Specialty Crop Producers' Crop Insurance Decisions

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Abstract

Virtually all the studies reviewed examined the crop insurance participation decision of midwestern producers of corn, soybeans, or other feed grains. Such program crops also have price or income support programs, which make crop producers less vulnerable to risk. Therefore, the role and implication of crop insurance for program crops may be different from those for non-program crops including specialty crops. Consequently, the results from the studies for program crops may not be applicable to specialty crop cases. The objective of this study is to analyze factors affecting specialty crop producers' uses of crop insurance as a risk management tool.

Key words: Crop insurance participation, specialty crop producers, binary logit estimation

SPECIALTY CROP PRODUCERS' CROP INSURANCE DECISIONS

Crop insurance was first introduced in the United States in the early 1900's. While over the century some private insurance companies have offered coverage, most multi-peril crop insurance (MPCI) was provided by the federal government through the Federal Crop Insurance Corporation (FCIC). Historically, most of the crop insurance programs were for the traditional "program commodities" such as corn, soybeans and feed grains. The goal of the Federal Crop Insurance Act of 1980 was for the MPCI program to replace the increasingly expensive federal disaster payment program as a means for covering crop losses. The intention of the act was to expand coverage to all crops, including specialty crops,[1] where actuarially feasible (Gardner and Kramer). Subsequent legislation, the Federal Crop Insurance Act of 1994 and 1996 Farm Bill, substantially increased the level of government subsidy of the crop insurance program and allowed for expansion of crop insurance to revenue insurance products. The recent passage of the Agricultural Risk Protection Act of 2000 required expansion of crop insurance coverage to specialty crops and encouraged developing new specialty crop insurance programs (Cameron). In 2003, crop insurance is available for 62 specialty crops (including 21 specialty crops insured under pilot programs), an increase of 29% from 48 specialty crops in 1998 (U.S. Department of Agriculture, Risk Management Agency). Many specialty crop growers rely on federal catastrophic (CAT) multiple-peril crop yield insurance, which provides growers a minimum level of coverage – 50% of the farmer's actual production yield history at 55% of the expected market price (Lee et al.; Richards).

[1] Specialty crop means any agricultural crop, except wheat, feed grains, oilseeds, cotton, rice, peanuts, and tobacco (U.S. Department of Agriculture, Risk Management Agency).

Since the passage of Federal Crop Insurance Act of 1980, there has been a significant amount of research published on crop insurance. While some of the research has examined issues such as moral hazard or adverse selection, much of the work has focused on explaining the demand, or lack of demand, for crop insurance. Particularly, factors affecting crop insurance participation have been extensively studied (Gardner and Kramer; Hojjati and Bockstael; Goodwin; Smith and Baquet; Sherrick et al., 2003). It has been found that the cost of insurance, premium subsidy, farm size, education, ownership, farm income, off-farm income, yield, and profit are among the factors that affect crop insurance participation. Knight and Coble provide a survey of a major portion of this literature, particularly with regard to MPCI. Their survey reviews the literature on simulation studies of MPCI participation incentives and econometric assessments of both county and farm level participation decisions. Their conclusions from the results of the econometric studies is that crop producers that expect higher returns are more likely to insure; participation increases with farm size, but participation decreases for more diversified producers.

Coble et al. examine demand for crop insurance of Kansas wheat farmers suggesting inclusion of both expected returns to insurance and market returns as well as an index measure of crop specialization and diversification. Sherrick et al. (2004) utilize a survey of corn and soybean farmers in Illinois, Iowa, and Indiana to analyze farmers' choices among crop insurance alternatives. As one of the factors affecting farmers' decisions, they consider a composite risk management importance score that is created by averages of farmer's ratings on use of alternative risk management options such as government program, multiple crops, hedging/option, and so on. Users of insurance are characterized by having a greater composite risk management importance score.

Virtually all the studies reviewed examined the participation decision of midwestern producers of corn, soybeans, or other feed grains. Such program crops also have price or income support programs, which make crop producers less vulnerable to risk. Therefore, the role and implication of crop insurance for program crops may be different from those for non-program crops including specialty crops. Consequently, the results from the studies for program crops may not be applicable to specialty crop cases.

The objectives of this study are to analyze specialty crop producers' crop insurance decisions and whether the characteristics of specialty crop insurance participation are similar to those for program crops, and to provide implications for developing specialty crop insurance. A survey of specialty crop producers in California, Florida, New York, and Pennsylvania provides the data for the analysis. First, the results from the survey are summarized. Second, theoretical framework for the analysis of crop insurance participation is described. Third, empirical estimation procedures are explained and the results are interpreted. Finally, this paper concludes with summary and policy implications.

Survey Results

This study utilizes a survey of specialty crop producers in California, Florida, New York, and Pennsylvania. The survey was conducted by the USDA Risk Management Agency and NASS in cooperation with the land grant institutions for the four states to examine the unique needs of specialty crop producers for managing their risk and to develop new risk management tools and instruments, particularly crop insurance. The survey questions included information on farm size and county location; years in farming; specialty crops grown; marketing channels; yield, price, and profit fluctuation; preferences for and availability of specific risk management tools; crop insurance use; and financial characteristics. A total of 18,756 usable surveys were returned with a response rate of 29% (Table 1).

The greatest number of responses was from California (55%) followed by Florida (18%), New York (15%), and Pennsylvania (12%). A total of 137 different specialty crops were represented in the survey. The survey asked to specialty crop producers to indicate their primary specialty crop. The major specialty crops included nurseries (9.9%), wine grapes (9.2%), all oranges (7.8%), almonds (7.6%), walnut (6.2%), Christmas trees (5.1%), and raisin grapes (5.0%). Thus, these seven specialty crops represented over 50% of the survey responses. Out of 137 specialty crops, 35 crops made up 90% of the survey responses and 49 crops made up 95%. At the other extreme, there were 16 specialty crops that were represented by a single producer. The primary specialty crops were consolidated into seven categories as shown in Table 2: vegetables, ornamental, citrus, berries and melons, nuts, non-citrus fruit, and miscellaneous crops.[2]

About 60% of the survey responses indicated that they did not purchase crop insurance during the last five years. As Figure 1 shows, only in California, did the number of crop insurance buyers exceed the number of non-buyers. The percentage of citrus, nut, non-citrus fruit growers purchasing crop insurance were above the average (Figure 2). A high of 80% of the ornamental producers reported that they did not purchase crop insurance over the last five years. Table 3 provides the survey respondent

[2] The miscellaneous group includes; maple syrup, bee & honey total colonies, aquaculture, herbs, honey producing colonies, mint, watercress, peppermint, wild rice, safflower, canola, quail, taro, and other livestock including exotic.

characteristics categorized by crop insurance buyers versus non-buyers for all four states. The averages of farm size and farming year of crop insurance buyers exceed those of non-buyers. The overall average debt to asset ratio of crop insurance buyers exceeds that of non-buyers, however, in California and Pennsylvania non-buyers are more leveraged. The average off-farm income share of crop insurance buyers is less than that of non-buyers. About 63% of the crop insurance buyers reported that they produce their specialty crops exclusively for processing use, while 60% of the non-buyers reported that 100% of their crop product was for fresh use. However, this pattern depends on the characteristics of industry that each state consists. Above a half of crop insurance buyers received government disaster payments or loans, while only 15% of non-buyers reported receiving such payments.

Demand for Crop Insurance

Past studies analyzed farmers' participation in insurance programs or demand for insurance by utilizing the expected utility maximization framework (Calvin; Goodwin; Sherrick et al., 2004; Smith and Baquet). According to the theory, since under risk, profit is stochastic, responses to risk (e.g., purchasing crop insurance) can be affected by the mean and variance of expected profit. Using the certainty equivalent concept, a farmer's maximization problem is expressed as

(1) $$Max \quad \pi_{CE} = E(\pi) - \frac{\lambda}{2}\sigma^2$$

where π_{CE} is the certainty equivalent of profit, π, with the expected profit, $E(\pi)$ and variance σ^2. $\lambda/2$ is Pratt's measure of risk aversion.[3] Further, by equating the certainty equivalent with insurance to that without insurance, one can solve for the insurance premium that a farmer would be willing to pay.

The model in (1) indicates that factors that affect profit and risk attitude may also affect crop insurance decisions. Among the factors included in this study affecting profits and a farmer's risk attitude ($\lambda/2$) are years in farming, previous yield, price, and profit fluctuations, importance of and use of risk management tolls, farm size, and familiarity with crop insurance. These are further developed in the following discussion.

Years in Farming

It is generally accepted that farmers, like most everyone, differ in their attitudes toward risk. These attitudes are influenced by certain personal factors such as age, education, and previous farming experience. Lacking specific age and education information, years in farming are used in this study as a composite measure of these personal factors. An argument could be made that as one's farming experience increases, he might tend to become more risk averse (tend to purchase insurance), while on the other hand as wealth position improves from additional years in farming, he might tend to come less risk averse.

Price, Yield, and Profit Fluctuation

It would be expected that as risk increases, farmers have more incentive to use crop insurance. The producers surveyed were asked to indicate for their primary specialty

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[3] Assume that the utility function is characterized by constant risk aversion and profit function is normally distributed with mean $E(\pi)$ and variance σ^2.

crop over the last five years the largest fluctuation from their five-year average for yield per acre, price, and profit (after deducting production and marketing expense from revenue). A scale from one to five was used, e.g., one if the fluctuation was less than 10%, two if the fluctuation was between 10 to 24%, and so on up to five for 75 to 100%.

The survey also asked farmers to indicate what was the main cause of low profit over the last five years, was it poor yield, poor quality, high input costs, low market price, or inability to sell crop due to quarantine. Under the premise that poor yield is the major cause of low profits in producing specialty crops, specialty crop producers who experienced low profit due to poor yield may have more tendency to insure than those who had low profit because of other reasons.

Risk Management Tools

Crop insurance decisions can be affected by other strategies to manage risk. Utilizing the survey, this study analyzes the insurance participation of specialty crop producers characterized by the use of crop diversification, non-farm income, different marketing channels, and government disaster assistance programs. A farmer is considered diversified if he grows more than one specialty crop and not diversified if he produces a single crop. Off-farm income shares are expressed as the proportion of income from non-farm work to total income. Specialty crop producers who diversify into multiple crops or other sources of income may have less need to insure. Over the last decade, government disaster payments have served as both a supplement and complement to crop insurance for specialty crop producers. Likewise, recipients of disaster payments in the past may not insure since they think they will be protected by government assistance.

Some specialty crop producers grow their crops for processing, while others produce for fresh use. It would be likely that for many producers who sell processed, there is an increased likelihood for these producers to use production and/or marketing contracts to reduce risk, while fresh market producers that sell in farmers markets, roadside stands or U-pick would tend to have fewer opportunities to reduce price or market risk.

Farm Size

As farm size increases, it would be expected that the probability of purchasing crop insurance would increase as well. Also, as farm size increase, one might expect management expertise to increase and consequently result in the use of more sophisticated risk management tools. For this study, both operation acres and total gross sales serve as measure of the size of farm.

Familiarity with Crop Insurance

Finally, indicators regarding perceptions of specialty crop producers to the importance of risk management and familiarity of crop insurance are included in the model. Specialty crop producers who think risk management is importance and are familiar with crop insurance may be more likely to insure. Table 5 provides the definitions of the dependent variable (crop insurance purchase) and the independent variables used in this study. The dependent variable is qualitative, representing one for crop insurance user and zero for non-user.

Empirical Estimation and Results

As the crop insurance participation decision is examined as a dichotomous choice, a binomial logit model is used to estimate factors affecting specialty crop producers' purchasing crop insurance. The likelihood function is

(2) $$L = \prod_{\mathbf{y}=0} F(-\boldsymbol{\beta}'\mathbf{x}) \prod_{\mathbf{y}=1} \left[1 - F(-\boldsymbol{\beta}'\mathbf{x})\right]$$

Assuming that the cumulative distribution of disturbance is logistic (Maddala), the functional form is as follows:

(3) $$F(-\boldsymbol{\beta}'\mathbf{x}) = \frac{1}{1+\exp(\boldsymbol{\beta}'\mathbf{x})}; \qquad 1 - F(-\boldsymbol{\beta}'\mathbf{x}) = \frac{\exp(\boldsymbol{\beta}'\mathbf{x})}{1+\exp(\boldsymbol{\beta}'\mathbf{x})}$$

$F(-\boldsymbol{\beta}'\mathbf{x})$ is the probability that a farmer does not participate in insurance programs ($\mathbf{y} = 0$), while $1 - F(-\boldsymbol{\beta}'\mathbf{x})$ is the probability when he participates ($\mathbf{y} = 1$). $\mathbf{x}$ is the set of independent variables that affect the insurance decision. $\boldsymbol{\beta}$ is the vector of the coefficients that are estimated using the maximum likelihood procedures.

The logit models were estimated with the entire data and also separately with each state. First of all, the goodness-of-fit of our models were considered. A goodness-of-fit is a measure of indicating the accuracy of the model, which can be evaluated in terms of the fit between the calculated probabilities and observed response frequencies in the case of having qualitative dependent variables (Maddala). Along with the likelihood ratio statistics, McFadden's or $\text{pseudo} - R^2$ was computed as follows:

(4) $$\text{McFadden's } R^2 = 1 - \frac{\log L_{UR}}{\log L_R}$$

where L_{UR} is the value of the likelihood function when maximized with respect to all parameters ($\boldsymbol{\beta}$); and L_R is the likelihood value when maximized with respect to the constant only (setting all the other parameters equal to zero). Both McFadden's R^2 and the likelihood ratio statistics are reported in Table 6, indicating the logit models estimated in our study provide a good fit to the data, as the calculated likelihood ratio statistics are greater than the critical value at the corresponding degrees of freedom.

Table 6 presents parameter estimates and t-ratios of the logit models. Also reported are marginal effects of a change in each explanatory variable on the probability of crop insurance participation computed at the sample means. Since the parameters of a logit model are not the marginal effects, the following equation was used for calculating the marginal effect of a change in a continuous variable (Greene):[4]

$$(5) \qquad \frac{\partial E[y|\mathbf{x}]}{\partial \mathbf{x}} = f(\boldsymbol{\beta}'\mathbf{x})[1 - f(\boldsymbol{\beta}'\mathbf{x})]\boldsymbol{\beta}$$

where $f(\cdot)$ is the logistic density function.

For the entire sample, all variables except years in farming and yield fluctuation are statistically significant at the 5% level. Seven variables are statistically significant at the 1% level. Unlike the yield fluctuation variable, the parameter estimate on profit fluctuation is positive and statistically significant at the 1% level.

The parameter estimate on off-farm income share is negative and statistically significant, indicating that specialty crop producers having other income sources are less likely to insure. However, the coefficient of the variable indicating crop diversification into multiple commodities is positive and statistically significant. Richards finds the same result for California grape growers, suggesting that growers with multiple commodities may be signaling themselves as more risk-averse than those growing a single crop, and

[4] The marginal effect of a discrete explanatory variable are computed by taking the difference in the two probabilities when the discrete variable was set to one and to zero respectively. However, in this study, the approximation using Equation (5) are reported (Green).

therefore more likely to buy insurance. Specialty crop producers who received government disaster payments in the past are more likely to insure. This result suggests that government assistance is complement for crop insurance and does not discourage participation in crop insurance programs (Gardner and Kramer).

A grower who produces his specialty crop exclusively for processing use is more likely to participate than a grower producing for 100% fresh use. The result is not what we expected. That is, we hypothesized that fresh market producers with fewer opportunities to reduce risk are more like to insure. This is because only in California where the number of specialty crop growers producing their crops for processing is much greater than the number of fresh market producers, crop insurance participation rate was over 50%. Therefore, it can be said that the unexpected result came from a regional characteristics rather than industry specifics. Later, estimation results of individual crops are reported.

The parameter estimate on the reason for low profit is negative and statistically significant, indicating that poor yield is not a major motivation to buy insurance, and further, market risk such as high input price or low output price is the main concern for specialty crop producers. This is consistent with the result obtained above, which is insignificant parameter estimate on yield fluctuation, but positive and significant parameter estimate for profit fluctuation.

Parameter estimates for the indicators regarding perceptions of specialty crop producers to importance of risk management and familiarity of crop insurance are positive and strongly significant. This obvious result suggests that extensive education on risk management and vigorous advertisement for crop insurance programs will eventually create more attention from specialty crop producers.

There is no evidence in this study that operation acres and sales have any effect on crop insurance decisions. Parameter estimates for the variables are statistically significant at the 5% level. This result is different from most other studies' findings that the larger size midwestern farmers are more likely to participate.

The regional and crop-categorical dummy variables were included in the logit model. The regional dummy variables for California and Florida are positive and statistically significant at the 1% level implying that Specialty crop producers in California and Florida are more likely to insure than are producers in New York and Pennsylvania. The dummy variables for citrus, nuts, and non-citrus fruits are positive and statistically significant at the 1% level. Vegetable and ornamental growers are less likely to participate than fruit and nut producers.

Concluding Remarks

This study analyzed specialty crop producers' crop insurance decisions using econometric estimation. This type of research is not new but virtually all the studies were conducted for non-specialty or traditional field crops that have price or income support programs. From this point of view, this research provided helpful information to those who are interested particularly in the characteristics of specialty crop producers' risk management practices – crop insurance decisions. Participation profiles of specialty crop producers were similar to those of non-specialty crop producers, but not always. For example, operation acreage and years in farming were not relevant factors on crop insurance decisions.

With no price or income support, specialty crop producers are more vulnerable to risk. The findings from this study indicate that specialty crop producers are concerned about price or market risk rather than production risk. In this case, revenue insurance may be more attractive to those producers. Also this study found that risk management education was effective and suggests that for the purpose of expanding insurance to more producers, it is important to let specialty crop producers know about it and consider crop insurance as a reliable risk management tool. Next step will be making more programs available to them. This leads us to address future work.

The survey used in this study provided tremendous information on specialty crop producers' crop insurance use, other risk management practices, and regional and limited financial profiles. However, unfortunately, the survey did not provide such data on price of insurance, i.e., premium and actual yield history of crop insurance users. Each specialty crops are not homogenous and different from conventional field crops in that they are often high-valued and perishable. To develop an effective program for each crop or a group of similar crops, construction of insurance price information and quantity demanded based on the existing programs is necessary and finally, analysis of crop insurance demand should be conducted.

Table 1. Number of survey responses by state.

	Number of Usable responses	Percent
California	10,285	54.8%
Florida	3,394	18.1%
New York	2,789	14.9%
Pennsylvania	2,279	12.2%
All producers	**18,756**	**100%**

Table 2. Primary specialty crop groups.

	Number of Responses	Percent
Vegetables	1,873	10.0%
Ornamental	4,028	21.5%
Citrus	2,438	13.0%
Berries and melons	516	2.8%
Nuts	2,871	15.3%
Non-citrus fruit	6,265	33.4%
Misc.	763	4.1%
All producers	**18,754**	**100%**

Table 3. Respondent Characteristics of Crop Insurance Buyers and Non-Buyers by State.

	All		California		Florida		New York		Pennsylvania	
	Buyer	Non-buyer	Buyer	Non-buyer	Buyer	Non-buyer	Buyer	Non-buyer	Buyer	Non-buyer
Average farm size	336.83	99.65	299.62	100.42	522.50	106.65	335.54	96.37	260.74	92.88
Average farming year	26.46	23.53	26.65	23.48	22.30	22.26	29.67	24.41	30.69	24.12
Average off-farm income share	51.58	66.47	56.55	69.23	44.32	67.29	37.44	59.59	46.69	67.19
Average debt-to-asset ratio	0.40	0.30	0.49	0.50	0.24	0.19	0.26	0.15	0.34	0.36
Percentage										
100% processing use	63%	40%	75%	60%	29%	30%	56%	29%	22%	7%
100% fresh use	37%	60%	25%	40%	71%	70%	44%	71%	78%	93%
Grower only	86%	92%	89%	88%	81%	90%	89%	99%	83%	92%
Grower-shipper	14%	8%	11%	12%	19%	10%	11%	1%	17%	8%
Multiple crop growers	39%	28%	39%	22%	21%	20%	53%	40%	66%	40%
Receive disaster payments	53%	15%	51%	12%	46%	24%	73%	18%	73%	13%

Table 4. Respondent Characteristics of Crop Insurance Buyers and Non-Buyers by Crop Group.

	Vegetable		Ornamental		Citrus		Berries and Melons		Nut		Non-citrus Fruit	
	Buyer	Non-Buyer	Buyer	Non-Buyer	Buyer	Non-Buyer	Buyer	Non-Buyer	Buyer	Non-Buyer	Buyer	Non-Buyer
Average farm size	990.92	182.16	100.27	117.40	576.96	78.69	415.69	98.62	297.65	80.89	196.74	60.32
Average farming year	30.56	25.01	21.30	21.81	27.90	26.44	25.59	21.75	26.54	24.14	26.58	23.64
Average												
Off-farm income share	36.47	54.16	30.05	60.49	61.63	77.52	51.12	61.51	56.64	74.58	53.75	69.23
Average debt-to-asset ratio	0.37	0.29	0.42	0.27	0.29	0.17	0.42	0.42	0.46	0.36	0.42	0.42
Percentage												
100% processing use	31%	6%	1%	0%	48%	64%	0%	3%	98%	90%	77%	68%
100% fresh use	69%	94%	99%	100%	52%	36%	100%	97%	2%	10%	23%	32%
Grower only	83%	93%	75%	90%	95%	96%	80%	96%	90%	98%	88%	94%
Grower-shipper	17%	7%	25%	10%	5%	4%	20%	4%	10%	2%	12%	6%
Multiple crop growers	79%	70%	15%	18%	42%	28%	69%	47%	37%	18%	37%	25%
Receive disaster payments	78%	19%	39%	11%	59%	24%	67%	18%	53%	9%	50%	17%

Table 5. Definitions for Dependent and Independent Variables Used in Crop Insurance Decision Analysis.

Variables	Description
<u>Dependent</u>	
Participation	Crop insurance users (1)/ non-users (0) during 1997-2001.
<u>Independent</u>	
Operation acres	Acreage in the farming operation in 2001.
Years in farming	Number of years in farming.
Yield fluctuation	Farmer's assessment on the largest yield fluctuation from the 1997-2001 averages. Scale: 1 to 5* * Less than 10% (1), 10~24% (2), 25~49% (3), 50~74% (4), 75~100% (5)
Profit fluctuation	Farmer's assessment on the largest profit fluctuation from the five-year average. Scale: 1 to 5* * Less than 10% (1), 10~24% (2), 25~49% (3), 50~74% (4), 75~100% (5)
Off-farm income share	Percentage of the household's total income from non-farm activities in 2001.
Sales	Total gross sales of all agricultural commodities in 2001.
Crop diversification	More than one major crops grown (1)/ only one major crop grown (0).
Marketing channels	Farmers were asked how their primary specialty crops are used for 100% processing use (1)/ 100% fresh use (0).
Reason for low profit	Producers were asked what the main cause of the lowest profit over 1997-2001. Poor yield (1)/ other reasons (0)* * Other reasons include poor quality, high input costs, low market price, and quarantine.
Receive government payment	Received government payments or loans: Yes (1)/ no (0).
Importance of risk management	Producers were asked if risk management became more important in 1997-2001
Familiarity of crop insurance	Producers were asked if becoming more familiar with crop insurance.

Note: Several studies included debt and asset or debt-to-asset ratio in their crop insurance demand analysis as an indicator of financial risk that producers have. The survey used in this study asked producers the value of debt and asset, but the response rate was very low, and therefore, this study did not use those variables.

Table 6. Logit Estimation Results for the Entire Specialty Crops.

	ALL		CA		FL		NY		PA	
	Parameter Estimates [a]	Marginal Effects [b]	Parameter Estimates	Marginal Effects	Parameter Estimates	Marginal Effects	Parameter Estimates	Marginal Effects	Parameter Estimates	Marginal Effects
Constant	-3.705**	-0.835	-2.2618**	-0.5636	-1.9429**	-0.4284	-3.9477**	-0.5367	-5.1367**	-0.3423
	(-12.40)		(-11.0770)		(-8.5000)		(-8.5003)		(-9.2400)	
Operation acres	0.215*	0.048	0.0005*	0.0001	-0.0001	0.0000	0.0001	0.0000	0.0002	0.0000
	(2.33)		(2.5670)		(-0.3350)		(0.4429)		(0.6610)	
Year in farming	0.003	0.001	-0.0001	0.0000	0.0033	0.0007	0.0007	0.0001	0.0224*	0.0015
	(1.08)		(-0.0310)		(0.6280)		(0.0962)		(2.5320)	
Yield fluctuation	-0.015	-0.003	-0.0953*	-0.0237	0.1006	0.0222	0.0632	0.0086	0.1685	0.0112
	(-0.48)		(-2.2990)		(1.5800)		(0.6096)		(1.2670)	
Profit fluctuation	0.104**	0.023	0.2069**	0.0516	-0.0405	-0.0089	-0.0046	-0.0006	0.0705	0.0047
	(3.62)		(5.6150)		(-0.7060)		(-0.0455)		(0.5340)	
Off-farm income share	-0.011**	-0.003	-0.0074**	-0.0018	-0.0097**	-0.0021	-0.0071*	-0.0010	-0.0109**	-0.0007
	(-10.83)		(-4.8370)		(-5.4170)		(-2.2007)		(-2.7940)	
Sales	0.070*	0.016	0.0000	0.0000	0.0000**	0.0000	0.0000	0.0000	0.0000	0.0000
	(2.46)		(0.4680)		(4.5130)		(0.6926)		(0.0720)	
Crop diversification	0.215*	0.049	0.4186**	0.1032	-0.2112	-0.0455	0.3612	0.0496	0.3043	0.0205
	(2.55)		(3.6750)		(-1.2030)		(1.5242)		(1.0710)	
Marketing channels:										
Processing or fresh	0.507**	0.115	0.8420**	0.2074	0.4384**	0.0995	0.9925**	0.1464	1.5152**	0.1672
	(5.22)		(7.9110)		(2.7180)		(4.1004)		(3.9820)	
Reason for low profit:										
Poor yield	-0.189*	-0.042	-0.1130	-0.0282	-0.3138	-0.0671	0.0032	0.0004	-0.0483	-0.0032
	(-2.47)		(-1.1200)		(-1.8840)		(0.0141)		(-0.1780)	
Receive										
Government payment	1.574**	0.366	1.6857**	0.3816	1.0059**	0.2315	1.8401**	0.3041	2.4770**	0.2926
	(20.61)		(14.7270)		(7.2660)		(8.2908)		(9.2950)	
Importance of										
Risk management	0.573**	0.128	0.6241**	0.1545	0.4390**	0.0965	0.5582*	0.0751	0.8757**	0.0588
	(7.91)		(6.3530)		(3.0810)		(2.4321)		(3.0820)	

Familiarity of Crop insurance	1.829**	0.393	1.6126**	0.3826	2.0190**	0.4343	2.2071**	0.3253	1.9224**	0.1535
	(25.08)		(16.4840)		(14.2360)		(9.1156)		(6.3340)	
Dummy:										
California	1.120**	0.249								
	(7.88)									
Florida	1.115**	0.263								
	(7.55)									
New York	0.081	0.018								
	(0.53)									
Vegetables	0.403	0.095								
	(1.54)									
Ornamentals	0.320	0.074								
	(1.26)									
Citrus	0.692**	0.165								
	(2.64)									
Berries and melons	-0.031	-0.007								
	(-0.09)									
Nuts	0.682**	0.162								
	(2.59)									
Non-citrus fruits	1.061**	0.247								
	(4.27)									
Number of OBS	6234		2989		1602		815		828	
Log of L_{UR} [c]	-2734.32		-1437.46		-743.11		-289.64		-214.64	
Log of L_R	-4202.51		-2071.15		-1057.37		-483.07		-407.88	
Chi-squared	2936.39		1267.38		628.52		386.86		386.47	
Significance	0		0		0		0		0	
McFadden's R^2	0.3494		0.3060		0.2972		0.4004		0.4738	

[a] Asymptotic t-ratios in parenthesis. ** indicates significance at the 1% level and * indicates significance at the 5% level.

[b] Marginal effects are calculated at the sample means.

[c] L_{UR} is the value of the likelihood function when maximized with respect to all parameters; and L_R is the likelihood value computed with only a constant term.

Figure 1. Purchasing crop insurance by state.

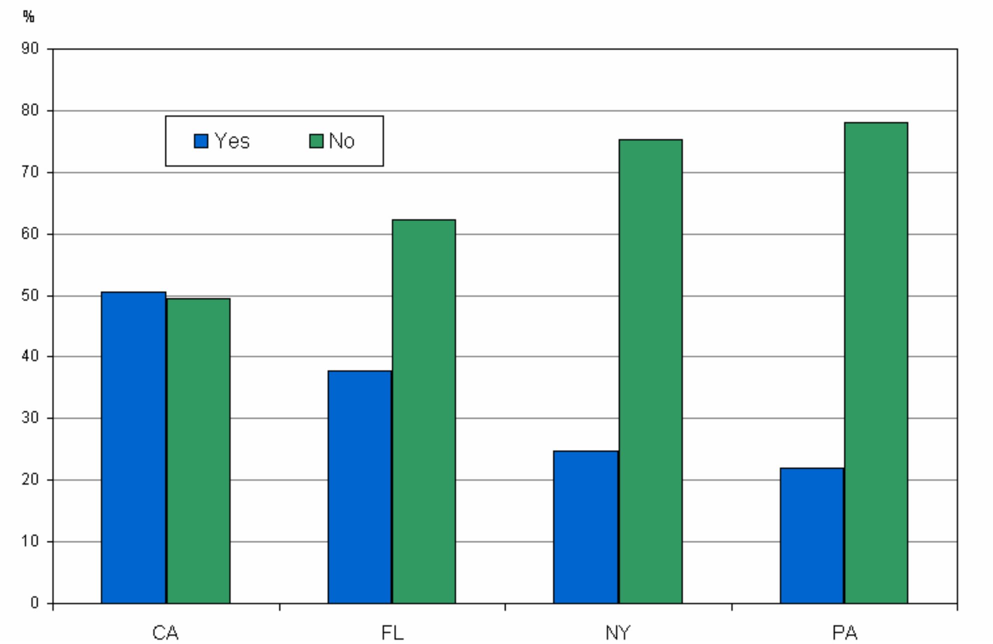
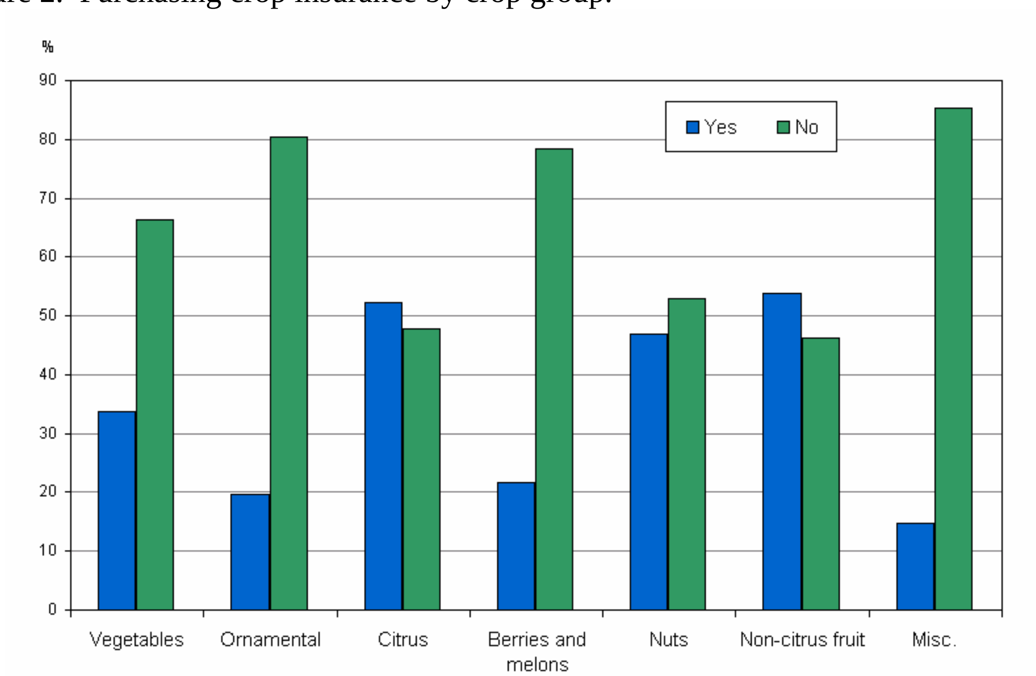


Figure 2. Purchasing crop insurance by crop group.



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