problems associated with VEG production, use of crop insurance, and interest in crop insurance designed for VEG. Two focus groups with VEG producers were held in Illinois in December 2001. The producers were randomly selected from a producer survey panel maintained by Farm Research Institute. However, the participants had to be either current or past producers of VEG and willing to drive to the focus group location. The first group of producers was from a 150-mile radius of Champaign, Illinois and the second group was from a 60-mile radius of Peru, Illinois.

The results from the focus group analysis then provided the framework for the mail survey sent to 6,104 Illinois producers in February 2002. While over 900 responses were received, there were 889 useable surveys, resulting in a 15% response rate. Table 1 provides the breakout by farm size for the respondents' crop acres by three producer groups – 1) producers who had never grown VEG; 2) producers who had grown VEG in the past but did not grow VEG in 2001; and 3) producers who grew VEG in 2001. The largest group of producers was the non-VEG producers. The current VEG producers had the largest average farm size of over a thousand acres, while the non-VEG producers, as a group, had the smallest farm acreage. The survey asked the respondents about their perceptions of the risk involved with VEG production and detailed questions about VEG production (if they had produced VEG), risk management, use of crop insurance and potential interest in VEG crop insurance. The survey results provided the data for the empirical analysis.

Analysis of VEG Risk Perceptions

Using a Likert scale, the survey respondents were asked to compare risk associated with overall VEG production to commodity corn and soybean production. The scale was as follows: (1) Lower risk; (2) About the same level of risk; and (3) Higher risk. Producers who had grown VEG in 2001 were also asked to compare the risk associated with the specific VEG they had grown to commodity production. For example, if a producer had grown seed corn, he was to rate the risk associated with seed corn to commodity corn production.

Since the VEG risk perception rating was an ordered discrete variable, OLS was not the appropriate estimation method. An ordered probit model was used to evaluate the empirical relationship between risk perceptions and the producer characteristics hypothesized to influence the perceptions. Following Kmenta and Greene, the underlying model of binomial or ordinally

ranked estimation assumes that the true value of the dependent variable, Y_i^*, is unobservable. This is based on the presumption of the existence of the relationship:

$$Y_i^* = \alpha + \beta X_{i+} \varepsilon_i$$

where Y_i^* represents the unobservable variable; X_i is a vector of explanatory variables on the i^{th} observation; ε_i is ~ N (0,1); and ε_i and ε_j ($_i \neq _j$) are independent.

It is assumed that Y_i^* is related to the observable alternative categories of choice as follows:

$$Y_i = 0 \text{ if } Y^*_i \leq 0,$$

$$= 1 \text{ If } 0 \leq Y_i^* < A_1,$$

$$= 2 \text{ if } A_1 \leq Y_i^* \; A_2.$$

For the ordered probit model, the A_i is an unknown "threshold" parameter to be estimated along with β. The model is estimated using maximum likelihood methods. The probability of a given discrete outcome is a function of $\beta' X_i$. The components of β do not have the classical regression model interpretation of the marginal change in the dependent variable as the levels of X_i change (Greene). Unlike the classical regression model, the marginal change in probabilities is a function of X_i as well as β. In the general case, the signs of the coefficients only indicate direction of changes in the highest and lowest ranked categories of Y_i for changes in X_i, but not for the interior categories. For example, if a component of β is greater than zero, then an increase in the corresponding X_1 indicates that the probability of Y=0 decreases and the probability that Y=2 increases. The following probabilities are specified:

$$P (Y_i = 0) = F (-\alpha - \beta X_i),$$

$$P(Y_i = 1) = F(A_1 - \alpha - \beta X_i) - F(-\alpha - \beta X_i), \text{ and}$$

$$P(Y_i = 2) = F(A_2 - \alpha - \beta X_i) - F(A_1 - \alpha - \beta X_i)$$

where $F(\cdot)$ is a standard cumulative normal distribution function.

Originally, the overall risk perception of VEG risk compared to commodity risk was to be evaluated. However, the preliminary analysis indicated that no significant relationships existed between the VEG risk rating and the independent variables. Due to the potential variation of risk associated with specific VEG types (e.g., non-GMO soybeans compared to tofu soybeans), an overall risk rating may not be the appropriate risk perception measure. Therefore, analysis turned to estimating the relationships between risk ratings for individual VEG types and explanatory variables.

Two models were defined – one for value-enhanced corn types and one for value-enhanced soybean types. As previously mentioned, two "approaches" were included. The first "approach" was to capture causal effects from factors that directly impact risk perceptions. For each model, dummy variables were defined to capture any difference in the risk perception caused by the VEG type. It is hypothesized that if producers had experienced problems with VEG production, they would have a higher risk perception of VEG production. VEG production problems associated with risk include (1) price premium reduction due to the crop falling below quality standards, or no price premium being received because the crop failed to meet standards; (2) contract default by the buyer; (3) lower than expected yields; (4) GMO contamination; (5) storage problems; and (6) harvesting problems[1]. If the producers had problems with any of these issues, the problems may increase their perception of VEG risk. Another barometer of risk

[1] The respondents were asked if they had problems with the marketing window for pricing the grain and with the delivery schedule. These problems are more a reflection of inconvenience to the producer, and not of increased risk.

perception is production or input costs. The producers were asked if their annual input costs for VEG were typically lower, the same or higher than commodity grain production. While higher input costs may not increase the probability of higher risk, they may increase the magnitude of risk exposure, thus creating a higher risk perception.

The producers also indicated the percent of the crop that was produced under contract, one manner in which producers manage risk. A higher portion of VEG crop grown under contract was expected to lower the risk perception due to a guaranteed market and price premium, assuming the crop meets the quality standards. Table 2 and Table 3 summarize the explanatory variables used in the two risk perception models. Starch corn and food soybeans are the VEG types for which the dummy variables were omitted from the respective corn and soybean models. The "Lower" cost dummy variable was omitted from the models so the "Same" and "Higher" cost explanatory variables could be compared to lower costs.

Analysis of VEG crop insurance

The respondents were asked whether or not they would be interested in crop insurance specifically designed for VEG. The explanatory variables for the analysis included the overall VEG risk perception. If a producer believes that VEG risk is higher than commodity risk, he might be more likely to purchase VEG crop insurance. Previous use of multiple peril or revenue-based crop insurance was also considered. It might be more likely that VEG crop insurance would be purchased if a producer had used one of these crop insurance products in the past than if no crop insurance policies had been previously purchased. It is hypothesized that the extent to which VEG production is part of the overall farm production, the more likely VEG crop insurance would be purchased. If at least a portion of the VEG acreage is produced under contract, it might indicate that the VEG contract requires crop insurance to be carried, thus

implying an increased probability of interest in the VEG crop insurance. However, contracted acreage might also imply that the producer does not feel crop insurance is necessary. If a producer has had problems with VEG production (indicated by a dummy variable), the greater the chance a risk management tool such as VEG crop insurance would be used.

The model was estimated using the probit procedure, and the explanatory variables are presented in Table 4.

Results

Producer VEG Risk Perceptions

Table 5 presents the summarized responses to the respondents' perceptions of VEG risk compared to commodity production risk. The majority of the respondents indicated that they perceived VEG risk to be greater than risk associated with commodity production. Producers who had previously grown VEG, but were no longer producing VEG, rated VEG risk on average significantly higher than current VEG producers and producers who had never grown VEG.

Based on the results of the focus groups and consultation with research experts, four specific sources of VEG risk were identified from risks associated with all aspects of growing a VEG crop. The four risk sources were (1) yield uncertainty; (2) price premium uncertainty as a result of not meeting quality standards; (3) risk of contamination from other crops; and (4) strength and commitment of the buyer or contractor. The survey respondents were asked to rate their perceived level of risk associated with each source on a Likert scale of 1 to 5. Table 6 shows the summarized responses for the four risk sources. "Price premium uncertainty" was the highest rated source of VEG risk by all respondents while "yield uncertainty" was perceived as being the lowest rated source of risk.

Table 7 presents the results for the analysis of producer characteristics influencing current VEG producers' perceptions of risk associated with corn. Producers who rated the risks associated with white, high oil and seed corn reported a significantly a higher risk perception for VEG than for commodity production. However, there appeared to be no significant impact on risk perception associated with food, non-GMO, and waxy corn production. Quality (defined as the percent of crop for which no or reduced premiums were received), GMO contamination, and default problems did not seem not to impact VEG risk perception significantly. The degree to which the production is under contract and lower than expected yields greatly influenced the risk perception of the VEG.

Model results suggest that producers perceive risk to be greater with contracted production than with open market commodity production. The sign of the contract coefficient was expected to be negative – the greater degree of contracted production, the lower the probability VEG risk would be rated high. The positive coefficient implies that as contracted production increases, the probability of a higher risk rating increases. Perhaps the increased risk perception is due to increased uncertainty of meeting contract specifications. Experience with lower than expected yield appears to influence risk perceptions of individual VEG types positively. VEG production costs relative to commodity production also affect VEG risk perception. Compared to lower costs, both the same and higher costs significantly influence the probability of the rating. The higher cost variable is more influential than the same cost variable. This implies that a producer's experience with VEG costs compared to commodity production impact VEG risk perceptions.

Risk rating was significantly influenced by value-enhanced soybean type (Table 8). Seed, STS, non-GMO, and tofu types were positively related to the risk rating for the value-

enhanced soybean types. The STS coefficient indicates the STS has the strongest impact on risk perceptions of the VEG types. As with the corn model, the degree to which the production is under contract and the cost comparison significantly influence the risk perception of the respective crop. The lower than expected yield coefficient is significant only at the 10% level. Other problems with the crop (such as GMO contamination and quality problems) appear not to influence risk perceptions of value-enhanced soybeans.

Producer Interest in VEG Crop Insurance

The producer survey asked the respondents about their use of crop insurance. Figure 1 summarizes the responses to the type of crop insurance policies the producers have used in the past. The survey allowed more than one type of policy to be selected. Hail insurance is the most frequently purchased type of crop insurance for these Illinois cash grain farmers. Multiple peril insurance is the second most frequently purchased policy. Only 71 respondents had never used crop insurance.

The survey respondents were asked whether or not they would be interested in crop insurance specifically designed for VEG production. Table 9 shows that only about 24% of all the respondents, but 39% of the current VEG producers, would be interested in this type of crop insurance. The respondents were then presented with four policy provisions that the VEG crop insurance might contain (Figure 2). They rated these four provisions on a Likert scale of one to five based on their perceived importance. Of the producers interested in VEG crop insurance, the policy provision that received the highest rating was the "price election adjusted to include expected contract price premium"**.** This implies that the producer would be compensated for the VEG's expected price premium if an indemnity payment was made. The provision rated least important was the "adjustment for VEG yield history versus the commodity yield history". This

result is not surprising because in many, if not most cases, the VEG-adjustment would be downward.

Table 10 presents the results from the probit analysis of factors impacting current VEG producer adoption of VEG insurance. The producers' risk perceptions and farm size do not appear to influence their interest in VEG-crop insurance. However, the degree to which they are involved in VEG production, whether they have had VEG production problems, produce some of their VEG crop under contract, and utilize either multi-peril or revenue-based crop insurance does appear to influence their interest in VEG crop insurance. The greater the portion of VEG acres to total farm acreage, the greater the interest in VEG crop insurance. If the producer has contracted VEG acreage, he is less interested in VEG crop insurance. However, the coefficient signs for VEG production problems and previous crop insurance use are not what were expected. While previous crop insurance experience is the most influential factor, it was expected that previous crop insurance use would increase the likelihood of VEG crop insurance adoption. The negative coefficient indicates that previous use decreases the probability of being interested in VEG crop insurance. This result may suggest that the producer believes current crop insurance products are adequate to handle VEG or that crop insurance is not needed at all.

Summary and Conclusion

Illinois corn and soybean producers perceive VEG production as being riskier than commodity grain production. VEG risk was rated higher by producers who have previously grown VEG than by current and non-VEG producers. The past producers' higher risk perception may be a result of bad experiences with VEG production (e.g., loss of price premium), and their perception contributed to the decision not to grow VEG in 2001. Producers' perception of higher

risk associated with VEG production signals that producers may be interested in risk management tools designed to manage the risks unique to VEG production.

Of the four VEG risk sources rated by the producers, "price premium uncertainty as a result of not meeting quality standards" was considered the highest source of risk while "yield uncertainty" was rated the lowest source of risk. Therefore, producers may be most interested in addressing the management of risks associated with not meeting quality standards resulting in reduced price premiums. However, the low rating of "yield uncertainty" may indicate that many producers do not manage VEG risks using crop insurance if the insurance deals only with yield.

The factors that appear to impact the probability of a higher risk rating significantly are the VEG type for which the risk is rated, whether or not the production is under contract, input costs, and lower than expected yields. Seed and high oil corn, and STS and non-GMO soybeans have the most significant influence on risk perceptions of the VEG types. Difference in risk perceptions by VEG type may merit different approaches to managing risk associated with each VEG type. Since input costs significantly impact risk perceptions, management of VEG input costs could be addressed to help manage VEG risk. It appears that experiences with lower than expected yield do impact the risk perception of the specific VEG type.

Approximately 24% of all the producers (39% of the current VEG producers) would be interested in VEG crop insurance. The policy provision rated the most important was a "price election adjusted to include expected contract price premium". The degree to which a producer is involved in VEG production affects the probability of being interested in VEG crop insurance significantly. In addition, whether or not contracts are used, problems with VEG production have been experienced, and crop insurance has been previously used were also found to influence interest in the VEG insurance significantly. However, the direction in which these

factors impact interest in crop insurance is unexpected. Most significantly is crop insurance; its previous use decreases the probability of the interest in VEG crop insurance, implying the possibility that the producers feel the current insurance products meet their needs. These unexpected results indicate that further investigation is needed to determine why these factors influence crop insurance adoption in the manner in which they do, and if other production characteristics can be found to signal adoption of crop insurance designed for VEG crops.

The results provide insight into producer behavior and risk management associated with VEG production. Knowledge of which producer characteristics and production experiences significantly impact the perceptions of risk associated with VEG production will be pertinent in three areas: 1) development of policies; 2) educational programs and materials; and 3) risk management tools addressing VEG risk. Understanding the producer characteristics, past use of crop insurance, and other producer factors will assist developers and providers of crop insurance products in designing and marketing crop insurance products designed for VEG.

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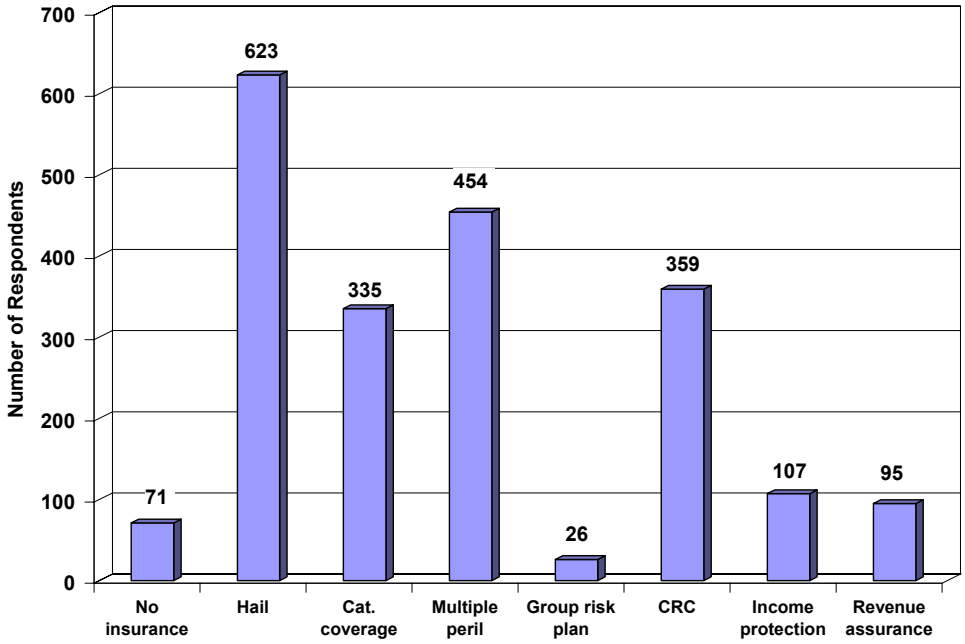

Figure 1. Use of Crop Insurance Policies by All Respondents

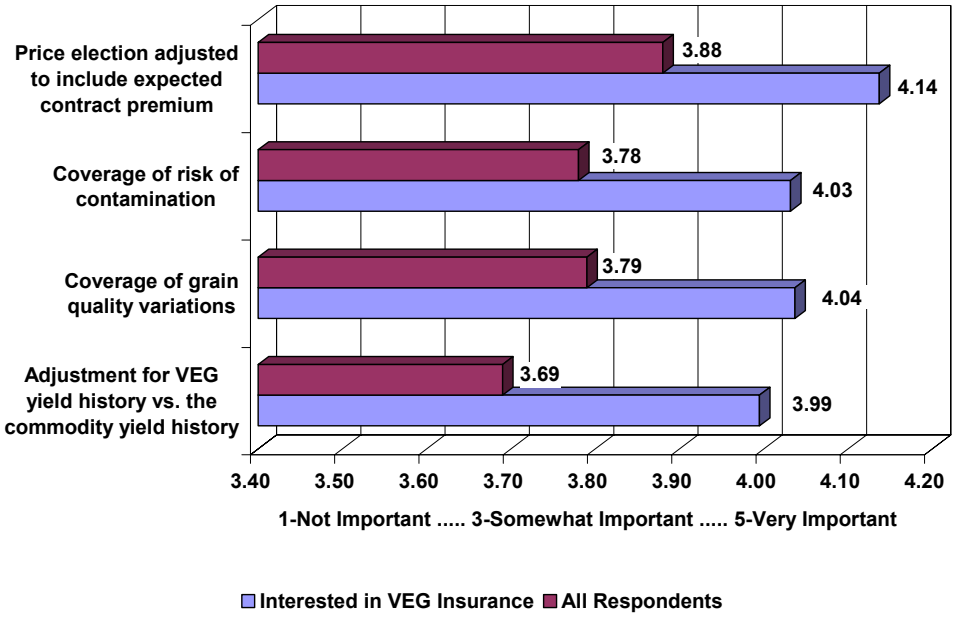

Figure 2. Producer Interest in VEG Crop Insurance Policy Provisions

Table 1. 2001 Crop Production by Producer Group

	Non-VEG Producers	Current VEG Producers	Past VEG Producers	All Respondents
Total Crop Acres (Avg)	727	1,168	918	929
Corn Acres (Avg)	355	591	464	465
Soybean Acres (Avg)	344	545	447	440
Number Respondents	385	333	171	889

Table 2. Explanatory Variable Names and Definitions for VEG Risk Perception Ordered Probit Model for Value-enhanced Corn

Variable	Variable Definition
White	1 = If producer grew white corn; 0 = Otherwise
Food	1 = If producer grew food grade corn; 0 = Otherwise
Oil	1 = If producer grew high oil corn; 0 = Otherwise
NonGMO	1 = If producer grew non-GMO corn; 0 = Otherwise
Seed	1 = If producer grew seed corn; 0 = Otherwise
Waxy	1 = If producer grew waxy corn; 0 = Otherwise
Contract	Portion of VEG acreage under contract
Badlow	Percent of VEG crop for which no or reduced premium was received
Same	1 = If producer perceived VEG production costs to be the same as commodity production costs; 0 = Otherwise
Higher	1 = If producer perceived VEG production costs to be higher than commodity production costs; 0 = Otherwise
Default	1 = If producer had experienced problems with contract default by buyer; 0 = Otherwise
Lowyield	1 = If producer had experienced problems with lower than expected yields; 0 = Otherwise
GMO	1 = If producer had experienced problems with GMO contamination; 0 = Otherwise
Storage	1 = If producer had experienced problems with storage; 0 = Otherwise
Harvest	1 = If producer had experienced problems with harvesting; 0 = Otherwise

Table 3. Explanatory Variable Names and Definitions for VEG Risk Perception Ordered Probit Model for Value-enhanced Soybeans

Variable	Variable Definition
Seed	1 = If producer grew seed soybeans; 0 = Otherwise
STS	1 = If producer grew STS soybeans; 0 = Otherwise
NonGMO	1 = If producer grew non-GMO soybeans; 0 = Otherwise
Tofu	1 = If producer grew tofu soybeans; 0 = Otherwise
Contract	Portion of VEG acreage under contract
Badlow	Percent of VEG crop for which no or reduced premium was received
Same	1 = If producer perceived VEG production costs to be the same as commodity production costs; 0 = Otherwise
Higher	1 = If producer perceived VEG production costs to be higher than commodity production costs; 0 = Otherwise
Default	1 = If producer had experienced problems with contract default by buyer; 0 = Otherwise
Lowyield	1 = If producer had experienced problems with lower than expected yields; 0 = Otherwise
GMO	1 = If producer had experienced problems with GMO contamination; 0 = Otherwise
Storage	1 = If producer had experienced problems with storage; 0 = Otherwise
Harvest	1 = If producer had experienced problems with harvesting; 0 = Otherwise

Table 4. Explanatory Variable Names and Definitions for VEG-Specific Crop Insurance Interest

Variable	Variable Definition
Same	1 = Producer's perception of VEG risk is the same as commodity production; 0 = Otherwise
Greater	1 = Producer's perception of VEG risk is greater than that of commodity production; 0 = Otherwise
Acres	Number of producer's total crop acres
Vegprod	Percent of total crop acres that are in VEG production
Contract	1 = Portion of VEG acreage is produced under contract; 0 = Otherwise
Vegprob	1 = Producer has experienced production problems with VEG; 0 = Otherwise
Insuse	1 = Producer has used multi-peril or revenue based crop insurance; 0 = Otherwise

Table 5. Risk of VEG production compared to commodity production by producer group

	Non-VEG Producers		Current VEG Producers		Past VEG Producers		All Producers	
Risk Categories	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Lower risk	3	0.8%	5	1.5%	1	0.6%	9	1.0%
Same risk	90	23.4%	113	33.9%	33	19.3%	236	26.5%
Higher risk	196	50.9%	198	59.5%	119	69.6%	513	57.7%
Not enough information	92	23.9%	16	4.8%	18	10.5%	126	14.2%
Null	4	1.0%	1	0.3%		0.0%	5	0.6%
Total responses	385		333		171		889	
Avg within classification	2.67*		2.61*		2.77		2.66	

* Significantly different from "Past VEG Producers"

Table 6. Sources of VEG Risk

	Average	Max.	Min.	Mode	Standard Deviation	Number Responses
Yield uncertainty	3.38[1]	5	1	3	0.97	864
Premium uncertainty	3.79	5	1	4	0.94	865
Contamination risk	3.59	5	1	4	1.07	865
Buyer strength	3.42[1]	5	1	3	1.03	864

[1] "Yield Uncertainty" and "Buyer Strength" are the only two sources for which the averages ratings were not significantly different from one another

Table 7. Ordered Probit Model Results for Risk Perception of Value-Enhanced Corn

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]
WHITE	0.7481	0.4458	1.6780*	0.0933
FOOD	0.0515	0.3752	0.1370	0.8908
OIL	0.8046	0.3797	2.119**	0.0341
NONGMO	0.2484	0.3920	0.6340	0.5262
SEED	0.8173	0.2857	2.861***	0.0042
WAXY	0.7066	0.8544	0.8270	0.4083
CONTRACT	0.0061	0.0023	2.608***	0.0091
BADLOW	-0.0041	0.0044	-0.9340	0.3505
SAME	1.0759	0.3157	3.408***	0.0007
HIGHER	1.7687	0.3794	4.661***	0.0000
DEFAULT	-0.0584	0.2588	-0.2260	0.8215
LOWYIELD	1.0342	0.2270	4.556***	0.0000
GMO	0.0952	0.5133	0.1850	0.8529
STORAGE	-0.2978	0.3759	-0.7920	0.4282
HARVEST	0.4774	0.3283	1.4540	0.1459
Number of Observations				203
Chi-squared				72.930

*, ** and *** - Significant at the 10%, 5% and 1% levels, respectively.

Table 8. Ordered Probit Model Results for Risk Perception of Value-Enhanced Soybeans

Variable	Coefficient	Standard Error	b/St.Er.	P[|Z|>z]
SEED	0.8019	0.2987	2.685***	0.0073
STS	1.6138	0.3063	5.269***	0.0000
NONGMO	0.9451	0.2193	4.309***	0.0000
TOFU	1.7991	0.6117	2.941***	0.0033
CONTRACT	0.0042	0.0021	2.032**	0.0422
BADLOW	0.0009	0.0037	0.2320	0.8162
SAME	0.5238	0.2087	2.51**	0.0121
HIGHER	1.3112	0.2505	5.235***	0.0000
DEFAULT	0.3407	0.4928	0.6910	0.4893
LOWYIELD	0.4916	0.2894	1.6990*	0.0893
GMO	0.4801	0.3350	1.4330	0.1517
STORAGE	-0.0278	0.3129	-0.0890	0.9291
HARVEST	0.5175	0.3551	1.4570	0.1450
Number of Observations				224
Chi-squared				35.659

*, ** and *** - Significant at the 10%, 5% and 1% levels, respectively.

Table 9. VEG Production History versus Interest in VEG Insurance (Excludes Null Observations)

	Number of Respondents			
	Interested in VEG Insurance	Not Interested in VEG Insurance	No Plans to Grow VEG	Total
Non-VEG Producers	38	60	268	366
Current VEG Producers	117	173	9	299
Past VEG Producers	40	66	58	164
Total	195	299	335	829

Table 10. Probit Regression Results for Interest in VEG Crop Insurance

Variable	Estimate	Standard Error	Chi-Square	Pr > ChiSq
Intercept	1.5834	0.4597	11.8661***	0.0006
Same	-0.0482	0.3430	0.0197	0.8883
Greater	-0.2213	0.3323	0.4437	0.5053
Acres	-9.46E-06	0.0001	0.0152	0.9020
Vegprod	0.5559	0.2934	3.5896*	0.0581
Contract	-0.3937	0.1569	6.2977**	0.0121
Vegprob	-0.3530	0.2004	3.1032*	0.0781
Insuse	-0.8360	0.2546	10.7861***	0.0010
Log Likelihood			-195.2035	

*, ** and *** - Significant at the 10%, 5% and 1% levels, respectively.