PREFERENCES FOR CROP INSURANCE

WHEN FARMERS ARE DIVERSIFIED

by

Steven C. Blank and Jeffrey McDonald

Extension Economist and Research Assistant, respectively, in the Agricultural Economics Department, University of California, Davis.

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Abstract

The government intends to rely on an insurance-based solution to yield risk, therefore, it is important to identify which characteristics most effect a grower's decision regarding whether or not to use crop insurance. This case study uses California cross-sectional survey data to directly compare the relative effects of three types of characteristics which are expected to influence insurance preferences. In general, results from the model estimated indicate that preferences for crop insurance are a function of both the commodities produced and the risk environment faced by individual growers.

Key words: crop insurance, risk management, survey data

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PREFERENCES FOR CROP INSURANCE WHEN FARMERS ARE DIVERSIFIED

In the past, crop insurance has had a relatively low level of utilization in California. Agriculture in California is different than that in other regions of the country, and consequently, so are risk attitudes and strategies. Compared to other regions, yields in California are more predictable and agriculture is more diverse, with over 250 crops grown (Carter and Nuckton). Given a moderate climate, irrigation control of water, and broad options for diversification, most California growers' concern for yield risk has been relatively low. But recently, six years of drought, a major freeze, and farm lenders' new attitudes toward these risks have combined to make yield risk exposure a renewed concern of California growers (Blank and McDonald).

However, it is not clear that the new focus on yield risk will lead to increased use of crop insurance in the state because of the wide opportunities for diversification. Crop insurance deals directly with yield risk, yet diversification can also be useful when facing yield risk because diversifying reduces income risk, of which yield risk is a component (Weimar and Hallam; Blank). When selecting risk management tools, producers do consider outside recommendations (Knight *et al.*), but will usually choose the tool(s) with which they feel the most comfortable (Liapis and Moffitt; Tew, Reid and Rafsnider). For California growers experienced in managing a diversified operation, this may put crop insurance at a disadvantage because using diversification to manage yield risk would not require any strategy changes whereas using insurance would be a new strategy for most. Previous studies (such as Calvin; Goodwin; Goodwin and

Kastens; Hojjati and Bockstael; Vandeveer and Loehman) have found that characteristics of a farm and/or its manager (e.g. age, education) influence grower preferences for crop insurance. Characteristics of the commodity grown (such as being an annual or perennial) also influence crop insurance preferences (Skees; Williams *et al.*). Finally, the risk characteristics of the manager (such as a predisposition to diversify) and/or the commodity can influence insurance preferences (Carriker *et al.*; Robison and Barry; Williams, Harper and Barnaby). Therefore, preferences for crop insurance in California may be influenced by all three types of characteristics: farm/manager, commodity, risk. So the question becomes: are preferences for crop insurance due primarily to the state's unique farming operations, commodities produced, or risk environment (including the wide-spread use of diversification)? Alternatively, the question might be: are there any unique characteristics of California agriculture which may explain the relatively low level of participation in crop insurance?

The answers to these questions have implications for crop insurance programs nationally. With the 1994 reforms in crop insurance and disaster aid programs, the government has signaled its intent to rely on an insurance-based solution to yield risk. Therefore, it is important to identify which characteristics most effect a grower's decision regarding whether or not to use crop insurance. In such an effort, California serves as a useful case study because examples of vitually every type of farming operation and commodity found in the country are represented in the state's diverse agriculture. This enables direct comparisons of the relative effects of all three types of characteristics which are expected to influence insurance preferences.

OBJECTIVE AND PROCEDURES

This paper's objective is to address the questions above. Empirical tests of the effects of variables representing each of the three types of characteristics listed above are conducted using cross-sectional data. From the results are drawn inferences regarding why individuals do or do not use crop insurance.

Data used in this study comes from a broad-based mail survey taken in 1992-93 which was used to elicit information from agricultural producers across California. For the purposes of this study, there are four categories of growers which are of interest:

1) All growers who responded to the survey,
2) Those growers who grew at least one insurable crop and chose to purchase crop insurance,
3) Those growers who grew at least one insurable crop and chose not to purchase crop insurance, and
4) Those growers who did not grow any insurable crops, and therefore cannot purchase crop insurance.

Categories 2-4 are mutually exclusive, as well as collectively exhaustive of the entire survey response data base (which is category 1). The three sub-categories (2-4) were created to enable comparison between the responses for growers who differ in their current preference for crop insurance as a risk management tool. Differences between categories (2) and (3) are of particular interest.

Several of the questions in the survey required cardinal responses (continuous and numerical). For these questions, tests for significant differences are performed for means and variances between the three subsets of growers. In testing for differences in the means, the two tailed Student's t-test is used. The test of difference between variances uses the F distribution. The F test is two tailed with all positive values for both the observed and critical values. Both tests are conducted to identify differences with a significance level of $\alpha = 0.05$.

Both cardinal and ordinal information from the survey is useful in identifying the characteristics which may distinguish between growers who insure and those who choose not to insure. This information is used to derive a regression model which predicts the insurance preference of a particular grower given information regarding the three types of characteristics discussed earlier. Due to the dichotomous nature of the decision whether or not to insure (and thereby the choice variable for the regression model), there are two alternative regression tools: probit and logit analysis. These methods generate the estimated probability of a producer choosing to insure, given the available information. This study uses the probit method of dichotomous dependent variable analysis although, in the case of the model developed here, both methods are expected to perform equally well (Maddala).

SURVEY RESULTS

Survey responses were received from across California. The size of the random sample was 2091. From that total, 569 producers (27%) returned completed questionnaires from which the data were collected. Respondents include people from all regions of the state and, in total, include producers of 76 different commodities.

For all survey questions requiring cardinal responses, summary statistics are reported in Table 1 for each of the three categories of producers: those who are insured, those uninsured by choice, and those who cannot insure because they do not grow a crop covered by existing insurance programs. Table 2 lists sets of results for tests of differences between the means and variances, one set of results for each of the three possible 2-way comparisons between the three categories of producers.

Significant differences are found in the responses to most, but not all, of the questions listed in Tables 1 and 2. Beginning with question 2, the results indicate that insured and uninsured (by choice) grower groups have the same average size farm, but the insured group has a significantly higher variance in total farm acreage. This implies that insured growers are more often small, but some big operators are insured. The average size and variance in acreage for producers who cannot insure are both significantly higher than the two other grower categories primarily due to the inclusion of livestock producers in the sample.

The results for question 40 parts A and B are somewhat contradictory with the results for question 2. Insured and uninsured grower groups have about the same average amounts of assets and debts, but the insured group has a significantly lower variance for both values. This may imply that the biggest operators are uninsured. Expressing the average debt and asset totals as a debt ratio (debt as a percentage of assets) shows that producers who cannot insure have the lightest debt load (a debt ratio of 16.4%) while insured growers carry more debt (28.9%) and uninsured growers carry even more (36.3%). Although some of these differences may be due to production and financing differences across commodities, they are possibly due to risk preferences.

The results concerning various diversification strategies are mixed. Results for question 5 reveal that insured growers receive a significantly smaller percentage of their household income from off-farm sources (36.2%), compared to uninsured growers (52.1%). This implies that income diversification may substitute for insurance. However, the results in Tables 1 and 2 for the variable DEP show that there is no difference between insured and uninsured growers in terms of their degree of production diversification. The DEP variable represents the percentage of total acreage in production of the grower's primary crop. As shown in Table 1, both grower groups have two-thirds of their acreage in one crop on average, thus they depend heavily on that crop for their income. On the other hand, growers who cannot insure have an average of just over half their acreage allocated to their primary product. This significant difference implies that production diversification is more common with growers of crops for which insurance is not available.

The mean responses to question 7 parts A, B and C indicate that rain represents a significantly smaller percentage of water supplies for insured growers than for both the other producer categories. The fact that insured growers have the highest percentage of water coming from surface water sources, compared to the other grower groups, may be an indicator of more risk averse attitudes.

The precautions taken by insured growers regarding their water sources have significantly lowered their output reductions during the recent drought, as evidenced by the results for question 9. By depending less on rain, insured growers had smaller production losses which, in turn, means they had additional funds with which to buy insurance. However, the apparent contradiction that growers suffering the smallest output losses due to drought are those who buy yield loss insurance may simply reflect the risk averse nature of those growers compared to uninsured growers.

The results for questions 27 and 29 show that insured growers hedge a smaller percentage of their output using futures and options than do uninsured growers (although these results may be influenced by the limited list of crops which can be hedged). About twice as much output is hedged by uninsured growers as that hedged by insured growers. This implies that growers may be substituting price insurance for yield insurance depending upon their expectations of payoffs from the two investments, similar to the results reported by Poitras.

From the results above it can be concluded that higher off-farm income reduces demand for insurance, smaller growers insure more often, if price protection is available people may substitute it for yield protection, and more diversification is used in the absence of insurance. The conclusions regarding price protection and diversification raise the question of whether the decision to use crop insurance is influenced by a grower's level of use of another risk tool. This issue is considered by first identifying the extent of joint versus separate use of crop insurance and each of four other risk tools.

The two columns of Table 3 present the portions of respondents falling into the two-variable cross-tabulation divisions expressed as percentages of the entire sample size of 569. For each of the four tools compared with crop insurance, a 2-by-2 block of results is reported. In each block the percent of respondents who used neither tool is in the upper left-hand division (labeled "not used-not used"), the portion of respondents who used both tools is reported in the lower right-hand division (labeled "used-used") while the two remaining divisions report the portions of respondents who used one or the other of the two tools being compared. For example, 39% of respondents used neither crop insurance nor diversification, 11% used both tools, and 14% and 37% of respondents used only insurance or diversification, respectively.

Evaluating the results involves interpreting the relative sizes of the values in the three divisions reporting the use of at least one of the two tools. In general, if the two tools are complementary, the used-used division would have a value relatively high compared to either of the off-diagonal divisions. This condition appears to hold for crop insurance and diversification. Nearly half of insured producers (62 of 139 respondents) also use diversification.

If two risk tools are competitive, or substitutes, there would be few growers using both of them at the same time. The results in Table 3 appear to indicate that forward contracting, government programs, and hedging are competitors with crop insurance. Hedging, in particular, has very little overlap with users of crop insurance (although this may be due to a lack of hedging or insurance opportunities).

These comparisons between tools are understandable given the nature of the tools themselves. Diversification reduces income risk, which is a function of both price and yield risk; the three other tools deal only with price risk. Thus, if a producer's primary concern is for price risk, then forward contracting, hedging, or government program

EMPIRICAL ASSESSMENT OF PREFERENCES FOR CROP INSURANCE

This assessment of preferences for crop insurance briefly evaluates yield risk, then develops a model to test hypotheses concerning who does and does not insure.

Yield Risk in California

The survey results in Table 5 for all growers show that a minority of respondents had suffered a yield loss of sufficient size to receive an insurance indemnity (even at the 75% protection level) in the last three years. However, the results for the separate categories of producers tell a more detailed story. About 58% of insured growers had yield decreases of at least 25% at least once during the previous years, and nearly one-quarter of insured growers had lost over 50% of their crop. About 59% of uninsured growers did not suffer losses sufficient to trigger an indemnity. Together these two results could be interpreted as possible evidence of adverse selection occurring in the California markets. However, the fact that 41% of uninsured growers could have collected on insurance at least once indicates that either those growers are uninformed about crop insurance or that they believe the value of expected indemnities are outweighed by the known costs of insurance.

Dichotomous Choice Model Estimation and Analysis

The general format of the model to estimate the probability of a producer using crop insurance follows the convention

(1) $$\text{Prob. (Hedge)} = \alpha + \beta X + \varepsilon$$

participation will be the tool of choice (if available) because those tools deal with the perceived problem. For growers who face significant yield risk, either crop insurance, diversification, or both can be used to manage that risk. Unfortunately, these results are contaminated by the question of tool availability. Some respondents may have wished to use crop insurance, but could not because programs were not available for their commodity.

To evaluate this issue, Table 4 breaks the data into groups based on availability of insurance. For each of the three categories of growers a column of indexes is presented to give a measure of the relative degree of use for each tool. If a tool's use is distributed proportionately across each grower group, it will have an index of 1.0 for each group in the table. An index above 1.0 indicates that more growers in that group use the tool than "average". Similarly, an index below 1.0 indicates a relatively low level of use for that group.

The results in Table 4 highlight some significant differences between insured and uninsured growers. The indexes for insured growers show a reliance on crop insurance, average levels of use for diversification and government programs, and relatively low levels of use for forward contracting and hedging. For growers uninsured by choice, diversification is used less often and the three price risk tools (forward contracting, hedging and government programs) are each used more often. This implies that these uninsured growers are producing a crop for which price risk is apparently more of a concern than yield risk.

where α denotes the intercept, X is the matrix of independent variables, β is the coefficient vector for the independent variables X, and ε is the random error term.

The set of responses to the survey must be reduced to achieve an accurate model of decision making in crop insurance. The main restriction placed on the sample is that all observations considered must correspond to growers who grew at least one insurable crop. Thus, the sample size for this analysis is reduced by excluding producers who cannot insure.

Based on preliminary evaluation of the survey data and the results of other studies (such as Hojjati and Bockstael, Goodwin and Kastens, Calvin, Goodwin), several variables were chosen to represent a grower's predisposition concerning crop insurance:

- Farm/manager characteristics:
  - Farm or ranch size
  - Revenue bracket
  - Number of acres in insurable crop
  - Age of grower
  - Number of years farming
  - Education level
  - Off-farm income level
- Risk characteristics:
  - Degree of crop diversification
  - Degree of yield loss in recent years
  - Debt/asset ratio

Also, to test whether commodity characteristics are significant, dummy variables for growers of cotton, almonds, grapes, and oranges were added to the model. These crops are representative field, nut, and fruit products and each have significant numbers of growers in the state.

Several probit regressions were performed using different combinations of the above explanatory variables. Two versions of the model proved to perform best given the limited data and are discussed below. The first version of the model did not include the debt ratio variable because many respondents did not provide that data. By excluding the debt ratio the sample size was maximized at 463 observations from growers of an insurable crop. The regression results for that model follow.

$$
\begin{aligned}
(2) \qquad INS = & -1.699 - .000005SIZE + .17286SALES - .000166ACRES \\
& \quad (-4.29)^{**} \quad (-0.20) \qquad (3.73)^{**} \qquad (-1.64)^{*} \\
& - .00376DEP - .0635AGE + .1364OFF + .12687LOSS \\
& \quad (-0.02) \qquad (-1.06) \qquad (0.86) \qquad (2.57)^{**} \\
& + 1.1492ALM - .0147COT + .49015GRP + .4698ORG \\
& \quad (6.36)^{**} \qquad (-0.06) \qquad (2.93)^{**} \qquad (2.23)^{**}
\end{aligned}
$$

The variables are defined as:

INS is a value of 1 for insured growers and 0 for uninsured growers,
SIZE is the total number of acres in the farm,
SALES is the total sales revenue,
ACRES is the number of acres planted to the primary insurable crop;
DEP represents the proportion of a grower's total acreage which is allocated to their primary crop,
AGE is the categorical response from the end of the survey,
OFF is the percent of household income from off-farm sources,
LOSS is the categorical response indicating the size of recent yield losses,
ALM is a value of 1 for almond growers (primary crop) and 0 for all others,
COT is a value of 1 for cotton growers (primary crop) and 0 for all others,
GRP is a value of 1 for grape growers (primary crop) and 0 for all others, and
ORG is a value of 1 for orange growers (primary crop) and 0 for all others.

The values in parentheses are t-ratios and double asterisks indicates that the variable is significant at the 95% level and a single asterisk implies significance at the 90% level. The Cragg-Uhler R^2 for the equation is 0.233 and it predicted correctly 76% of the time, as shown in the prediction success table below. These statistical results are as good or better than those for some previous attempts to develop insurance choice forecasting models, such as Goodwin and Kastens or Calvin.

		Actual: Non-insured	Insured
Predicted:	Non-insured	311	83
	Insured	28	41

Interpreting the results in equation 2 leads to four conclusions, three of which are easily understandable and one which is surprising. The first expected conclusion is that growers with higher levels of SALES revenues are more likely to insure. This may indicate either that these growers are large enough that they can "afford" to use some cash on insurance or that they believe too much is at risk to go uninsured. Thus, the availability of cash flows are important to a grower's insurance decision. High value crops or crops with multiple seasons are, therefore, more likely to be insured.

The second conclusion is that recent yield LOSSes increase a grower's willingness to insure. California's recent drought may have increased growers' awareness of yield risks and, thus, a significant shift in the demand for crop insurance (and other risk tools) is possibly just now being detected in results such as these.

The third conclusion is that significant differences in demand for insurance exist across commodities. Three of the four dummy variables are significant, meaning that commodity characteristics or the insurance program (cost of coverage and probabilities of indemnities) for individual products make growers judge the relevant risk-reward tradeoffs to favor purchasing insurance.

The surprising result from equation 2 is the negative sign on the ACRES variable. This implies that smaller parcels of an insurable crop are more likely to be insured than are large parcels. Combined with the result noted above concerning sales revenues, the implication is that small scale and large scale growers are more likely to insure while "average" growers are uninsured by choice much more often. However, the ACRES variable is significant at only the 90% confidence level, so the result is not strong.

Overall, the first model's performance was mixed in terms of its ability to predict which growers would purchase crop insurance. Although it did well in identifying 311 of 339 growers that are *not* insured, the model only identified about one-third of insured growers accurately. Thus, the model's 76% accuracy rating is misleading.

To improve on the results for the first model presented in equation 2, a second model was developed by adding the financial information about the grower's debts and assets. Using the debt/asset ratio further reduced the sample size to 316 due to the necessity of excluding observations for which the debt and/or asset figure(s) are not reported. The second model's regression results follow.

$$
\begin{aligned}
(3) \qquad INS = & -2.121 - .000009SIZE + .1472SALES - .000256ACRES \\
& \;\; (-3.67)^{**} \quad (-0.34) \qquad (2.47)^{**} \qquad (-1.28) \\
& + .0104DEP + .0317AGE + .2218OFF + .1061LOSS \\
& \;\; (0.04) \qquad (0.35) \qquad (1.15) \qquad (1.82)^{*} \\
& + 1.1489ALM - .2552COT + .4397GRP + .5521ORG \\
& \;\; (5.39)^{**} \qquad (-0.87) \qquad (2.16)^{**} \qquad (2.23)^{**} \\
& + 1.217DEBT - .8546DEBT2 \\
& \;\; (2.08)^{**} \qquad (-2.02)^{**}
\end{aligned}
$$

The variables are defined as above with the addition of:

DEBT is the percentage of assets offset by debt, and
DEBT2 is DEBT squared.

The values in parentheses are t-ratios. The Cragg-Uhler R^2 for the equation is 0.251 and it predicted correctly 76% of the time, as shown in the prediction success table below.

		Actual: Non-insured	Actual: Insured
Predicted:	Non-insured	200	56
	Insured	21	39

The results in equation 3 are similar to those in equation 2, with one exception. The sales revenues variable and the dummy variables for almonds, grapes and oranges are all still significant as is the LOSS variable (although its level of significance is lower in equation 3). The difference in the two models is the addition of DEBT and DEBT2, both of which are significant in equation 3. The debt ratio is a measure of financial risk in a firm, thus it is expected that growers with higher ratios are more likely to insure.

Overall, the second model performed better at predicting which growers would purchase crop insurance. The percentage of correct predictions was the same as for the first model, at 76%, but the second model did better in the sense that more (41%) of insured growers were correctly identified, as shown in the second success table.

Using the second model's results to consider the two questions posed at the beginning of this paper leads to clear answers. For the first question: preferences for crop insurance are not due primarily to the state's unique farming operations, but are a function of both the commodities produced and the risk environment. Of the five variables in the model to represent farm/manager characteristics, only Sales is significant, whereas three of the four commodity dummy variables and two of the three risk characteristic variables are significant. For the second question: the characteristics of California agriculture do not explain the relatively low level of participation in crop insurance in the state, it is a function of the unique characteristics of the situation faced by individual growers and the suitability (or lack thereof) of the crop insurance program available to them. If an insurance program fits a grower's specific needs it will be used, if it does not, growers will not use it no matter where their location.

SUMMARY AND CONCLUDING COMMENTS

To identify preferences for crop insurance within California agriculture, this study evaluates cross-sectional survey data paying attention to differences in characteristics of farms/managers, the commodity produced, and the risk environment. Numerous results can be identified from the analysis reported in this paper. A list of conclusions follows.

* Smaller growers insure more often
* Some big operators are insured
* Higher sales revenues increase the probabilities of a grower insuring
* Growers with relatively low off-farm income levels insure more often
* Higher debt levels increase the probabilities of a grower insuring
* Growers suffering recent yield losses insure more often
* Perennial crops are insured much more often than annual crops

* People may substitute price protection, if available, for yield protection

* More diversification is used in the absence of crop insurance

The last conclusion above implies that use of crop insurance and diversification are related. When one of the tools is unavailable to a grower, the other is used more often. However, the results for the DEP variable show that insured and uninsured growers are diversified to the same extent, on average. So, even though both tools reduce yield risk, it does not appear that they are considered to be substitutes. When both are available, both are considered, but separate decisions are made.

In general, results from the model estimated here indicate that preferences for crop insurance are a function of both the commodities produced and the risk environment faced by individual growers. This implies that if growers from other states were brought to California and asked to make the insurance decision for some California operations, it is expected that no differences in insurance preferences would become apparent between growers from California and elsewhere. The model's results also indicate that the existing generic, Midwest-oriented crop insurance program is inappropriate as a solution to yield risk nationally. Crop insurance policies need to be tailored to local needs; the national "cookie cutter" approach will fail. One size obviously does not fit all. Commodities differ in their level of yield risk and growers face unique risk environments. To offer all producers a truly valuable yield risk tool and raise participation rates, standardization at the national level must be replaced by versatile, local insurance programs.

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Table 1. Responses Across Producer Categories to Selected Questions

	Insured Producers			Uninsured by Choice			Cannot Insure		
Q #	Mean	StD.	N	Mean	StD.	N	Mean	StD.	N
2	1015.9	3568	128	1063.3	2564	357	2946.4	7154	84
5	0.362	0.283	80	0.521	0.329	228	0.423	0.32	52
7A	0.400	0.343	128	0.359	0.394	357	0.253	0.37	84
7B	0.554	0.36	128	0.507	0.403	357	0.553	0.42	84
7C	0.042	0.11	128	0.135	0.279	357	0.182	0.319	84
8	0.461	0.237	85	0.447	0.249	163	0.38	0.249	22
9	0.172	0.128	50	0.223	0.170	171	0.259	0.159	45
17A	0.455	0.317	77	0.387	0.356	147	0.333	0.31	25
17B	0.310	0.302	77	0.258	0.309	147	0.22	0.23	25
24	0.396	0.303	25	0.343	0.254	64	0.325	0.29	14
27	0.104	0.155	14	0.204	0.249	31	0.25	0.185	4
29	0.138	0.180	4	0.230	0.301	14	0.06	0.012	3
40A	2289800	4292600	105	2294600	7198700	264	3519300	8465800	59
40B	662640	1916000	99	833590	6494400	241	576260	1172000	53
DEP	0.667	0.307	128	0.663	0.325	339	0.525	0.347	75

Note: The first column lists the survey question number. The mean response, standard deviation of responses, and total number of responses are listed in successive columns for each of the three categories of producers.

Question 2 asks for total farm acreage. Q# 5 asks for the proportion of total income coming from off-farm sources -- results are for only those who answered >0. Q# 7 parts A, B and C ask for the proportion of water supplies coming from surface irrigation sources, wells, and rain, respectively. Q# 8 indicates the average amount that surface water deliveries have been reduced for respondents who had some reduction. Q# 9 shows the average amount of output reduction due to the drought for those respondents who had suffered a loss. Q# 17 A and B show the share of labor expenditures that are paid to farm labor contractors now and five years ago, respectively. Q# 24 asks for the propotion of output forward contracted for respondents contracting. Q# 27 asks, for hedgers, the propotion of output hedged using futures. Q# 29 asks, for hedgers, the propotion of output hedged using options. Q# 40 A and B ask for asset and debt totals, respectively. DEP represents the proportion of a grower's total acreage which is allocated to their primary crop.

Table 2. Tests of Differences Across Producer Categories for Selected Questions

	Insured-Uninsured				Insured-Cannot insure				Uninsured-Cannot insure			
	Means	Variances			Means	Variances			Means	Variances		
Q#	t	F	F. Crit		t	F	F. Crit		t	F	F. Crit	
2	-0.138	1.935	0.76	1.270	-2.293	0.249	0.650	1.580	-2.377	0.129	0.680	1.540
5	-4.139	0.740	0.68	1.390	-1.119	0.782	0.570	1.800	1.982	1.057	0.640	1.690
7A	1.114	0.758	0.76	1.270	2.912	0.859	0.680	1.540	2.333	1.134	0.680	1.540
7B	1.227	0.798	0.76	1.270	0.018	0.735	0.680	1.540	-0.910	0.921	0.680	1.540
7C	-5.260	0.155	0.76	1.270	-3.874	0.119	0.680	1.540	-1.243	0.765	0.680	1.540
8	0.434	0.906	0.60	1.670	1.373	0.906	0.514	2.220	1.185	1.000	0.548	2.160
9	-2.288	0.567	0.61	1.560	-2.917	0.648	0.556	1.830	-1.332	1.143	0.620	1.720
17A	1.461	0.793	0.63	1.530	1.700	1.046	0.531	2.080	0.787	1.319	0.568	2.010
17B	1.214	0.955	0.63	1.530	1.567	1.724	0.531	2.080	0.723	1.805	0.568	2.010
24	0.775	1.423	0.48	1.880	0.722	1.092	0.410	2.700	0.215	0.767	0.485	2.520
27	-1.640	0.387	0.39	2.310	-1.441	0.702	0.263	8.660	-0.448	1.812	0.308	8.460
29	-0.762	0.358	0.12	3.800	0.864	225.0	0.100	15.400	2.105	629.2	0.241	14.30
40A	-0.008	0.356	0.74	1.300	-1.043	0.257	0.641	1.600	-1.031	0.723	0.704	1.510
40B	-0.371	0.087	0.74	1.300	0.344	2.673	0.641	1.600	0.574	30.706	0.641	1.690
DEP	0.124	0.892	0.76	1.270	2.934	0.783	0.763	1.270	3.152	0.877	0.680	1.540

Note: The first column lists the survey question number. The t-statistic for differences between the mean response for the two grower categories, the F-statistic for differences between the variances for the two grower categories, and the low and high critical values for the F-statistic are listed in the four successive columns for each of the pairs of producer categories being compared.

Table 3. Joint Versus Separate Use of Risk Management Tools

		Crop Insurance Not Used	Crop Insurance Used
		(%)	(%)
Diversification	Not used:	39	14
	Used:	37	11
Forward Contract	Not used:	58	19
	Used:	18	5
Gvt. Program	Not used:	61	19
	Used:	15	5
Hedging	Not used:	71	23
	Used:	5	2

Note: each 2 x 2 group of percentages do not total 100 due to rounding error.

Table 4. Index of Producers' Relative Use of Risk Management Tools

Tool:	Grower Groups (% of sample)								
	Insured Growers (22%)			Uninsured by choice (63%)			Cannot Insure (15%)		
	(No.)	(%)	(Index)	(No.)	(%)	(Index)	(No.)	(%)	(Index)
Crop insurance	117	84.2	3.74	18	13.0	.21	4	2.9	.19
Diversification	58	21.4	.95	152	56.1	.89	61	22.5	1.52
Forward Contract	26	19.6	.87	88	66.2	1.05	19	14.3	.97
Gvt. Program	27	23.7	1.05	79	69.3	1.10	8	7.0	.48
Hedging	7	20.0	.89	25	71.4	1.14	3	8.6	.58
Diverse*	3	33.3	1.48	4	44.4	.71	2	22.2	1.51

* This includes diversifying income sources and diversifying into multiple geographical markets for a product.

Note: The percentages listed indicate the portion of all users of the relevant tool which fall into each producer category, thus the three percentages in each row total 100. The three percentages for crop insurance are not 100, 0, 0, as expected, because some respondents indicated that they had insured within the previous 3 years, but are now uninsured or cannot insure.

The index is calculated by dividing the percentage of tool users which fall into that producer category (which is given in the preceding column) by the percentage of the total sample represented by the producer category (listed next to the category headings).

Table 5. Growers Suffering a Yield Decrease in the Last 3 Years

Yield Decrease	All Growers		Insured Growers		Uninsured by choice		Cannot insure	
	(No.)	(%)	(No.)	(%)	(No.)	(%)	(No.)	(%)
Under 10%	151	28.4	21	16.9	99	30.3	31	38.3
10-25%	146	27.4	31	25.0	93	28.4	22	27.2
25-35%	96	18.0	26	21.0	56	17.1	14	17.3
35-50%	60	11.3	16	12.9	39	11.9	5	6.2
Over 50%	79	14.8	30	24.2	40	12.2	9	11.1
Totals:	532	100.0	124	100.0	327	100.0	81	100.0