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Rob King

RISK ANALYSIS FOR AGRICULTURAL  
PRODUCTION FIRMS: CONCEPTS,  
INFORMATION REQUIREMENTS AND POLICY ISSUES

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PRODUCERS' ATTITUDES, PERCEPTIONS AND MANAGEMENT RESPONSES  
TO VARIABILITY

George F. Patrick

The Southern Regional Research Project S-180 Outline, "An Economic Evaluation of Risk Management Strategies for Agricultural Production Firms," emphasizes of a comprehensive evaluation of integrated risk management strategies combining production, marketing and financial responses. Objective 1 of the project is the identification and quantification of various sources of risk affecting the behavior and survival of farm firms. Objective 3 is to identify, analyze and evaluate production, marketing, and financial strategies which farmers use or can use in risk management programs.

In summarizing accomplishments under Western Regional Research Project W-149, "An Economic Evaluation of Managing Market Risks in Agriculture," Barry noted that some surveys had been done. However, this surveying had not been widespread enough to understand how risk responses might differ with firm and producer characteristics. Informal discussions also focused on the lack of knowledge of what producers actually consider as sources of variability and responses they use. A subcommittee of S-180 members interested in this research area developed a pilot questionnaire which was applied in twelve states.

This paper briefly discusses the procedures utilized in the pilot study. Some general characteristics of producers responding are presented. The importance of sources of variability in crop and livestock production, as well as the importance and use of various responses to variability are analyzed. Type of operation, size of firm unit, debt to total assets and educational level of the operator are the major characteristics considered in these analyses. Producers' perceptions of their overall risk management, risk balancing and costs associated with risk management are also discussed. The paper concludes with a summary of the findings and some recommendations for future work. This will be supplemented by comments and observations from three individuals involved in this pilot study.

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Procedures and Respondent Characteristics

An initial questionnaire was developed and circulated to interested individuals. Some informal interviews were conducted to obtain producers' reactions and difficulties with the questionnaire. Based on these experiences and discussion at an S-180 subcommittee meeting, a revised questionnaire was developed. It was recognized that the questionnaire was not ranch oriented and had a Corn Belt bias, but that these difficulties could be minimized in the interview situation.

The revised questionnaire (Appendix A), with some variations, was applied in twelve states. Each state was requested to interview ten or more producers with operations similar to one of the USDA typical farm types (Hatch, et al.). Producers were generally selected to provide firms with a range of size, tenure and financial conditions as well as varied producer characteristics. Survey techniques included individual personal interviews, group interviews with instructions for completion, and telephone contacts followed by mailed questionnaires. No attempt was made to obtain a statistically representative sample, but overall the respondents had a wide range of enterprises, firm sizes and operator characteristics.

Table 1 summarizes the distribution of survey respondents by state and type of operation. Crop producers had no livestock. Livestock producers had either no crops or forages as their primary crop. All but one of the livestock firms, an Indiana hog producer, had cattle and would be considered ranches. The mixed producers had both crops and livestock (including catfish). It should be noted that only two dairy operations were included among the respondents.

Table 1. Distribution of Survey Respondents by State and Type of Operation

<u>State</u>	<u>Typical Farm</u>	<u>Type of Operation</u>			<u>Total</u>
		<u>Crop</u>	<u>Mixed</u>	<u>Livestock</u>	
AL	Mixed farming	3	19	--	22
AZ	Irrigated cotton; ranching	10	2	4	16
FL	Northern - mixed	2	7	--	9
GA	Mixed farming	1	8	--	9
IL	Champaign Co. - corn/soybean	12	--	--	12
IN	Clinton Co. - hog producers	--	9	1	10
KS	Wheat/livestock	1	16	--	17
MS	Delta - mixed farming	5	4	--	9
ND	Wheat - barley/fallow	8	2	--	10
OK	Ranching	--	3	9	12
WA	Lincoln/Adams Co.- wheat growers	8	4	--	12
WY	Albany Co. - ranchers	--	<u>1</u>	<u>10</u>	<u>11</u>
	Total	50	75	24	149

About 85 percent of the respondents owned some land, 54 percent cash rented land and 41 percent share rented land. Wheat was the primary crop on 35 operations (23.5 percent) and grown by 39 other producers (26.2 percent). The other primary crops and number of producers were: peanuts, 30; corn, 26; cotton, 19; hay, 19; soybean or soybeans/wheat double crop, 12; sorghum, 2; and barley, 1. The acreage of the primary crop ranged from 20 to 3500 acres. Soybeans was the leading second crop. Slightly over 52 percent of the respondents grew three crops, but only about 25 percent grew four or more crops. Of the 141 operations growing crops, 4.3 percent grew less than 100 acres, 19.9 percent grew from 100 to 249 acres, 18.4 percent grew from 250 to 499 acres, 33.3 percent grew from 500 to 1,000 acres, 19.1 percent grew 1,000 to 4,999 and 5 percent grew more than 5,000 acres.

Two-thirds of the respondents had livestock. Cow-calf (62), farrow to finish (12), cow-yearling (11) and stocker cattle (7) were the primary livestock enterprises. Only 36 of 99 operations with livestock had more than one enterprise and only 4 operations had a third type of livestock.

Gross sales information for 1980 through 1982 was obtained for 99 respondents. However, sales information was not obtained from respondents in Alabama, Florida and Georgia. For purposes of analyses of differences by firm size, the seven sales categories were reduced to four. When gross sales was not available, firm size was estimated on the basis of crop acreage. Small firms were those with gross sales of less than \$100,000 or less than 250 acres of crops. Medium firms had sales in the \$100,000 to \$199,999 range or between 250 and 499 acres in crops. Large firms were those with gross sales of between \$200,000 and \$499,999 or 500 to 999 acres in crops. Very large firms were those with a \$500,000 or more in gross sales or a 1,000 acres or more in crops. Table 2 presents the frequency of respondents by 1982 gross sales and the size of firm category.

Table 2. Number of Firms by 1982 Gross Sales and Size of Firm Category<sup>a</sup>

1982 Gross Sales (in thousands)	Number of Firms	Size of Firm Category	Number of Firms	Percent of Firms
under \$20	2	> small	50	33.6
20-39	8			
40-99	16			
100-199	26	medium	36	24.2
200-499	26	large	41	27.5
500-999	13	> very large	22	14.8
over \$1,000	<u>8</u>			
Total	99		149	100.0

<sup>a</sup>Size of firm category is based on gross sales if available.

The vast majority, 92 of 149 (62 percent) of the firms were individual or family proprietorships and 22 (15 percent) were family partnerships. A total of 26 firms (14 percent) were incorporated, 5 as "S" corporations and 21 as "C" corporations. The remaining 9 firms (6 percent) used a combination of business organizations.

The individuals interviewed were asked to indicate the taxable income from 1980 to 1982 for the firm and for their family unit. As can be seen in Table 3 for 1982, 23 of the firms (17.3 percent) had losses or negative taxable incomes. For the family unit, 13 of those reporting (11.3 percent) had losses. Information was available on both firm and family taxable incomes in 95 cases and the categories were the same for 54 (57 percent). Family taxable income exceeded firm income in 28 cases and was less in 13 cases. For 130 cases, information was available on firm taxable income for both 1981 and 1982. Taxable incomes were in the same category both years for 97 cases (75 percent). Taxable firm incomes had been higher in 1981 than 1982 for 22 cases (17 percent) and 1982 had been higher than 1981 for 11 cases (8 percent). Changes in taxable family income for 1981 and 1982 were very similar to firm income.

Table 3. Number and Percent of Firms and Families by 1982 Taxable Income Levels

Taxable Income 1982	Firms		Families	
	Number	Percent	Number	Percent
loss - negative	23	17.3	13	11.3
\$ 0 - 4,999	17	12.8	7	6.1
5,000- 9,999	8	6.0	9	7.8
10,000-19,999	27	20.3	17	14.8
20,000-29,999	14	10.5	22	19.1
30,000-49,999	18	13.5	20	17.4
50,000-99,999	15	11.3	16	13.9
\$100,000 or more	<u>11</u>	<u>8.3</u>	<u>11</u>	<u>9.6</u>
Subtotal	133	100.0	115	100.0
No response	16		34	

The firm and family net worth varied widely among the respondents. All but 5 respondents provided information on either firm or family net worth, but only 85 respondents provided both. Table 4 indicates frequency of respondents by category of firm and family net worth. For the 85 respondents providing information on both firm and family net worth, the categories were the same for 52 respondents (61 percent). In 22 instances the firm net worth exceeded the family net worth and the situation was reversed for 11 respondents.

Of the 149 respondents, 41 had no operating credit and 43 had no long-term debt. A total of 24 had no debt. Only 12 respondents, less than 10 percent, had more than \$250,000 of production or operating credit and only 20 had \$250,000 or more of long-term debt.

Table 4. Number and Percent of Firms and Families by Net Worth Levels

Net Worth (in thousands)	Firms		Families	
	Number	Percent	Numbers	Percent
less than \$100	14	13.6	28	22.2
100 to 249	24	23.3	25	19.8
250 to 499	18	17.5	13	10.3
500 to 999	16	15.5	24	19.1
1,000 to 2,499	17	16.5	20	15.9
2,500 to 4,999	10	9.7	13	10.3
5,000 or more	4	3.9	3	2.4
Subtotal	103	100.0	126	100.0
No response	46		23	

A debt to total asset ratio was computed for each respondent. If available, the firm net worth was set equal to the midpoint of the category. For example, if the respondent was in the \$100,000 to \$249,999 interval, a net worth of \$175,000 was assumed. The family net worth was used if the firm's net worth was unknown. Similar procedures were used in determining the amount of debt. If a respondent had indicated only operating or long-term debt, the other was assumed to be zero. Several respondents had written comments indicating their response was the total debt. An estimated debt to total asset percentage was computed and the frequencies are presented in Table 5. For 18.7 percent of the respondents the level of debt equalled or exceeded their net worth.

Table 5. Number and Percent of Respondents by Estimated Debt to Total Asset Percentages

Level of Debt to Total Assets	Number of Respondents	Percent of Respondents
None	24	16.7
Less than 20%	59	41.0
20 to 49%	34	23.6
50% and over	27	18.7
Total	144	100.0

The educational level of producers responding to the questionnaire appeared considerably higher than the average of U.S. producers. Only 21 (14.1 percent) had not completed high school and 35 (23.5 percent) were high school graduates. Over 27 percent (41 producers) had attended vocational or technical school beyond high school or some college. Almost 35 percent (52 producers) had graduated from college. Ten of the college graduates had graduate work.

The majority of producers were between the ages of 30 and 59 as can be seen in Table 6. Only 8 producers (5.4 percent) were under 30 years of age and 6 (4.0 percent) were 70 or older. The years of farming experience paralleled age very closely.

Table 6. Number and Percent of Respondents by Age and Years of Farming Experience

Years of Age	<u>Respondents</u>		Years of Farming Experience	<u>Respondents</u>	
	Number	Percent		Number	Percent
less than 30	8	5.4	less than 10	24	16.1
30 to 39	39	26.2	10 to 19	26	17.4
40 to 49	35	23.5	20 to 29	28	18.8
50 to 59	46	30.9	30 to 39	32	21.5
60 to 69	15	10.1	40 to 49	33	22.1
70 and over	<u>6</u>	<u>4.0</u>	50 and more	<u>6</u>	<u>4.0</u>
Total	149	100.0	Total	149	100.0

Of the 149 producers, 94 (63.1 percent) did not work off the farm and 17 (11.4 percent) worked off the farm 200 days or more per year. Part-time off-farm work was somewhat frequent. A total of 19 producers (12.8) worked off-farm for less than 50 days per year, 11 (7.4 percent) worked off-farm for between 50 and 124 days per year and 8 (5.4 percent) worked off-farm for between 125 and 200 days annually. Although information was not obtained on the number of days in off-farm activities by spouses and family members, almost 43 percent of the respondents indicated some off-farm work by family members.

#### Importance of Sources of Variability

Producers were told that variability in agriculture makes the outcome of decisions and actions uncertain. An outcome may be better or worse than expected. Variability in agriculture is the result of many factors. They were then asked to indicate the importance of a list of sources of variability in their crop and/or livestock production. Each source of variability was highlighted and illustrations given. For example in the crop section of the questionnaire, weather variability illustrations were drought, hail, flooding, etc. In the livestock section, weather variability was illustrated by heat, cold, climatic conditions affecting feed supplies, etc. The importance of a source of variability was indicated on a scale from 1 to 5 with 0 indicating "does not apply." If a particular source of variability was extremely important to them, the producers were instructed to circle "5." Moderately important was "3" and not important was "1." Producers having both crops and livestock completed both sets of questions while specialized producers completed only the crop or livestock section.



Questionnaires were completed in the late summer and fall of 1983. Thus producers in many states had experienced the heat and drought conditions of the '83 summer. Arizona had experienced extensive flooding. The Russian downing of the Korean airliner in early September brought international events into the limelight. The influence of these events on the results is unknown.

After reviewing the producers' responses, it was found that a number of crop producers had responded "does not apply" to some sources of variability in crop production. Similarly some livestock producers gave the "does not apply" response to some sources of variability in livestock production. The "does not apply" response was intended to be used only if the question referred to enterprises which a producer did not have. Therefore, these "does not apply" responses were recoded to "not important" for this analysis.

#### Importance by Type of Producer

Table 7 presents the mean value of responses to the importance of sources of variability, the standard deviations and associated t value for differences between means for producers of different types. There were no statistically significant differences in the importance assigned to sources of variability in crop production between crop and mixed producers. Both crop and mixed producers assigned the greatest importance to weather variability and this was followed by product prices as the second most important source of variability. Crop producers ranked world events in third place, while it was ranked sixth by mixed producers. Mixed producers ranked diseases and pests in third place and it was followed closely by inflation. Unexpected changes associated with hired labor was ranked last by both groups.

In contrast to crop production, there were substantial differences between mixed and livestock producers with respect to the importance given to sources of variability in livestock production. Among livestock producers, weather and product prices tied for first place in the ranking, input costs were third, and inflation was fourth. Although mixed producers also ranked product prices in first place, they assigned significantly lower importance to them than livestock producers. Inputs costs were ranked second by mixed producers and weather variability was third. As in crop production, unexpected changes associated with hired labor was ranked last of a source of variability by both producer groups. On all but one of the sources of variability (changes in technology), livestock producers assigned higher values than mixed producers. Overall, there were nine sources of variability in livestock production for which the difference between group were statistically significant (t values of over 2.0).

#### Size of Firm

It is commonly hypothesized that producers' attitudes toward variability in agriculture may be related to the size of firm. Based on 1982 gross sales, or acres in crops when sales information was not available, firms were classified into four size categories as discussed

Table 7. Mean Importance Ratings and Standard Deviations (in parentheses) of Sources of Variability in Crop and Livestock Production by Type of Producer

Source of Variability	Crop Production			Livestock Production		
	Crop n=50	Mixed n=75	t value <sup>a</sup>	Mixed n=75	Livestock n=24	t value <sup>a</sup>
Weather	4.48 (.81)	4.65 (.81)	-1.12	3.75 (1.33)	4.52 (0.79)	-3.39
Diseases and pests	3.94 (.89)	4.07 (.98)	-0.76	3.70 (1.21)	3.83 (1.19)	-0.42
Product prices	4.40 (.76)	4.34 (1.12)	0.36	3.99 (1.19)	4.52 (0.85)	-2.39
Input costs	3.92 (1.03)	3.94 (1.21)	-0.12	3.95 (1.26)	4.13 (0.87)	-0.79
Capital equipment	3.50 (1.18)	3.65 (1.26)	-0.66	2.97 (1.36)	3.17 (1.11)	-0.72
Loan fund availability	3.10 (1.37)	2.80 (1.55)	1.11	2.44 (1.56)	2.87 (1.42)	-1.24
Cost of credit	3.56 (1.20)	3.27 (1.50)	1.19	2.82 (1.72)	3.78 (1.35)	-2.78
Use of leverage	3.02 (1.32)	3.01 (1.46)	0.02	2.50 (1.53)	3.09 (1.54)	-1.60
Leasing	2.90 (1.52)	2.45 (1.46)	1.63	1.82 (1.27)	2.74 (1.54)	-2.59
Changes in technology	2.90 (1.01)	2.83 (1.29)	0.33	2.45 (1.38)	2.39 (1.12)	0.21
Government programs	3.62 (1.19)	3.25 (1.48)	1.50	2.16 (1.39)	3.48 (1.53)	-3.67
Gov't. laws regulations	3.18 (1.22)	2.93 (1.36)	1.06	2.63 (1.57)	3.65 (1.19)	-3.31
Inflation	3.86 (1.07)	4.06 (1.15)	-0.97	3.36 (1.54)	4.09 (1.20)	-2.34
World events	4.02 (1.04)	3.68 (1.18)	1.69	3.04 (1.40)	3.74 (1.14)	-2.42
Safety and health	3.70 (1.13)	3.61 (1.41)	0.41	3.40 (1.55)	4.09 (1.08)	-2.38
Family plans	3.16 (1.18)	2.93 (1.50)	0.94	2.75 (1.63)	3.30 (1.26)	-1.71
Hired labor	2.40 (0.97)	2.38 (1.34)	0.09	2.21 (1.51)	2.73 (1.28)	-1.61

a/ t values were calculated using separate variance estimates to test for differences between group means.

previously. The mean importance of sources of variability in crop and livestock production, together with their standard deviations, are presented in Table 8.

In crop production, all four size groups ranked weather as the most important source of variability and product prices second. Exact rankings of the next several sources of variability differed among groups, but diseases and pests, input costs, inflation and world events had similar values.

Chi square and Kendall's tau c were used to determine whether the differences in importance given a source of variability were independent of the producer group (Hollander and Wolfe). Kendall's tau c, unlike Chi square which can be used with nominal data, assumes that one of the variables is on an ordinal scale and is corrected for unequal marginals (Norusis). With a systematic association between variables the Kendall's tau c may be statistically significant for situations in which the Chi square is not.

Chi square values were significantly different from zero at the 10 percent level or higher for inflation and hired labor. Kendall's tau c was significant at the 5 percent level or higher for changes in technology and hired labor. Larger producers gave greater importance to technology than smaller producers. Although the importance given to family plans as source of variability increases with the size of firm, the relationship was not statistically significant. The only source of variability in crop production with a statistically significant and consistent change with size of firm was the increasing importance of hired labor.

There were differences in the ranking of sources of variability in livestock production by size of firm. The small and medium size producers ranked product prices first, while large and very large groups gave greater importance to input costs. Chi square values, significant at the 10 percent level or higher, were encountered for leasing, world events and hired labor indicating there were differences among groups. However, the only systematic relationship was the increasing importance given to hired labor as a source of variability by the larger firms.

#### Financial Position: Debt to Total Assets

The degree of leverage of a firm is also hypothesized to have effects on a producers' attitudes toward variability. As discussed previously, an estimated debt to total asset percentage was calculated for each producer. If information on the firm's net worth was not available, the net worth of the family was used. Table 9 presents the means and standard deviations of the importance of the sources of variability in crop and livestock production by level of percent debt.

There were differences in ranking of importance of weather, diseases and pests, product prices and input costs in crop production among the groups. However, the major differences were with respect to credit availability and cost. Kendall's tau c was significant at the 1 percent level for loan fund availability, the cost of credit and use of

Table 8. Mean Importance Ratings and Standard Deviations (in parentheses) of Sources of Variability in Crop and Livestock Production by Size of Firm <sup>a/</sup>

Source of Variability	Crop Production				Livestock Production			
	Size of Firm				Size of Firm			
	Small n=37	Med. n=30	Large n=38	Very large n=18	Small n=35	Med. n=21	Large n=27	Very large n=13
Weather	4.59 (.93)	4.70 (.65)	4.53 (.80)	4.50 (.86)	3.97 (1.29)	4.27 (.94)	3.81 (1.36)	3.54 (1.45)
Diseases and pests	4.16 (1.04)	3.90 (1.00)	4.05 (.84)	3.72 (.90)	3.85 (1.35)	3.86 (1.15)	3.46 (1.10)	3.77 (1.09)
Product prices	4.34 (1.11)	4.37 (.81)	4.32 (1.12)	4.39 (1.04)	4.03 (1.20)	4.68 (.57)	3.78 (1.34)	4.08 (.95)
Input costs	4.08 (1.26)	3.77 (1.10)	3.92 (1.10)	4.00 (.97)	3.83 (1.36)	4.23 (.97)	3.85 (1.17)	4.31 (.95)
Capital equipment	3.30 (1.37)	3.77 (1.17)	3.80 (1.04)	3.56 (1.30)	3.09 (1.38)	3.32 (1.21)	2.70 (1.35)	3.00 (1.08)
Loan fund availability	2.81 (1.66)	2.93 (1.48)	3.05 (1.41)	2.89 (1.37)	2.51 (1.56)	2.71 (1.62)	2.52 (1.45)	2.38 (1.66)
Cost of credit	3.30 (1.58)	3.43 (1.19)	3.45 (1.37)	3.33 (1.50)	2.97 (1.79)	3.25 (1.62)	2.93 (1.62)	3.23 (1.78)
Use of Leverage	2.95 (1.53)	2.97 (1.25)	3.22 (1.34)	2.83 (1.54)	2.54 (1.63)	2.70 (1.49)	2.78 (1.55)	2.54 (1.51)
Leasing	2.70 (1.68)	2.53 (1.38)	2.84 (1.42)	2.22 (1.44)	2.17 (1.54)	2.33 (1.46)	1.78 (1.12)	1.77 (1.36)
Changes in Technology	2.53 (1.30)	2.80 (1.03)	3.24 (1.18)	2.94 (.94)	2.40 (1.38)	2.14 (1.28)	2.59 (1.28)	2.69 (1.32)
Government programs	3.41 (1.52)	3.17 (1.21)	3.53 (1.39)	3.61 (1.29)	2.20 (1.53)	3.14 (1.42)	2.26 (1.38)	2.62 (1.76)
Government laws	3.00 (1.37)	2.73 (1.08)	3.11 (1.31)	3.44 (1.54)	2.86 (1.54)	3.14 (1.62)	2.52 (1.42)	3.23 (1.69)
Inflation	4.05 (1.29)	3.90 (1.09)	3.97 (1.05)	3.83 (1.15)	3.60 (1.58)	3.90 (1.33)	3.15 (1.41)	3.62 (1.66)
World events	3.81 (1.18)	4.07 (1.11)	3.74 (1.18)	3.50 (1.15)	3.51 (1.27)	3.57 (1.29)	2.56 (1.34)	3.15 (1.46)
Safety and health	3.78 (1.27)	3.50 (1.30)	3.63 (1.36)	3.78 (1.26)	3.57 (1.29)	3.57 (1.69)	3.37 (1.62)	3.92 (1.38)
Family plans	2.81 (1.41)	3.10 (1.32)	3.11 (1.43)	3.17 (1.30)	2.63 (1.52)	3.24 (1.48)	2.81 (1.77)	3.15 (1.35)
Hired labor	1.86 (1.06)	2.43 (1.13)	2.63 (1.32)	3.06 (.94)	1.65 (1.01)	2.43 (1.57)	2.78 (1.60)	3.00 (1.47)

<sup>a/</sup> Size of production unit was defined in terms of 1982 gross sales. Small producers had sales of less than \$100,000, medium had sales of \$100,000 to \$199,999, large from \$200,000 to \$499,999 and very large had sales of \$500,000 and more.

Table 9. Mean Importance Ratings and Standard Deviations (in parentheses) of Sources of Variability in Crop and Livestock Production by Percent Debt.

Source of Variability	Crop Production				Livestock Production			
	Level of Percent Debt <sup>a</sup>				Level of Percent Debt <sup>a</sup>			
	None n=18	Low n=45	Med. n=32	High n=28	None n=19	Low n=39	Med. n=22	High n=18
Weather	4.50 (.86)	4.60 (.86)	4.63 (.79)	4.57 (.74)	3.79 (1.40)	4.26 (1.14)	3.86 (1.11)	3.33 (1.53)
Diseases and pests	4.06 (1.05)	4.07 (.91)	3.91 (.96)	4.04 (.90)	3.56 (1.54)	3.85 (1.18)	3.80 (.83)	3.44 (1.38)
Product prices	4.00 (1.14)	4.36 (1.00)	4.41 (.98)	4.59 (.80)	4.16 (1.12)	4.23 (1.04)	3.82 (1.18)	4.00 (1.50)
Input costs	3.83 (1.38)	4.04 (1.15)	4.00 (1.05)	3.74 (1.02)	4.05 (1.18)	4.08 (1.18)	3.95 (1.09)	3.61 (1.46)
Capital equipment	3.39 (1.54)	3.76 (1.13)	3.59 (1.16)	3.48 (1.25)	2.79 (1.27)	3.26 (1.33)	2.82 (1.10)	2.89 (1.53)
Loan fund availability	2.00 (1.45)	2.89 (1.30)	2.94 (1.54)	3.67 (1.41)	1.63 (.90)	2.82 (1.47)	2.32 (1.49)	3.12 (1.90)
Cost of credit	2.00 (1.14)	3.44 (1.31)	3.66 (1.31)	3.96 (1.19)	2.11 (1.49)	3.31 (1.58)	3.10 (1.76)	3.35 (1.84)
Use of leverage	1.89 (1.02)	2.91 (1.29)	3.34 (1.36)	3.65 (1.41)	1.84 (1.34)	2.82 (1.39)	2.61 (1.56)	3.06 (1.85)
Leasing	2.44 (1.54)	2.16 (1.28)	2.97 (1.62)	3.22 (1.42)	2.05 (1.65)	2.28 (1.41)	1.64 (1.26)	1.94 (1.14)
Technology	2.35 (1.27)	2.84 (1.00)	3.25 (1.16)	2.77 (1.31)	2.00 (1.16)	2.56 (1.25)	2.68 (1.36)	2.23 (1.52)
Government programs	3.44 (1.62)	3.60 (1.37)	3.06 (1.22)	3.48 (1.37)	2.63 (1.64)	2.74 (1.63)	2.14 (1.25)	2.06 (1.39)
Government regulations	2.83 (1.54)	3.42 (1.22)	2.97 (1.15)	2.67 (1.39)	3.21 (1.84)	3.18 (1.37)	2.41 (1.44)	2.29 (1.53)
Inflation	3.33 (1.41)	4.11 (.94)	4.06 (1.11)	4.11 (1.09)	3.58 (1.74)	3.64 (1.44)	3.29 (1.45)	3.41 (1.54)
World events	3.56 (1.42)	3.91 (.95)	3.88 (1.19)	3.81 (1.18)	3.42 (1.61)	3.54 (1.05)	2.77 (1.38)	2.65 (1.58)
Safety	3.61 (1.46)	3.69 (1.24)	3.88 (1.29)	3.37 (1.31)	3.89 (1.37)	3.67 (1.36)	3.32 (1.64)	3.12 (1.69)
Family	2.50 (1.47)	3.29 (1.33)	3.00 (1.39)	3.00 (1.33)	2.68 (1.67)	3.23 (1.44)	2.48 (1.54)	2.71 (1.69)
Labor	2.44 (1.38)	2.60 (1.16)	2.25 (1.22)	2.19 (1.08)	2.33 (1.57)	2.49 (1.43)	1.95 (1.40)	2.35 (1.58)

a/ Level of debt is defined in terms of the estimated debt to the firm's total asset ratio. None includes producers with no debt. Low indicates less than 20 percent debt, medium is 20 to 49 percent debt and high is 50 percent and more debt. If the firm net worth information was not available, family net worth was used.



leverage. In all cases, the greater the percent of debt, the greater importance given to these sources of variability in crop production. Producers with greater percentages of debt also gave significantly greater importance to product prices as a source of variability. Although less systematic in relation to the level of debt, there were significant differences among groups with respect to the importance of leasing, government laws and regulations, and inflation as sources of variability.

In livestock production, producers with greater percentages of debt also gave significantly greater importance to availability of loan funds, cost of credit and use of leverage than producers with less debt. However in contrast to crop production, product prices tended to be given less importance as a source of variability by producers with higher percentages of debt. Although weather and input costs were given greater importance by producers with lower percentages of debt, the relationship was not statistically significant for input costs. Government laws and regulations, world events and safety were all given significantly less importance as sources of variability by producers with higher percentages of debt.

#### Educational Level of the Operator

Another factor which may influence a producer's perceptions and attitudes about variability is level of education. Producers were grouped as those with a high school education or less, those with some post high school training and college graduates. Table 10 presents the means and standard deviations of the importance ratings by educational level of the operator.

In crop production, Chi square values were statistically significant at the 10 percent level or higher for weather, capital equipment costs and world events, indicating differences among groups. Kendall's taus were significant at the 5 percent level for weather and input costs, but were not significant at even the 20 percent level for either product prices or credit costs. With respect to livestock production variability, government programs was the only source with a Chi square value which was significant at the 10 percent level. None of the Kendall's taus were significant at the 10 percent level.

There were fewer differences among educational levels in the importance given to various sources of variability than for the type and size of firm or level of debt. Furthermore, these differences were less systematically related to the level of education than the other factors analyzed. Although other operator and firm characteristics could be used to classify producers, it appears clear that producers do differ in the importance given to various sources of variability.

#### Importance and Use of Response Methods

Producers were given a total of 21 responses, each with a brief description, which could be used to deal with variability (see Appendix A). They were asked to indicate the importance of each method for dealing with variability in their operation. Possible responses were

Table 10. Mean Importance Ratings and Standard Deviations (in parentheses) of Source by Variability in Crop and Livestock Production by the Operator's Level of Education.

Sources of Variability	Crop Production			Livestock Production		
	Level of Education <sup>a</sup>			Level of Education		
	High School n=42	Post high school training n=30	College graduate n=45	High School n=45	Post high school training n=24	College graduate n=26
Weather	4.60 (.94)	4.75 (.50)	4.46 (.82)	3.89 (1.34)	4.08 (1.26)	3.67 (1.36)
Diseases and pests	3.79 (1.14)	4.03 (1.08)	3.94 (.92)	3.58 (1.39)	3.76 (1.20)	3.77 (1.07)
Product prices	4.13 (1.25)	4.17 (1.23)	4.43 (.88)	4.06 (1.21)	4.12 (1.24)	3.96 (1.22)
Input costs	4.08 (1.16)	4.03 (1.08)	3.70 (1.10)	3.83 (1.32)	4.00 (1.19)	4.04 (1.16)
Capital equipment	3.54 (1.35)	3.72 (1.21)	3.51 (1.08)	2.98 (1.34)	2.96 (1.37)	3.00 (1.27)
Credit availability	2.90 (1.56)	2.89 (1.53)	2.83 (1.40)	2.57 (1.63)	2.38 (1.38)	2.52 (1.55)
Credit cost	3.08 (1.49)	3.36 (1.55)	3.57 (1.25)	3.02 (1.70)	2.91 (1.78)	3.07 (1.66)
Leverage	2.85 (1.40)	3.06 (1.55)	3.04 (1.35)	2.64 (1.52)	2.61 (1.59)	2.56 (1.60)
Leasing	2.35 (1.48)	2.81 (1.55)	2.68 (1.42)	2.23 (1.52)	1.75 (1.26)	1.89 (1.22)
Technology	2.80 (1.15)	2.81 (1.31)	2.91 (1.08)	2.19 (1.25)	2.58 (1.47)	2.63 (1.28)
Government programs	3.29 (1.50)	3.19 (1.41)	3.38 (1.36)	2.36 (1.54)	2.88 (1.48)	2.22 (1.50)
Government laws	2.98 (1.38)	3.14 (1.42)	2.89 (1.26)	2.83 (1.59)	3.17 (1.58)	2.56 (1.45)
Inflation	3.77 (1.39)	4.06 (1.12)	4.00 (.98)	3.49 (1.61)	3.74 (1.36)	3.26 (1.51)
World events	3.42 (1.44)	3.83 (1.21)	3.94 (.90)	3.15 (1.37)	3.42 (1.47)	2.96 (1.37)
Safety	3.69 (1.32)	3.83 (1.30)	3.53 (1.25)	3.51 (1.47)	3.54 (1.69)	3.48 (1.45)
Family	2.81 (1.41)	3.30 (1.41)	3.07 (1.21)	2.70 (1.55)	3.13 (1.73)	2.85 (1.46)
Labor	2.44 (1.38)	2.19 (1.12)	2.57 (1.08)	2.17 (1.52)	2.22 (1.45)	2.59 (1.39)

<sup>a</sup>/ Level of education is coded as high school being high school graduate or less; post high school training includes individuals with some college, technical and vocational training; and college graduate also includes those with post graduate training.

"very important," "moderately important," "slightly important," "not important" and "does not apply." Producers were asked to indicate whether they used a response method and if they did, to briefly describe how they used it.

Chi square and Kendall's tau c were calculated to determine whether the degree of importance given a response method is independent of the producer group classification. There are some response methods, such as feed reserves for crop producers and crop insurance for livestock producers, for which the "does not apply" response is appropriate. With respect to most response methods there is little difference between "not important" and "does not apply." These responses were combined in the following analyses.

Table 11 summarizes the classification of responses to variability, percentage of producers by level of importance of the response, and the percentage of producers utilizing the response in their operations. Pacing investments was considered very important as a response to variability by 56.3 percent of the producers. Market information was considered very important by 48.6 percent of the producers, while enterprise diversification was considered very important by 40.3 percent. Other responses considered very important by 30 percent or more of the producers were spreading sales, maintaining eligibility for government commodity programs, maintaining financial reserves and debt management.

Responses considered not important by a majority of producers were: government emergency credit program (68.8 percent), hedging (64.3 percent), all-risk crop insurance (62.4 percent), geographic dispersion (58.7 percent), family off-farm work activities (54.4 percent), operator off-farm work activities (54.1 percent), and hail insurance (52.3 percent).

About 90.5 percent of producers indicated they obtained market information to improve knowledge of expected prices and 89.6 percent paced investments. Enterprise diversification, spreading sales and forward contracting of output or inputs were each used by over 77 percent of producers. The government emergency credit program (18.2 percent) and hedging (18.3 percent) were the least commonly used responses. Although off-farm work activities were considered not important by a majority of producers, about 49.6 percent had off-farm work activities and 42.9 percent had family members involved in off-farm work.

It should be noted that all these percentages are calculated on the basis of producers responding to the question, not total producers. The number of producers not responding to whether they used the response question was generally higher than the producers not responding to the importance of response question. If producers indicating that a response was not important skipped their use of the response question, the percentage of producers using a method would be overestimated. Manual review of the questionnaires might indicate the extent of this problem.

Table 11. Classification of Responses to Variability, Percentage of Producers by Level of Importance of Response Method and Percent of Producers Using Response.

Response Method	Importance of Response Method				Producers <sup>a</sup> using response (%)
	Very	Moderate	Slight	Not	
	----(percentage of producers)-----				
PRODUCTION RESPONSES					
Enterprise diversification	40.3	32.7	8.3	18.8	77.6
Geographic dispersion	9.4	18.8	13.0	58.7	37.0
Prod. practice diversification	23.0	41.7	15.1	20.1	72.4
Feed reserves	20.1	26.6	11.5	41.7	65.7
Maintaining flexibility	27.5	26.8	26.8	19.0	65.1
Idling production capacity	8.8	28.5	24.1	38.7	56.7
MARKETING RESPONSES					
Spreading sales	31.7	42.1	9.0	17.2	77.3
Forward contracting	22.6	14.4	37.0	26.0	77.6
Hedging	7.9	11.4	16.4	64.3	18.3
Market information	48.6	36.1	8.3	6.9	90.5
Government commodity program	31.5	33.6	14.0	21.0	74.6
FINANCIAL RESPONSES					
Hail insurance	19.5	13.3	14.8	52.3	47.3
All-risk crop insurance	13.5	12.8	11.3	62.4	31.1
Financial reserves	36.7	30.2	13.7	19.4	65.6
Inventory reserves	17.2	18.7	15.7	48.5	46.0
Credit reserves	26.8	35.2	14.1	23.9	68.2
Debt management	33.1	9.8	16.5	40.6	51.3
Gov't. emergency credit	11.6	7.2	12.3	68.8	18.2
Pacing investments	56.3	27.5	5.6	10.6	89.6
Operator off-farm activities	22.2	11.9	11.9	54.1	49.6
Family off-farm activities	11.0	16.9	17.6	54.4	42.9

<sup>a/</sup> Calculated as a percentage of producers responding to this question, not total producers.

In presentation of the effects of type of firm, size of firm, percent debt and educational level of the operator on the importance and use of response methods, only those responses for which there are statistically significant differences among groups will be presented.

#### Type of Producer

Among the production responses, there were significant differences among types of producers on enterprise diversification and production practice diversification. Over half, 51.4 percent, of the mixed producers considered enterprise diversification as "very important" as compared with 35.0 and 28.6 percent of the livestock and crop producers respectively. Of the mixed producers, 89.9 percent used diversification as a response to variability as compared with 67.4 percent of crop producers and 59.1 percent of livestock producers. Some 56.5 percent of the livestock producers considered production practice diversification "not important" as compared with 16.2 and 8.3 percent of the mixed and crop producers respectively. Differences in use of the production practice response were highly significant. Only 42.1 percent of livestock used diversified production practices as compared with 75.0 percent of mixed producers and 80.9 percent of crop producers.

There were also significant differences among groups with respect to the importance and use of marketing responses. Some 36.0 percent of crop producers and 24.7 percent of mixed producers considered forward contracting as "very important" in contrast to 8.7 percent of livestock producers. Forward contracting was done by 93.8 percent of the crop producers, 73.8 percent of mixed producers and 52.4 percent of livestock producers. These differences in use were highly significant. In contrast to forward contracting, hedging was considered "very important" by 27.3 percent of the livestock producers and only 6.4 and 2.8 percent of crop and mixed producers respectively. About 30.4 percent of the livestock producers used hedging as compared with 25.0 percent of crop producers and 9.5 percent of mixed producers. Differences among groups were significant at the 5 percent level. Although differences among groups with respect to the importance of spreading sales were not significant, significantly fewer livestock producers (59.1 percent) spread sales as compared with 77.8 and 83.1 percent of the crop and mixed producers respectively.

Differences among groups with respect to the government commodity programs were highly significant. Only 4.8 percent of the livestock producers considered these programs as "very important" and 29.4 percent participated. In contrast, 40.0 percent of crop producers and 33.3 percent of mixed producers considered the programs as very important and 89.4 and 75.8 percent respectively participated.

Among the financial responses to variability, there were highly significant differences among groups with respect to the importance of hail insurance and inventory reserves. Only 8.2 percent of the mixed producers considered hail insurance as "very important" compared with 36.1 percent of crop farmers. Significantly more, 79.1 percent of the crop producers, as compared with 34.0 percent of mixed producers purchased hail insurance. Only 27.8 percent of livestock producers con-



sidered inventory reserves as "not important" as compared with 63.8 percent of the crop producers and 43.5 percent of mixed producers. Although crop producers utilized inventory reserves as a response to variability less than other groups, differences were not significant.

Differences in importance attached to all-risk crop insurance and pacing investments were not significant, but differences in use of these responses were. Significantly more mixed producers (44.6 percent) than crop producers (19.0 percent) used crop insurance. Only 78.3 percent of livestock producers paced investments as compared with 89.2 and 95.7 percent of the mixed and crop producers.

Off-farm work activities by the operator or other family members can be a response to variability. Although there were no significant differences among groups, substantial percentages of producers participated or had family members participating in off-farm work. Some 38 percent of the crop and livestock producers and 35 percent of the mixed producers worked off-farm more than 125 days per year.

In terms of some of the operator and firm characteristics, it was found the crop producers had significantly larger areas of crops than mixed producers (1098 vs. 702 acres). The crop producers were significantly younger (43.3 vs. 49.8 years of age) and had significantly less experience in farming (20.7 vs. 29.4 years) than mixed producers. Livestock producers were younger (46.1 years of age) and had less farming experience (26.0) than mixed producers, but the differences were not statistically significant. There were significant differences among the three groups with respect to education (Chi square = 17.98 for 4 d.f.) A total of 25 crop producers (50 percent) had completed college as compared with about 27 and 25 percent for mixed and livestock producers respectively. Conversely, 52 percent of the mixed producers have a high school education or less as compared with 33 percent of the livestock producers and 18 percent of the crop producers.

Chi square values did not indicate significant differences among the three producer groups for gross sales, taxable farm income or taxable family income for 1980 through 1982. Although the Chi square for firm net worth was significant (15.71 for 8 d.f.) with livestock firms having higher net worths, family net worths were similar. The groups were also similar with respect to operating credit, intermediate or long-term credit, and estimated debt/asset percentages.

#### Size of Firm

There were a number of significant differences among size of firms with respect to the importance given to responses and their use of them. Among the production responses there were substantial differences among groups with respect to diversified production practices and flexibility. Only 14.9 percent of the small firms considered diversified production practices "very important" in contrast to 31.6 and 31.8 percent of the large and very large firms. Only 62.8 percent of the small firms used diversified production practices as compared with 78.1 percent of the medium, 76.3 percent of the large and 76.2 percent of

the very large firms. With respect to flexibility, 50.0 percent of the very large firms considered it "very important" as compared with 19.1 percent of small firms. Some 12.5 to 15.2 percent of the larger firms considered flexibility as "not important" in contrast to 29.8 percent of small firms. There were also significant differences in the use of flexibility among groups with 57.9 of the small, 56.3 percent of the medium, 68.4 percent of the large and 85.7 percent of the very large firms using flexibility. Although larger firms gave more importance to geographic dispersion of production, differences in use were not significant among groups.

The groups differed significantly with respect to the importance given to marketing responses and their use of them. Hedging was considered "not important" by 78.7 percent of small firms and 70.6 percent of medium firms as compared with 56.8 percent and 36.4 percent of the large and very large firms. Over 27 percent of the large and very large firms hedged as compared with 11 percent of the small and medium firms. Although larger firms gave greater importance to spreading sales and forward contracting, differences in use of the response methods were not statistically significant.

Operator off-farm work activities were "very important" to 47.8 percent of the small firms as compared with less than 10 percent of the other firms. Off-farm work activities by family members were significantly more important for the small firm category than other groups. Significantly more small firm operators were in off-farm activities (79.5 percent) than other groups (34.6 percent overall). Of the small and medium firms, 52.5 and 55.2 percent respectively had family members in off-farm activities. This compares with 22.6 and 36.8 percent for the large and very large firms.

Other financial responses for which there were significant differences among size groups were inventory reserves, debt management and hail insurance. Inventory reserves were considered more important by the small and medium size firms. Inventory reserves were utilized by 51.4 percent of small firms and 65.6 percent of the medium firms as compared with 33.3 and 26.3 percent of the large and very large firms. Debt management (refinancing) was considered "very important" by 40.0 percent of small firms and 38.7 percent of medium firms in contrast to 27.8 percent of large firms and only 19.0 percent of very large firms. There were also significant differences in use of debt management as 59.5 and 62.1 percent of the small and medium firms had used it as compared with 42.4 and 33.3 percent for the large and very large firms. The small and very large firms gave more importance to hail insurance, but differences in use were not statistically significant.

With respect to other characteristics of the firm and operator, there were no significant differences among size of firms in age categories of the operator or type of operation. As would be expected, the relationships between the size of firm and firm net worth, family net worth, operating credit, long term credit and farm income were highly significant. The larger firms were also associated with operators with higher levels of education.

Financial Position: Debt to Total Assets

The percentage of producers considering enterprise diversification as "very important" increased from 29.2 percent for the no debt group to 55.6 percent for those highly leveraged (50 percent or more debt). Only 60.0 percent of the no debt group indicated they used enterprise diversification as compared with 92.0 percent of the highly leveraged. For flexibility, the percentage considering it "not important" dropped from 43.5 percent of the no debt group to 3.7 percent for the highly leveraged group. Only 44.4 percent of the no debt group practiced flexibility as compared with 80.8 percent of highly leveraged. Although there were no significant differences in the importance given to production practice diversification, there was a significant association between higher levels of percent debt and a greater percentage of producers using production practice diversification. Feed reserves were maintained by all of the debt free livestock producers, but use declined to 58.8 of the livestock producers with 50 percent or more debt.

In the area of marketing responses, the groups with some debt tended to be quite similar and presented a contrast to the no debt group. There were significant differences with respect to the importance given and use of spreading sales, forward contracting and hedging. Spreading sales was considered "not important" by 33.3 percent of the no debt group and 11.9 percent of those with debt. Only 57.1 percent of the no debt group used spreading of sales as compared with 81.7 percent of the others. Forward contracting was considered "very important" by 28.8 percent and used by 80.9 percent of those with some debt. Only 12.5 percent of those with no debt considered forwarding contracting important and 52.6 percent utilized it. Hedging is considered "not important" by 62.3 percent of those with some debt and 70.8 percent of the no debt group. None of the producers with no debt used hedging as compared with 21.9 percent of those with some debt. Although there was no significant difference in the importance given market information by producers, 23.8 percent of those with no debt did not use market information as compared with only 7.1 percent of producers with debt.

Although there were not significant differences in the importance given to holding financial or inventory reserves by the groups, there were significant differences in the use of these methods. The percentage of producers holding financial reserves dropped from 88.9 percent for the no debt group to 40.0 percent for the group with 50 percent debt. The percentages holding inventory reserves were 63.2 for the no debt group and 27.3 percent for the highly leveraged group. Of those with 50 percent debt or more, 72.0 percent considered debt management "very important" and 80.0 percent had utilized the response. In contrast, only 16.7 percent of the no debt group considered it "very important" and 17.6 percent had utilized it. Only 44.0 percent of the highly leveraged group considered the government emergency credit program as "not important" as compared with 87.5 percent of those with no debt. Differences in use were also highly significant, 36.0 percent of the highly leveraged group as compared with 5.9 percent of those with no debt. Although the importance given to pacing investments increased with the level of debt, there were no significant differences in the groups in their use of the pacing investments response.

The no debt and 50 percent or more debt groups were similar with respect to the importance and use of all-risk crop insurance. Over 27 percent of each group considered crop insurance "very important" and about 54 percent of both groups used it. In contrast, for producers with some debt but less than 50 percent debt, less than 10 percent considered crop insurance "very important" and 22.7 percent utilized it.

There were a number of significant associations by the level of debt and other characteristics of the firm and operator. Producers with no debt tended to be older. Some 47.6 percent of the producers 60 years of age or older had no debt as compared with 13.3 percent of those under 40. Over one-half of the producers with 50 percent or more debt were under the age of 40. Higher levels of debt were associated with higher levels of education. As would be expected, higher debt percentages were associated with lower levels of firm and family net worth. The higher percentages of debt were also associated with lower farm and family incomes.

#### Educational Level of the Operator

Among the production responses, there were statistically significant differences among educational levels for flexibility and enterprise diversification. Flexibility was considered "not important" in dealing with variability by 6.1 percent of the college graduates and "very important" by 36.7 percent. Of those with some college, 28.9 percent considered flexibility as "not important" and 21.1 percent as "very important." The percentages for those with a high school education or less, the respective figures were 21.6 and 23.5 percent. Flexibility was used by 83.0 percent of the college graduates, 54.3 percent of the some college group and 56.8 percent of the high school group. Enterprise diversification was "moderately or very important" for 86.0 percent of the college graduates as compared with 69.2 and 60.5 percent for the high school and some college groups. Only 63.9 percent of the some college group used enterprise diversification as compared with 80.9 and 85.1 percent of the high school and some college groups.

Producers with higher levels of education gave greater importance to market information, forward contracting and hedging. These producers also made greater useage of forward contracting and hedging. Of the college graduate group, 41.2 percent considered forward contracting "very important" as compared with 23.1 percent of the some college group and 13.5 percent of the high school group. The percentages considering hedging "very important" were 11.8, 13.9, and 0 for the college graduate, some college and high school groups respectively. Forward contracting was used by 90.9 percent of the college graduates, 73.7 percent of the some college and 66.0 percent of the high school groups. The percentages for hedging were 28.9, 23.5 and 4.4 percent for the respective groups. Producers with higher levels of education gave greater importance to maintaining eligibility for government commodity programs. Significantly more, 86.0 percent, of the college graduates participated in programs as compared with 67 percent for each of the other groups.

In the financial responses, the more highly educated group gave less importance to all-risk crop insurance and utilized it less. Of the high school group, 23.1 percent considered all-risk crop insurance "very important" and 44.4 percent used it. In contrast, only 9.1 percent of the college graduate group considered it "very important" and 26.6 percent used it. A similar pattern was also observed for the use of inventory reserves. In the high school group, 25.5 percent considered inventory reserves "very important" and 56.8 percent utilized them. In contrast, only 6.4 percent of the college graduate group considered them very important and 33.3 percent used them. Although the more highly educated groups gave greater importance to financial reserves, there were no significant differences in use among groups.

There were a number of statistically significant associations between the educational level of the operator and other characteristics. Younger operators had higher levels of education. Only 5.4 percent of the operators with a high school education or less were under 40, but 57.7 percent of the college graduate groups were under 40. Higher levels of education were associated with higher levels of firm and family net worth as well as percent debt. However, the associations between educational level and the levels of farm and family income were not significant.

#### Managerial Strategies and Variability

Eight states included a section of the questionnaire asking about managerial strategies and variability. These were Illinois, Indiana, Kansas, Mississippi, North Dakota, Oklahoma, Washington and Wyoming for a total of 93 producers. This section was not included in the questionnaires for Alabama, Arizona, Florida and Georgia. Table 12 provides the wording of the questions. If producers responded affirm-

Table 12. Managerial Strategies and Variability

Questions	Number of Responses	% responding	
		No	Yes
When managing your farm business do you combine responses into an overall strategy?	87	13.8	86.2
If you take an action which increases variability in one aspect of your operation, do you try to offset this with other actions in another part of the business?	85	56.5	43.5
Are there costs associated with responses to variability? Do you get up some income to reduce variability?	75	44.0	56.0
Have your responses to variability resulted from or been influenced by people or institutions (e.g., lenders, etc.) with whom you deal?	89	43.8	56.2



atively to questions, they were asked to illustrate this with an example from their operation. Producers, at least in Indiana, seemed to have substantially greater difficulty in understanding and responding to this section of the questionnaire. A number requested clarification and/or guidance in responding to this section.

The vast majority of producers responding, 86.2 percent, indicated that they did combine responses into a strategy to cope with variability. Several Indiana producers articulated a "philosophy of life" which they followed in their intermediate and long-term decision-making which had substantial safety-first considerations. Significantly more, 93.2 percent, of those graduating from college as compared with 73.1 percent of those with high school education or less responded that they combined responses. Size or type of operation and level of debt had no significant effect.

Only 43.5 percent of the producers indicated that when taking an action which increased variability in one aspect that they took another action to offset it. Several Indiana producers indicated that although they considered the overall business when making a decision, they avoided situations where taking one action would require offsetting actions. It appears that they recognized risk balancing, but avoided situations in which it was necessary. Significantly more of the producers with 50 percent or more debt, 58.5 percent, as compared with only 30.8 percent of with no debt took offsetting actions.

Overall 56.0 percent of the producers responding indicated there were costs associated with responses to variability. Of producers with a college education 68.0 percent responded positively to the question, significantly more than the 45.8 percent of producers with high school educations. Level of debt, firm size and type of producer were not significant. It was surprising to me that this question had the lowest response rate of any question in this section. Almost 20 percent of the producers did not respond.

Other people or institutions influenced the responses to variability of 56.2 percent of the respondents. Although there was a tendency for more highly educated producers to be more influenced by others, differences were not statistically significant. Differences among types of producers were significant. Although 68.8 percent of crop producers were influenced by others, only 42.1 percent of livestock producers were.

#### Summary and Conclusions

This paper presents some analysis of pilot survey work done in 12 of the states cooperating in the S-180 regional research project. A primary objective of this survey was to determine whether firm and producer characteristics influence producers' perceptions of importance and responses to variability. A total of 149 respondents were classified by type of operation, size in gross sales, debt to total assets and educational level of the operator.

When comparing crop and mixed producers with respect to the importance of various sources of variability in crop production, there were no statistically significant differences between groups. When classified by size of firm, there were differences among size classes with respect to the importance of inflation, hired technology and changes in technology as sources of variability. Product prices, availability of loan funds, cost of credit, use of leverage, leasers, government laws and regulation, and inflation differed in importance as sources of variability when firms were classified by the debt to total asset ratio. When firms were classified on the basis of the operator's educational level, there were differences in the importance given to weather, product prices, input prices and the cost of credit as sources of variability in crop production.

Producer and firm characteristics were also associated with significant differences in livestock production. Mixed and livestock producers had significant differences with respect to the importance of weather, product prices, cost of credit, leasing, government commodity programs, government laws and regulations, inflation, world events, and safety and health. In all these cases, livestock producers assigned higher values to these sources of variability than mixed producers. However when classified by size, there were significant differences only with respect to leasing, world events and hired labor. Weather, product prices, availability of loan funds, cost of credit, use of leverage, government rules and regulations, world events, and safety and health differed significantly among the firms when classified by the debt to total percentage. Producers with higher levels of debt tended to give greater importance to factors at least partially under their control as compared with the importance given to weather, world events and product prices by the producers with lower debt percentages. Leasing and changes in technology, both given higher levels of importance by producers with higher levels of education, were the only significant differences among sources of variability in livestock production.

Based on these results, there are operator or firm characteristics associated with differences in almost all of the sources of variability in both crop and livestock production. Diseases and pests, capital equipment and changes in family plans were the only sources of variability for which size, type, financial position or educational level was not associated with significant differences. Furthermore, all of the factors considered were associated with significant differences.

There were also significant differences in responses to variability when respondents were classified by the factors discussed above. When classified by type of producer there were significant differences in diversification of enterprises and production practices, forward contracting, hedging, participation in government commodity programs, use of hail insurance and inventory reserves. Differences in geographic dispersion, production practice diversification, spreading sales, forward contracting, flexibility, use of inventory reserves responses were associated with firm size. In addition, off-farm activities by the operator and family were of major importance for smaller producers.

Although there were relatively few differences in the importance of sources of variability associated with education, there were substantial differences with respect to responses. More highly educated producers gave greater importance to and made greater use of enterprise diversification, forward contracting, hedging, government commodity programs, financial reserves and flexibility. Producers with higher levels of debt gave greater importance to variability associated with the availability and cost of credit.

My impression, based on interviews with Indiana producers as well as an overview of the questionnaires from other states, is that producers give great emphasis to long-run aspects of variability. They express some concern for year-to-year variability and certainly take actions to reduce it. However, producers expressed considerable concern about decisions affecting several production periods.

Overall, it is clear that there are differences among producers in this pilot study with respect to their perceptions and responses to variability. Some of these differences support common hypotheses about producers' actions. However, there does not appear to be a strong relationship between the importance placed on a source of variability and a producer's responses. A somewhat different type of questionnaire design, similar to that used in Florida and Georgia, would be more useful in analyzing this.

This survey was a pilot survey. I judge it successful. Producers did differ with respect to the importance given to sources of variability in crop and livestock production. Differences also existed with respect to producers' responses to variability. Future research design should incorporate this. However, success of the pilot project does not imply that the survey should be expanded nationally with a statistical representative sample. In many cases, the questions asked were too general to identify specific concerns of producers. More specific questions or follow-up questions could be tailored for specific types of producers. It was also difficult to separate the degree to which a producer's use of a response was due to variability or other factors. Expansion of the geographic scope of a study would complicate both of these problems. However, I would strongly encourage additional research in this area using representative samples from limited areas. I would also encourage individual researchers to work in cooperation to facilitate comparison and generalization of their results.

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## Appendix A

CONFIDENTIAL

State: \_\_\_\_\_

Questionnaire No. \_\_\_\_\_

## FARMERS' ATTITUDES, PERCEPTIONS AND MANAGEMENT RESPONSES TO VARIABILITY

I. General Information About the Farm

Please complete or check the correct response.

## 1. Size of Farm (in a normal year)

- a. Acres owned \_\_\_\_\_;  
 Acres cash rented \_\_\_\_\_;  
 Acres share leased \_\_\_\_\_;
- b. Acres in crops and/or harvested forage \_\_\_\_\_;
- c. Acres in pasture or range \_\_\_\_\_.

## 2. Primary crops (please list in order of importance by acres).

	<u>Crop</u>	<u>Acres (in normal year)</u>
a.	_____	_____
b.	_____	_____
c.	_____	_____
d.	_____	_____
e.	_____	_____

## 3. Primary livestock enterprises (please list in order of importance).

For breeding livestock, indicate the average number of head on hand at one time.

For feeder livestock, indicate total yearly production in head and one time capacity of facilities.

	<u>Type of Livestock</u>	<u>Size of Enterprise</u>
a.	_____	_____
b.	_____	_____
c.	_____	_____

## 4. Gross farm sales per year, 1980-1982. (Please check correct category)

	1980	1981	1982
Under \$20,000	_____	_____	_____
\$20,000-\$39,999	_____	_____	_____
\$40,000-\$99,999	_____	_____	_____
\$100,000-\$199,999	_____	_____	_____
\$200,000-\$499,999	_____	_____	_____
\$500,000-\$999,999	_____	_____	_____
Over \$1,000,000	_____	_____	_____

## 5. Form of business organization. (Please check correct response)

Individual or family proprietorship \_\_\_\_\_; Family partnership \_\_\_\_\_;

Other partnership \_\_\_\_\_; "S" corporation \_\_\_\_\_;

Regular corporation \_\_\_\_\_; Other or combination \_\_\_\_\_;

Indicate combination \_\_\_\_\_



## II. Relative Importance of Variability

Agriculture is characterized by variability. This variability makes the outcome of decisions and actions uncertain. An outcome may be better or worse than expected. Variability in agriculture is the result of many factors. The following factors represent possible sources of variability. Please indicate the relative importance of each source of variability to your farm business. If you have both crops and livestock, please complete both sections. Otherwise, complete only the appropriate section.

### VARIABILITY FOR CROP PRODUCERS

(Please circle the number representing the importance to you of each source.)

	<u>Extremely Important</u>	<u>Moderately Important</u>	<u>Not Important</u>	<u>Does Not Apply</u>		
a. Weather variability (drought, hail, flooding, etc.)	5	4	3	2	1	0
b. Diseases and pests (plant diseases, insects, etc.)	5	4	3	2	1	0
c. Commodity prices (fluctuating prices received due to supply and demand factors)	5	4	3	2	1	0
d. Costs of operating inputs (fluctuating prices for seed, chemicals, fertilizers, fuel, etc.)	5	4	3	2	1	0
e. Costs of capital equipment (unexpected variation in machinery and land prices)	5	4	3	2	1	0
f. Availability of loan funds (unexpected variation in availability of funds from lending institutions)	5	4	3	2	1	0
g. Cost of credit (unexpected variation in interest rates)	5	4	3	2	1	0
h. Use of leverage (unexpected changes in vulnerability of cash flows and credit worthiness due to high leverage)	5	4	3	2	1	0
i. Leasing (unexpected changes in availability or terms of leasing cropland)	5	4	3	2	1	0

	<u>Extremely Important</u>	<u>Moderately Important</u>	<u>Not Important</u>	<u>Does Not Apply</u>		
j. Changes in technology (development of new capital items that make existing items obsolete and of reduced value, e.g., new harvester)	5	4	3	2	1	0
k. Government commodity programs (unexpected changes in target prices, loan levels, eligibility requirements)	5	4	3	2	1	0
l. Government laws and regulations (unexpected changes in tax laws, environmental regulations, labor regulations, etc.)	5	4	3	2	1	0
m. Inflation (unexpected changes in prices, costs and investment returns)	5	4	3	2	1	0
n. World economic situation (unexpected world events which affect your farm)	5	4	3	2	1	0
o. Safety and health (accidents, personal or family illness)	5	4	3	2	1	0
p. Family plans (unexpected changes in family situation, family goals, etc.)	5	4	3	2	1	0
q. Hired labor (unexpected changes associated with hired labor)	5	4	3	2	1	0
r. Other (please indicate sources of variation)	5	4	3	2	1	0
	5	4	3	2	1	0
	5	4	3	2	1	0

#### VARIABILITY FOR LIVESTOCK PRODUCERS

(Please circle the number representing the importance to you of each source.)

	<u>Extremely Important</u>	<u>Moderately Important</u>	<u>Not Important</u>	<u>Does Not Apply</u>		
a. Weather variability (heat, cold, climatic conditions affecting feed supplies, etc.)	5	4	3	2	1	0
b. Diseases and pests (animal dis- eases, insects, parasites, etc.)	5	4	3	2	1	0

	<u>Extremely</u> <u>Important</u>	<u>Moderately</u> <u>Important</u>	<u>Not</u> <u>Important</u>	<u>Does Not</u> <u>Apply</u>		
c. Livestock and product prices (fluctuating prices received due to supply and demand factors)	5	4	3	2	1	0
d. Costs of operating inputs (fluctuating prices for feed, feeder livestock, etc.)	5	4	3	2	1	0
e. Costs of capital equipment (unexpected variation in costs of livestock facilities, breeding stock, etc.)	5	4	3	2	1	0
f. Availability of loan funds (unexpected variation in availability of funds from lending institutions)	5	4	3	2	1	0
g. Cost of credit (unexpected variation in interest rates)	5	4	3	2	1	0
h. Use of leverage (unexpected changes in vulnerability of cash flows and credit worthiness due to high leverage)	5	4	3	2	1	0
i. Leasing (unexpected changes in availability or terms of leasing land)	5	4	3	2	1	0
j. Changes in technology (development of new capital items that make existing items obsolete and of reduced value, e.g., confinement buildings)	5	4	3	2	1	0
k. Government agricultural programs (unexpected changes in government programs affecting livestock producers, e.g., dairy program, public land, etc.)	5	4	3	2	1	0
l. Government laws and regulations (unexpected changes in tax laws, environmental regulations, feed additives, labor regulations, etc.)	5	4	3	2	1	0
m. Inflation (unexpected changes in prices, costs and investment returns)	5	4	3	2	1	0

	<u>Extremely Important</u>	<u>Moderately Important</u>	<u>Not Important</u>	<u>Does Not Apply</u>		
n. World economic situation (unexpected world events which affect your farm)	5	4	3	2	1	0
o. Safety and health (accidents, personal or family illness)	5	4	3	2	1	0
p. Family plans (unexpected changes in family situation, family goals, etc.)	5	4	3	2	1	0
q. Hired labor (unexpected changes associated with hired labor)	5	4	3	2	1	0
r. Other (please indicate sources of variation)	5	4	3	2	1	0
	5	4	3	2	1	0

III. Management Responses to Variability

This part of the survey lists a number of responses or methods which some farmers use to deal with variability. First, please indicate the relative importance of these methods for dealing with the variability on your farm. If a method is extremely important to you, circle the "very important". If the method does not apply to the variability you face, circle the "does not apply".

Second, please indicate whether you use this method or response in your farm operation to deal with variability. If you do use a response, please add some brief comments to describe how you use it. Sometimes you may use a response for a reason other than variability. If there are other reasons important in your decision, please indicate this too.

1. Enterprise diversification: production of more than one enterprise to spread risks and stabilize total returns.

a. How important is this method to you? (Please circle appropriate response)

Very Important      Moderately Important      Slightly Important      Not Important      Does Not Apply

b. Do you use this method? No \_\_\_\_\_ Yes \_\_\_\_\_. If you use this method, please provide a brief description of how you use it.

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2. Geographic diversification: operation of farm units of over a wide geographic area to spread risks and stabilize returns.
- a. How important is this method to you? (Please circle appropriate response)
- |                   |                         |                       |                  |                   |
|-------------------|-------------------------|-----------------------|------------------|-------------------|
| Very<br>Important | Moderately<br>Important | Slightly<br>Important | Not<br>Important | Does Not<br>Apply |
|-------------------|-------------------------|-----------------------|------------------|-------------------|
- b. Do you use this method? No \_\_\_\_ Yes \_\_\_\_ . If you use this method, please provide a brief description of how you use it.
- 
- 
- 
3. Production practice diversification: use of multiple varieties combinations of herbicides, use of fertilizers in different forms, etc. to spread risks and stabilize returns.
- a. How important is this method to you? (Please circle appropriate response)
- |                   |                         |                       |                  |                   |
|-------------------|-------------------------|-----------------------|------------------|-------------------|
| Very<br>Important | Moderately<br>Important | Slightly<br>Important | Not<br>Important | Does Not<br>Apply |
|-------------------|-------------------------|-----------------------|------------------|-------------------|
- b. Do you use this method? No \_\_\_\_ Yes \_\_\_\_ . If you use this method, please provide a brief description of how you use it.
- 
- 
- 
4. Maintaining feed reserves: use of physical reserves of feed to offset drought or other unfavorable weather conditions.
- a. How important is this method to you? (Please circle appropriate response)
- |                   |                         |                       |                  |                   |
|-------------------|-------------------------|-----------------------|------------------|-------------------|
| Very<br>Important | Moderately<br>Important | Slightly<br>Important | Not<br>Important | Does Not<br>Apply |
|-------------------|-------------------------|-----------------------|------------------|-------------------|
- b. Do you use this method? No \_\_\_\_ Yes \_\_\_\_ . If you use this method, please provide a brief description of how you use it.
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- 
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5. Spreading sales: use of frequent sales to stabilize prices and to approach the average price during the marketing period.

a. How important is this method to you? (Please circle appropriate response)

Very	Moderately	Slightly	Not	Does Not
Important	Important	Important	Important	Apply

b. Do you use this method? No \_\_\_\_ Yes \_\_\_\_ . If you use this method, please provide a brief description of how you use it.

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6. Forward contracting: use of contractual agreements with a local elevator product handler or input supplier which specify price, quantity, time and perhaps other stipulations of commodity and/or input delivery.

a. How important is this method to you? (Please circle appropriate response)

Very	Moderately	Slightly	Not	Does Not
Important	Important	Important	Important	Apply

b. Do you use this method? No \_\_\_\_ Yes \_\_\_\_ . If you use this method, please provide a brief description of how you use it.

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7. Use of futures markets: hedging on futures markets to stabilize commodity prices.

a. How important is this method to you? (Please circle appropriate response)

Very	Moderately	Slightly	Not	Does Not
Important	Important	Important	Important	Apply

b. Do you use this method? No \_\_\_\_ Yes \_\_\_\_ . If you use this method, please provide a brief description of how you use it.

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8. Market information: obtaining outlook information and reports on market conditions that contribute to knowledge of expected prices.
- a. How important is this method to you? (Please circle appropriate response)
- |                   |                         |                       |                  |                   |
|-------------------|-------------------------|-----------------------|------------------|-------------------|
| Very<br>Important | Moderately<br>Important | Slightly<br>Important | Not<br>Important | Does Not<br>Apply |
|-------------------|-------------------------|-----------------------|------------------|-------------------|
- b. Do you use this method? No \_\_\_\_ Yes \_\_\_\_ . If you use this method, please provide a brief description of how you use it.
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
9. Government commodity programs: maintaining eligibility for government loan, price support and income programs.
- a. How important is this method to you? (Please circle appropriate response)
- |                   |                         |                       |                  |                   |
|-------------------|-------------------------|-----------------------|------------------|-------------------|
| Very<br>Important | Moderately<br>Important | Slightly<br>Important | Not<br>Important | Does Not<br>Apply |
|-------------------|-------------------------|-----------------------|------------------|-------------------|
- b. Do you use this method? No \_\_\_\_ Yes \_\_\_\_ . If you use this method, please provide a brief description of how you use it.
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
10. Hail insurance: purchasing hail insurance as a safeguard against hail damage.
- a. How important is this method to you? (Please circle appropriate response)
- |                   |                         |                       |                  |                   |
|-------------------|-------------------------|-----------------------|------------------|-------------------|
| Very<br>Important | Moderately<br>Important | Slightly<br>Important | Not<br>Important | Does Not<br>Apply |
|-------------------|-------------------------|-----------------------|------------------|-------------------|
- b. Do you use this method? No \_\_\_\_ Yes \_\_\_\_ . If you use this method, please provide a brief description of how you use it.
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

11. All-risk crop insurance: purchasing all-risk crop insurance as a safeguard against loss due to low yields.

a. How important is this method to you? (Please circle appropriate response)

Very Important	Moderately Important	Slightly Important	Not Important	Does Not Apply
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b. Do you use this method? No \_\_\_\_ Yes \_\_\_\_ . If you use this method, please provide a brief description of how you use it.

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12. Maintaining financial reserves: holding bank accounts, mutual funds, stocks, bonds, and other financial assets as a reserve for bad times.

a. How important is this method to you? (Please circle appropriate response)

Very Important	Moderately Important	Slightly Important	Not Important	Does Not Apply
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b. Do you use this method? No \_\_\_\_ Yes \_\_\_\_ . If you use this method, please provide a brief description of how you use it.

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13. Holding inventory reserves: maintaining inventories of grain or other commodities as a reserve for bad times.

a. How important is this method to you? (Please circle appropriate response)

Very Important	Moderately Important	Slightly Important	Not Important	Does Not Apply
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b. Do you use this method? No \_\_\_\_ Yes \_\_\_\_ . If you use this method, please provide a brief description of how you use it.

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14. Holding credit reserve: limiting borrowing to have a reserve of unloaned funds to draw upon in response to unexpected events.

a. How important is this method to you? (Please circle appropriate response)

Very Important	Moderately Important	Slightly Important	Not Important	Does Not Apply
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b. Do you use this method? No \_\_\_\_ Yes \_\_\_\_ . If you use this method, please provide a brief description of how you use it.

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15. Debt management: working with primary lenders to carry over loans, defer payments, refinance or otherwise restructure indebtedness for orderly payoff under adversity.

a. How important is this method to you? (Please circle appropriate response)

Very Important	Moderately Important	Slightly Important	Not Important	Does Not Apply
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b. Do you use this method? No \_\_\_\_ Yes \_\_\_\_ . If you use this method, please provide a brief description of how you use it.

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16. Utilizing government credit program: becoming eligible for and using government (FmHA) emergency credit programs.

a. How important is this method to you? (Please circle appropriate response)

Very Important	Moderately Important	Slightly Important	Not Important	Does Not Apply
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b. Do you use this method? No \_\_\_\_ Yes \_\_\_\_ . If you use this method, please provide a brief description of how you use it.

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17. Maintaining flexibility in farm organization: ability to change enterprises, marketing policies, production systems, and investment plans with changes in operating environment.

a. How important is this method to you? (Please circle appropriate response)

Very Important	Moderately Important	Slightly Important	Not Important	Does Not Apply
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b. Do you use this method? No \_\_\_\_ Yes \_\_\_\_ . If you use this method, please provide a brief description of how you use it.

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18. Idling production capacity: ability to idle acreage, livestock production or other productive capacity with changes in operating capacity.

a. How important is this method to you? (Please circle appropriate response)

Very Important	Moderately Important	Slightly Important	Not Important	Does Not Apply
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b. Do you use this method? No \_\_\_\_ Yes \_\_\_\_ . If you use this method, please provide a brief description of how you use it.

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19. Pacing of investments and expansion: plan capital expenditures (machinery, facilities, breeding livestock and land) to avoid becoming overextended.

a. How important is this method to you? (Please circle appropriate response)

Very Important	Moderately Important	Slightly Important	Not Important	Does Not Apply
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b. Do you use this method? No \_\_\_\_ Yes \_\_\_\_ . If you use this method, please provide a brief description of how you use it.

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20. Off-farm activities by farm operator: complement farm activities and income with part or full-time off-farm work. May be farm related like seed or fertilizer sales, grain hauling, custom work, etc.

a. How important is this method to you? (Please circle appropriate response)

Very Important	Moderately Important	Slightly Important	Not Important	Does Not Apply
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b. Do you use this method? No \_\_\_\_ Yes \_\_\_\_ . If you use this method, please provide a brief description of how you use it.

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21. Off-farm activities by other family members: family members complement farm activities and income with off-farm employment.

a. How important is this method to you? (Please circle appropriate response)

Very Important	Moderately Important	Slightly Important	Not Important	Does Not Apply
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b. Do you use this method? No \_\_\_\_ Yes \_\_\_\_ . If you use this method, please provide a brief description of how you use it.

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22. Do you practice other responses to variability that are not mentioned above? If yes, please indicate what they are.

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IV. Managerial Strategies and Variability

The previous section indicated a number of possible production, marketing, and financial responses to variability.

1. When managing your farm business do you combine responses into an overall strategy? No \_\_\_\_ Yes \_\_\_\_ . If so, please briefly explain your overall strategy and how the responses interact.

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2. If you take an action which increases variability in one aspect of your operation, do you try to offset this with other actions in another part of the business? No \_\_\_\_ Yes \_\_\_\_ . If so, please explain and give some examples.

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3. Are there costs associated with your responses to variability? Do you give up some income to reduce variability? No \_\_\_\_ Yes \_\_\_\_ . If so, please give some examples.

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4. Have your responses to variability resulted from or been influenced by other people or institutions (e.g., lenders, etc.) with whom you deal? No \_\_\_\_ Yes \_\_\_\_ . If so, how?

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V. Information Needs for Dealing with Variability

Judgements and decisions regarding production, marketing and financing have to be made on a daily basis in farming. Today's agriculture places increased emphasis on management's ability to make sound decisions.

1. What types of decisions are the most difficult for you? Why are these decisions more difficult than others for you?

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2. How important are the decisions on variability relative to other decisions you must make?

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3. What are the key decisions you must make relating to variability?

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4. What types of information are most useful in making these decisions?

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5. What types of information not currently available would be most helpful to you in making decisions on variability?

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