# RISK AND RISK MANAGEMENT IN THE PRODUCTION AND MARKETING OF VALUE-ENHANCED GRAINS[1]

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**ABSTRACT**

A study was conducted to further understanding of the risks and risk perceptions associated with value-enhanced grain (VEG) production, and issues surrounding the management of these risks, including the role of crop insurance. The project's focus was on value-enhanced corn and soybean production in Illinois. Data were collected through two producer focus groups, review of contracts for specialty corn and soybean production, and a mail survey of more than 900 responding Illinois agricultural producers. The key findings of the study include: 1) Risks unique to VEG production include base price, price premium, quality, yield, contract, investment, relationship, product liability, and market access risks; 2) overall, producers perceive VEG production to be riskier than commodity production, and VEG experiences appear to influence risk perceptions; 3) limited VEG risk management tools include production contracts, crop insurance, production practices, and legal counsel; and 4) traditional crop insurance presents certain problems when insuring VEG crops. These problems include valuation differences in commodity and value-enhanced grains, VEG yield as it relates to APH, and limited quality loss provisions.

**Key Words:** Value-enhanced grain production, crop insurance, risk perceptions, risk management tool

## EXECUTIVE SUMMARY

*Purpose and Objectives*

Changing consumer preferences and technological advances have altered the production and marketing of commodity grains such as corn and soybeans. Specialized traits and customized management and handling practices that add value to certain end uses have been introduced into corn and soybeans. The term value-enhanced grains (VEG) has become a common descriptor for these non-commodity products. Many different types of VEG are now being grown for specific end uses.

Production of these new value-enhanced types of corn and soybeans often requires different production practices, quality considerations, marketing methods, and contractual relationships than those used for commodity grain production. As a result, the VEG production system has created a new set of risks for VEG growers. Unfortunately, these new risks cannot always be managed effectively with the current risk management tools available for commodity corn and soybean production.

The main objective of a study conducted by Ag Education & Consulting (AEC) and the Economic Research Service, USDA (ERS) was to further the understanding of the risks and risk perceptions involved in value-enhanced grain production and to articulate issues surrounding the management of these risks. In addition, the manner in which crop insurance products currently offered do or do not manage VEG risk effectively was also evaluated. The project's focus was on production of value-enhanced corn and soybeans in Illinois.

*Methodology*

To meet the study's objectives, several sources of data were employed. Data used to characterize the risks associated with VEG production were collected through two producer focus groups, review of contracts for specialty corn and soybean production, and a mail survey of more than 900 responding Illinois agricultural producers. In addition, results from the University of Illinois (UI) Value Project and the U.S. Grains Council's (USGC) Value-Enhanced Grains Quality Reports were used to supplement the description of the VEG production and marketing in Illinois. Two brainstorming sessions with research experts were also held to evaluate and analyze the risks involved in VEG production and the risk management tools employed by producers. This project is referred to as the AEC project.

*Key Findings*

The key findings of the study include the following:

1. Risks unique to VEG production exist. These risks include base price, price premium, quality, yield, contract, investment, relationship, product liability, and market access risks.
2. Overall, producers perceive VEG production to be riskier than commodity production, and their experiences with VEG appear to influence their risk perceptions.
3. Limited risk management tools currently exist to help manage VEG risk. These tools include production contracts, crop insurance, production practices, and legal counsel.
4. Traditional crop insurance presents certain problems when insuring VEG crops. These problems include valuation differences in commodity and value-enhanced grains, VEG yield as it relates to APH, and limited quality loss provisions.

Details of these findings can be found in *Risks of Growing Value-Enhanced Corn and Soybeans in Illinois.*

## OVERVIEW OF VALUE-ENHANCED GRAIN PRODUCERS

### Socioeconomic Characteristics

Based on the UI Value Project, the USGC Value-Enhanced Grain Quality Reports and the results of the AEC study, a profile of producers growing VEG has emerged. Distinguishing characteristics of VEG growers are found to be:

**Age**—VEG producers are younger than the producers not interested in growing VEG.

**Education**—VEG producers have more college education than producers not interested in VEG.

**Farm size**—VEG producers operate larger farms than producers not interested in VEG.

**On-farm storage**—VEG producers have more on-farm storage capacity than non-VEG producers. However, this capacity difference may be due to larger farm size, not due to the simple desire to have proportionately greater storage capacity.

**Off-farm income**—VEG producers rely less on income from off-farm employment than non-VEG producers.

**Use of crop insurance**—VEG producers are more likely to carry revenue-based crop insurance than non-VEG producers.

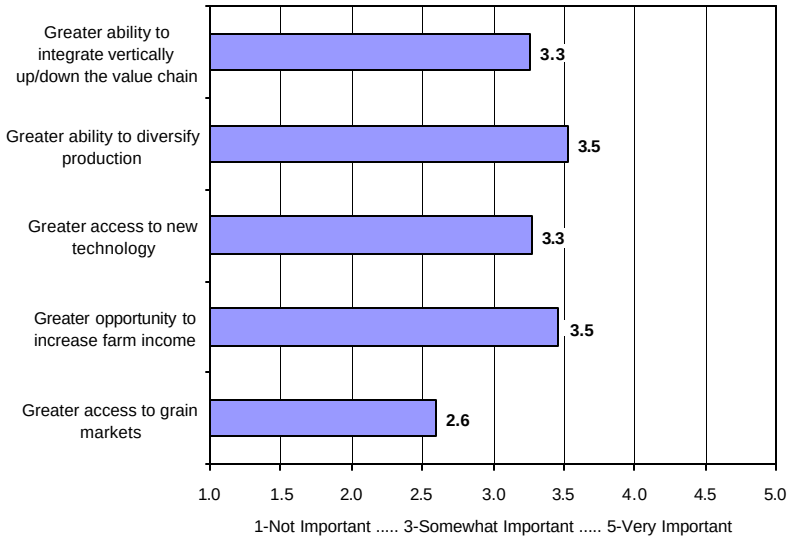
**Income strategy**—VEG producers are more likely to consider producing specialty crops or joining producer alliances to increase income than non-VEG producers.

**Future of VEG**—VEG producers and those interested in producing VEG are more likely to believe that producers of the future will produce more commodities closely tailored to

the demand of end use markets. Producers not interested in growing VEG believe that producing standard commodities and selling them on the open market will remain a viable strategy.

**Reasons for growing and not growing Value-Enhanced Grain**

The AEC study investigated the perceived benefits of growing VEG. Five benefits were specified, and it was found that across all producers, the greatest benefit to VEG production is the greater ability to diversify production (Figure 1). However, producers currently growing VEG believe that the most important benefit to VEG production is the greater opportunity to increase income. Greater access to grain markets is perceived as the least beneficial reason for producing VEG.




Source: AEC Producer Survey

Figure 1. Producers' Perceptions of the Benefits of Growing VEG

Producers responding to the USGC producer surveys have indicated the primary reason for not growing VEG to be the lack of sufficient premiums. The respondents have also indicated that they do not grow value-enhanced corn because there are no markets in their area or that they are happy with their current hybrids or returns. The Illinois producers responding to the UI Value Project survey stated that the most frequent reason for not growing VEG is the lack of markets for the specialty crops. Other reasons included uncertainty of profits and inadequate information about risk.

**Illinois VEG Production**

For the purposes of the AEC study, VEG is corn or soybeans with particular characteristics that add end user values and is marketed based on attributes beyond standard grade factors. Table 1 lists the VEG types the Illinois producers participating in the survey and focus groups reported to have grown in 2001.

**Risk Associated with VEG Production in the Midwest**

Analysis of data collected for this project (focus groups, contract reviews, survey, discussions with economists and industry experts) identified nine risks unique to VEG production. The nine types of risks, as well as the main risk category in which they fall, are listed in Table 2.

| Table 1. Value-Enhanced Corn and Soybeans | |
|---|---|
| **Corn** | **Soybeans** |
| Non-GMO | Seed |
| High Oil, High Oleic, High Oil | Non-GMO |
| Yellow Food Grade | Tofu (Clear Hilum) |
| White Food Grade | Organic |
| Waxy | High Protein/High Isoflavone |
| High Extractable Starch | Low Linoleic Acid |
| Organic | High Sucrose |
| High Lysine | High Oil |
| Nutritionally Dense | Low Saturated Fat |
| High Amylose | High Oleic |
| Seed | Food Grade |
| Low Stress Crack | STS |
| Low Temperature Dried | |
| Post-Harvest, Pesticide-Free | |

| Table 2. Risks in Value-Enhanced Grain Production | |
|---|---|
| **Risk** | **Category** |
| Base Price | Market Risk |
| Price Premium | Market Risk |
| Market Access | Market Risk |
| Quality | Production Risk |
| Yield | Production Risk |
| Contract | Business Risk |
| Relationship | Business Risk |
| Product Liability | Business Risk |
| Investment | Financial Risk |

While VEG production contains the risks mentioned above, these risks are also present in the production of commodity grains. Base price risk is an example, whereas production of value-enhanced and commodity grains both face base price risk. The following sections define these VEG risks, discuss their sources, and identify how these can be different for commodity and VEG production.

## Market Risk

*Base Price*

The base price is the base grain market price onto which a premium is added to determine the final market price of a VEG. Most value-enhanced grains are priced at a premium over the commodity grain price. Therefore, the base price is often the commodity grain price. Base price

risk is the risk of lower than expected grain prices other than changes in expected market price premiums.

In most cases, the base price risk is similar for both commodity grain and VEG. The pricing structure for many VEG products is tied to a futures price or the local cash commodity price. For example, a VEG contract may be priced at 30 cents over the December futures price. In this case, the futures price volatility would impact the VEG producer the same as a producer pricing commodity grain using the same December futures price. This type of VEG pricing system would not have basis risk like commodity grain sold at the local cash price since changes in the local basis do not affect the price. Other VEG contracts may be priced at a specified premium over the local cash price. In this case, the VEG producer would have a basis risk equal to the commodity producer.

There are several issues related to VEG pricing specifications that affect base price risk. First, VEG pricing tied to a specific futures contract month may limit the pricing options for a producer and increase price risk. The pricing options available to the producer may be limited by the VEG contract. Second, the timing of the pricing may be limited by the contract. VEG contracts may include a pricing window that defines the time period during which the grain must be priced. For example, a contract may specify that the grain must be priced between harvest and March of the following year. The pricing window for the VEG may affect the producer's ability to market the grain. Focus group respondents indicated that the narrow pricing window for some products is a drawback to raising VEG.

*Price Premium*

Price premium risk is the risk of a change in premium without a change in quality within the crop year. Changes in price premium as a result of changes in quality are a quality risk, not a premium risk. Changes in quality risk may affect the price premium. To help clarify the different sources of risk, the two risk categories were separated for the purpose of the AEC study.

The sources of price premium risk are fairly limited. VEG raised under contract will typically have a set premium schedule in the contract. If the price premium for a given quality level decreases, this is a contract default on the part of the buyer. This type of price premium change would be a contract risk versus premium risk. It affects the premium level received but the real source of risk is the strength of the contract.

A more likely source of price premium risk is the risk faced by a grower producing VEG for the open market. This type of grower is also known as a speculative grower or "growing on spec." The speculative grower does not have a contract guaranteeing a premium. The premium level is set by the market at the time of sale and may be higher or lower than was expected when the crop was planted.

The AEC producer survey asked the respondents about their problems with expected premiums. While the VEG producers growing at least a portion of their VEG type under contract experienced lower than expected premiums (32% of the producers), a higher portion of VEG growers with no contract received lower than expected premiums (48%) (Table 3). This could indicate that producers growing VEG under no contract made their decision to produce VEG with an expectation of premium they would receive for the crop, but their actual receipts fell

short of their projection. For the VEG growers with contracts, their lower than expected premiums are most likely due to quality issues, not due to changes in premiums.

**Table 3. VEG Producers' Problems with Lower than Expected Premiums**

| | No Contract | | Grown under Contract | | |
|---|---|---|---|---|---|
| | Number | Percent | Number | Percent | Total |
| Problems with Lower than Expected Premium | 108 | 48.2% | 98 | 32.3% | 206 |
| No Problems with Lower than Expected Premium | 116 | 51.8% | 205 | 67.7% | 321 |
| **Total** | **224** | | **303** | | |

Source: AEC Producer Survey

Price premium risk is solely a property of VEG production. Commodity grain by definition does not receive a price premium.

*Market Access*

Market access risk is the risk of not having a viable market for the crop. Short-term market access risk is the risk of not having a market during the crop year for either a VEG crop not grown under contract or the over-production of a VEG crop. For example, if a producer grows white corn without a contract, he faces the risk of not having a market for the crop and/or not receiving the premium level he expects for the crop. Short-term market access for commodity grain is typically not an issue.

Long-term VEG market access relates to the risk of markets for a grain product disappearing over multiple crop years after a producer has made investments to produce this product. VEG products that require specialized equipment, production skills, or grower certification create these types of long-term market access risks. For example, a grower of organic soybeans has to certify his farm as organic. The certification process takes several years and may cost the producer in terms of lower production levels and management time. Loss of the organic market for his crops is a long-term risk. Unlike production systems requiring specialized facilities such as hog production, many of the inputs purchased and investments made for VEG production can be re-deployed for use with commodity production.

**Production Risk**

*Quality*

Quality risk is the risk of an unexpected quality level in the grain that affects the grain's value through discounts or reduced premiums. Quality risk also includes the risk of the grain being rejected by the buyer due to low quality or contamination.

There are several sources or components of quality risk:

**Variety risk**—Quality performance can vary significantly by variety. Even when two varieties of the same corn type are planted in the same field and raised under the same growing conditions, they can have significant differences in quality.

**Growing condition quality risk**—Quality can be adversely affected by poor weather and growing conditions during the growing season. Many quality factors including chemical composition and test weight are affected by growing conditions that are often out of the

producer's control.

**Contamination risk**—Contamination can be the result of operator error at the farm level but it can also occur due to pollen drift and seed impurities that are out of the producer's control. The risk of the crop being contaminated in the field or after harvest can have significant consequences for some products such as non-GMO corn and soybeans.

**Operator error based quality risk**—Quality can be lower than expected due to farm-level operator error related to combine settings, dryer temperatures, or segregation.

**Storage quality risk**—Once the grain is harvested there is also a risk that the quality will deteriorate in storage. Storage risk will vary with the initial quality characteristics of the grain, the storage conditions, and the duration of storage.

**Measurement risk**—This is the risk that sampling or measurement error may give erroneous quality results when the grain is tested. The invalid quality results may lead to lower than expected premiums, discounts, or rejection of the grain.

**Rejection risk**—Often there are varying degrees of penalties for grain that does not meet the buyer's specifications. The ultimate penalty is rejection. The buyer may not accept the grain, forcing the producer to find another outlet for the grain and possibly forcing the producer to default on a contract to deliver the grain at the desired quality level.

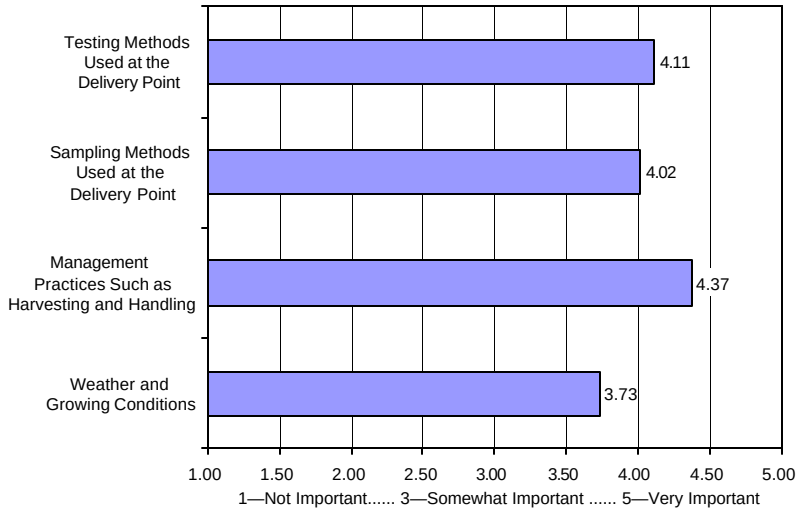
The majority of AEC survey respondents did not experience problems with their crop being rejected due to quality standards, GMO contamination, delivery schedule, storage or harvest (Table 4). The factor that caused the largest percentage of producers' problems was their delivery schedule. However, it is unknown whether the problems were due to the VEG going out of condition before the buyer would take delivery or due to the inconvenience of the delivery schedule. Based on the remarks made in the focus groups and on the producer survey, it is most likely that the problems with delivery schedules are not related to quality, but to inconvenience.

**Table 4. Problems with Issues Related to Quality**

| | Yes | | No | |
|---|---|---|---|---|
| **Problem** | **Number** | **Percent** | **Number** | **Percent** |
| Crop Rejected Due to Not Meeting Quality Standards | 118 | 22.4% | 409 | 77.6% |
| GMO Contamination | 44 | 8.3% | 483 | 91.7% |
| Problem with Delivery Schedule | 208 | 39.5% | 319 | 60.5% |
| Storage | 55 | 10.4% | 472 | 89.6% |
| Harvesting | 65 | 12.3% | 462 | 87.7% |

Source: AEC Producer Survey

Present and past VEG growers were asked in the producer survey about their perception of how important specific factors are in meeting quality specifications (Figure 2). While the average responses were rated between somewhat to very important, the respondents rated management practices as the most important factor affecting quality specifications. Management practices are the one factor completely under the producer control while the others are either beyond anyone's control or controlled by other parties.




Source: AEC Producer Survey

Figure 2. Risk Factors Affecting Meeting Quality Specifications

There are differences in the types and impact of quality risks for commodity grain and VEG. Quality variability in commodity grains can only negatively affect the grain's value whereas VEG production can receive a premium for high quality levels or discounts for low quality levels.

*Yield*

Yield risk is simply the risk of lower than expected production. Yield risk should not be confused with an expected yield drag. Many types of VEG have an expected yield drag. For example, a producer of white corn may expect to have a 5% yield drag or yield deficiency compared to his standard yellow corn varieties. However, the expected yield drag is not a risk since it was known ahead of time. Yield risk is a result of unexpected yield variability. In the example above, having a yield drag of more than 5% is the yield risk.

There are several sources or components of yield risk.

**Weather**—Weather conditions including rainfall, temperatures, wind, and hail are typically the most critical drivers of yield. Yields can be adversely affected by poor weather conditions resulting in lower than expected yields.

**Variety risk**—Yield performance can vary significantly by variety. Even when two varieties of the same corn type are planted in the same field and raised under the same growing conditions they can have significant differences in yield. Top yielding varieties do not always perform well in all weather conditions, soil types, or geographical regions. Relative variety performance often changes with growing conditions. Proper variety selection is a critical driver of yield but the selection process is complicated by the fact that relative performance may change with growing conditions.

**Unknown yield drag**—One of the major components of yield risk in growing a new type or variety of VEG is the unknown yield drag. Yield drag varies with variety, weather, soil types, and climate. There may be limited information on the expected yield drag when the producer decides to grow a new product or variety.

**Soil fertility**—Soil fertility levels are an important driver of yield. Low soil fertility levels increase the risk of low yields.

**Pest pressure**—Pest pressure from weeds and insects can affect yields and may differ among

types and varieties.

**Field operation timing**—The timing of field operations including planting, spraying, and harvesting can be critical to yield performance.

VEG growers responding to the producer survey were asked about problems related to lower than expected yields. Only 25% of the respondents indicated that they had encountered problems related to lower than expected yields. This result could indicate that while the VEG producers may expect some form of yield drag, only one quarter of the growers have had problems above and beyond their expectation of yield drag.

While both commodity and value-enhanced grain production experience yield risk, the manner in which the risks are manifested differ. VEG varieties are often more sensitive to poor weather conditions, have greater yield variability, limited genetic diversification, and greater unknown yield drag.

**Business Risk**

*Contract*

Contract risk is the risk of contract default by the producer or the contractor.

There are several components of contract risk.

**Contract default**—Default by contractor during the crop year. Default occurs when either the buyer or producer does not perform as stipulated in the contract.

**Contract termination of multiple one-year contracts after several years**—Termination of a single year contract after the producer has grown under contract for multiple years.

**Not understanding contract terms**—Producer may not understand contract terms or "fine print" and therefore may incur costs or be subject to conditions that were not expected.

**Producer contract violations**—Contract default as a result of producer actions. Producers risk the consequences of intentionally or accidentally violating contract terms.

**Payment risk**—Producers face risk of non-payment for the grain they deliver, if the buyer encounters financial adversity, bankruptcy, loss of market, etc.

Contract risk does not appear to be a significant source of risk. As part of the producer survey, VEG growers were asked if they had had problems with contract default with buyers. Only 39 of the 527 respondents or 7.4% indicated they had experienced problems with contract default. Since there is a greater use of contracts in VEG than commodity production, many of the risks related to contracts are specific to VEG. Payment risk is applicable to both VEG and commodity production, while buyer default on VEG-specific contract terms such as premium levels is solely a VEG production risk.

*Relationship*

Relationship risk is the risk of adversely affecting relationships with buyers, suppliers, or other resource providers that are critical to the success of the farm operation.

There are several sources of relationship risk. All of them deal with losing access to critical resources.

**Landlord**—Access to land

**Lender**—Access to capital

**Supplier**—Access to critical supplies including genetics, production technology, and knowledge

**Buyer/processor**—Access to markets, revenue opportunities, and market knowledge

Access to critical resources through relationships is important for both commodity and VEG growers. However, some relationship risks are unique to VEG production. To grow grain for a VEG market, producers need to maintain relationships with key buyers and input suppliers. Relationships with lenders and landlords may be influenced by a producer's participation in VEG production. How these relationships are affected depends on the lender's and landlord's perceptions of the risks and returns associated with VEG. According to the VEG producers responding to the AEC survey, the majority indicated that their landlord(s) had no influence on the decision to grow VEG. Therefore, for this group of producers, landlord relationship risk may not be high.

*Product liability*

Product liability risk is the risk that a producer may be liable for any problems associated with the grain they have sold.

This may include liability for contamination or food safety problems. End user concerns over GMOs have made contamination and liability risk more relevant in recent years. GMO contamination can come from impure seed, pollen drift, and grain segregation problems. The many sources of contamination and the ability to trace problems back to individual farms are increasing producer risk. StarLink corn is an example. If contracted food grade corn is required not to contain any StarLink, the producer could be held liable for contaminating an entire barge shipment if StarLink corn can be traced back to the individual producer. In addition, GMO contamination in organic production means that the crop cannot be labeled organic.

**Financial Risk**

*Investment*

Investment risk is the risk associated with returns on a long-term asset. There are two main components of investment risk: variability in returns and loss of the asset. Variability in returns is the result of annual change in the costs or revenue associated with the asset. Loss of the asset may be a result of fire, theft, natural disaster, or other peril, and is often covered by property insurance.

VEG production may include sources of added investment risk above the investment risk associated with commodity grain production. Production of some VEG types may require investment in specialized equipment or facilities. Long-term returns on these investments may be uncertain since production contracts are typically for a single year. If the producer loses the contract or if the economics of the product become less favorable, the returns on the investment may be affected.

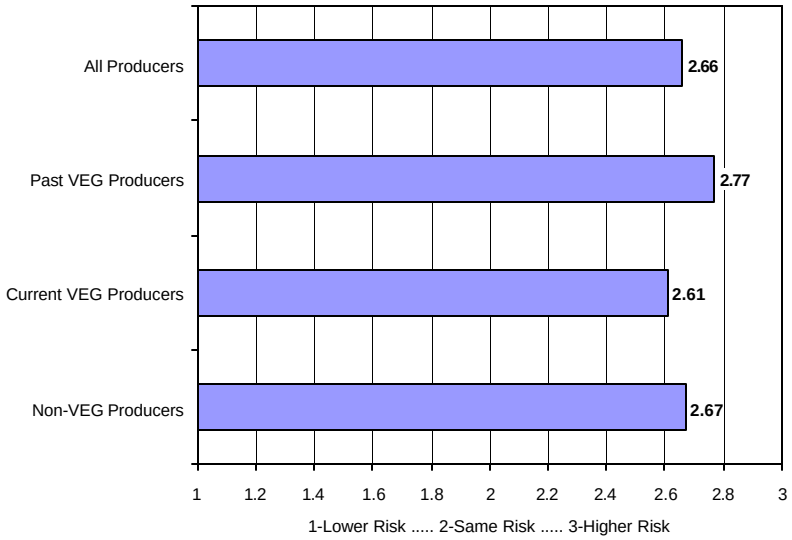
A small number of the AEC survey respondents have made capital investments in order to produce VEG. Sixty-two producers or 12% of the respondents had made additional capital investments, averaging $32,682. Seventy-five percent of the investments were from over $5,000 up to $50,000 with the lowest and highest investments being $100 and $250,000, respectively.

## RISK PERCEPTIONS

### Overall VEG Risk Compared to Commodity Risk

*Perceptions of current, non- and past VEG producers*

Producers' perceptions of the risk involved in producing and marketing crops influences the adoption and implementation of risk management tools. The AEC Producer Survey assessed producers' perceptions of the risks involved in growing VEG. Fifty-eight percent of all respondents perceive VEG production to have higher risk than commodity grain production, while 27% believe commodity and VEG production present the same levels of risk. Current VEG producers rate VEG risk the lowest of the three producer groups while past VEG growers believe VEG production has the highest level of risk compared to commodity production (Figure 3).




Source: AEC Producer Survey

Figure 3. Producers' Perceptions of VEG Risk Compared to Commodity Risk

*Reasons for Risk Perceptions*

The AEC Producer Survey asked the respondents about the reasons behind their perceptions of the risks associated with VEG production. Those who felt VEG risk was lower than the risk associated with commodity grain production indicated that the benefits outweighed the costs. The producers who indicated that risk affiliated with VEG production was the same as those associated with commodity grain production replied that the benefits were about the same as the costs associated with VEG production. Other reasons for rating VEG and commodity grain production risks to be the same include the following:

- Non-GMO production has not created additional risks.
- No problems with VEG production have been experienced.
- There are always risks involved in production agriculture.
- The similarity in risks between VEG and commodity grain production are due to similar production practices.

The majority of the respondents indicated that VEG production is riskier than commodity grain production. Their reasons for rating VEG production higher include the following:

- Limited market access for VEG products
- Premium decay
- Pest problems or limited agronomic practices

- Special handling and storage requirements
- Yield problems
- Higher costs translating into costs being greater than the benefits of VEG production
- Quality problems
- Extra labor required
- Delivery problems
- Buyer default on contract
- Contamination

*Differences in Risk Perception by Variety or Contracted Production*

The AEC survey asked the producers about their perceptions of risk associated with the particular type(s) of VEG they grew in 2001 to determine if perceptions of risk could differ by VEG type. Table 5 summarizes the scores of the respondents. For VEG types with more than five observations, white corn received the highest average overall risk score of the value-enhanced corn types, and tofu soybeans were rated, on average, as the riskiest specialty soybeans. The respondents rated the non-GMO corn and food grade soybeans as the least risky specialty corn and soybeans, respectively.

**Table 5. Average Risk Rating of VEG Production Compared to Commodity Grain Production**

| | | | Risk Factor Average Score on Scale of 1 to 5 | | | |
|---|---|---|---|---|---|---|
| VEG Type | Number of Obs. | Overall Risk Score (Scale of 1 to 3) | Yield Uncertainty | Premium Uncertainty | Contamination Risk | Buyer Strength |
| White Corn | 27 | 2.67 | 3.32 | 3.07 | 3.18 | 2.22 |
| Hard Endosperm/Food Grade Corn | 57 | 2.26 | 2.26 | 2.95 | 3.07 | 2.63 |
| High Oil Corn | 55 | 2.64 | 2.89 | 3.30 | 2.48 | 2.65 |
| Non-GMO Corn | 57 | 2.12 | 1.68 | 3.18 | 3.21 | 2.82 |
| Seed Corn | 19 | 2.47 | 3.68 | 2.68 | 3.05 | 2.16 |
| Waxy Corn | 6 | 2.50 | 2.83 | 1.83 | 2.67 | 2.17 |
| High Starch Corn | 12 | 2.36 | 1.83 | 3.08 | 3.25 | 3.08 |
| High Amylose Corn | 1 | 3.00 | 2.00 | 3.00 | 4.00 | 4.00 |
| Low-Temperature Dried Corn | 4 | 2.50 | 2.00 | 3.00 | 3.00 | 3.00 |
| Low-Stress Crack Corn | 1 | 3.00 | 3.00 | 1.00 | 1.00 | 2.00 |
| Organic Corn | 3 | 2.67 | 3.00 | 3.33 | 3.67 | 3.00 |
| Nutrit.Enhanced Corn | 6 | 2.50 | 2.83 | 2.00 | 2.67 | 2.17 |
| Seed Soybeans | 89 | 2.28 | 2.36 | 3.38 | 2.78 | 2.68 |
| STS Soybeans | 35 | 2.40 | 2.08 | 3.00 | 2.72 | 2.59 |
| Non-GMO Soybeans | 101 | 2.21 | 1.81 | 3.02 | 3.17 | 2.87 |
| Organic Soybeans | 2 | 3.00 | 3.00 | 4.00 | 4.00 | 3.50 |
| Tofu Soybeans | 12 | 2.67 | 3.42 | 3.17 | 2.92 | 2.50 |
| Food Grade Soybeans | 16 | 2.20 | 2.19 | 2.88 | 2.69 | 2.07 |
| High Protein Soybeans | 4 | 2.00 | 2.00 | 2.00 | 2.25 | 2.50 |
| All Types | | 2.34 | 2.32 | 3.08 | 2.95 | 2.66 |

Source: AEC Producer Survey

Risk perceptions were also analyzed based on whether or not VEG was produced under contract. A higher proportion of producers growing under contract rated VEG production risk to be higher than commodity production risk (Table 6). The greater risk perception of production under contract may be due to production and quality provisions in the contract. The lower risk perception for VEG producers not growing under contract may explain why they are willing to grow VEG without contracts.

**Table 6. Risk Perception of VEG Production Compared to Commodity Production**

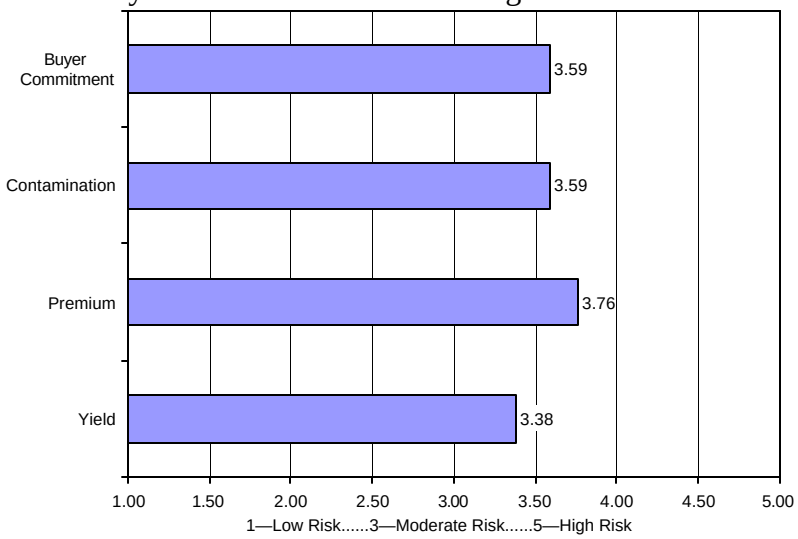
| | No Contract | | Produced under Contract | |
|---|---|---|---|---|
| **Perceived Level of Risk** | **Number** | **Percent** | **Number** | **Percent** |
| Lower | 5 | 2.4% | 7 | 2.4% |
| Same | 143 | 67.5% | 165 | 56.3% |
| Higher | 64 | 30.2% | 121 | 41.3% |
| Average Score | 2.28 | | 2.39 | |

Source: AEC Producer Survey

**Specific Sources of VEG Risk**

*Sources of risk by production category*

The AEC survey asked the producers about their perception of specific sources of VEG risk. The risk of loss of premium was given the highest score across four risk categories, while yield risk appears to be the lowest rated factor of the four (Figure 4). Current VEG growers consistently rate the risk factors lower than the non-growers and past VEG growers do. This perception of lower risk may influence their decisions to grow VEG.

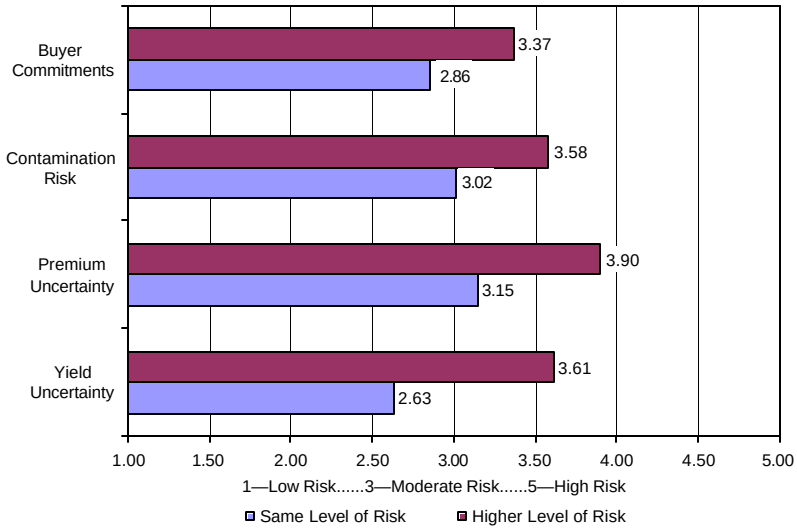



Source: AEC Producer Survey

Figure 4. Source of Risk or Uncertainty with VEG Production for All Respondents

Current VEG producers rating overall VEG risk higher than commodity risk consistently rated, on average, the specific sources of risk to be higher risk than producers rating VEG risk to be the same as commodity production risk (Figure 5). Both groups of producers, on average, rated premium uncertainty as a result of not meeting quality standards the most important source of

risk. Yield risk has the greatest difference in perception between the two groups. This may be caused by a greater yield variability problem for those rating VEG risk higher than for those rating VEG risk the same as commodity production risk.




Source: AEC Producer Survey

Figure 5. VEG Risk Perception of Current VEG Producers

*Differences in Sources of Risk by VEG type*

The value-enhanced types receiving the highest average scores for each of the risk factors are the following (for types with more than five observations) (See Table 5):

- Yield uncertainty—seed corn and tofu soybeans
- Premium uncertainty—high oil corn and seed soybeans
- Contamination risk—high starch corn and non-GMO soybeans
- Buyer strength—high starch corn and non-GMO soybeans

Premium uncertainty received the highest score across all VEG types, followed by contamination risk. These results are consistent with the average ratings for all respondents rating VEG risk factors, regardless of the VEG type. Perceptions of the risk factors involved in VEG production at the aggregate level are fairly consistent across all sets of experiences with VEG production.

## TOOLS AVAILABLE FOR MANAGING RISK ASSOCIATED WITH VEG PRODUCTION

### Production Contracts

Production contracts can be used to manage multiple sources of VEG risk including price premium, market access, quality, contract, and product liability risks. The AEC Producer Survey results indicated that not all the producers grew their VEG production under contract, and in fact, no VEG type had 100% contracted production. Non-GMO corn and soybeans had the smallest proportion of contracted production. No value-enhanced corn with specialized handling traits was grown under contract. Buyer contract default was the least frequent and second most infrequently reported problem for value-enhanced corn and soybean production, respectively.

### Crop insurance

*Purposes of crop insurance*

Currently there are several types of federal crop insurance products available. These insurance products and their characteristics are shown in Table 7.

**Table 7. Federal Crop Insurance Products**

| Product | Crop Revenue Coverage (CRC) | Group Revenue Insurance Plan (GRIP) | Group Risk Plan (GRP) | Income Protection (IP) | Multiple Peril Crop Insurance (MPCI) | Revenue Assurance (RA) |
|---|---|---|---|---|---|---|
| Coverage | individual revenue | county revenue | county yield | individual revenue | individual yield | individual revenue |
| Insurance Units | basic, optional, enterprise | one unit per county | one unit per county | enterprise | basic, optional, enterprise, whole farm | basic, optional, enterprise, whole farm |
| Price Reference for Guarantee | higher of the projected harvest price and the fall harvest price | projected harvest price | 60-100% of the FCIC price | projected harvest price | 60-100% of the FCIC price | projected harvest price (or same as CRC if Fall Harvest Price Option is selected) |
| Yield Reference for Guarantee | 50-85% of producer's APH | 70-90% of the expected county yield | 70-90% of the expected county yield | 50-85% of producer's APH | 50-85% of producer's APH | 65-85% of producer's APH |
| Guarantee | higher of the projected harvest price and the fall harvest price x APH x coverage level | projected harvest price x expected county yield x coverage level | expected county yield x coverage level | projected harvest price x APH x coverage level | APH x coverage level | projected harvest price x APH x coverage level (or same as CRC if Fall Harvest Price Option is selected) |
| Gross Revenue | actual yield x harvest price | county average yield x harvest price | not applicable | actual yield x harvest price | not applicable | actual yield x harvest price |
| Loss Due If | gross revenue is less than the final guaranteed revenue | the county level gross revenue is less than the guaranteed revenue | average county yield is less than guaranteed yield (expected county yield x level) | gross revenue is less than the guaranteed revenue | actual yield is less than the yield guarantee | gross revenue is less than the guaranteed revenue |
| Indemnity Payment | gross revenue less final guarantee | county level gross revenue less guarantee | (county yield less guarantee) x price election | gross revenue less guarantee | (actual yield less guarantee) x price election | gross revenue less guarantee |

| **Price Definitions** | | |
|---|---|---|
| Projected harvest price: | Corn | Average of the daily settlement prices in February for the CBOT December corn futures contract |
| | Soybeans | Average of the daily settlement prices in February for the CBOT November soybean futures contract |
| Fall harvest price: | Corn | Average of the daily settlement prices in November for the CBOT December corn futures contract |
| | Soybeans | Average of the daily settlement prices in October for the CBOT November soybean futures contract |
| FCIC price: | Market prices set by the Federal Crop Insurance Corporation in the spring prior to insurance closing date<br>The FCIC price does not change during the year. | |

Each of these insurance products basically guarantees the producer some revenue or yield level based on price and/or yield guarantees. The main differences between the insurance products are the price and yield references. For the Group plans, the yield reference is the county average yield for the crop. The individual producer's actual yield is the yield reference for all the other insurance products. The FCIC price is the reference price for GRP and MPCI. The FCIC price is set in the spring and is the expected average price for the crop. The December corn futures contract and the November soybean futures contract on the Chicago Board of Trade are the reference prices for the other insurance products. The differences between the CRC, IP, and RA products relate to when the futures price is referenced. This can be in the spring, at harvest, or the higher of the two prices.

The Actual Production History (APH) is used to set the guarantees under all FCIC-backed insurance plans except the Group plans, which are based on county level yields. The APH is based on a minimum of four and up to ten years of yield records for each insurance unit. If at least four successive years of records are not available, a transition or "T" yield for each missing year must be substituted. Each county has a different T yield. It is based on the historical county average yield for the past ten years. T yields are discounted when a producer has less than three years of yield records. Once four years or more of production history are available, the APH is the simple average of all of the yearly reported yields. The four years of history will eventually build to ten years. After ten years of history are reached, the APH becomes a moving ten-year average yield.

Current FCIC-backed crop insurance products cover losses associated with the following perils:

- Adverse weather conditions
- Fire
- Insects, but not damage due to insufficient or improper application of pest control measures
- Plant disease, but not damage due to insufficient or improper application of disease control measures
- Wildlife
- Earthquake
- Volcanic eruption
- Failure of the irrigation water supply, if applicable, due to unavoidable cause of loss occurring within the insurance period

Besides covering yield losses, the current insurance products also cover some quality traits. However, the coverage is only on test weight and damage. Loss occurs only if the grain does not meet U.S. No. 4 quality levels. Quality losses are only covered on problems that occurred in the field. Damage or test weight problems associated with drying or storage conditions are not covered.

*Use of crop insurance*

The AEC producer survey asked about the producers' use of crop insurance. A small number of producers has never purchased crop insurance. Hail and multiple peril crop insurance are the most frequently purchased insurance policies purchased by the respondents (Table 8). Crop revenue coverage is the most frequently purchased revenue insurance policy.

**Table 8. Types of Crop Insurance Policies Used by Producer Group**

| | Number of Respondents | | | |
|---|---|---|---|---|
| | | Current | | |
| **Policy Type** | **Non-VEG Producers** | **VEG Producers** | **Past VEG Producers** | **Total** |
| Never purchased crop insurance | 37 | 22 | 12 | 71 |
| Hail | 264 | 232 | 127 | 623 |
| Catastrophic coverage | 145 | 116 | 74 | 335 |
| Multiple peril | 201 | 164 | 89 | 454 |
| Group risk plan | 10 | 12 | 4 | 26 |
| Crop revenue coverage | 128 | 162 | 69 | 359 |
| Income protection | 37 | 48 | 22 | 107 |
| Revenue assurance | 27 | 46 | 22 | 95 |

The producers were also asked about their reasons for purchasing and not purchasing crop insurance. Risk management is the most frequently stated reason for purchasing crop insurance. Lender requirement is the least frequently stated reason for purchasing crop insurance (besides "Other") (Table 9).

**Table 9. Reasons for Purchasing Crop Insurance by Producer Group**

| | Number of Respondents | | | |
|---|---|---|---|---|
| | | Current | | |
| **Reason** | **Non-VEG Producers** | **VEG Producers** | **Past VEG Producers** | **Total** |
| Risk management | 199 | 209 | 88 | 496 |
| Part of overall grain marketing program | 201 | 164 | 89 | 454 |
| Low-cost premiums justify purchase | 67 | 56 | 32 | 155 |
| Requirement of government program | 174 | 132 | 82 | 388 |
| Requirement of lender | 47 | 39 | 21 | 107 |
| Other | 12 | 6 | 7 | 25 |

The survey results indicated that expense is the most frequently indicated reason for not purchasing crop insurance. The second most common reason was that there was not enough variation in their production to justify the expense for crop insurance.
Less than 5% of the respondents have purchased different crop insurance policies for their VEG production. Six percent of past and current VEG producers have had crop insurance as part of their VEG contract.

AEC survey respondents rated four possible provisions for VEG crop insurance for level of importance (Table 10). Price election adjusted to include expected contract premium was rated the most important provision for VEG crop insurance. Adjusting for VEG yield history versus the commodity yield history was rated the least important VEG crop insurance policy provision.

**Table 10. Importance of Provisions for VEG Crop Insurance by Producer Group**

| | Average Importance Rating (Scale: 1=not important, 5=very important) | | | |
|---|---|---|---|---|
| **Provision** | **Non-VEG Producers** | **Current VEG Producers** | **Past VEG Producers** | **Total** |
| Adjustment for VEG yield history vs. the commodity yield history | 3.75 | 3.53 | 3.89 | 3.69 |
| Coverage of grain quality variations | 3.81 | 3.68 | 3.99 | 3.79 |
| Coverage of risk of contamination | 3.84 | 3.65 | 3.91 | 3.78 |
| Price election adjusted to include expected contract premium | 3.90 | 3.78 | 4.05 | 3.88 |

Source: AEC Producer Survey

*Potential Problems with Using Existing Crop Insurance Products for VEG*
There are several potential problems with using existing FCIC-backed crop insurance products to insure VEG. These problems relate to VEG characteristics and mostly stem from prices and yields.

*Differences in Commodity and VEG Value*
First, grain prices used to set guarantee levels and payment rates are based on commodity grain prices. VEG may have a significantly higher value than commodity grain. If a VEG producer that has crop insurance suffers a yield loss, the price used to set the indemnity payment may be lower than the market price for the VEG.

For example, assume a producer raised a value-enhanced corn product that had a $0.30 per bushel premium. He insured the crop with CRC at the 85% coverage level. Both the projected and actual harvest prices were $2.00 per bushel. His APH was 150 bushels per acre, giving him a revenue guarantee of $255 per acre ($150 \times 2.00 \times 85\%$). He had an actual yield of 100 bushels per acre. The actual gross revenue was $200 per acre, giving him an insurance payment of $55 per acre. Table 11 shows the details of this example using the base commodity price and the VEG price. Given that the actual value of the crop was $0.30 per bushel over the commodity price, the actual value of the loss would have been more than $55 per acre. If a premium of $0.30 per bushel over the commodity price had been used to determine the payment, the payment

would have increased to $63.25 per acre. The expected revenue for the producer was $345 per acre using the expected premium and APH. However the covered revenue level was $255 per acre, making the actual coverage level only 74% versus the 85% coverage level used in the insurance policy.

**Table 11. Crop Revenue Coverage Example**

| | Using Base Price | Using VEG Price |
|---|---|---|
| APH, Bushels/Acre | 150 | 150 |
| Price For Guarantee, $/Bushel | 2.00 | 2.30 |
| Coverage Level | 85% | 85% |
| Revenue Guarantee, $/Acre | 255.00 | 293.25 |
| Actual Yield, Bushels/Acre | 100 | 100 |
| Harvest Price, $/Bushel | 2.00 | 2.30 |
| Gross Revenue, $/Acre | 200.00 | 230.00 |
| Insurance Payment, $/Acre | 55.00 | 63.25 |
| Expected Revenue | | 345.00 |
| Covered Revenue | 255.00 | |
| Actual Coverage Level | | 74% |

Source: AEC

By using current crop insurance products to insure VEG, producers may not be getting the coverage levels they need due to the higher value of the crop. For VEG with a significant premium level over commodity grain, the indemnity payment will not cover the actual value of the loss.

*Actual Production History*

The second major problem with using current crop insurance products for VEG is the calculation of the APH. The APH for the farm or insurance unit may have been established based on commodity grain yields versus the VEG type being insured. The VEG may not have the same expected yield as commodity grain. Some VEG products have an expected yield drag of over 10% compared to commodity grain. Other VEG products have almost no yield drag. Insuring these types of grains with standard insurance products without adjusting the APH may result in higher than expected yield losses on the part of the insurance company. Current policies require growers to report which types of grain they are raising so that their APH might be lowered as part of a specially written policy if they are growing a low yielding grain type. However, growers may not report the grain type given the advantage of keeping the higher APH.

The source data for the APH can also be a problem when growers switch to raising commodity grain after raising a type of low yielding VEG. Growers that have been raising a relatively low yielding VEG for several years will have a lower APH than if they had been growing standard commodity grain. This low APH is appropriate if the growers continue to raise the same type of

grain. However, if they switch to raising a higher yielding VEG or commodity grain, the APH established on their farms will result in lower coverage levels than may be appropriate for the types of grain they are raising. For example, a producer may have been raising a VEG that typically yields 10% less than commodity corn for the last ten years, resulting in an APH of 140 bushels per acre. That APH will be used in the following year even if the producer now switches to higher yielding commodity corn. Assuming the 10% yield drag is accurate, the producer's APH would have been 155.6 bushels per acre (140/(100% - 10%)) if commodity yields were used.

*Limited Quality Loss Provisions*

Existing policies only cover severe quality problems that result in corn or soybeans not meeting the grade requirements for U.S. No. 4 at the time of harvest. Quality traits other than grade factors are often critical to the value of VEG. Quality factors such as oil content, purity, stress cracks, and splits are often important in determining the value of VEG. Quality levels are important to VEG producers since they often affect the premium levels received. Quality loss provisions in current insurance products do not cover the types of quality factors that may be economically important to growers.

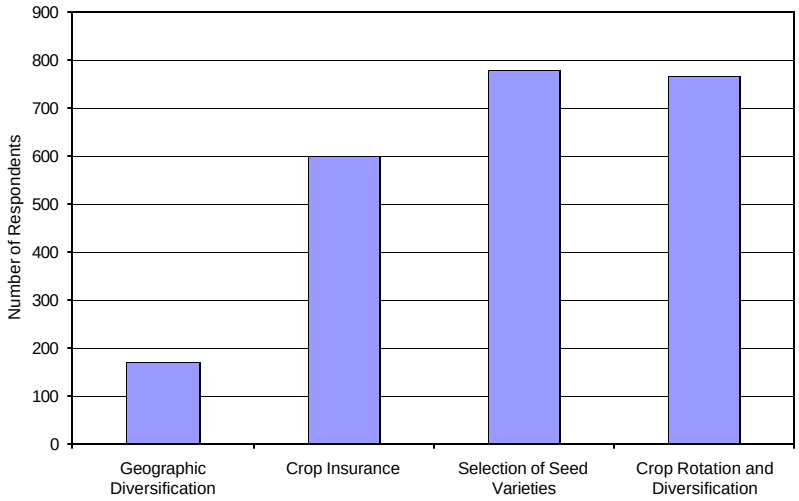
**Other Risk Management Tools**

*Yield Risk*

Even though crop insurance is the main tool for managing yield risk, there are management practices that producers can also use to help manage yield risk. Some of these practices are listed below.

**Variety selection**—Selecting varieties designed for specific growing areas and soil types.
**Variety diversification**—Using multiple varieties to reduce variety risk (within the limits of a contract for VEG).
**Geographic diversification**—Spreading out farming area to reduce local weather risks.
**Fertility**—Maintaining proper fertility levels.
**Pests**—Managing weed and insect levels to optimize yield.
**Equipment capacity**—Having sufficient machinery capacity to accomplish field operations during critical periods.
**Management practices**—Using good management practices for the specific crop type and growing conditions.

The producer survey asked about the methods producers use to manage yield risk (Figure 6). The most frequent method employed by the respondents is the selection of seed varieties, followed closely by crop rotation and diversification. Crop insurance is used by 68% of the survey respondents.




Source: AEC Producer Survey

Figure 6. Methods for Reducing Yield Risk

Yield risks can also be managed with different rental arrangements on rented land. Share rental arrangements help reduce yield risk since the producer and landowner share the yield risk. Most 50/50 share rental arrangements call for the producer and landowner to each receive 50% of the production and pay for 50% of the input costs. Variable cash rental arrangements that adjust the rental payment for yield also help reduce yield risks.

*Quality Risk*

Crop insurance is one tool available to producers that may help to manage quality risks. However, current policies have limited quality coverage, and payments are only made for severe quality problems in the field. Quality deterioration during handling or storage is not covered, and thus there is little opportunity to shift the risk of quality deterioration after harvest.

There are other ways for producers to reduce quality risks. However, none of these practices will eliminate them. Similar to yield risk, producers may be able to reduce quality risk related to varietial differences by planting several varieties to increase diversification. Producers may be able to use written management guidelines designed to reduce the risk of contamination in grains that need to be segregated from harvest through delivery. Management practices such as maintaining proper fertility levels and field selection may reduce some quality trait risks. Other management practices such as the use of low temperature drying techniques and monitoring the quality of the grain in storage may reduce other quality risks. Knowledge and experience that producers gain from raising a certain grain type over time is often critical to their continued long-term success. Producers without this experience may face higher quality risks.

Producers may also be able to manage some of the risks associated with quality measurement and sampling. They may be able to request that grain samples be saved so that they can be retested if problems arise. They may be able to request re-sampling of shipments or bins if testing results are unfavorable.

*Contract Risk*

There are few tools to manage contract risks. Producers need to read and understand contract terms. Knowledge about the contractor and the contract terms will also reduce the risk of "fine print" obligations and "surprises."

There is a mechanism to manage payment risk in Illinois. The Illinois Grain Insurance Fund is designed to protect producers from grain buyer default. Producers who sell grain to licensed grain dealers in Illinois may be covered against payment default depending on how the grain was sold to the dealer. The level of coverage depends on the mechanism used to sell the grain to the dealer and when delivery occurred. Payments are made to commodity grain producers based on the local commodity price on the date of failure. The Illinois Department of Agriculture is currently dealing with how to value VEG that may be involved with a buyer in default.

## CONCLUSION

As VEG production becomes more prevalent, the risks associated with their production need to be identified, and effective means for managing the risks may need to be developed. Risks with unique VEG aspects include base price, price premium, market access, quality, yield, contract, relationship, product liability, and investment. Overall, producers perceive VEG production to be riskier than commodity production, and their experiences with VEG appear to influence their perceptions.

There are existing tools available to help producers manage VEG-specific risk. These tools include forward pricing tools, production contracts, crop insurance, production practices, and legal council. Crop insurance, however, provides challenges when used to insure VEG crops. The problems include differences in commodity and VEG value, VEG yield as it relates to APH, and limited quality loss provisions. Producers rated the risk of losing premium as the most important specific source of risk. They also indicated that the most desirable policy provision for VEG-specific insurance would be a price election adjusted to include expected contract premium. Since crop insurance is an important risk management tool, it could play an influential role in managing risks inherent in VEG production. However, to maximize its effectiveness for VEG production, the problems with using crop insurance for VEG production need to be addressed.

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