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1. Background

1.1 Red River Valley Agriculture

Agriculture in the Red River Valley (RRV) has experienced successive severe production and economic shocks in recent years. The region has been known for production of small grains (wheat, barley, and oats) and several specialty crops (e.g., dry beans, potatoes, sugarbeets, and sunflowers). Yet, over time the region had become dominated by a relatively narrow set of agricultural cropping enterprises. Several years of wheat and barley scab in the 1990s sharply reduced yields and grain quality and added to the volatility of farm returns in the RRV.

Sharply lower commodity prices in the latter 1990s, due to deteriorating international demand, also greatly reduced farm profitability and escalated the financial problems of a wide spectrum of farmers throughout the RRV and elsewhere in Minnesota. As a result of these shocks, many farmers in northwestern Minnesota and northeastern North Dakota counties have not been able to continue farming.

Table 1. Net Returns Per Acre in the Red River Valley, 1994-1999 a/

Crop	1994	1995	1996	1997	1998	1999	Mean	Standard Deviation
					(in $ / acre)			
Canola	--	--	--	--	53.4	62.6	58.	6.
Sunflowers b/	0.8	-13.6	-2.7	7.5	51.4	41.8	14.	26.
Dry beans (navy)	134.2	-13.3	98.9	-30.8	46.9	28.5	44.	64.
Alfalfa hay	55.5	82.8	65.4	39.7	43.7	56.3	57.	16.
Soybeans	21.6	33.4	28.7	43.2	34.8	55.8	36.	12.
Sugarbeets	203.1	93.1	209.3	105.6	16.9	133.8	127.	73.
Corn grain	59.4	29.5	23.9	40.3	11.6	10.6	29.	19.
Wheat (spring)	-0.9	-0.1	27.9	-33.3	-2.9	18.4	2.	21.
Barley	-13.7	9.8	8.9	-32.7	-23.2	31.3	-3.	24.
Corn silage	-17.0	-57.0	-14.9	59.6	--	--	-7.	49.
Potatoes	58.9	-18.0	121.8	26.0	--	--	47.	59.

a/ Returns over total expenses per acre of cash rented land. Returns include government payments.
b/ Nonconfectionary sunflowers only.
Source: MnSCU Farm Management Program, Red River Valley reports.

There is evidence that the volatility of farm returns in relatively high for several of the key crops grown in the RRV, based on farm business reports (see Table 1). We note that spring wheat and barley generated negative returns in percentage terms during 1994-98. The returns on other crops, such as dry beans and sunflowers, were also quite volatile. The most volatile crops in absolute terms (as indicated by the standard deviation measure) include sugarbeets, dry beans, corn silage and potatoes. In terms of relative volatility (as measured by the coefficient of variation), the most risky crops are wheat, barley, corn silage, sunflowers and dry beans.[1] In recent years, canola has provided more stable profits and it has played an increasingly significant role in the crop rotation. Consequently, farmers throughout the RRV have been altering their production plans in order to diversify their production risks and to reduce their operating costs. In addition, farmers have elected to make various adjustments in how they manage their household expenses and revenue-generating activities, some have been forced to financially

[1] The coefficient of variation is calculated as the standard deviation divided by the mean, multiplied by 100.

restructure their farm businesses, while others have left farming. The focus of this paper is to better understand what RRV farmers did to adapt to economic adversity.

1.2 Farm Financial Stress

Clearly, farmers are adapting in several ways to the recent series of production and price shocks as they attempt to improve their chances for business survival. Although the current financial stress of farmers in the RRV is basically an income problem, it has its roots in several aspects (production, marketing and financing) of the farm business. Lenders and farmers alike recognize that farms in the RRV must become profitable, and disaster relief programs do not make that happen.

1.3 Study Objective

This paper investigates the range and effectiveness of adaptive farm business management and household responses of RRV commercial farmers during this period of production and market shocks and changing farm policy. Our focus is on farms in the northern RRV region. We attempt to identify strategies that RRV farmers have used to improve farm survival by analyzing a combination of farm business records and farmer survey data. Based on this analysis of past responses, we evaluate how effective those responses have been in dealing with farm income problems.

A primary objective of this paper is to identify the set of farm characteristics and adaptive farm management (production, marketing and finance) responses that have contributed to improved farm performance and survivability in the RRV region. We investigate the role of changes in several areas: agricultural cropping activities, size and financial structure of farms, off-farm work and income opportunities of farm households, farm and household expenditures, marketing strategies, and farm programs. Our underlying hypothesis is that farmers who made significant adjustments in their farming operations and management strategies performed better than farmers who made no adjustments or delayed their response to the production and market price shocks that occurred. These findings may be used to identify farm business and household strategies that small and large farms can use to be more financially sustainable in the future.

2. Farm Data

We gather farm-level data from three primary sources: farm lenders (Farm Credit Services and the USDA Farm Service Agency), vocational farm management records, and farmer mail surveys.

Initially, RRV farmers are identified by using an existing farm records database. The list of farmers in the database is used to generate the panel for the mail survey. Secondly, the survey responses of farmers are used to generate a complete set of farm business data that complements the survey responses. This eliminated the need to ask many mail survey questions about the financial history of the farm. The mail survey goes beyond the collection of standard financial and business data to assemble information about the farm household and the strategy farmers used in the areas of business/production management and household adjustments, e.g., off-farm work and household expenditures.

2.1 Survey Questionnaire

Survey questionnaires were mailed to 400 commercial crop farmers in the Red River Valley region of northwestern Minnesota and northeastern North Dakota in February, 1999. The questionnaire was designed to identify a range of production, market, and financial management strategies in response to wheat scab, changing federal farm policy, and economic shocks due to lower farm commodity prices.

The farms included in the survey were all Farm Credit Service borrowers. They were classified by general location as either Valley farmers or NonValley farmers. The dividing line between Valley and NonValley farms in Minnesota is roughly Highway 75 north of Crookston and Highway 9 south of Crookston. In North Dakota the farmers surveyed included those operating farms west of the Red River and east of a line 10 miles west of Interstate 29. Usable survey responses were received from 185 farmers (a 46 percent response rate). The responses included 109 Valley farmers and 76 NonValley farmers. The nonrespondents were not contacted concerning the reason for no response.

The questionnaire was primarily comprised of questions about current cropping operations of the farm (crop acreage and yield) and changes in crop production activities between 1994 and 1998. In addition, questions were asked about crop marketing strategies, investment in farm assets, use of crop insurance, use of hired labor, family living expenses and nonfarm income. The questionnaire and the mean responses of the combined Valley and NonValley farmers to the survey questions are reported in Appendix A.

2.2 Farm Business Data

Farm business data were assembled for all farmers who responded to the survey and signed a release of information form. The release form allowed the lender to generate a financial history for 1994-1998 on each farm without revealing the name or location of the farm. In the case of farmers participating in the MnSCU Vocational Farm Management record keeping program and farmers who were borrowers through the Farm Service Agency, the financial summaries were generated as FINAN printouts using FINPACK. In the case of Farm Credit Services borrowers, the data was retrieved using Farm Equity Manager and the farm client database. These financial histories include information typically found on annual farm income statements and balance sheets.

2.3 Supplemental Farm Information

The third source of farm-level information is a supplementary questionnaire that was completed by the farm service officer or the farm business management instructor who was familiar with the farmer. This questionnaire asked for information about the financial restructuring and/or refinancing history of the farmer. It also asked for a subjective assessment of the management skills of the farmer in the areas of production, marketing, financial and overall management skills. The respondents were asked to place farmers into one of three groups: the top 20%, the middle 60%, or the bottom 20% of farmers with whom they were familiar.

3. Farmer Survey Responses

In this section we briefly summarize the survey and financial data that was collected (in order to characterize the farms in the sample). We also review the business and household adjustments

that farmers made in response to production and market shocks during 1994-1998. These farm-level responses are documented by reporting the overall trends in management practices in the RRV region and by contrasting the responses of different groups of farmers – both Valley and NonValley farmers. Our objective is to identify the basic categories of management responses. In a later section we evaluate the impacts of those strategies on farm performance.

3.1 General Farm Characteristics

Our review of the general characteristics of the farms in the survey focuses on: 1) the size distribution of farms (based on cropland operated, annual gross sales), 2) age of farmer, and 3) overall financial performance.

Table 1. Total Crop Acres and Farm Size in 1998.

Item	Valley Farms (n=109)	NonValley Farms (n=76)
	(number of acres)	
Total Crop Acres	211,054	108,972
Mean crop acres per farm	1,936	1,434
Median crop acres per farm	1,608	1,057
Total Acres Rented	148,134	73,221
Mean crop acres per farm	1,359	963
Median crop acres per farm	1,230	628

In Table 1 we observe that the average (mean and median) size of the cropping operations of the responding farmers in the Valley is larger than in the NonValley region in terms of total crop acres and total rented acres. The median Valley farm consists of 1,608 acres of cropland, while a NonValley farm is approximately 1,057 acres of total cropland. The median number of crop acres rented by Valley farmers is about 1,230 acres compared to 628 acres among NonValley farmers responding to the survey. This suggests that Valley farmers may be more heavily exposed to the volatility of crop prices and the uncertainties of weather and disease problems. In addition it may be that the profitability and financial condition of Valley farmers is more significantly affected by changing cash rents and land market conditions.

Table 2. Percentage Distribution of Farms by Annual Sales, 1995 and 1998.

Sales Class	Valley Farms		NonValley Farms	
	1995	1998	1995	1998
Under $100,000	9.7	14.1	23.1	36.2
$100,000 - $250,000	43.0	34.0	53.8	31.8
$250,000 - $500,000	26.4	28.3	17.3	24.4
$500,000 - $1 million	15.3	20.0	2.0	6.2
Over $1 million	5.6	3.6	3.8	0.2

The data indicate that the Valley farms are larger on average than the NonValley farms in the sample (see Table 2). This is illustrated by the larger percentages of Valley farms in the over $250,000 sales classes in 1995 and 1998. The data also suggest that the size distributions of farms by sales class have shifted slightly in both the Valley and NonValley regions. The percentage of Valley farms with sales under $250,000 decreased, while the percentage of farms over $500,000 in sales increased. The median sales of Valley farms in the sample increased slightly from about $258,000 in 1995 to about $294,000 in 1998. Thus, the sales data from Valley farmers responding to the survey reflects the widening distribution of farm sales.

The data for NonValley farms reflects a similar pattern of change. The distribution of NonValley farms was more concentrated (about 54%) in the $100,000 - $250,000 sales class in 1995. By 1998, the distribution had become more uniform. Many farms shifted into the under $100,000 size class and the $250,000 - $500,000 sales class by 1998. While many factors may be influencing the changing size distribution of farm sales, we suggest that the widening distribution of Valley and NonValley farms is due in part to the effects of production and market shocks on crop sales revenues.

Table 3. Percentage Distribution of Farmers by Age, 1999.

Age Category	Valley Farmers	NonValley Farmers
Under 35 years	6.4	6.6
35-44	43.1	26.3
45-54	33.9	35.5
55-64	11.0	22.4
Over 65 years	5.6	9.2
Total	100.0%	100.0%

Based on the age distribution reported in Table 3, the average age of Valley farmers is slightly younger than that of NonValley farmers in the survey. This is shown by the larger number of Valley farmers in the 35-44 age group and fewer Valley farmers in the 55-and-older age groups. We see a similar pattern in the response that farmers gave to the question about when they became the manager of their farming operation. About 35% of the Valley farmers indicated that they had become the manager during the period since 1985. Among the NonValley farmers about 29% had taken over as manager of their farm after 1985.

What does this information about age and experience as a farm manager reveal about the ability of farms to sustain their farming operations during this period of economic and production shocks? First, 1985 is a significant year in terms of the past financial stress experienced by Minnesota farmers. Farmers, who were managers prior to 1985, were likely to have experienced first-hand the problems associated with farm financial stress. It has been suggested that the severe financial and economic conditions of the early and mid-1980s left a more resilient group of farmers in its wake. Thus, it is of some interest to compare the performance of farmers in this pre-1985 group with those in the post-1985 group. Second, we would like to know if younger farmers, and those who have less management experience, have been more willing to explore new management alternatives than older, more experienced farmers. These issues are explored further in a later section.

Table 4. Percent Rates of Return on Farm Assets, 1994-98. a/

	Valley Farms				NonValley Farms			
Year	Mean	Top Quintile (80 Per-centile)	Median (50 Per-centile)	Bottom Quintile (20 Per-centile)	Mean	Top Quintile (80 Per-centile)	Median (50 Per-centile)	Bottom Quintile (20 Per-centile)
1994	8.2	23.4	6.5	-6.7	4.1	21.3	1.6	-9.3
1995	4.3	20.1	3.7	-9.1	2.9	14.5	3.5	-8.6
1996	10.6	31.9	6.6	-2.1	5.2	17.9	3.6	-5.1
1997	3.6	12.9	3.8	-8.3	-0.4	9.6	-0.6	-9.7
1998	3.1	16.3	2.3	-7.3	3.1	13.6	2.8	-5.7

a/ The ROA is calculated by dividing net farm income by total farm assets. Net farm income may be expressed in before-tax or after-tax terms. The ROA numbers in this table are on a before-tax basis.

The rates of return on assets (ROA) in Table 4 suggest that worsening crop production and market price conditions have significantly reduced average Valley and NonValley farm profitability. Using 1994 as a base year, the mean ROAs in three of the next four years (1995, 1997 and 1998) fell below that level. The median ROAs suggest a similar pattern among Valley and NonValley farmers. The data in Table 4 also point out the wide range of profitability experienced by Valley and NonValley farmers. The inter-quintile range (ROA in the 80th-percentile group minus the ROA in the 20th-percentile group) was typically greater than 20%. Moreover, the range among Valley farmers was typically greater than among NonValley farmers in the sample. In the low return years of 1997 and 1998, the inter-quintile range was significantly smaller for both the Valley and NonValley farms. This indicates that the production and price shocks were felt widely among farmers in the region.

Table 5. Percent Rates of Return on Farm Equity, 1994-98. a/

	Valley Farms				NonValley Farms			
Year	Mean	Top Quintile (80 Per-centile)	Median (50 Per-centile)	Bottom Quintile (20 Per-centile)	Mean	Top Quintile (80 Per-centile)	Median (50 Per-centile)	Bottom Quintile (20 Per-centile)
1994	0.9	47.5	8.2	-66.2	3.4	54.2	-0.9	-38.6
1995	0.5	32.4	2.4	-35.2	-0.5	31.9	-0.1	-36.1
1996	12.5	52.8	6.3	-33.4	5.9	41.4	2.3	-21.6
1997	-6.4	29.5	2.8	-14.7	-7.1	16.3	-4.3	-40.4
1998	1.8	30.8	0.6	-73.1	1.5	26.6	2.1	-21.7

a/ The ROE is calculated by dividing net farm income by total farm equity. Net farm income may be expressed in before-tax or after-tax terms. The ROE numbers in this table are on a before-tax basis.

The rates of return on farm equity (ROE) are reported in Table 5. The mean and median ROEs provide a similar picture of the volatile profits experienced by farms in the RRV region during 1994-98. The ROE numbers magnify the effects of income variability, since they reflect the degree of financial leverage that individual farmers use. For example, a farmer that uses more debt financing will experience greater variability in the ROE for a given variation in the net farm income. The ROE also signifies the rate at which a farmer is increasing or depleting the equity of the farming operation. We see this pattern by comparing the magnitude of the mean and median ROE numbers in Table 5 with the corresponding ROA numbers in Table 4.

The ROE numbers generally are lower than the ROA numbers at each percentile level with the exception of the 80th-percentile group. The lower ROE numbers are particularly noticeable among Valley and NonValley farmers in the 20th-percentile group. Among that group of farmers, there was on average an annual loss of between 30% (among NonValley farmers) and 44 % (among Valley farmers) of their equity capital in this period of income volatility. This contributed to the increasing exit rate among unprofitable farmers in the latter 1990s.

Table 6. Government Payment/Net Farm Income Ratios for Valley Farmers, 1994-1998. a/

Measure	1994	1995	1996	1997	1998
25th Percentile	38%	28%	46%	48%	48%
50th Percentile (median)	0	0	0	4	5
Range (min., max.)	(0-157)	(0-92)	(0-28)	(0-68)	(0-205)

a/ Numbers are for 72 Valley farmers for whom data was available in all five years.

Direct government payments to farmers during these years probably reduced the rate of exit among Valley farmers, as it supplemented low farm incomes. How significant were these revenues for Valley farmers? In Table 6 we report the ratio of government payments/net farm income for 72 farmers in the sample. We see that the level of government support varied from 28% to 48% of net farm income for about one fourth of the farmers. This represents a significant proportion of earnings from a nonfarm source. However, the level of government payments is really negligible for over half of the farmers, as reflected by the low median values in most years. The level of government payments appears to have been relatively higher in 1997 and 1998.

Various factors, including the deteriorating performance of farms in the Valley region, have prompted several farmers in the survey to consider discontinuing farming. About 17% of the Valley farmers responding to the survey indicated that they do not plan to be in farming for the next 5 years. The percentage of NonValley farmers who do not plan to farm for the next 5 years was lower at about 13%. Consider the younger average age of Valley farmers (e.g., fewer farmers in the over-54 age group) and the higher percentage that indicate they will not be in farming after 5 years. The implication is that Valley farmers are experiencing a somewhat higher incidence of financial stress in their farming operations and that this deterioration of performance has led to a faster exit rate.

What might happen to those farms where the farmer is planning to discontinue farming? To answer that question the survey asked farmers to state whether their children or a relative might take over the farming operation when they leave. Among Valley farmers about 33% stated that relatives or children will probably take over the farm, about 30% do not have family members to continue the farm, and the remaining 37% are unsure about whether a family member would or would not continue the farm. Among NonValley farmers the percentage of farmers who expect that a family member will take over the farm is about 21% and about 41% have no one to continue the farm. About 38% of the NonValley farmers do not know if some one in their family would run the farm after they discontinue farming. These seem to be high percentages of farmers who either do not have a clear or positive idea about the future ownership, or the continued management of their farms.

3.2 Production Responses

During 1995-1998, farmers in the survey made significant adjustments in their crop rotations and the number of acres under cultivation.

3.2.1 Adjustments to Total Cropland

The data in Table 7 suggest that on average farmers increased the total number of acres in cropland during this period.

Table 7. Percentages of Total Cropland Acreage Adjustments, 1995-98.

Item	Valley Farms	NonValley Farms
Total Cropland Acres Added (percent of 1994)	42418 (25%)	18774 (21%)
Mean acres added	695	536
Cropland Acres Reduced (percent of 1994)	3067 (2%)	5367 (6%)
Mean acres reduced	341	224

Total cropland acreage increased by 25% among Valley farmers in the sample and by 21% among NonValley farmers. This was unexpected. Due to the profitability problems that farmers were experiencing, it was expected that farmers would respond by decreasing the total number of cropland acres.

An alternative explanation might be found in the underlying range of profitability that the farmers were experiencing. It may be that the more profitable farmers increased their acreage by more than the associated decrease of cropland (or no change) among the farmers who were not profitable. Alternatively, farmers may have increased their total number of crop acres while increasing the number of acres producing more profitable crops in an effort to offset previous year losses. Thus, there was a net increase of 354 acres of cropland per farm among Valley farmers and 312 acres per farm among NonValley farmers responding to the survey.

When asked the source of cropland acres added, the dominant source of new cropland acres was the Conservation Reserve Program (CRP). About 36% of the Valley farmers indicated that they had added cropland by planting land that had been released from the CRP (see Table 8). Among NonValley farmers the percent of farmers that reported CRP acres as the source of new cropland was just 8%. Thus, the picture that emerges among farmers in the RRV region is that cropland acres increased on average during 1994-98, but the increase was heavily influenced by the number of acres coming out of the CRP program. Some Valley farmers indicated that they had enrolled additional cropland in the CRP program during this period, but the percentage of farmers doing so was relatively small when compared to those indicating that they resumed farming land that had been previously in the CRP.

Table 8. Percentage of Farmers Reporting Adjustments to Total Cropland, 1995-98.

Item	Valley Farms	NonValley Farms
Cropland Acres Added:	(percent of farmers)	
a) Acres from CRP	35.8	8.0
b) Acres purchased	8.3	8.0
c) Acres rented	5.6	--
Cropland Acres Reduced:	(percent of farmers)	
a) Acres enrolled into CRP	4.6	7.0
b) Acres Sold	2.8	7.0
c) Acres Rented	--	3.0

3.2.2 Changes in Crop Rotation

In the Valley about 62 % of the farmers reported that they changed their cropping mix after the 1996 Farm Bill because it gave them the flexibility to plant more crops. Among those who responded positively, 90 % of the farmers quit growing barley or reduced their barley acreage. At the same time, most of the farmers favored growing soybeans, canola, sugar beets and dry beans in decreasing order of preference. The primary reasons put forward for the change towards this crop mix included the desire for higher profit, increased use of contract farming and more reliable market prices. In the NonValley area, almost all the farmers shifted from growing barley to other crops. Compared to Valley farmers, most of the farmers in the NonValley region preferred growing more soybeans, corn (grain), canola, dry beans, sunflower, and forage crops in decreasing order of preference.

Table 9. Harvested Acres of Major Crops in 1998. a/

Crop	Valley Farms			NonValley Farms		
	Total Harvested Acres	Percent of All Farms b/	Mean Acres per Farm	Total Harvested Acres	Percent of All Farms b/	Mean Acres per Farm
Wheat	87,837	98.2	821	39,195	88.2	585
Soybeans	32,081	83.5	353	16,121	61.8	343
Sugarbeets	28,256	65.1	398	--	--	--
Barley	16,540	100.0	152	6,080	52.6	152
Dry Beans	14,958	44.0	312	6,183	35.5	229
Canola	6,228	24.8	231	7,038	44.7	207
Potatoes	5,416	15.6	319	1,140	13.2	114
Corn (grain)	4,717	29.4	147	7,257	53.9	177
Sunflower	2,659	27.5	89	5,298	39.5	177
Corn (silage)	470	9.2	147	1,443	17.1	111
Other	4,654	21.1	202	7,830	59.2	174

a/ Crops are listed in decreasing order of importance based on the number of acres harvested on Valley farms.

b/ The percent of all farmers in the Valley and NonValley areas responding to the survey, who indicated that they grew this crop during 1998.

Information about cropping activities is reported in Table 9. The summary data suggests that in 1998, wheat continued to be the dominant crop in terms of total acres and average acres harvested per farm. The second and third most important crops in the Valley were soybeans and sugarbeets, respectively. In the NonValley, they are soybeans and dry beans. Canola tends to be a major crop in both the Valley and NonValley regions. Thus, what emerges in 1998, is a more diversified set of agricultural enterprises in the RRV.

Table 10. Major Crop Planting Intentions in 1999 with Comparison to 1998.

Crop	Valley Farms		NonValley Farms	
	Mean Acres Intending to Plant in 1999	Crop Acres in 1999 as Percent of 1998	Mean Acres Intending to Plant in 1999	Crop Acres in 1999 as Percent of 1998
	(acres)	(percent)	(acres)	(percent)
Wheat	842	103	637	109
Soybeans	379	108	357	104
Sugarbeets	396	100	125	113
Barley	51	34	59	39
Dry Beans	289	93	232	101
Canola	267	116	243	117
Potatoes	331	104	121	107
Corn (grain)	108	74	142	80
Sunflower	197	222	169	96
Corn (silage)	37	25	96	133
Other	286	141	185	106

The survey suggests that a large proportion of the farmers have shifted their crop rotation toward new crops or crops that played a relatively minor role in previous years (see Table 10). Farmers were asked if the shift was in response to a desire to increase the number of crops in the rotation, or if it was to grow a crop that was expected to be more profitable. The survey responses indicate

that a majority of the farmers had made these changes in order to increase farm profitability. Among Valley farmers about 51% indicated that profitability was their main objective, while about 23% indicated that the reason was to increase their crop rotation. Among NonValley farmers the responses were quite similar. About 59% of the NonValley farmers were attempting to increase farm profitability by adjusting their cropping plans. Another 19% of NonValley farmers were doing so to improve their crop rotation. In principle, either of these objectives may be a response to past production and economic shocks. One can interpret from these responses that a high proportion of the farmers in the Valley region was attempting to change the mix of crops in order to improve farm performance and sustainability.

To put the planting intentions of farmers into perspective, farmers were asked for the number of USDA historical base acres of wheat and barley on their farms. About 83% of the farmers provided that information. We divided the mean number of acres of each crop they intended to plan in 1999 by the corresponding mean number of historical base acres. The result indicates that a significant decrease has occurred in the average number of wheat and barley acres per farm among Valley and NonValley farmers, but the most dramatic decrease has been in barley. Valley farmers intended to plant 83% of their base wheat acres in 1999 and just 18% of their base barley acres. Similarly, NonValley farmers intended to plant 93% of their wheat base acres and just 19% of their barley base acres.

These decreases in wheat and barley planting intentions may reflect farmer responses to both lower crop prices and disease problems. Of course, disease problems also suggest that there is lower grain quality and, therefore, reduced prices for wheat and barley. Without additional information it is not possible to determine whether the production (disease) shock has had a smaller effect than generally lower grain prices (independent of grain quality problems) on farmer decisions. Wheat and barley have experienced similar disease problems in recent years, thus it is likely that the sharper decline in barley acreage is primarily a response to lower market prices.

3.2.3 Grain Yields and Quality

In Table 11 we see a trend toward lower wheat and barley yields during 1993-98. Farmers were asked what the normal yields for wheat and barley were prior to 1993. When that normal yield is compared with annual reported yields during 1993-1998, we see that the mean yield per acre fell sharply for wheat and barley during the subsequent 6 years. The exception year in the Valley appears to have been in 1996. This provides strong evidence that yields for wheat and barley were affected generally by the scab problem. The other aspect of this problem was the sharp deterioration of grain quality.

Table 11. Historical Mean Wheat and Barley Yields, 1993-98.

	Valley Farms		**NonValley Farms**	
	Wheat	**Barley**	**Wheat**	**Barley**
Year	Mean bushels per acre (percent of pre-1993 yield)			
Prior to 1993 a/	49 (100%)	73 (100%)	42 (100%)	68 (100%)
1993	27 (55%)	58 (79%)	26 (62%)	58 (85%)
1994	29 (59%)	57 (78%)	28 (67%)	54 (79%)
1995	34 (69%)	58 (79%)	29 (69%)	51 (75%)
1996	46 (94%)	68 (93%)	38 (90%)	60 (88%)
1997	35 (71%)	53 (73%)	32 (76%)	54 (79%)
1998	43 (88%)	52 (71%)	38 (90%)	45 (66%)

a/ Farmers were asked what was the normal yield per acre prior to 1993.

This quality dimension of the crop disease problem is reflected for barley in Table 12. The proportion of the annual barley crop that was sold as feed barley increased significantly, reflecting the lower quality of barley being produced on Valley and NonValley farms. Prior to 1993, farmers typically marketed about 54% of their barley crop as lower quality feed barley. In the post-1993 period, the percentage of feed barley increased to 80-90%. This is lower quality barley that commands a lower market price. In response, farmers began to shift away from the production of barley toward more profitable crops.

Table 12. Percent of Barley Crop That is Sold as Feed , 1993-98.

	Valley Farms	NonValley Farms
Prior to 1993 a/	54.5	53.9
1993	93.2	81.5
1994	91.5	85.1
1995	86.2	85.8
1996	85.4	79.4
1997	91.0	89.0
1998	87.4	87.9

a/ Farmers were asked what was the normal percentage of barley sold as feed prior to 1993.

3.2.4 Adjustments to Sugarbeet and Potato Acreage

Farmers who had grown sugarbeets or potatoes during 1994-98, were asked if their acreage had stayed the same or changed and, if it had changed, why. There were 63 farmers who provided written responses (55 Valley farmers) to the question on sugarbeets. Nine farmers wrote comments (7 Valley farmers) on potato production.

The responses indicate that about 80% of the Valley farmers who were growing sugarbeets had increased their acreage of sugarbeet production. The average increase was about 111 acres per farm when compared to 1994. About 11% of the farmers indicated that they had reduced their acreage of sugarbeets by an average of 180 acres. The remaining 9% of the farmers had not adjusted their sugarbeet acreage since 1994. The reasons given for increasing the acreage of sugarbeets fall into five general categories. The majority (about 60%) of farmers state that they did so for reasons of better profitability. About 20% of the farmers stated that they did so because the sugar cooperative had sold additional shares. Three less-frequent reasons for increasing sugarbeet acreage included: excess capacity of land and machinery, concerns about crop rotation, and family-related reasons (e.g., a retirement). Interestingly, just two farmers stated that disease problems in their wheat production had prompted them to raise more sugarbeets. We interpret the farmers that stated the cooperative stock offering, as the reason for increasing their sugarbeet production, as reflecting a preference for higher profits. The reasons cited for reducing the acreage of sugarbeets included: farm debt and cash flow problems, crop rotation and disease problems, and changes in business organization.

Among NonValley farmers the number of responses concerning sugarbeet acreage adjustments was expectedly small, although the average increase in sugarbeet acreage was larger at 156 acres per farm. The primary reasons given for increasing their sugarbeet acreage was similar to that of Valley farmers. They cited the desire for increased profit and the availability of additional cooperative stock as factors. None of the NonValley farmer respondents reduced their acreage of sugarbeet production.

The situation among potato growers in the RRV affected fewer farmers in the survey, but the acreage adjustments were relatively large. About 30% of the responding farmers indicated that they had increased their potato acreage by an average of 447 acres per farm. The main reason given for increasing potato production was the improvement of markets and increased availability of production contracts. Another 30% had decreased their acreage by about 550 acres per farm. The dominant reasons for reducing acreage were problems with profitability and crop disease. The remaining Valley farmers had not adjusted their acreage since 1994. Among NonValley farmers most indicated that they had reduced their acreage of potatoes since 1994 for easons similar to those given by Valley farmers.

3.2.5 Production Practices

In order to control the effects of scab in wheat and barley, some farmers were reportedly using changes in tillage practices to break the cycle of the disease. The survey asked farmers to indicate if they had made changes in their tillage practices. The survey data does not indicate that a major shift in tillage methods had occurred. Large percentages (43% of Valley farmers and 38% of NonValley farmers) continued to use moldboard plows for fall tillage operations. A similarly large percentage (48%) of all farmers in the survey indicated that they had not changed their tillage methods in the past several years.

Table 13. Application of Fungicide to Wheat Acres, 1994-99.

Year	Valley Farms	NonValley Farms
	(percent of wheat acres sprayed)	
1994	13.3	19.0
1995	15.4	19.4
1996	24.4	25.6
1997	27.3	33.5
1998	58.5	43.2
1999 plan	66.5	42.6

One of the practices that farmers have employed to control wheat and barley disease is to increase their use of fungicides. During 1994-98, we observe a significant increase in the frequency of use of fungicides among Valley and NonValley farmers (see Table 13). The percentage of farmers using fungicides increased from less than 20% in 1994 to about 58% among Valley farmers and about 43% among NonValley farmers in 1998. This increase in fungicide use continues according to the reported plans of farmers for 1999.

Some farmers in the RRV region also employ paid crop consultants to advise them on crop production practices. Farmers who use crop consultants may have been better able to control crop disease problems. These consultants appear to be more frequently used by Valley farmers than by NonValley farmers. Among Valley farmers about 35% reported using a paid crop consultant in 1998. In comparison, crop consultants were used by about 24% of the NonValley farmers.

3.3 Financial Responses

The financial responses of farmers to economic shocks and financial stress can take several alternative forms. Those might include: reducing farm operating expenses, reducing family living expenses, taking an off-farm job to supplement household income, reducing purchases or leasing

rather than purchasing production assets, purchasing crop insurance, and in some instances refinancing or restructuring farm debts.

3.3.1 Crop Insurance

As indicated in Table 14, the percentage of farmers in the Valley who carry multiple-peril crop insurance (MPCI) on their wheat crop is significantly higher than that among NonValley farmers. In contrast, Valley and NonValley farmers tend to carry about the same level of MPCI coverage on average.

Table 14. Multiple Peril Crop Insurance (MPCI) Coverage of Wheat, 1994-99.

	Valley Farmers		NonValley Farmers	
Year	Farmers with Coverage (in %)	Average Level of Coverage (in %)	Farmers with Coverage (in %)	Average Level of Coverage (in %)
1994	86.2	67.9	60.5	66.7
1995	86.2	67.9	60.5	67.3
1996	84.4	68.4	61.8	68.4
1997	83.5	67.4	56.6	65.5
1998	82.6	66.3	59.2	64.4
1999 plan	78.9	70.1	52.6	69.0

There may be several reasons for the observed differences in the percentage of Valley and NonValley farmers with MPCI coverage. The MPCI premiums are based on area yields and loss histories. The result may be that the insurance premiums are perceived to be relatively higher in the NonValley areas and, thus, less attractive to NonValley farmers. When farmers were asked about their use of MPCI on row crops, a similar pattern emerged. A higher percentage of Valley farmers (about 83%) carried MPCI on their row crops while in the NonValley areas about 53% of the farmers carried that coverage.

3.3.2 Controlling Expenses and Revenues

Farmers were asked about the strategies that they were using during the previous 5 years to control their expenses and to increase their farm and nonfarm revenues. Several of these responses are financial in character, while others are closely related to the production activities of the farm.

According to farmers responding to the survey, the most frequent financial adjustment made during 1994-98 was the postponement of machinery purchases (see Table 15). The next most frequently reported adjustments were: 1) the reduction of family living and other nonfarm expenses, 2) the reduction of farm operating expenses by hiring custom operators, and 3) the investment in value-added ventures off the farm. These responses all ranked about equal in frequency of use. Thus, it appears that farmers became increasingly aware of the need to reduce farm and nonfarm expenses as a major strategy for adapting to economic shocks. It also indicates that farmers were looking for alternatives to farm income in order to stabilize their total incomes. This strategy is also reflected in the next most frequently reported responses of farmers. They indicated that they were leasing machinery instead of purchasing it. They also took off-farm jobs to diversify their income.

Table 15. Financial Adjustments Made by Farmers, 1994-1998.

Response a/	Valley Farmers	NonValley Farmers
	(percent of farmers)	
Postponed replacement of machinery	76.1	78.9
Reduced family living and other nonfarm expenses	43.1	46.1
Hired custom operators to reduce farm expenses	43.1	34.2
Invested in a value-added venture off-the-farm	42.2	31.6
Leased machinery instead of purchasing it	29.4	19.7
Took an off-farm job	27.5	35.5
Started doing custom work	22.9	26.3
Purchased or shared use of machinery with another farmer	19.3	14.5
Purchased a fungicide sprayer	17.4	6.6
Purchased a grain cleaner	16.5	11.8
Sold production assets to make debt payments	10.1	14.5
Discontinued use of a crop consultant	9.2	13.2
Other	17.4	17.1

a/ Responses of Valley and NonValley farmers are ranked from the most to the least frequent response by Valley farmers.

The adjustments made by NonValley farmers appear to differ from the Valley farmer responses in at least one respect. NonValley farmers identified off-farm work as a more frequently used strategy for dealing with the financial stress that occurred during 1994-98. This suggests that NonValley farmers may perceive off-farm work as being more accessible to them. Alternatively, NonValley farms are typically smaller than Valley farms. Thus, part-time farming may be more common among the NonValley farmers in the sample. Nonetheless, off-farm employment may be a significant factor in improving farm survivability, even if it has relatively little to do with the performance of the farm business.

Since land rent is a significant part of the overall cost of production in the RRV, farmers were asked to indicate if they had made an effort to renegotiate their land rental agreements. About 56% of the Valley farmers indicated that they had re-negotiated their land rental agreement during 1994-98. Among the NonValley farmers in the survey, 41% indicated that they had renegotiated their rental agreement in this period. The higher percentage of farmers in the Valley who had renegotiated their rental agreements may indicate that Valley land rents were becoming more of a problem for farmers who cash rent a significant share of their cropland and tend to pay higher average rents than NonValley farmers. Although only 20 farmers provided comments on this question, many of them indicated that they had attempted to reduce their rents due to lower prices. A significant proportion of those farmers had been able to lower their rent in 1999, but others indicated that landlords were not generally willing to reduce rents. As a consequence, some farmers had decided to drop their high rent land. Interestingly, the primary reason given for successfully reducing land rents was lower farm prices, not lower yields due to crop disease problems.

An additional strategy that farmers may have used to reduce expenses is to hire less labor. The responses of farmers to the survey indicate that about equal proportions of both Valley and NonValley farmers increased and decreased their use of hired labor. Thus, there was no significant shift away from the use of hired labor in order to reduce those costs of operation. However, among NonValley farmers those who reported increasing their use of labor, the increase was by about 87% while those decreasing their use of labor made a decrease of about 53%. A majority of the farmers (84% in the Valley and 76% in the NonValley area) also indicated that reduced availability of hired labor was not a factor that would have caused them to reduce their farm size.

3.3.3 Financial Restructuring

Supplemental information about the financial histories of the farms revealed that several Valley and NonValley farms had participated in various forms of financial restructuring during 1994-98. About 20% of the Valley farmers in the sample had gone through a loan reamortization, a debt deferral, or a general financial restructuring during this period. Similarly, about 20% of the farmers had received an emergency loan at one time during the period. In the Valley, the greatest number of financial restructuring actions occurred during 1998 and 1999. The average amounts of the loan reamortization and general financial restructuring adjustments were about $160,000 and $190,000, respectively. The average size of a debt deferral was about $50,000.

The incidence of financial restructuring among NonValley farmers appeared to be only slightly lower. The frequency of emergency loans was relatively higher (about 28%) among the NonValley farmers responding to the survey. The average amounts of the loan reamortizations and the general financial restructuring actions were also relatively large (about $200,000 and $160,000, respectively). The average debt deferral was about $35,000. The average emergency loan to NonValley farmers in the survey was about $82,000 (compared with about $102,000 among Valley farmers).

These financial restructuring actions raise a general question about the impact they had on subsequent farm performance and survivability. If a significant financial restructuring occurred early in the 1994-98 period, presumably that provided a greater benefit for the farmer than a restructuring that occurred later in the period. An alternative view is that an early financial restructuring may have removed the incentive for a farmer to make other needed adjustments in the farm business, and the impact of the restructuring on farm performance and survivability was reduced.

3.4 Marketing Responses

When asked about their marketing of grain crops in 1998, farmers reported that they typically sold grain without a contract. That is, they waited until after harvest to price their grain. Among Valley farmers about 49% of the grain crop was marketed on average without a contract. Among NonValley farmers the average percentage of the grain crop sold without a contract was even higher at about 80%. Relatively small percentages (12-14%) of the grain crop were priced using futures or option contracts in 1998 by both Valley and NonValley farmers. Similarly small percentages (14-18%) were marketed using forward cash contracts. These responses indicate that farmers were using relatively risky pricing strategies for marketing their grain crops in 1998. This may reflect several factors, one of which was the fact that cash grain prices were quite low during 1998.

Valley farmers did indicate that they were likely to change their grain marketing strategy in favor of more forward cash contracts in 1999. Valley farmers reported that their plan was to market about 56% using forward cash contracts. NonValley farmers also indicated a small increase in the use of forward cash contracts and less tendency to sell without a contract.

Farmers were asked to comment on changes that were made in the marketing plan during the last 5 years. A total of 82 farmers provided comments (48 Valley farmers and 34 NonValley farmers). The comments fall into four general categories: no change, increased use of futures and options contracts, increased use of forward contracts, and various other comments indicating their desire to acquire more information prior to marketing their crop.

Table 16. Grain Marketing Strategies of Farmers in 1998.

Year	Valley Farmers			NonValley Farmers		
	Forward Cash Contract	Futures or Option Contract	No Contract	Forward Cash Contract	Futures or Option Contract	No Contract
	(average percent of grain crop marketed) a/					
1998	14.3	12.1	49.0	17.5	14.2	79.7
1999 plan	56.0	17.9	50.7	19.0	21.9	73.1

a/ The percent of the grain crop marketed in a year may sum to more than 100%, since the mean percentages reflect combinations of pricing strategies used by different farmers.

Our review of the frequency of these general categories among Valley and NonValley farmers suggests that the two groups are not different in the changes they had made when pricing their small grain crops (see Table 16). About 25% of the farmers state that they had made no significant change in their pricing strategy. Another 25% indicate that they were increasing their use of forward cash contracts and/or forward pricing of small grains. An additional 25% stated that they had increased (or intended to increase) their use of futures, options, and hedge-to-arrive contracts. The last 25% indicated in various ways that they were watching market prices more closely and attempting to improve the effectiveness of their pricing strategy.

Some written comments indicated that farmers had not used forward contracting in recent years because either grain prices were too low (e.g., in 1998) relative to the costs of production or the crop yield was too uncertain. One farmer indicated that with the new crop insurance revenue option he is now more comfortable with forward contracting compared to previous years when scab reduced crop yields sharply and made forward contracting risky. Overall the farmer survey suggests that some farmers have responded to uncertain small grain prices by increasing their efforts to forward price or hedge their crops. Uncertainty about the yields of small grains due to disease problems appears to have kept some farmers from significantly increasing their use of forward cash contracts for fear of not having a sufficiently large crop to deliver at harvest. The fact that only 82 out of 185 farmers responded to the question suggests that most farmers had not made significant changes in their small grain pricing strategy. Under the assumption that most farmers wait until harvest to price their crop, these results suggest that most Valley and NonValley farmers remained exposed to significant market price risk during these difficult years.

In order to improve their marketing performance during this period of price uncertainty, farmers may have subscribed to a market advisory service. The responses of farmers to the survey suggest that about 35% of farmers did subscribe to these marketing services in 1998. That percentage was uniform for Valley and NonValley farmers. This would appear to be a relatively low proportion of farmers who use these services to improve their access to market information.

4. Analysis of Survey Data

In this section we explore several alternative explanations for differences in the performance of farmers in the RRV. We begin by hypothesizing that some of the widening distribution of farm financial performance is due to differences in production, financial and other responses that farmers made to production and market price shocks and differences in the timing of those responses.

4.1 Farm Financial Performance

The primary financial performance indicator that we use for analysis is the cash flow-to-equity ratio (CFE). The CFE ratio (expressed as a percentage) reflects the cash flow of the farming operation adjusted for the effects of nonfarm revenues and expenses. The CFE ratio is defined as, net farm income (NFI) plus the annual depreciation expense (DEP) plus nonfarm income (OFI) minus family living expense (FLE), all divided by total farm equity capital (EQTY). As an accounting equation,

CFE = (NFI + DEP + OFI – FLE) / EQTY

In addition we use the total debt-to-total asset ratio (DA) to differentiate farm performance according to the use of financial leverage.

Table 17. Summary of Farm Financial Performance a/

Financial Measure b/	Valley				NonValley			
	1995	1996	1997	1998	1995	1996	1997	1998
CFE – mean	5.0	8.7	11.1	5.0	-1.2	9.0	8.6	2.7
CFE – median	3.4	6.7	2.6	5.3	2.2	4.1	3.0	3.9
CFE min.,max.	-72, 47	-167, 110	-85, 801	-72, 57	-89, 51	-67, 130	-43, 158	-51, 27
DA – mean	36.5	36.0	37.9	40.8	43.3	55.9	39.8	40.6
DA – median	37.3	33.7	39.0	41.8	40.3	36.5	36.3	35.0
DA min.,max.	0 to 96	0 to 102	0 to 101	0 to 84	0 to 108	0 to 795	0 to 118	0 to 117

a/ The panel data consists of 77 Valley farmers and 53 NonValley farmers.
b/ The financial measures (expressed as percentages) are the cash flow /equity ratio (CFE) and the debt/asset ratio (DA).

In the case of Valley farms, the median CFE reported in Table 17 indicates that cash flow performance was relatively low during 1995 and 1997. The same pattern of cash flow problems surfaces among the NonValley farms. The median debt/asset position shows less yearly variation. However, the median debt/asset ratio increased for Valley farmers between 1995-98, while there was a noticeable decline in the proportion of debt among NonValley farmers. This suggests that financial conditions among NonValley farmers may have improved relative to Valley farmers. These variations suggest that it is useful to look more closely at how farms shifted between the different levels of CFE and DA over time.

In Table 18 we report the percentages of Valley farmers in the "financially stressed" category. This includes farmers that experienced a negative CFE. In 1995, about 17% of the Valley farmers in the sample were in this category. By 1996, these farms had declined to 11% of the sample. The number increased sharply to 39% in 1997, and then fell to 21% in 1998.

In contrast we also identify a category of farmers that were "seriously financially stressed." These are the farmers with both a negative CFE ratio and a DA ratio greater than 40%. About 11% of the Valley farmers in the sample were seriously financially stressed in 1995 (Table 18). By 1996 this number fell to 6%, but it increased to 28% in 1997, and in 1998 it dropped again to 16%. None of the Valley farmers in the sample were in the seriously financially stressed category throughout the 4-year span. Table 18 also illustrates that during the years in which cash flow stress was the most severe (1997 and 1998), the Valley farms with the highest debt burdens tended to perform the worst.

Table 18. Valley Farm Financial Performance, 1995-1998. a/

Debt / Asset	**Cash Flow / Equity Capital (as a percent)**					
(as a percent)	< -10	-10 to 0	0 to 10	10 to 20	> 20	Total
1995:						
70 to 100	**0% a/**	**3%**	8%	0%	1%	12%
40 to 70	**3**	**5**	17	3	8	36%
10 to 40	0	5	27	6	0	38%
0 to 10	0	1	8	1	4	14%
Total	**3%**	**14%**	60%	10%	13%	100%
1996:						
>100	**0% a/**	**0%**	0%	0%	1%	1%
70 to 100	**1**	**0**	1	0	8	10%
40 to 70	**1**	**4**	15	4	7	31%
10 to 40	1	1	33	7	1	43%
0 to 10	0	1	9	3	1	14%
Total	**4%**	**7%**	58%	13%	18%	100%
1997:						
>100	**0% a/**	**0%**	0%	0%	1%	1%
70 to 100	**8**	**1**	0	1	1	11%
40 to 70	**7**	**12**	7	7	4	35%
10 to 40	0	7	21	8	1	36%
0 to 10	1	4	9	1	0	16%
Total	**16%**	**23%**	36%	17%	8%	100%
1998:						
70 to 100	**3% a/**	**4%**	1%	0%	3%	10%
40 to 70	**5**	**4**	23	5	5	42%
10 to 40	0	4	26	5	3	38%
0 to 10	0	1	8	0	0	9%
Total	**8%**	**13%**	58%	10%	10%	100%

a/ Percentages represent number of farmers in each cell as a percent of the total number of Valley farmers (n=77).

In Table 19 we note the percentages of NonValley farmers that fall into the "financially stressed" and "seriously financially stressed" categories. In 1995, about 36% of the NonValley farmers in the sample experienced a negative CFE ratio. This number decreased to 27-31% during 1996-97, and then fell again to about 17% in 1998. Thus, cash flow stress appears to have been reduced over time. The proportion of farmers that were seriously financially stressed similarly declined from about 23% in 1995 to about 10% in 1998.

Table 19. NonValley Farm Financial Performance, 1995-1998. a/

Debt / Asset (as a percent)	Cash Flow / Equity Capital (as a percent)					Total
	< -10	-10 to 0	0 to 10	10 to 20	> 20	
1995:						
Insolvent (>100)	**0% a/**	**0%**	0%	0%	4%	4%
70 to 100	**6**	**0**	0	0	2	8%
40 to 70	**13**	**4**	15	2	6	40%
10 to 40	4	6	28	2	0	40%
0 to 10	0	4	6	0	0	9%
Total	**23%**	**13%**	49%	4%	11%	100%
1996:						
Insolvent (>100)	**0%**	**2%**	0%	0%	0%	2%
70 to 100	**2**	**2**	4	2	2	11%
40 to 70	**4**	**8**	9	13	2	25%
10 to 40	2	8	21	8	4	42%
0 to 10	0	0	9	0	0	9%
Total	**8%**	**19%**	43%	23%	5%	100%
1997:						
Insolvent (>100)	**0% a/**	**0%**	0%	0%	2%	2%
70 to 100	**4**	**0**	2	4	4	13%
40 to 70	**6**	**10**	10	4	0	28%
10 to 40	0	4	28	2	4	38%
0 to 10	0	8	10	2	0	19%
Total	**10%**	**21%**	49%	11%	10%	100%
1998:						
Insolvent (>100)	**4% a/**	**0%**	0%	0%	8%	11%
70 to 100	**0**	**2**	0	6	2	10%
40 to 70	**0**	**4**	19	8	0	31%
10 to 40	0	6	34	2	0	42%
0 to 10	0	2	6	0	0	8%
Total	**4%**	**13%**	58%	15%	10%	100%

a/ Percentages represent the number of farmers in each cell as a percent of the total number of NonValley farmers (n=53).

4.2 The Impact of Adjustments on Performance

Several alternative farm and household adjustments might have been undertaken in order to respond to financial stress. We investigate those adjustments by defining measures and estimating models that attempt to explain the impacts of those strategies on farm performance.

The various strategies that farmers reported using during 1994-98, could be organized into three general categories. The first category is strategies that are designed to improve asset management and, therefore, operational efficiency. The financial effects may be to either increase revenues or reduce costs. The second category is strategies that involve household activities and business investments. These could include adjustments to family living expenses and efforts to diversify income with off-farm sources. A third category might include strategies that focus on production and/or market risk and the use of financial leverage (e.g., use of outside consultants, purchase of

crop insurance, paying down debt, etc.). These strategies may improve performance in two ways: reducing the variability of earnings and/or increasing the average level of earnings.

Asset management is first analyzed by interpreting the simple correlation coefficients between the various strategies reported by farmers. Positive correlation coefficients suggest that the strategies are complementary. For example, farmers that postponed machinery purchases tended to: lease more of their farm machinery (r =.19), hire custom operators (r =.25), and engage in custom work themselves (r =.27). Farmers who leased machinery were more likely to purchase machinery and equipment with other farmers in a share arrangement (r =.19) , hire custom operators (r =.13), and engage in custom work (r =.12). It is noteworthy that the highest correlation occurs between farmers who reported doing custom work and those who reported selling machinery to reduce their debt (r =.31). This latter result clearly indicates an effort to improve overall utilization of machinery and equipment while addressing a debt service problem.

Some asset management decisions involved acquisitions, such as the purchase of a fungicide sprayer and/or a grain cleaner. We infer that these purchases were motivated by the grain quality problems due to wheat and barley scab. In some cases farmers reported making these purchases jointly (r =.16). Farmers who purchased a fungicide sprayer were more likely also to lease assets (r =.14), but less likely to postpone machinery and equipment purchases (r = -.17). Farmers who purchased grain cleaning equipment were much more likely to lease assets (r =.36), sell machinery (r =.14) and to share purchase machinery (r =.14). Interestingly, farmers who reported purchasing a grain cleaner or a fungicide sprayer were likely to have discontinued their use of a crop consultant (r =.21 and r =.34, respectively). This may signal an effort by some farmers to manage the problem by reducing the cost of crop consultants and substituting specific investments in production assets.

Household and off-farm investment strategies reported by farmers suggest that these alternative adjustment strategies have been pursued in combination to improve financial performance and survival. The reduction of family living expenses and the taking of an off-farm job were complementary strategies (r =.29). In contrast, investing in a value-added, off-farm agricultural venture tended to be a weakly-correlated substitute for the reduction of household expenditures (r = -.13).

It is interesting to note that these household strategies tend to complement the asset management strategies of farmers. For example, reduction of family living expenses tends to be positively correlated with the postponement of machinery replacements, leasing of assets, share purchase of machinery and equipment, and doing custom work. Generally, these strategies would have the short-term effect of reducing cash outlays, thus improving liquidity and financial survival.

4.3 Regression Analysis

The impact of management adjustments and other factors on farm performance is evaluated using ordinary least squares (OLS) regression analysis. Two measures of performance were identified in order to determine the strength of the relationship between these factors and farm performance. The two measures are the cash flow-to-equity ratio (CFE) and the rate of return-to-equity ratio (ROE). We expect these two models to produce somewhat different results because the strategies that improve cash flow performance of the farm-household unit may not be the same as the strategies that improve farm profitability. In each model the explanatory variables are selected based on hypotheses about the effects on performance of production, marketing and financial characteristics of the farms and the strategies the farmers reported using. Definitions of the variables used in the regression analysis are reported in Appendix B.

We estimate three general types of models. One model predicts the standard deviation of CFE and ROE. A second model predicts the negative deviation of the CFE and ROE ratios. A third model predicts the change in the level of the CFE and ROE ratios from 1995 to the following period 1996-1998. Each type of model answers a slightly different question. The standard deviation model looks for factors that reduce the overall variability of CFE and ROE. The semi-variance model looks for factors that reduce the negative deviations (downside variability) of CFE and ROE. The change model looks for factors that improve the overall performance of farms.

We estimate each model using a stepwise delete procedure to identify the most significant explanatory variables. In each case we report the variables with significance levels of 20 percent or better. Our discussion focuses on the interpretation of the results.

4.3.1 Variability of Performance

In the standard deviation models of CFE (SDCFE) and ROE (SDROE) we predict the overall variability of farm performance during 1995-1998. Although this is quite a short time series from which to calculate the standard deviation measures, the regression results suggest that both the CFE and ROE models explain a significant part of the overall variability of farm performance (Table 20).

One of the most significant variables in the SDCFE model is the proportion of wheat acreage (WHEAT%). As expected, the higher the percentage of wheat acres in the farm, the greater is the overall variability of the CFE ratio during 1995-98. This may be attributable to wheat scab disease and/or falling wheat prices. We also find that the higher the proportion of sugar acreage in the farm (SUGAR%), the lower is the variability of cash flow. Sugar has historically been one of the better cash crops in the Valley, and it appears to stabilize the cash flow of sugarbeet farms during 1995-98. If a farmer is evaluated as a weak financial manager (FINMGR), the result is that the variability of cash flow to equity is increased significantly. Interestingly, the length of farm management experience is found to have a negative impact on cash flow performance. If farmers managed their farms prior to 1985 (MANG85), the results suggest that they experience greater overall variability of cash flow (compared to farmers who began managing after 1985). We interpret this result with caution, since the length of management experience may reflect other characteristics of the farmer and/or the farming operation. We also find that a farmer that received an emergency loan in 1996, tended to be associated with a higher degree of overall CFE variability.

Just two of the "management adjustment" variables were found to be significant predictors of CFE. The strategy of investing in value-added ventures off the farm (VALADD) is found to significantly decrease the variability of CFE. This may imply either a diversification of the overall sources of cash flow or the selection of off-farm enterprises that exhibit less cash flow variability. The positive coefficient on the purchase of a grain cleaner (CLEANR) appears to reflect the fact that farmers who experience the greatest disease problems with their grain, decide to purchase grain-cleaning equipment to control the problem. It is logical that the immediate impact is to increase the variability of cash flow because of the cost of the investment, while the positive impact on earnings may be delayed.

In the SDROE model (Table 20) the results indicate again that weak financial management (FINMGR) has the effect of raising the variability of ROE. Also, farmers who managed their

Table 20. Regression Results for Variability of Return Models.

Explanatory Variable	Standard Deviation of CFE (SDCFE) Model	Standard Deviation of ROE (SDROE) Model	Negative Deviation of CFE (NDCFE) Model	Negative Deviation of ROE (NDROE) Model
CONSTANT	48.3*** (2.66)	5.22 (4.76)	83.42 (91.95)	2373.42*** (378.14)
WHEAT%	.09*** (.03)			
SUGAR%	-.04** (.02)	.13* (.08)		
DECYLD		.60** (.26)		
EMER95			846.66** (387.18)	
EMER96	5.61* (3.36)			
REST96				696.32*** (234.51)
FINMGR	3.22* (1.90)	21.76*** (7.81)	-393.49 (243.78)	
PRDMGR			803.76 (584.18)	1855.01*** (494.30)
MKTMGR			-487.93** (228.99)	
MANG85	1.83* (1.06)	8.04* (4.38)		
JOBOFF				-249.61** (126.75)
FAMEXP		-11.07** (4.56)		
MPCINS				-2234.86*** (352.22)
VALADD	-2.59** (1.09)		-363.36*** (132.93)	-167.87 (119.28)
CLEANR	3.88*** (1.38)		687.43*** (162.72)	
SPRAYR		14.72*** (5.42)	328.06** (149.56)	
FUNGSP				3.24 (2.37)
CUSTWK			330.34** (139.84)	
SHAREQ		16.63*** (5.54)		
Adjusted R-Square	0.34	0.34	0.298	0.490
F-statistic	6.07***	6.20***	4.66***	12.07***

a/ The numbers in parentheses are standard errors. Note: *** indicates the coefficient is significant at the 1% level, ** indicates the coefficient is significant at the 5% level, and * indicates the coefficient is significant at the 10% level.

farms prior to 1985 (MANG85) experience greater than average variability of ROE. The decline of average wheat yields during 1995-98 from their normal levels (WHTYLD) has the effect of significantly increasing the variability of ROE. In comparison with the previous model, the proportion of sugarbeet acreage in the crop mix (SUGAR%) appears to increase the variability of ROE. While the effect is not strong, it was unexpected. The strategy of reducing family living expenses (FAMEXP) has the effect of reducing the variability of ROE.

Some of the significant variables in the SDROE model require further explanation. For example, the purchase of a fungicide sprayer (SPRAYR) has a positive coefficient. We interpret this to indicate that farmers who purchase a sprayer are experiencing a more significant problem with crop disease. The immediate effect of the purchase is to increase the variability of ROE, while the long-term benefits of the sprayer are delayed. Similarly, the strategy used by some farmers of purchasing machinery and equipment with another farmer (SHAREQ) implies greater variability of ROE. It may be that farmers who use that financial strategy are already experiencing significant financial stress. Thus, while farmers use a logical strategy for improving farm profitability, the farm is also experiencing a high level of variability of ROE due to other factors.

The set of significant variables in the negative deviation (NDCFE and NDROE) models in Table 20 is quite different from those in the previous standard deviation models. For example, the level of financial management skills is less influential, while production and market management skills appear to be more important.

In the NDCFE model, we find that receiving an emergency loan in 1995 (EMER95) is associated with a downward shift in the CFE of Valley farms. The positive sign on the production management variable (PRDMGR) is not highly significant, but it does indicate that poor production management corresponds with worse CFE performance. The negative sign on the marketing management variable (MKTMGR) is quite unexpected. This suggests that farmers with relatively weaker market management skills tend to experience better CFE performance compared to other farmers in the sample. We have no explanation for this rather unexpected result. Among the management strategy variables we see that investing in value-added ventures of the farm (VALADD) tends to reduce downward movements in the CFE ratio. However, other strategies such as buying a grain cleaner (CLEANR), buying a fungicide sprayer (SPRAYR), or engaging in custom work (CUSTWK) are factors that are associated with downside movements in CFE. As earlier, we interpret these positive signs on the investments in equipment to mean that farmers incur a cash expense that immediately reduces the CFE, while the long-term benefits are not yet realized. The custom work result may reflect the fact that farmers who decide to do custom work are experiencing relatively greater cash flow problems than other farmers in the sample.

In the NDROE model the effect of weak production management (PRDMGR) is to significantly reduce the ROE of the farm business. Secondly, by taking an off-farm job (JOBOFF) the ROE performance of the farmer was improved. That is, there is less of a downward shift in the ROE of the farm when off-farm earnings are generated. This is a rather interesting result, since off-farm earnings are not directly related to the ROE measure. There may be other factors, not in the model, that account for adjustments made by the farmers in their farming activities in order to earn off-farm income. The JOBOFF variable picks up their effects. Third, we see that financial restructuring in 1996 (REST96) is associated with a relatively greater downward shift on the ROE of the farm. The implication is that farmers who were required to restructure early in this period also experience lower ROE performance throughout the period. This result is not expected, since restructuring is typically viewed as a way to improve the financial performance of the farm business. It may be that the immediate impact of restructuring is to reduce ROE, while the long-

Table 21. Regression Results for Change of Average Return Models.

Explanatory Variable	Average CFE Model	Average ROE Model	Average CFE Model with interaction	Average ROE Model with interaction
CONSTANT	-28.56*** (10.04)	5.39 (3.34)	-19.98 (14.71)	5.59 (3.59)
SUGAR%		-.06 (.04)	-.11* (.06)	.08* (.04)
DECYLD	-.75** (.22)			
EMER95		63.80*** (11.51)		41.79*** (8.38)
EMER96	55.78*** (12.01)		56.65*** (11.88)	15.61** (7.50)
EMER97		53.73*** (11.54)		51.64*** (11.61)
EMER98	-11.43 (7.17)		-15.22** (6.55)	
REST95	21.21* (11.39)	23.38*** (7.46)	23.21** (11.20)	18.06** (7.63)
REST96		-44.76*** (6.22)		-33.41*** (6.00)
REST97	-33.96*** (10.09)		-32.57*** (9.88)	
REST98		-5.47** (2.48)		-6.34** (2.61)
CONSUL	6.16 (4.05)		8.88** (4.28)	
PRDMGR		-43.68*** (15.62)		
MKTMGR		8.28* (4.48)		
MANG85	5.48 (3.84)		8.18** (3.96)	
CASHSA	.16* (.08)	-.11** (.05)	.24*** (.09)	-.12** (.05)
JOBOFF	-5.80 (4.29)		-10.61* (6.24)	
MPCINS			-15.10 (11.26)	
VALADD			7.41 (5.50)	
MLEASE			12.81* (6.81)	
SHAREQ			13.24** (6.43)	6.65 (4.85)
CUSTWK				-10.06** (5.08)
CLEANR	-9.31* (5.40)		-15.10 (10.25)	9.02 (6.72)
Adjusted R-Square	0.346	0.454	0.381	0.416
F-statistic	4.65***	7.19***	4.03***	5.33***

a/ The numbers in parentheses are standard errors. Note: *** indicates the coefficient is significant at the 1% level, ** indicates the coefficient is significant at the 5% level, and * indicates the coefficient is significant at the 10% level

term benefits of restructuring are not reflected in the data. Finally, we see that the effect of carrying multiple-peril crop insurance on small grain crops (MPCINS) is to reduce the downward shift of the ROE among Valley farmers. Similarly, the strategy of investing in value-added ventures off the farm (VALADD) has a beneficial effect by reducing the magnitude of downward shifts in the ROE of the farm.

The standard deviation and negative deviation models in Table 20 suggest some general conclusions. First, the level of financial management skills is a factor in determining which Valley farmers experience less variability in their financial performance during this period of significant production and market price risk. Similarly weak production management skills of individual farmers contribute to poor financial performance and greater uncertainty about the sustainability of the farm business. Second, contrary to our expectations, the effects of selecting crop enterprises and declining wheat yields on cash flow performance or farm profitability are not as strong as they were initially assumed to be. Third, a strategy of investing in value-added ventures off the farm can have significant risk-reducing effects on both the variability of farm profits and the variability of cash flow in the combined farm-household unit. Fourth, the reduction of family living expenses appears to provide an additional strategy for reducing some of the variability of financial performance in the Valley region. Fifth, financial restructuring and marketing management strategies do not appear to have the expected effects of reducing the variability of financial performance in the short run.

4.3.2 Changes in Average Performance

In Table 21 we report two types of models for CFE and ROE. In these models we attempt to predict changes in the level of financial performance from 1995 to the subsequent (1996-1998) period. The first set of models predicts the changes in the average level of the CFE and ROE measures. The second set of models also predicts the changes in the average level of the CFE and ROE measures with interaction effects. Here, we assume that the effectiveness with which the various management strategies were implemented varies directly with the overall management ability of the farmer. To do this we multiply the dummy (0,1) variable for the level of overall management of a farmer (which is 1 if the farmer is in the top 20% of farmers, a 0 otherwise) times each of the dummy variables for strategies reported by the farmer. Thus, these interaction models capture the effects of strategies conditional on the quality of management employed by the farmer. We presume that this says more about the effectiveness of the adjustment strategy.

In the average CFE model declining wheat yields (DECYLD) tend to reduce the CFE of the farm. Emergency loans (EMER96) and loan restructuring (REST95) in the early years tend to improve CFE. Conversely, emergency loans (EMER98) and financial restructuring (REST97) in the later years tend to reduce CFE. The only other variable that has a significant impact on CFE performance is the proportion of the small grain crop that is marketed using a post-harvest cash sales strategy in 1998 (CASHSA). We use this variable as an indicator of the marketing strategy used by the farmer. Interestingly, the cash sales strategy suggests an improvement in farm financial performance. Other management strategy variables are not found to be significant predictors of the change in CFE.

The results of the average ROE model indicate that the availability of emergency loans and financial restructuring in the early years improves the average level of ROE. Factors that reduce the level of ROE include financial restructuring in 1996 and 1998 (REST96 and REST98), weak production management skills (PRDMGR), and higher levels of cash sales when marketing small grains (CASHSA). Contrary to our expectations, we also see that the effect of relatively weak

market management skills (MKTMGR) is to improve the level of ROE of the farm business. This is result deserves further analysis.

We compare the interaction models for average CFE and average ROE in Table 21 with the two previous (noninteraction) models. The interaction models generally support the results that were already reported in Table 21, but the interaction of overall management ability makes some of the effects more significant. For example, the proportion of cash sales of grain (CASHSA) is still positive, but more significant, and may indicate that a cash sales strategy is relatively effective when employed by a skilled manager. Second, the strategies of leasing machinery (MLEASE) and sharing the acquisition costs of machinery and equipment (SHAREQ) improve cash flow performance among skilled managers. Third, an off-farm job taken by a top manager (JOBOFF) tends to have a negative impact on overall cash flow. This suggests that other on-farm strategies may be more effective for that group of farmers.

Other variables are also more significant predictors of cash flow performance in the interaction model. For example, financial restructuring in the first year (REST95) has a larger positive effect on the level of CFE in 1996-98. An emergency loan in the last year (EMER98) is associated with a more significant negative shift in the CFE of the farmer. The use of a paid crop consultant in 1998 (CONSUL) also has a positive impact on the average level of cash flow.

When we turn to the average ROE model with interaction we see many of the same relationships as in the ROE model without interaction. Three of the variables are worth a closer look. First, a higher proportion of sugar acres (SUGAR%) tends to raise the level of ROE, although the effect is not strong. An emergency loan in 1996 (EMER96) tends to have a positive effect on the level of ROE of the farm in later years. Finally, by engaging in custom work (CUSTWK) a farmer with above average management skills would have reduced the ROE of the farm during 1996-1998.

The regression models reported in Tables 20 and 21 provide quite different results concerning which variables are good predictors of the financial performance of Valley farmers. No dominant model or set of variables emerges from our analysis. What explanations might be offered for these somewhat inconsistent results? First, the data series is quite short. The number of annual observations per farm is limited to 4 years. Thus, the long-term financial impact of management adjustments may not be adequately reflected in the data. Second, the implementation of these strategies may vary considerably between farmers. Although the interaction models try to account for this, the effectiveness of implementation is not captured explicitly in the data. Third, income from outside sources (e.g., government payments) may have had a sufficiently large effect on net income for enough of the farmers in the sample that they reduced the significance of the impact that adaptive management strategies had on financial performance.

5. Conclusions

Agriculture in the Red River Valley (RRV) has experienced successive severe production and economic shocks in recent years. There is evidence that the volatility of net returns per acre is relatively high during 1994-1999 for several of the key crops grown in the RRV. Although the current financial stress of farmers in the RRV represents an income problem, it has its roots in several aspects (production, marketing and financing) of the farm business. Farmers throughout the RRV have altered their production plans in order to diversify their production risks, reduced their operating costs and household expenses, and engaged in off-farm revenue-generating activities. Some have been forced to financially restructure their farm businesses.

The rates of return on equity indicate volatile profits experienced by farms in the RRV region during 1994-98. Lower rates of return on equity are particularly noticeable among Valley and NonValley farmers in the 20th-percentile group. Among that group of farmers, there was on average an annual loss of between 30% (among NonValley farmers) and 44 % (among Valley farmers) of their equity capital in this period. The implication of these and other indicators is that Valley farmers are experiencing a higher incidence of financial stress in their farming operations. This deterioration of financial performance is having an impact on the exit rate of both Valley and NonValley farmers. The responses to the farmer survey indicate that there is a relatively high percentage of farmers who either do not have a clear or positive idea about the future ownership of their farms or who would continue to manage their farms.

Survey responses indicate that farmers in the Valley are attempting to change the mix of crops in order to improve farm performance and sustainability. A majority of the RRV farmers reported that they changed their cropping mix after the 1996 Farm Bill because it gave them the flexibility to plant more crops. Among those farmers about 90 percent had quit growing barley or reduced their barley acreage. At the same time, most of the farmers favored growing soybeans, canola, sugarbeets and dry beans (in decreasing order of preference). The primary reasons put forward for the shift in crop mix included the desire for higher profit, increased use of contract farming, and more reliable market prices in the new crops. In the Valley about half of the farmers indicated that profitability was their main objective, while about 23% indicated that the reason was to increase their crop rotation. What has emerged through 1998-1999, is a more diversified set of farms in the RRV. In addition to changes in the crop mix and crop rotation, farmers also increased their use of fungicides from less than 20% (in 1994) to about 58% among Valley farmers and about 43% among NonValley farmers in 1998.

The financial responses of farmers to economic shocks and financial stress have taken several alternative forms. They include: reducing farm operating expenses, reducing family living expenses, taking an off-farm job, reducing purchases of or leasing production assets, purchasing crop insurance, and in some instances refinancing or restructuring farm debts. The most frequent financial adjustment made during 1994-98 was the postponement of machinery purchases. The next most frequently reported adjustments were: the reduction of family living and other nonfarm expenses, the reduction of farm operating expenses by hiring custom operators, and the investment in off-farm value-added ventures. NonValley farmers identified off-farm work as a more frequently used strategy for dealing with financial stress during 1994-98. Off-farm work may be more accessible to NonValley farmers. Alternatively, NonValley farms are typically smaller than Valley farms and part-time farming may be more common among NonValley farmers. Off-farm employment opportunities appear to be a significant factor in improving farm survivability in the RRV region.

Over half of the Valley farmers indicated that they had re-negotiated their land rental agreement during 1994-98. Additionally, about 20% of the Valley farmers had gone through a loan reamortization, a debt deferral, or a general financial restructuring during 1994-1998. Similarly, about 20% of the farmers had received an emergency loan at one time during the period. In the Valley, the greatest number of financial restructuring actions occurred during 1998-1999. The incidence of financial restructuring among NonValley farmers appears to be only slightly lower, while the frequency of emergency loans is relatively higher.

Many farmers report that they typically sell grain without a contract. That is, they wait until after harvest to price their grain. Among Valley farmers about 49% of the grain crop in 1998 was marketed without a contract. Among NonValley farmers the average percentage of the grain crop sold without a contract was even higher at about 80%. Valley farmers do indicate that they are

likely to change their grain marketing strategy in favor of more forward cash contracts in the future. Our results suggest that most Valley and NonValley farmers were exposed to significant market price risk during 1994-1998.

Several factors may explain the observed differences in the financial performance of Valley farmers during 1994-1998. Cash flow performance was relatively poor during 1995, 1997 and 1998. In 1995, about 17% of the Valley farmers were "financially stressed," as reflected by a negative cash flow position. By 1996, the percentage of these farmers declined to 11%. The percentage increased sharply to 39% in 1997, and then fell to 21% in 1998. Farmers who were "seriously financially stressed" include those with both a negative cash flow position and a high financial leverage position. About 11% of the Valley farmers were seriously financially stressed in 1995. By 1996 this percentage fell to 6%, but it increased to 28% in 1997, and dropped again to 16% in 1998.

The strategies that farmers report using during 1994-98, can be organized into 3 general categories. The first category includes strategies to improve asset management. The second is strategies that involve changes in household revenues and expenses and business investments. The third is strategies that focus on reducing production and/or market risk and using less financial leverage. These strategies may improve performance by reducing the variability of cash flow and net farm earnings and/or by increasing the average level of cash flow and earnings.

The survey suggests that farmers who postpone machinery purchases tend to: lease more of their farm machinery, hire custom operators, and engage in custom work themselves. A strong relationship is found between farmers who report doing custom work and those who report selling machinery to reduce their debt. This result suggests that farmers were making an effort to improve overall utilization of machinery and equipment while addressing their debt-servicing problems.

Household and off-farm investment strategies are pursued in combination to improve financial performance and survival. The reduction of family living expenses and the taking of an off-farm job are complementary strategies. We find some evidence that these household strategies tend to complement the asset management strategies of farmers.

We find that some specific factors and management strategies tend to reduce the variability of financial performance (less variability of the cash flow and rates of return on equity ratios). First, the level of financial management skills is a factor in determining which Valley farmers experience less variability in their financial performance during this period of significant production and market price risk. Similarly weak production management skills of individual farmers contribute to poor financial performance and greater uncertainty about the sustainability of the farm business. Second, contrary to our expectations, the effects of selecting crop enterprises and declining wheat yields on cash flow performance or farm profitability are not as strong as they were initially assumed to be. Third, a strategy of investing in value-added ventures off the farm can have significant risk-reducing effects on both the variability of farm profits and the variability of cash flow in the combined farm-household unit. Fourth, the reduction of family living expenses appears to provide an additional strategy for reducing some of the variability of financial performance in the Valley region. Fifth, financial restructuring and marketing management strategies do not appear to have the expected positive effects on farm financial performance in the short run.

Models are also estimated to predict changes in the level of financial performance from 1995 to the subsequent (1996-1998) period. Emergency loans and loan restructuring actions in the early

years tend to improve both the cash flow and net earnings performance of the farms. Weak financial and production management skills tend to have adverse effects on farm performance.

While no dominant set of factors emerges from the regression analysis, some explanations may be offered for the inconsistency of the model results. First, the data series is quite short. The number of annual observations per farm is limited to just 4 years. Thus, the long-term financial impact of management adjustments may not be adequately reflected in the data. Second, the effectiveness of implementation by farmers of these strategies may vary considerably. In addition farmers who were early adopters of these strategies may have benefited more than the late adopters. Although the interaction models try to account for the effectiveness of implementation, the survey data do not explicitly capture this effect. Third, income from outside sources (e.g., government payments) may have had a sufficiently large effect on net income of some farmers. Thus, the adaptive management strategies may have a relatively small impact on financial performance.

Appendix A
Survey Means for 185 Responding Producers in the Combined Valley and NonValley Regions

Red River Valley Producer Survey

The goal of this study is to help producers to identify successful production, marketing, and financial management strategies in response to wheat scab, government farm policy, and related economic shocks.

Q1. Total cropland acres you operated in 1998 (owned or rented, including fallow but excluding land rented to others or land in the Conservation Reserve Program)
1,730 acres (185 resp.)

Q2. Acres you rented in 1998: **1197 acres (185 resp.)**

Q3. Please indicate your total cropland acres in 1998 compared to 1994. (Circle the most accurate response and indicate the number of acres) **(185 resp)**

1 about the same total cropland acres as in 1994 (**93 resp.)** GO TO Q6

2 fewer acres than in 1994 : **323 fewer acres** (**26 resp.)** GO TO Q5

3 more acres than in 1994: **659 more acres (66 resp.)**

GO TO Q4

Q4. Which of the following best describes the additional cropland you farmed in 1998? (**102 resp**.)

1 the additional cropland was land I owned that came out of the CRP
GO TO Q6 (**9 resp.)**

2 I purchased the additional cropland
GO TO Q6 (**74 resp.)**

3 I rented the additional cropland

GO TO Q6

Q5. Based on Q3, how did you reduce your acreage? (Circle all that apply)

1 I put the cropland into the CRP during 1995-1998
GO TO Q6 **(10 resp)**

2 I quit renting some or all of my rented cropland
GO TO Q6 **(8 resp)**

3 I sold some cropland that I owned
GO TO Q6 **(2 resp)**

Q6. Approximately how many acres of the following crops did you harvest from your farm in 1998? Also, please indicate the year in which you quit growing or started growing the crop.

	Acres harvested in 1998	Acres you intend to plant in 1999	Year you started growing the crop (1994 or later)	Year you quit growing the crop (1994 or later)
Barley	**151**	**52**		
Canola	**217**	**253**		
Corn for grain	**163**	**126**		
Corn silage	**64**	**77**		
Edible dry beans	**281**	**269**		
Potatoes	**242**	**267**		
Soybeans	**349**	**371**		
Sugar Beets	**353**	**358**		
Sunflowers	**132**	**183**		
Wheat	**729**	**766**		
Other (circle all that apply – alfalfa, bluegrass, flax, oats or other)	**183**	**220**		

Q7. If you indicated in Q6 that you have started growing other or additional crops since 1994, did you do so because: (Circle the best response**) (136 resp.)**

1 You wanted to increase the number of crops in your crop rotation **(32 resp.)**

2 You decided to grow a crop that was more profitable **(83 resp.)**

3 Neither of the above **(20 resp.)**

Q8. What is the USDA historical wheat acreage base for the cropland acres you listed in Q1? **882** acres **(158 resp.)**

Q9. What is the USDA historical barley acreage base for the cropland acres you listed in Q1? **295 a**cres **(149 resp.)**

Q10. The 1996 Farm Bill provided for increased planting flexibility. Have you changed your crop mix in ways that you would not have been able to do before that?

1 No **(45 resp.)**

2 Yes (Please describe the changes): (**113 resp.)**

Q11. If you indicated in Q6 that you have grown sugar beets during 1994-1998, which of the following best describes your situation in 1998 compared to 1994? (Circle one and indicate the number of acres) (**77 resp.)**

I kept my sugar beet acreage about the same **(6 resp)**

I <u>increased</u> my sugar beet acreage by **119** acres in 1998 compared to 1994 **(6 resp)**

Please identify the major factors that led you to increase your acreage:

I <u>decreased</u> my sugar beet acreage by **174** acres in 1998 compared to 1994. **(8 resp)**

Please identify the major factors that led you to decrease your acreage;

Q12. If you indicated in Q6 that you have grown potatoes during 1994-1998, which of the following best describes your situation in 1998 compared to1994? (Circle one and indicate the number of acres)

1 I kept my potato acreage about the same **(4 resp.)**

2 I increased my potato acreage by **410**acres in 1998 compared to 1994).

Please identify the major factors that led you to increase your acreage **(4 resp.)**

3 I decreased my potato acreage by 3**70** acres in 1998 compared to 1994).

Please identify the major factors that led you to decrease your acreage **(5 resp.)**

Q13. How did your average wheat and barley yields during 1993-1998, compare with what you considered "normal" before 1993? Also, how much of your barley crop was sold for malting versus feed in those years?

Year	Wheat	Barley		
	yield per acre	yield per acre	% sold for Malting	% sold for feed
1993	**26.9 bu.**	**57.9 bu.**	**59%**	**89%**
1994	**28.7 bu.**	**55.6 bu.**	**46%**	**89%**
1995	**31.8 bu.**	**54.8 bu.**	**49%**	**86%**
1996	**42.5 bu.**	**64.9 bu.**	**62%**	**82%**
1997	**33.8 bu.**	**53.4 bu.**	**36%**	**90%**
1998	**41.3 bu.**	**49.8 bu.**	**37%**	**88%**
Normal (in 1992 and earlier)	**46.8 bu.**	**71.2 bu.**	**68%**	**55%**

Q14. If you have had losses due to scab since 1993, did you change your primary tillage practices with regard to your wheat and barley stubble?

1 More acres under minimum tillage **(22 resp.)**

2 More acres using a moldboard plow **(62 resp.)**

3 More acres under reduced tillage **(12 resp.)**

4 No change since 1993 **(81 resp.)**

Q15. If you have had losses due to scab since 1993, did you apply fungicide? (Indicate the approximate percentage of total wheat acres sprayed.)

Year	% of Wheat Acres Sprayed
1994	**15.4 %**
1995	**16.9%**
1996	**24.8 %**
1997	**29.7%**
1998	**52.9%**
1999 (plan)	**58.1%**

Q16. Did you employ a paid crop consultant in 1998? (**183 resp.)**

1 Yes **(56 resp.)**

2 No **(127 resp.)**

Q17. Have you made major improvements on your cropland drainage ditches since 1994?

1 Yes **(98 resp)**

2 No **(84 resp)**

Q18. Please indicate level of crop yield insurance coverage you carried on wheat during 1994-1998, and your crop insurance plan for 1999.

	Wheat					
Type of Coverage	1994	1995	1996	1997	1998	1999 plan
Basic multiple peril crop insurance	**67%**	**68%**	**67%**	**66%**	**70%**	**67%**
Crop revenue	%	___%	___%	___%	___%	___%
Income protection	___%	___%	___%	___%	___%	___%
Catastrophic (check)	___	___	___	___	___	___
Crop hail (check)	___	___	___	___	___	___
Other (indicate) _____	___	___	___	___	___	___

Q19. Please indicate approximately what percentages of your small grains crops you priced before harvest or sold with no contract in 1998, and what percentages you intend to price using those same methods in 1999.

Year	forward cash contracts	futures and/or options	Priced at or after harvest (i.e., no contract)	Total
1998	**15.4%**	**12.7%**	**61.5%**	
1999 plan	**9.5%**	**19.3%**	**59.8%**	

Q20. Please describe how you have changed the pricing strategy you use for your small grains crops during the past five years:

Q21. Did you have a paid subscription to a market advisory service in 1998?

1 yes **(57 resp.)**

2 no **(98 resp.)**

Q22. If you rent cropland, did you renegotiate your land rental agreement during 1994-1998?

1 No **(89 resp.)**

2 yes (Please describe): **(88 resp.)**

Q23. Please indicate which of the following changes have you made over the past five years. (Circle all that apply)

1 I purchased a fungicide sprayer. (**24 resp.)**

2 I purchased a grain cleaner. (**27 resp.)**

3 I invested in a value-added agricultural venture off the farm. (**70 resp.)**

4 I postponed replacing machinery or equipment. (**143 resp.)**

5 I sold machinery, equipment, or other production assets in order to make debt payments (**22 resp.)**

6 I started doing custom work for others, or I have increased the amount of custom work from what I have done normally. (**45 resp.)**

7 I hired custom operators to do some operations (i.e. combining) that I used to do with my own equipment. (**73 resp.)**

8 I leased a tractor or combine that I would have normally purchased. (**47 resp.)**

9 When purchasing machinery and/or equipment, I bought it together with another producer and we are sharing its use. (**32 resp.)**

10 I discontinued using a crop consultant in order to save money. (**20 resp.)**

11 I (we) reduced the level of family living expenses and other nonfarm **expenses (82 resp.)**

12 I (we) took an off-farm job in order to maintain our level of income**. (57 resp.)**

Other (Please indicate): (**32 resp.)**

Q24. If you hired labor in 1998, how did it compare with 1994? (**168 resp.)**

1 I used about the same amount of hired labor (**88 resp.)** GO TO Q26

2 I increased the use of hired labor by **67** percent (**37 resp.)** GO TO Q26

3 I decreased use of hired labor by 4**8** percent (**43 resp)**

Q25. Has reduced availability of hired labor been a factor leading you to reduce the size of your farming operation? (**108 resp.)**

1 Yes **(21 resp.)**

2 No **(87 resp.)**

Q26. Did you raise livestock in 1998? (**172 resp.)**

1 no **(133 resp.)**

2 yes **(39 resp.)**

Q27. Describe the livestock you had on your farm over the past five years:

Q28. Please indicate your age. **(181 resp.)**

1 under 35 years **(12 resp.)**

2 35 - 44 years **(66 resp.)**

3 45 - 54 years **(63 resp.)**

4 55 - 64 years **(32 resp.)**

5 65 years and over **(8 resp.)**

Q29. When did you become the primary manager of the operation at the present location?

(181 resp.)

1 1985 or later **(59 resp.)**

2 before 1985 (**122 resp.)**

Q30. Do you plan to be in farming for the next 5 years? **(179 resp.)**

1 yes **(153 resp.)**

2 no **(26 resp.)**

Q31. Do you have children or other relatives who plan to continue farming on your farm? **(181 resp.)**

1 yes **(51 resp.)**

2 no **(63 resp.)**

3 I don't know **(67 resp.)**

THANK YOU FOR YOUR HELP!

Appendix B
Description of Variables

Variable Name	Description
Independent Variables:	
CFE	Cash Flow/Equity ratio
ROE	Rate of Return on Equity ratio
SDCFE, SDROE	Standard deviation of the CFE and ROE ratios, respectively.
NDCFE, NDROE	Negative deviations of the CFE and ROE ratios from their mean (1995-1998) values, respectively
Dependent Variables:	
WHEAT%	Percentage of total crop acres planted to wheat in 1998
SUGAR%	Percentage of total crop acres planted to sugarbeets in 1998
DECYLD	Average wheat yield (1994-1998) divided by the normal wheat yield prior to 1994.
EMER9_	Emergency loan dummy variable for 1995-98 (=1 if yes, =0 if no)
REST9_	Financial restructuring dummy variable (=1 if yes, =0 if no)
FINMGR	Financial management dummy variable (=1 if in lowest 20%, =0 if not)
PRDMGR	Production management dummy variable (=1 if in lowest 20%, =0 if not)
MKTMGR	Market management dummy variable (=1 if in lowest 20%, =0 if not)
MANG85	Farm manager prior to 1985 (=1 if yes, =0 if no)
CONSUL	Crop consultant employed dummy variable (=1 if yes, =0 if no)
JOBOFF	Took job off the farm (=1 if yes, =0 if no)
FAMEXP	Reduced family living expenses (=1 if yes, =0 if no)
MPCINS	Purchased multiple-peril crop insurance in 1998 (=1 if yes, =0 if no)
CASHSA	Percentage of small grain crop sold for cash price after harvest
VALADD	Invested in a value-added venture off the farm (=1 if yes, =0 if no)
CLEANR	Invested in a grain cleaner (=1 if yes, =0 if no)
SPRAYR	Invested in a grain sprayer (=1 if yes, =0 if no)
FUNGSP	Average percentage of wheat crop acreage sprayed with fungicide
CUSTWK	Engaged in custom work (=1 if yes, =0 if no)
SHAREQ	Purchased equipment and machinery under a sharing arrangement with another farmer (=1 if yes, =0 if no)
MLEASE	Leased machinery (=1 if yes, =0 if no)