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AN ANALYSIS OF LENDERS' INFLUENCE ON AGRICULTURAL PRODUCERS' RISK MANAGEMENT DECISIONS

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Abstract

Agricultural lenders have a stake in and are in a position to influence their borrowers' management decisions. Risk management practice adoption is an area in which lenders might want to exercise this influence. This study employs logistic statistical models to estimate lenders' influence on crop producers' decisions regarding use of three alternative risk management practices: federal multiple-peril crop insurance, crop hail and fire insurance, and forward contracting. Results suggest lenders can exert significant influence on these decisions but that poor communication between lenders and borrowers likely reduces this influence.

Key words: risk management, crop insurance, forward contracting.

Credit financing for both capital purchases and annual operating expenditures is essential to the operation of most U.S. farms. As a result, agricultural lenders are in a position to have a stake in and to influence agricultural producers' management decisions. This influence can be exercised directly through interest rates, credit restrictions, or other direct credit responses, or indirectly through verbal recommendations or suggestions made in the course of credit counseling.

One area in which agricultural lenders might wish to influence their agricultural producer-borrowers' decisions is risk management. Crop producers, for example, have a wide range of risk management practices available to them. Among these are federal multiple-peril crop in-

surance (MPCI), crop hail and fire insurance, forward contracting, hedging, commodity options, farm program participation, and enterprise diversification. Lenders' and producers' attitudes toward use of each of these practices must depend on their perceptions regarding (a) the importance of the source of risk the practice is used to manage, and (b) the effectiveness of the practice in mitigating the associated risk.

Previous studies have investigated agricultural producers' perspectives on the importance of different sources of risk as well as the management practices they adopt to reduce those risks (Boggess et al.; Patrick). Other studies have examined lenders' credit responses to producers' use of forward contracting (Barry and Willmann), hedging (Harris and Baker), and MPCI (Pflueger and Barry). However, none of these studies provides a direct comparison of producers' and lenders' perceptions regarding the importance of different sources of risk or the effectiveness of risk management practices. More importantly, these studies do not directly investigate the influence of lenders' credit policies and recommendations on producers' risk management decisions.¹ This study examines these issues which may have important implications for crop producers, their lenders, and for agricultural policy.

The remainder of this paper is organized as follows. First, the survey procedure used to obtain information from agricultural producers and primary non-real estate agricultural lenders in three crop-producing regions of Texas is described. This is followed by profiles of the responding agricultural producers and lenders.

¹Barry and Willmann evaluated the effect of credit rationing on optimal producer forward contracting decisions using a normative decision model, but provided no evidence of actual behavioral responses.

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TABLE 1. NUMBER OF SURVEYS MAILED, RETURNED, AND CONSIDERED USEFUL, BY REGION

Agricultural Producers				
Region	Number of Surveys			Percent of Surveys Returned and Considered Useful
	Mailed	Returned	Useful ^a	
High Plains	1334	552	426	32
Blacklands	678	307	144	21
Coastal Bend	491	233	216	44
Total	2503	1092	786	31

Agricultural Lenders				
Region and Type of Institution	Number of Surveys			Percent of Surveys Returned and Considered Useful
	Mailed	Returned	Useful	
High Plains:				
Comm. Bank ^b	110	49	47	43
PCA ^c	22	14	11	50
FmHA ^d	27	25	22	81
Blacklands:				
Comm. Bank	46	14	14	30
PCA	9	7	6	67
FmHA	11	8	8	73
Coastal Bend:				
Comm. Bank	58	21	21	36
PCA	7	4	4	57
FmHA	10	6	6	60
Total	300	148	139	48

^a A number of reasons accounted for some returned surveys not being considered useful. The largest number were excluded because the respondent indicated that he/she was no longer actively involved in a farming operation.

^b Commercial banks.

^c Production Credit Association.

^d Farmers' Home Administration.

Next, producers' and lenders' responses regarding (a) the importance of sources of risk, (b) the effectiveness of alternative risk management practices, and (c) the effect of risk management practice adoption on lenders' views of loan requests are summarized. Results of logistic statistical models are presented relating producer use of three risk management practices—MPCI, crop hail and fire insurance, and forward contracting—to lenders' credit policies and producers' perceptions of lenders' attitudes, as well as producer and farm firm attributes. Finally, the study results are summarized and implications for agricultural producers, lenders, and agricultural policy are suggested.

SURVEY REGIONS AND PROCEDURE

The survey regions selected for this study are (a) the Texas High Plains—composed of 45

counties, (b) the Texas Blacklands—composed of 12 counties, and (c) the Texas Coastal Bend—composed of 20 counties (Figure 1). Crop production in all three study regions is diverse. Primary crops in the High Plains are: wheat—3.9 million acres, cotton—1.9 million acres, grain sorghum—0.8 million acres, and corn—0.4 million acres. Primary crops produced in the Blacklands are: wheat—348 thousand acres, grain sorghum—307 thousand acres, corn—182 thousand acres, and cotton—155 thousand acres. Coastal Bend crops include: grain sorghum—562 thousand acres, corn—329 thousand acres, cotton—241 thousand acres, and rice—186 thousand acres.²

The producer and lender surveys were conducted during July through September 1987. The mailing list for agricultural producers was developed from a Crop Reporting Service ran-

²These acreages are based on Texas Agricultural Statistical Service estimates for the 1987 crop year.

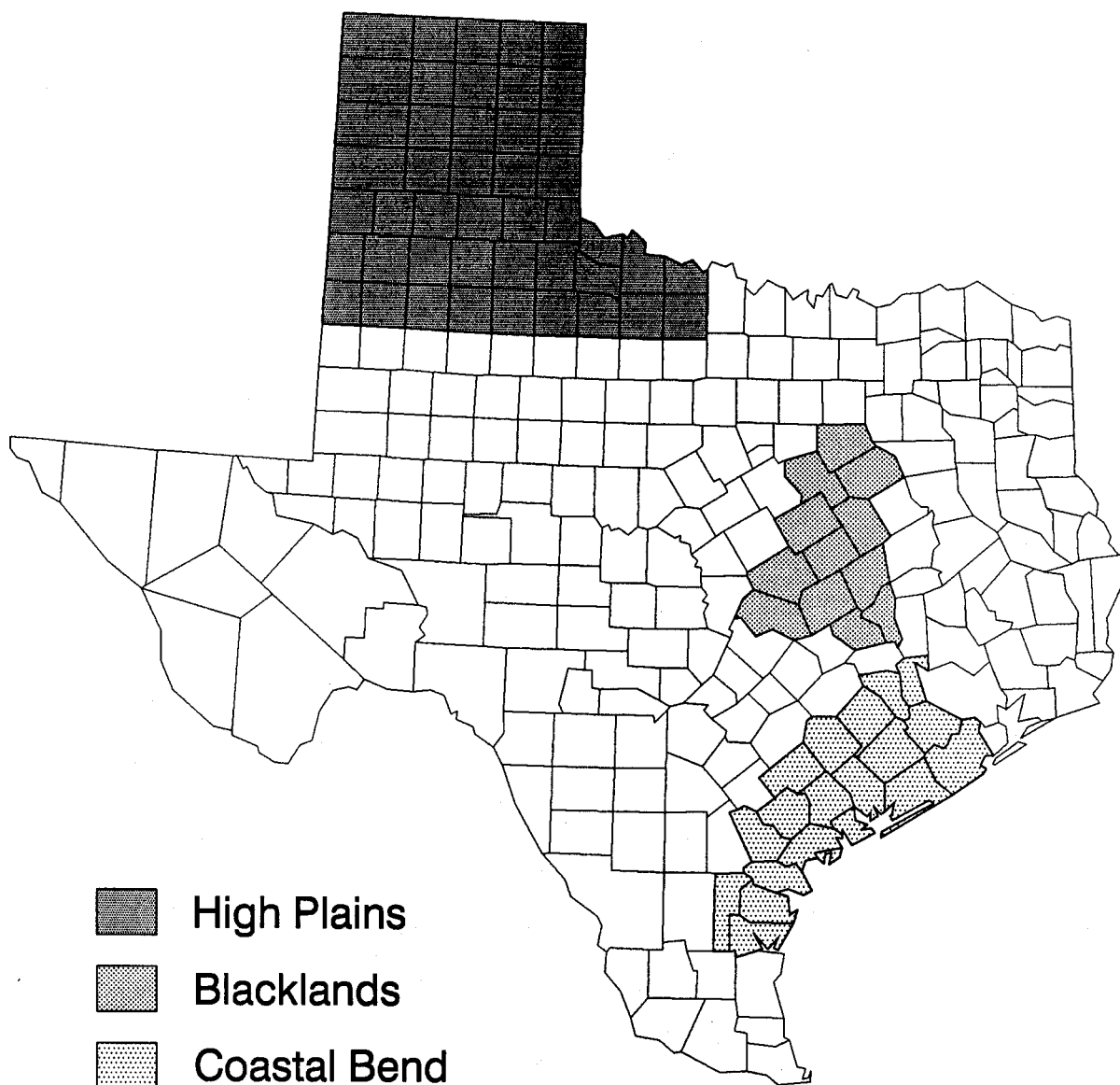


Figure 1. Geographic Areas Included in the Study Regions

TABLE 2. CHARACTERISTICS OF CROP PRODUCERS PARTICIPATING IN THE SURVEY

Characteristic	Regional Summary			Average or Total
	High Plains	Blacklands	Coastal Bend	
Average operator age	52	53	52	52
Last year of school completed				
Grade school	4%	7%	5%	5%
Some high school	8%	7%	8%	8%
High school graduate	25%	32%	25%	26%
Some college or technical school	28%	22%	27%	27%
Graduated from college	24%	22%	26%	24%
Postcollege graduate work	12%	9%	7%	10%
Acres farmed in 1987	1617	1078	1233	1416
1986 gross farm sales				
Less than \$40,000	31%	28%	23%	28%
\$40,000–\$99,999	31%	30%	24%	29%
\$100,000–\$199,999	19%	20%	25%	21%
\$200,000–\$499,999	15%	16%	22%	17%
\$500,000–\$799,999	3%	4%	5%	4%
\$800,000 and over	1%	1%	2%	1%
Amount of family's 1986 off-farm employment income and investment earnings				
\$0	25%	25%	21%	24%
\$1–\$4999	17%	10%	16%	15%
\$5000–\$9999	12%	7%	16%	12%
\$10,000–\$24,999	23%	25%	19%	23%
\$25,000–\$49,999	17%	22%	20%	19%
\$50,000 and over	6%	10%	8%	7%
Percent equity in farm operation				
Less than 20%	11%	6%	12%	10%
20–39%	10%	8%	16%	11%
40–59%	19%	18%	15%	18%
60–79%	18%	27%	18%	20%
80–99%	17%	17%	18%	17%
100%	24%	23%	22%	23%

dom sample which was updated by the agricultural extension agent in each county.³ Surveys were mailed to all commercial banks, Production Credit Associations (PCA's), and Farmers' Home Administration (FmHA) offices in the study regions. Initial mailings were followed by a postcard reminder 10 days later. Additional copies of cover letters and survey questionnaires were mailed to nonrespondents three weeks and five weeks after the first mailing. This survey procedure has been recommended by Dillman to minimize nonresponse bias. The number of surveys mailed, returned, and con-

sidered useful is broken out by region in Table 1.

Different survey instruments were used for producers and lenders. This was necessary in order to tailor the questions to each group. For example, producers were asked, "How important is each of the following sources of risk in terms of its effect on your annual net cash farm income?" while lenders were asked, "How important is each of the following sources of risk in terms of its effect on the annual net cash farm income of your agricultural borrowers?" Different survey instruments were also required to obtain information about respondent attributes

³The survey responses presented in this paper are a part of a larger risk management survey partially supported by the Federal Crop Insurance Corporation through the Federal Extension Service (ES-USDA). Approximately 8 percent of producers in the High Plains region were surveyed, while surveys were mailed to approximately 4 percent of producers in the Blacklands and 2.5 percent of producers in the Coastal Bend.

TABLE 3. CHARACTERISTICS OF RESPONDING LENDING INSTITUTIONS

Characteristic	Regional Summary			Average or Total
	High Plains	Blacklands	Coastal Bend	
Type of Institution ^a				
Independent bank	49%	40%	55%	48%
Affiliate of a multiple-bank holding company	10%	20%	14%	13%
Production Credit Association	13%	12%	10%	12%
Farmers' Home Administration	28%	28%	21%	27%
Size of Institution ^b				
Total institution assets (\$ million)	\$82	\$63	\$98	\$82
Total loan volume (\$ million)	\$43	\$37	\$51	\$44
Agricultural loans ^b				
Number of loans outstanding	240	158	163	208
Total volume (\$ million)	\$17	\$13	\$13	\$15
Proportion of total volume	39%	35%	25%	35%
Type of ag loan				
Crop	53%	45%	66%	55%
Livestock	37%	38%	22%	34%
Other	9%	17%	11%	11%
No. of agricultural loan officers ^c				
1 loan officer	20%	39%	22%	24%
2 loan officers	36%	30%	30%	34%
3 loan officers	17%	13%	15%	15%
4 loan officers	9%	9%	22%	12%
5 or more loan officers	18%	9%	11%	15%
Average loan approval limits				
per senior loan officer (\$1,000)	\$365	\$178	\$157	\$273
per junior loan officer (\$1,000)	\$108	\$89	\$72	\$94

^a Values reported are the percent of respondents in each institutional classification.

^b Values reported are averages for responding institutions.

^c Values reported are the percentage of lending institutions with the indicated number of agricultural loan officers.

that are different in nature for producers and lenders. Although different questionnaires were used for the two survey groups, the questionnaires were designed so that many questions, like those above, were mirror images. Through this approach, comparable information was obtained from producers and lenders. This comparability of responses is critical to the comparative analysis presented following brief profiles of the two survey groups.

PROFILE OF PRODUCER RESPONDENTS

As indicated in Table 2, the average age of responding producers is 52 years, with essentially no difference among regions. More than 85 percent of the respondents are high school graduates, while approximately one-third are college graduates.

The High Plains farms average 1,617 acres; Blacklands and Coastal Bend farms have less acreage. Gross farm sales are, on average, largest for the Coastal Bend respondents, followed by the Blacklands. The High Plains farms have a slightly lower revenue-producing capacity.

Two factors that may have a bearing on the risk management strategies a producer-decision maker adopts are the amount of income from off-farm sources and equity in the farm operation. Twenty-four percent of the producers have no nonfarm sources of income; nearly 50 percent have off-farm employment income and investment earnings of \$10,000 or more. The distributions of percent equity are similar for the three regions. Fewer low-equity (equity less than 40 percent) farms are represented in the Blacklands than in the High Plains and Coastal Bend. Overall, 39 percent of respondents

TABLE 4. PRODUCER AND LENDER RATINGS OF THE IMPORTANCE OF SOURCES OF RISK^a

Source of Risk	--- Average Ratings ---	
	Producers	Lenders
Injury, illness, or death of operator	5.31 (4)	5.45 (4)
Changes in government farm programs	5.43 (3)	5.90 (2)
Changes in the cost of seed, fuel, machinery repairs, chemicals, and/or custom services	5.17 (5)	5.20 (6)
Changes in interest rate and/or credit availability	4.46 (6)	5.13 (7)
Crop yield variability	5.76 (2)	5.74 (3)
Crop price variability	6.00 (1)	5.94 (1)
Changing family relationships, (e.g., divorce, dissolution of partnership, etc.)	3.93 (7)	5.26 (5)

^aSources of risk are listed in the order they were presented in the surveys. Values presented here are average ratings across all respondents. The rating scale was from 1 to 7, where a 1 represented "little effect" and a 7 represented "great effect." Numbers in parentheses are rankings for the respondent groups (1=highest).

reported less than 60 percent equity, 37 percent reported equity between 60 and 99 percent, and 23 percent reported they have no debt.

PROFILE OF LENDER RESPONDENTS

Summary information about the lending institutions represented by the responding loan officers is in Table 3.⁴ Forty-eight percent of these institutions are independent banks, 13 percent are affiliates of a multiple-bank company, 12 percent are PCA's, and 27 percent are FmHA offices. Some regional differences are evident. In the Blacklands, for example, the relatively smaller percentage of independent banks is offset by a larger percentage of affiliates of multiple-bank holding companies. The Coastal Bend has the largest percentage of commercial banking institutions, with slightly fewer PCA and FmHA respondents. Total assets for the High Plains institutions are near the average for the three regions. Institutions in the Blacklands average nearly \$20 million below, and the Coastal Bend institutions approximately \$16 million above, the overall average. Agricultural lending per institution in the High Plains is on a larger scale than in the other regions. The average High Plains lending institution has about 80 more agricultural loans

outstanding and nearly \$4 million more of total agricultural loan volume than lending institutions in the Blacklands or the Coastal Bend. The proportion of agricultural loans is largest in the High Plains at 39 percent, compared with 35 percent in the Blacklands, and 25 percent in the Coastal Bend. Crop loans make up a larger proportion of total agricultural loans in the Coastal Bend than in the Blacklands or High Plains; "other" agricultural loans account for a larger percentage of loan type in the Blacklands than in the other regions.

Twenty-seven percent of the responding lending institutions have four or more loan officers serving agricultural customers. Senior loan officers in the High Plains institutions have average loan approval limits double those of their counterparts in other regions and more than three times those of junior loan officers in their own institutions.

IMPORTANCE OF SOURCES OF RISK

A wide range of environmental, personal, and economic factors contributes to the risk faced by crop producers. One study objective is to gain a perspective on which of these sources producers and lenders consider most important. Clearly, this information is critical to understanding the types of risk management

⁴The lender surveys were addressed to the lending institutions. All were completed by individuals who identified themselves as agricultural loan officers. It is assumed that these respondents' views reflect those of their lending institutions.

TABLE 5. PRODUCER AND LENDER RATINGS OF EFFECTIVENESS OF ALTERNATIVE RISK MANAGEMENT PRACTICES^a

Risk Management Practice	----- Average Ratings -----	
	Producers	Lenders
Federal multiple-peril crop insurance	2.50 (7)	4.21 (7)
Commercial crop hail and fire insurance	2.55 (6)	4.32 (6)
Forward contracting the selling price of crops	3.63 (3)	5.16 (3)
Hedging the selling price of crops	2.77 (5)	4.42 (4/5)
Commodity options to place a "floor" under the selling price of crops	3.33 (4)	4.42 (4/5)
Diversification of farming/ranching enterprises	4.70 (2)	5.21 (2)
Government farm program participation	5.78 (1)	6.06 (1)

^aSources of risk are listed in the order they were presented in the surveys. Values presented here are average ratings across all respondents. The rating scale was from 1 to 7, where a 1 represented "little effect" and a 7 represented "great effect." Numbers in parentheses are rankings for the respondent groups (1=highest).

practices producers adopt and lenders recommend.

Producers and lenders were asked to rate the importance of several sources of risk. Each source was considered independently, without regard for possible interrelationships. The results of these ratings are presented in Table 4. A scale of 1 to 7 was used, with a rating of 1 indicating the source has "little effect" and a 7 indicating it has "great effect" on net farm income variability.

Two aspects of the ratings in Table 4 are of particular interest: (1) the absolute magnitude of the ratings and (2) the ranking of the sources of risk and relative rankings between the two respondent groups. The absolute magnitudes of the ratings are quite high, suggesting both groups consider all the sources of risk to be important. Between groups, the rankings are similar; however, they do indicate some general differences of opinion between producers and lenders. Crop price variability is rated highest by both groups. Producers rate yield variability second, while lenders rate it third after changes in government farm programs, which ranks third in the producer ratings. A notable feature of the comparative ratings is that producers rate changes in interest rates and/or credit availability and changing family relationships substantially lower than the other sources of risk. Although these factors rank low in the lender ratings, there is no substantial gap in the

absolute magnitudes. The narrow range for the lender ratings indicates lenders view all the sources of risk with similar importance.

EFFECTIVENESS OF ALTERNATIVE RISK MANAGEMENT PRACTICES

Results of producer and lender ratings concerning the effectiveness of alternative risk management practices in reducing income uncertainty resulting from crop yield and price variability are in Table 5. These ratings are, in general, much lower than those in Table 4. They indicate that producers, particularly, do not consider most of these risk management practices to be highly effective. Producers rate farm program participation and enterprise diversification substantially higher than the other practices. These two practices, along with forward contracting, also are rated highly by lenders. Relative rankings of the practices are quite similar between the two groups.

A noteworthy observation about the ratings in Table 5 is that risk management practices which mitigate the effects of both price and yield uncertainty—farm program participation and enterprise diversification—are rated highest. Next are practices which reduce price risk: forward contracting, commodity options, and hedging. Finally, the two insurance options, which afford yield risk protection only, are rated lowest. The rating of price risk as more important than yield risk (Table 4) may partially ex-

TABLE 6. PRODUCER AND LENDER ASSESSMENTS OF WHETHER RISK MANAGEMENT PRACTICE ADOPTION WOULD RESULT IN LOAN REQUESTS BEING VIEWED MORE FAVORABLY BY LENDERS

Risk Management Practice	Percent Indicating that Loan Requests Would Be Viewed More Favorably	
	Producers	Lenders
Federal multiple-peril crop insurance	19	68
Commercial crop hail and fire insurance	16	65
Forward contracting the selling price of crops	30	84
Hedging the selling price of crops	18	61
Commodity options to place a "floor" under the selling price of crops	20	68
Diversification of farming/ranching enterprises	30	74
Government farm program participation	69	92

plain this result.

EFFECT OF RISK MANAGEMENT PRACTICE ADOPTION ON LENDERS' VIEW OF LOAN REQUESTS

The results presented thus far indicate that the responding lenders believe their agricultural producer-borrowers face substantial risk from a number of sources. These responses also suggest that lenders believe a number of risk management practices substantially reduce the risk associated with commodity prices and crop yields. This leads to the question of how lenders respond to producers' use of these risk management practices. The length of the survey did not permit as much detail on this issue as would have been preferred. However, a general measure of lenders' attitudes and producers' perceptions of those attitudes was obtained.

Responses to a question regarding whether producers' use of each of the risk management practices studied would result in lenders "viewing their loan request more favorably" are presented in Table 6. In general, the lenders' responses are favorable and are reasonably, though not perfectly, consistent with the lenders' effectiveness rankings in Table 5. Striking differences, however, occur between the producers' and lenders' responses. Government farm program participation is the only practice that a majority of responding producers believe would influence lenders to view a loan request more favorably. No more than 30 percent of producers believe that any of the other practices would have this effect on lenders' attitudes.

Although producers would not be expected to predict with perfect accuracy lenders' atti-

tudes toward risk management practice adoption, the results in Table 6 are surprising. Communication between producers and lenders on this issue is clearly nonexistent or ineffective. If lenders would like to influence producers to adopt one or more of these risk management practices which they view favorably, a need for improved communication is indicated.

LOGIT ANALYSIS OF RISK MANAGEMENT PRACTICE ADOPTION

A primary study objective is to examine the influence of lenders' credit policies and producers' perceptions of lenders' attitudes on risk management practice adoption. Logit statistical models (Maddala) are estimated to predict (a) MPCI, (b) crop hail and fire insurance, and (c) forward contracting decisions based on these lender-related factors as well as producer and farm firm attributes. In each model, the dependent variable is binary, taking a value of zero if the respondent has not used the practice in the past four years and a value of 1 if the practice has been used during that time period. Since omitted observations are not permitted in logit analysis, only a subset of the responding producers—those who borrow operating capital and who completed all the relevant survey questions—are included in the analysis. Similar models are not estimated for hedging or commodity options because too few respondents have used these practices to yield reliable results. Information obtained through the survey is also insufficient to estimate models for farm program participation and enterprise diversification.

The independent variables included in the

TABLE 7. DESCRIPTION OF INDEPENDENT VARIABLES INCLUDED IN THE LOGIT MODELS

Variable Name	Type of Variable	Variable Description
----- Lender-Related Variables -----		
Type of Lender^a		
Prod. Credit Assoc.	Binary (0-1)	Takes a value of 1 if the primary source of operating capital is a production credit association.
FmHA	Binary (0-1)	Takes a value of 1 if the primary source of operating capital is the Farmers' Home Administration.
FmHA Guarantee	Binary (0-1)	Takes a value of 1 if the primary lender requires an FmHA operating loan guarantee.
Lender Policy^b		
Recommends Practice	Binary (0-1)	Takes a value of 1 if lender has ever recommended use of the practice.
Discusses Practice	Binary (0-1)	Takes a value of 1 if lender has ever discussed use of the practice.
Perception of Lender Attitude	Binary (0-1)	Takes a value of 1 if the respondent believes that lender would view the loan request more favorably if the practice were used.
Lender-imposed Operating Capital Restrictions	Binary (0-1)	Takes a value of 1 if the lender sets a fixed maximum on operating capital credit line.
----- Producer-Borrower Attributes -----		
Age	Continuous	Age of responding producer.
Education^c		
Some College	Binary (0-1)	Includes three classifications for producer respondents who have completed some college, are college graduates, or who have some postgraduate education.
College Graduate	Binary (0-1)	
Postgraduate	Binary (0-1)	
----- Farm Firm Attributes -----		
Region^d		
Blacklands	Binary (0-1)	Takes a value of 1 if respondent's farming operation is in the region indicated.
Coastal Bend	Binary (0-1)	
Off-farm Income^e		
\$10,000–\$24,999	Binary (0-1)	Takes a value of 1 if respondent's 1986 family off-farm income was in the specified range.
\$25,000 or more	Binary (0-1)	
Gross Sales^f		
\$ 40,000–\$ 99,999	Binary (0-1)	Takes a value of 1 if respondent's 1987 gross farm sales is in the indicated range.
\$100,000–\$199,999	Binary (0-1)	
\$200,000 or more	Binary (0-1)	
Percent Equity^g		
20%–39%	Binary (0-1)	Takes a value of 1 if respondent's percent equity in the farming operation is in the specified range.
40%–59%	Binary (0-1)	
60%–79%	Binary (0-1)	
80%–100%	Binary (0-1)	
Percent of Acreage Owned	Continuous	Acres Owned/Total Acres Farmed
Percent of Acreage Irrigated	Continuous	1987 Irrigated Acres Planted/1987 Total Acres Planted.
Primary Crop^h		
Corn	Binary (0-1)	Takes a value of 1 if respondent's most important source of gross farm income in 1986 was the indicated crop.
Cotton	Binary (0-1)	
Grain Sorghum	Binary (0-1)	
Rice	Binary (0-1)	
Wheat	Binary (0-1)	
Livestock or Dairy	Binary (0-1)	

^aDefault classification for this group is commercial bank.^bDefault classification is for producers whose lenders neither recommend nor discuss the practice.^cDefault classification for this group is high school education or less.^dDefault region is the High Plains.^eDefault classification for this group is producers/firms with less than \$10,000 of off-farm income in 1986.^fDefault classification for this group is farm firms with less than \$40,000 in gross sales for the year 1987.^gDefault classification for this category is farm firms with less than 20% equity.^hDefault classification for this category is all farms with a primary crop other than those listed.

logit models are described in Table 7. These variables can be classified into three primary categories:

- (1) lender-related variables,⁵
- (2) producer-borrower attributes, and
- (3) farm firm attributes.

There are a number of subclassifications within these categories. Most of the variables are binary classification variables, except respondent age, percent of acreage owned, and percent of acreage irrigated, which are continuous. The logit analysis results are presented in Table 8. Results presented for each model include: (a) parameter estimates for each independent variable, (b) the estimated change in probability for the variable (the probability effect), (c) significance levels for the parameter estimates based on chi-square likelihood ratio tests, (d) number of observations, (e) the McFadden R^2 statistic for the model, and (f) summary measures of the model's predictive capability (i.e., percent of adopters predicted correctly and percent of nonadopters predicted correctly). The McFadden R^2 statistics indicate that the explanatory power of the MPCl and crop hail and fire insurance models is quite good. The forward contracting model has somewhat less explanatory power; however, the McFadden R^2 is comparable to those for models of this type reported in a number of other studies using survey data (e.g., Capps and Kramer; Sonka, et al.).

The MPCl and crop hail and fire insurance models are particularly effective in predicting nonadopters, classifying more than 90 percent correctly. These models are somewhat less effective in predicting adopters, correctly classifying 62.5 percent of MPCl adopters and 58.4 percent of crop hail and fire insurance purchasers. The forward contracting model is equally effective in predicting adopters and nonadopters, classifying approximately three-fourths of each correctly. This difference in predictive capability is at least partially inherent in the models since the data include approximately equal numbers of producers who have forward contracted, while only 35 percent have used MPCl and 27 percent have purchased crop hail and fire insurance.

The lender-related variables comprise the

most uniformly significant class of variables across the three models. Type of lender, however, is not significant at the 0.2 level, with the exception of the FmHA variable in the forward contracting model. This indicates that FmHA borrowers are less likely than other producers to forward contract. Producers are more likely to adopt a practice when lenders recommend the practice or discuss it with them. Recommendation has the stronger effect, except in the case of forward contracting where the probability effects are similar.⁶ Also, producers who believe use of a practice will influence their lender to view their loan request more favorably (perception of lender attitude in Table 8) are more likely to adopt the practice. Lender-imposed operating capital restrictions increase the probability of MPCl adoption but decrease the probability of crop hail and fire insurance purchase. A possible explanation for this result is that MPCl participation does not require additional operating capital while crop hail and fire insurance does (i.e., payment for MPCl coverage is not required until the end of the crop year). Operating capital restrictions do not have a significant effect on forward contracting decisions.

Results for the producer-borrower attribute variables are mixed across the three models. Producer age is not significant at the 0.2 level in any of the models. Additional education is significant in the MPCl model—reducing the likelihood of participation—but is not significant in the other models.

Farm firm attributes also have mixed results. Blacklands producers are less likely to use MPCl than are producers in the other two regions. Producers in the Coastal Bend are less likely to purchase crop hail and fire insurance. Producers in both the Blacklands and Coastal Bend are more likely to forward contract than are producers in the High Plains. Off-farm income is significant in the forward contracting model only, indicating that producers (firms) with moderate amounts of off-farm income are more likely to forward contract than those with either more or less off-farm income. Gross sales, a measure of farm size, is a significant determinant of adoption for all three practices. Likelihood of adoption generally is greater for larger

⁵ It should be noted that the lender-related variables—with the exception of "Type of Lender"—are producer perceptions of lenders' attitudes, requirements, and policies.

⁶ The probability effects reported in Table 8 are an important product derived from the logit models. They should, however, be interpreted carefully. Specifically, these effects are not additive. The effect for each variable should be interpreted as the change in probability of adoption associated with that variable, assuming that all other qualitative or categorical variables are at their default values. Thus, the 0.172 probability effect for "lender discusses practice" in the MPCl model is the estimated increase in the probability of MPCl adoption given that the lender discusses but does not explicitly "recommend" the practice.

TABLE 8. LOGIT PREDICTIVE MODELS OF RISK MANAGEMENT PRACTICE ADOPTION BASED ON LENDER POLICIES, PERCEPTIONS OF LENDER ATTITUDES, PRODUCER ATTRIBUTES, AND FARM FIRM ATTRIBUTES

Variable ^a	Multiple-peril Crop Insurance			Crop Hail & Fire Insurance			Forward Contracting		
	Coefficient	Prob. ^b Effect	Signif. Level	Coefficient	Prob. ^b Effect	Signif. Level	Coefficient	Prob. ^b Effect	Signif. Level
Intercept	-0.418	N/A	0.770	-0.986	N/A	0.558	-2.244**	N/A	0.064
Type of Lender									
Prod. Credit Assoc.	0.178	0.032	0.688	-0.604	-0.050	0.257	-0.208	-0.052	0.579
FmHA	0.790	0.141	0.354	1.037	0.086	0.229	-1.166*	-0.291	0.150
FmHA Guaranteed	0.232	0.042	0.683	0.046	0.004	0.942	-0.397	-0.099	0.440
Lender Policy									
Recommends Practice	1.932**	0.346	0.005	2.818**	0.234	0.000	0.861**	0.215	0.100
Discusses Practice	0.962**	0.172	0.049	0.795*	0.066	0.166	0.932**	0.233	0.010
Perception of Lender Attitude	1.479**	0.265	0.003	1.694**	0.141	0.001	0.644**	0.161	0.081
Lender-imposed Operating Capital Restriction	0.511*	0.091	0.182	-0.652*	-0.054	0.146	0.060	0.015	0.857
Age	-0.020	-0.004	0.269	0.000	0.000	0.995	0.012	0.003	0.441
Education									
Some College	-1.020**	-0.183	0.030	-0.586	-0.049	0.289	-0.171	-0.043	0.668
College Graduate	-0.761*	-0.136	0.124	0.446	0.037	0.418	0.467	0.117	0.270
Post-graduate	-1.035*	-0.185	0.137	-0.958	-0.080	0.252	-0.538	-0.134	0.390
Region									
Blacklands	-2.117**	-0.379	0.003	-0.543	-0.045	0.325	1.186**	0.297	0.012
Coastal Bend	-0.311	-0.056	0.569	-3.582**	-0.298	0.003	0.647*	0.162	0.178
Off-farm Income									
\$10,000-\$24,999	-0.231	-0.041	0.614	0.099	0.008	0.844	0.546*	0.136	0.149
\$25,000 or more	-0.050	-0.009	0.918	0.481	0.040	0.347	0.208	0.052	0.602
Gross Sales									
\$40,000-\$99,999	0.882*	0.158	0.163	1.415**	0.118	0.044	0.649	0.162	0.239
\$100,000-\$199,999	1.313**	0.235	0.046	1.073*	0.089	0.151	1.400**	0.349	0.013
\$200,000 or more	1.078**	0.193	0.096	1.312**	0.109	0.076	1.757**	0.439	0.002
Percent Equity									
20%-39%	-0.608	-0.109	0.408	-0.788	-0.066	0.322	1.297	0.324	0.318
40%-59%	-1.304**	-0.233	0.062	-1.612**	-0.134	0.034	0.307	0.077	0.594
60%-79%	-1.735**	-0.311	0.014	-1.820**	-0.151	0.022	-0.151	-0.038	0.797
80%-100%	-0.996*	-0.178	0.156	-0.780	-0.065	0.313	0.262	0.065	0.653
Percent of Acreage Owned	-0.568	-0.102	0.348	1.135*	0.094	0.101	0.065	0.016	0.904
Percent of Acreage Irrigated	0.424	0.076	0.446	-0.822*	-0.068	0.165	-0.400	-0.100	0.418
Primary Crop									
Corn	0.227	0.041	0.798	0.295	0.025	0.771	-0.012	-0.003	0.987
Cotton	1.514**	0.271	0.067	-0.223	-0.019	0.815	-0.329	-0.082	0.623
Grain Sorghum	0.472	0.084	0.607	0.799	0.066	0.421	-0.702	-0.176	0.329
Rice	-2.416**	-0.432	0.098	-4.853	-0.404	0.807	-1.737**	-0.434	0.056
Wheat	1.334	0.239	0.157	0.409	0.034	0.701	-0.828	-0.207	0.305
Livestock or Dairy	0.922	0.165	0.286	-1.137	-0.095	0.272	-1.363**	-0.341	0.064
Number of Observations	275			281			285		
McFadden's R ²	0.36			0.41			0.24		
% of Adopters Predicted Correctly	62.5%			58.4%			74.3%		
% of Nonadopters Predicted Correctly	92.4%			93.1%			74.5%		

^a Variables are defined in Table 7.

^b The estimated change in probability of adopting the practice associated with the variable. These effects were calculated at the means of all independent variables.

* Significant at the 20% level based on the chi-squared test statistic.

** Significant at the 10% level based on the chi-squared test statistic.

firms. Both the MPCl and crop hail and fire insurance models indicate that the likelihood of adoption decreases as equity increases except for the highest equity level (80–100 percent), where the probability of adoption is somewhat greater than for firms with 40–79 percent equity. Percent equity is not significant in the forward contracting model.

Percent of acreage owned and percent of acreage irrigated are significant only in the crop hail and fire insurance model. In this case, the probability of purchasing crop hail and fire insurance increases with ownership but decreases modestly as the proportion of irrigated acreage increases.

Producers whose primary source of farm revenue is cotton are more likely to purchase MPCl, while rice producers are substantially less likely to participate. None of the primary crops is associated with increased crop hail and fire insurance adoption. Rice and livestock or dairy producers are less likely than others to forward contract their crops. Two factors that could contribute to this result for livestock and dairy producers are (1) these producers are already partially protected from risk through diversification and (2) they may feed at least some of their crops on the farm and therefore are not as concerned about selling price. A majority of Texas rice producers have traditionally marketed through a cooperative, probably contributing to their low use of forward contracting.

SUMMARY AND IMPLICATIONS

The study results have important implications for agricultural producers, agricultural lenders, and agricultural policy. This section summarizes the study results and suggests these implications.

Summary

The survey results indicate that both agricultural producers and agricultural lenders consider all the sources of risk studied to be important. Responding lenders in general view risk management practices including MPCl, crop hail and fire insurance, forward contracting, hedging, commodity options, enterprise diversification, and farm program participation as effective means to reduce risk associated with crop yield and price variability. Responding crop producers are much less optimistic regarding the effectiveness of these practices. Both producers and lenders rate price risk management practices higher than MPCl and crop hail

and fire insurance, which are used to manage yield risk.

Most responding lenders indicate that use of the risk management practices results in lenders' viewing loan requests more favorably. Producer perceptions are quite different. Fewer than 30 percent of responding producers believe that adoption of any of the practices other than government farm program participation has a favorable influence on lenders' attitudes.

The logit model results indicate that lenders can substantially increase the probability that their borrowers will adopt MPCl, crop hail and fire insurance, and forward contracting by recommending the practices. Discussing the practices with borrowers is somewhat less effective but still significant. Even if neither of these actions is taken, borrowers who believe that use of one of these practices will lead their lender to view their loan request more favorably are more likely to adopt the practice. Lender-imposed operating capital restrictions increase the probability of MPCl adoption but decrease the likelihood of crop hail and fire insurance purchase. Such operating capital restrictions do not have a significant effect on forward contracting decisions.

Implications for Agricultural Producers

A significant number of agricultural producers who participated in the survey are responsive to their lenders' views (as they perceive them) regarding risk management practice adoption. Many producers, however, apparently do not correctly interpret their lenders' views. This suggests that producers who are willing to consider their lenders' attitudes in formulating a risk management program should further investigate their lenders' preferences.

Implications for Agricultural Lenders

A clear implication of this study is that many lenders do not communicate effectively with their borrowers, at least concerning risk management practice adoption. Although most lenders surveyed favor the use of a number of risk management practices, most borrowers do not recognize this advocacy. Lenders who would prefer that their borrowers develop risk management programs including one or more of the available practices should discuss such programs with their customers. Straightforward recommendation of some risk management practices may be appropriate for lenders who strongly favor their use and who are willing to take a more active posture.

Policy Implications

Two of the risk management practices studied—farm programs and MPCl—are direct instruments of U.S. farm policy. Results suggest that crop producers and agricultural lenders consider farm program participation to be the most effective of the risk management practices studied. MPCl, however, is viewed by both groups as the least effective practice. Since passage of the Federal Crop Insurance Act of

1980, the federal government has engaged in an effort to increase MPCl participation. This study suggests one avenue to achieve this goal might be to work through agricultural lenders, who can have a significant influence on producers' MPCl participation decisions. Educational programs for agricultural lenders focusing on MPCl could be effective if they improve lenders' perceptions of MPCl or influence lenders to communicate more effectively with their borrowers concerning MPCl participation.

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