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SELECTED CHARACTERISTICS OF NORTH DAKOTA FARM FAMILIES ENGAGED IN SUSTAINABLE AGRICULTURAL PRACTICES

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The authors accept responsibility for any remaining errors or omissions.

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HIGHLIGHTS

The purpose of this study was to compare the characteristics of North Dakota farm families who have adopted sustainable agricultural practices to those who have not. Farmers surveyed were classified as conventional, sustainable, or mixed-type based on their practices, attitudes, self-identification, and sustainable agriculture group membership. The three types were compared for differences, and the findings are highlighted below:

- *Few of the conventional respondents were single (4.8 percent), widowed (1.1 percent) or divorced (0.5 percent), while 14.8 percent of the mixed-type and 13.8 percent of the sustainable group were single. Nearly seven percent of the sustainable group were divorced.*

- *Sustainable farmers and their spouses were younger than their conventional and mixed-type counterparts. The mean age of sustainable farmers was 41 years compared with 49 years for conventional farmers and 48 years for mixed type farmers. The average age for the spouses of sustainable farmers was 38 years, compared to 46 years for the spouses of the conventional farmers and 45 years for the spouses of the mixed-type farmers.*

- *Conventional farms had significantly higher hired labor costs/acre than their mixed-type and sustainable counterparts. However, no significant differences were found in the number of hours of labor family members contributed to the farms.*

- *Off-farm employment was common among all three groups, and a large segment of the sample could be defined as multiple job-holding farm households. Younger respondents were more likely to work off the farm (Pearson $r=-0.22$; $p=0.0004$), and the respondent's spouse was more likely to work off the farm as the debt-to-asset ratio increased (Pearson $r=0.19$; $p=0.0006$).*

- *Sustainable farmers were more likely than conventional farmers to work off the farm ($Chi^2=11.54$; $p=0.003$). The amount of off-farm employment for spouses did not vary significantly among the three groups. The spouses in all three groups worked more days off the farm than their mates.*

- *Although no statistically significant differences were found, in general, respondents classified as sustainable had higher future farming expectations that the other groups. Half of the sustainable respondents believed they would be farming more acres in five years, and all of them expected to be on the farm in the future, while 92.0 percent of the conventional and 95.8 percent of the mixed-type expected to be on the farm in the future.*

In this research, little difference was found among farm families who use sustainable agricultural practices and those who do not.

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The face of agriculture in the United States changed dramatically during the past several decades. Agricultural technologies became increasingly sophisticated through mechanization, specialization and chemical use. These changes increased yields and production greatly but not without costs. Public concern is growing over environmental degradation (soil erosion, nitrate runoff, chemical drift, and ground water contamination), agriculture's dependence on non-renewable resources, and the cost to the taxpayer of governmental involvement in agriculture.

Along with agriculture, rural America has changed. The U.S. farm population fell from over 30 million in 1930 to just over 5 million in 1985. Some reasons for this decline are the improved agricultural technologies that replaced agricultural labor and the economies of scale that increased farm consolidation (Murdock et al., 1988). The farm population decline caused the demise of many rural towns and reduced the viability of others. Murdock et al. (1988) stated that during the financial crisis of the 1980s:

> ". . . rural America was ill-prepared to weather an economic downturn, involving reductions in income, populations, service bases, and fiscal resources. Its reserves had been largely exhausted by decades of decline. It was in fact, an area that we would argue was highly vulnerable, an area for which further decline would lead to largely negative and permanent changes in the quality of life in rural America" (p. 69).

In response to these concerns, interest grew in sustainable agriculture. According to Reganold et al. (1990):

> "Sustainable agriculture embraces several variants of nonconventional agriculture that are often called organic, alternative, regenerative, ecological or low-input" (p. 112).

Although much attention has been focused on the environmental soundness, productivity, and economic potential of sustainable agriculture, its impact on the farm family is also important. Madden (1989) listed the values that gave rise to the sustainable agriculture movement:

> ". . . alarm over human health risk from exposure to agricultural chemicals in air, water and foods; abhorrence of environmental degradation, severe soil erosion, and depletion of natural resources; *concern over the future of the family farm;* and a desire to protect the rights of future generations to an abundance of food, clean water, and a decent environment" (p. 32, emphasis added).

Legislative discussions tying federal agricultural program payments to sustainable farm practices reflected the interest in sustainable agriculture.

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In 1988, the Northwest Area Foundation requested research proposals to determine the socioeconomic and agronomic impact of low-input sustainable agriculture (LISA) practices. Research teams from five states (Iowa, Minnesota, Montana, North Dakota, and Oregon) received funding from the foundation to participate in the project. North Dakota's multidisciplinary team of researchers and practitioners studied the agronomic, economic, and sociological issues pertaining to LISA practices.

How are agricultural practices related to family life? Does the amount of labor contributed to the farming operation by family members differ among types of farming? Is off-farm employment more prevalent for certain types of farming than it is for others? Are family characteristics such as marital status, household size, and ages of family members different in the various types of farming? The purpose of this report was to address these and related questions.

Sustainable farming practices are thought to demand more management skill and time and to require more intensive labor (Crosson and Ekey, 1988). Crosson (1989) stated that greater management demand may limit widespread adoption of sustainable methods. However, Lockeretz (1989) analyzed six conventional versus sustainable scenarios and found that labor costs per acre often were lower in the sustainable systems. Climatic and geographic constraints were major determining factors in the production methods selected and in the amount of family labor used.

Off-farm employment and part-time farming are part of rural life, although research definitions have not been consistent. Fuller (1984) advocated "multiple job-holding farm households" rather than "part-time farming." He differentiates between a full-time farming household (no members had gainful employment off-farm) and multiple job-holding farm households.

Warfield (1988) found that the primary reason for working off the farm was to supplement income. However, the extent of income derived from off-farm sources and the type of off-farm income (i.e., employment, rent, investments, non-farm or farm-related business, etc.) varied greatly by region (Leistritz et al., 1985).

Geographic Context

A shift in agricultural practices may have far-reaching consequences for North Dakota, which relies heavily on agriculture. Forty-three of North Dakota's 53 counties depend on agriculture,[2] and farm sources account for nearly 10 percent of the total state personal income.[3] Adopting alternative practices may change the state's agricultural production and income and affect the state's economic and social conditions.

North Dakota's agricultural industry is based primarily on the production of wheat, beef, barley, and sunflower. Cash receipts from marketing these products in 1988 were $666 million, $651 million, $233 million, and $168 million, respectively, accounting for over 70 percent of the state's farm marketing cash receipts (excluding government payments) (Bureau of the Census, 1989).

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[2]Agriculturally dependent counties are those where 20 percent or more of the total labor and proprietor income was produced from farming/ranching (Bender, et al., 1985; Ross and Green, 1985).

[3]Based on Bureau of Economic Analysis data for the 1980s.

Methods

Sample

To study the socioeconomic characteristics of farms using sustainable agricultural practices, 495 North Dakota farm and ranch operators were surveyed in March and April of 1990. The names of those farmers were obtained from two sources. First, a panel of 424 farmers who Leistritz et al. (1989) previously selected at random and surveyed were resurveyed. The panel had been contacted first in 1985 (N = 933) and again in 1986 (N = 759) and 1988 (N = 557). Respondents to the initial survey were screened "to ensure that all respondents were less than 65 years old, were operating a farm, considered farming to be their primary occupation, and sold at least $2,500 of farm products in 1984" (p. 1).

Second, the membership list of the Northern Plains Sustainable Agricultural Society (NPSAS) (n=71)was used. Members of this organization were added to enable a comparison of sustainable and conventional farmers. The reader should remain alert to the fact that subsequent analyses contained a disproportionate number of sustainable farmers relative to their actual proportion in North Dakota.

Procedures

Farmers were approached in three stages. Initially, each farmer received a letter explaining the project and indicating that s/he would be contacted soon by phone. Approximately a week later, the phone survey began. At least four efforts were made to contact each farmer. The response rate for this phone survey was 80.0 percent overall (340 panel-80.2 percent, 56 NPSAS-78.9 percent).

Finally, those who responded to the phone survey were mailed a questionnaire. The mail survey included a number of Likert-scale items that could be answered more rapidly in a self-administered questionnaire than by phone. A follow-up postcard was sent to farmers thanking them for their participation if they had already completed the mail survey and asking them to complete the survey if they had not. The response rate for the mail survey relative to those initially contacted by phone was 69.7 percent (230 panel-67.6 percent, 46 NPSAS-82.1 percent).

Classification System

The analysis focused on type of farmer as the independent variable, so a means was needed to determine whether a farmer was either conventional, sustainable, or somewhere in between as a mixed-type. Youngs et al. (1990) examined a number of approaches to measuring type of farmer and found considerable variability among approaches. Type of farmer is a complex variable involving multiple dimensions of comparison, and no single measure is likely to tap all of these dimensions simultaneously.

Rather than pick and choose among measures, an approach suggested in Northwest Area Foundation's Sustainable Agriculture Initiative was followed (Bird and Hassebrook 1990). This approach involved constructing an index based on a farmer's self-identification, practices, attitudes, and farm group membership. Each dimension was scored to reflect the degree to which a farm operation relied on internal resources versus off-farm inputs.

The index used responses to seven questions which measured the dimensions noted above. Responses to each question were re-coded to range from zero (high input/conventional) to one (low input/sustainable) and summed. The resulting index values ranged from 0.00 to 7.00. To simplify subsequent analyses, the scale was converted to three categories: conventional (0.00-

3.00; N = 187), mixed-type (3.01-5.00; N = 54), and sustainable (5.01-7.00; N = 29). The questions used in this index are described below.

Farmer Self-Identification. Farmers were asked to classify their farm operation's input use. Specifically, mail survey respondents were asked, "Which of the following lists of characteristics best describes your present farm/ranch operation?" Farmers could check one of the following statements: a) "My operation relies on such purchased inputs as fertilizer, pesticide, and/or energy inputs;" b) "My operation is actively reducing reliance on such purchased inputs as fertilizer, pesticide, and/or energy inputs;" and c) "My operation primarily relies on low-input practices." Farmers who chose the last option were classified as sustainable farmers and were scored 1. Farmers who chose the other options were scored 0.

Farm Practices. The questions on farm practices also focused on inputs. Farmers were asked about their use of two off-farm inputs, herbicides and commercial fertilizers, and about their use of green manure as an on-farm input. These questions had the same format: "On what percent of your cropland, if any, did you use [herbicide/commercial fertilizer/green manure] in 1989? ____ %"

To be consistent with the overall index, farmers' answers to these questions were converted from percentages to proportions (e.g., 100 percent became 1.00). In addition, the coding was done so that larger values reflected the use of fewer off-farm inputs and greater sustainability. This meant that the answers to the questions on herbicides and commercial fertilizers had to be subtracted from 100 percent before being converted to proportions. For example, a farmer who used herbicide on 30 percent of his or her cropland would be given a score of .70. No such conversion was needed for the question on green manure because larger values already implied greater use of farm-produced inputs. These percentages were converted directly to proportions.

Farmers' Attitudes. Farmers were asked a series of questions on the mail survey about their attitudes toward LISA-related issues. Two of the items focused on their attitudes toward chemical inputs and energy inputs, which were derived from Beus et al. (1988).

Farmers indicated the extent to which they agreed with the following statements: "The domination of nature by humans should be maintained through chemicals and scientific advances;" and "Farmers should reduce their reliance on external sources of energy and inputs." Each statement was followed by seven-point Likert scales labeled "strongly agree" to "strongly disagree." These scales were collapsed to scores of 0 or 1 to fit with the overall sustainability index. All responses on the disagree side of the midpoint for the question on chemical inputs and all answers on the agree side of the midpoint for the energy input question were assigned the score of 1, while the remaining scale values for either question were assigned the score of 0.

Farm Group Membership. Farm group membership was considered in calculating the index. Farmers who belonged to the Northern Plains Sustainable Agricultural Society were scored 1 while nonmembers were scored 0.

Combining the questions into one index created a continuous scale from 0.00 to 7.00 which was collapsed to three categories: conventional, mixed-type, and sustainable. To determine the relation of each of the components of the index to the overall index, a Kendall's Tau *b* coefficient was calculated for each question (scored 0 to 1) with the overall, three-category index. These coefficients are as follows: self-classification (.67), herbicide use (.61), commercial fertilizer use (.52), green manure use (.44), attitude toward chemical use (.53), attitude toward energy inputs (.42), and farm group membership (.66). These were modest coefficients for an index. Their size

was not surprising given the distinct dimensions represented by the seven questions composing the index.

Their size was consistent with research on farmer classification by Youngs et al. (1990) who found that farmers who might be classified as sustainable, mixed-type, or conventional along one dimension of farming often fell into a different category along another dimension. Nevertheless, each of the Chi^2 for the above coefficients was significant at $p < .0001$.

Finally, the mixed-type category of the farmers was examined to gain some understanding of whether they were mixed-type or whether they would shift toward either conventional or sustainable farming in the future. Following the questions on herbicide use, commercial fertilizer use, and green manure use, respondents were asked to indicate whether they thought their use of any of these items would increase, decrease, or stay the same in the next five years, or they didn't know what to expect.

The majority of mixed-type farmers planned to stay the same (herbicide, 58 percent; commercial fertilizer, 62 percent; green manure, 55 percent). For herbicides and commercial fertilizer, nearly as many planned to increase (13 percent and 19 percent, respectively) as those who planned to decrease (21 percent and 17 percent, respectively) their use of these products. Few mixed-type farmers planned to decrease their use of green manure (4 percent) and a third (33 percent) planned to increase their use of green manure. Overall, mixed-type farmers were simply mixed-type with some evidence of a shift toward the sustainable end.

After categorizing the respondents as either conventional, mixed-type, or sustainable, they were compared for their general characteristics, use of family labor in the farming operation, off-farm employment by respondent and spouse, future expectations, and education.

Findings

General Characteristics of Farm Operators and Their Families

Among the characteristics of sustainable agriculture, Strange (1984) stated that farms in a sustainable agriculture are family centered.

> "The farm is both a place of work and a home. Children are raised in an environment in which useful work is expected of them and in which responsibility is not learned abstractly, but is accepted in the normal course of growing up. Learning to farm is a matter of apprenticeship; while formal education is not spurned, it is not a substitute for the practical experience of farming and the common sense derived from it and necessary to it" (p. 118).

Over 88 percent of North Dakota's farms are owned by individuals or families. Another 10.5 percent are owned by partnerships, often comprised of families. Less than two percent of the state's farms are corporately owned (Bureau of the Census, 1989). Thus, the family continues to play a vital role in North Dakota agriculture. The following discussion addresses that role and compares conventional, mixed-type, and sustainable farm family characteristics.

Few of the conventional respondents were single (4.8 percent), widowed (1.1 percent) or divorced (0.5 percent), while 14.8 percent of the mixed-type and 13.8 percent of the sustainable group were single. Nearly 7 percent of the sustainable group were divorced (Table 1).

TABLE 1. MARITAL STATUS, BY FARMER TYPE, NORTH DAKOTA, 1989

	Conventional		Mixed		Sustainable		
	N	%	N	%	N	%	chi²
Marital Status[a]							
Married	174	93.5	46	85.2	23	79.3	
Single	9	4.8	8	14.8	4	13.8	
Widowed	2	1.1		0.0		0.0	
Divorced	1	0.5		0.0	2	6.9	
Total	186	99.9	54	100.0	29	100.0	18.33**

[a]Significant difference between conventional and sustainable.
**Significant at P≤.01
Note: Percentages may not add up to 100% due to rounding.

Sustainable farmers and their spouses were younger than their conventional and mixed-type counterparts. The mean age of sustainable farmers was 41 years compared with 49 years for conventional and 48 years for mixed type farmers. The average ages for the spouses of sustainable, conventional and mixed-type farmers was 38 years, 46 years, and 45 years respectively. No statistically significant differences were found among the types of farmers for the mean age of their children (Table 2).

TABLE 2. SELECTED CHARACTERISTICS, BY FARMER TYPE, NORTH DAKOTA, 1989

	Conventional	Mixed	Sustainable	F value
People in household	3.41	3.52	3.45	0.10
Mean respondent age[a,b]	48.7	47.7	40.9	5.94**
Mean age of spouse[a,b]	45.6	45.2	38.4	4.33*
Mean age - male offspring	13.3	12.7	11.8	
Mean age - female offspring	10.6	11.6	10.3	
Years farm in family	61.6	62.4	55.0	0.78
Years farming[a,b]	24.3	24.0	16.5	4.68*

[a]Significant difference between conventional and sustainable.
[b]Significant difference between mixed and sustainable.
*Significant at P≤.05; ** Significant at P≤.01

Family Labor in the Farm Operation

Comparisons of labor intensity and the proportion of labor coming from the family itself were made by asking farmers in the study how many hours per week each family member contributed to the farm during the summer and winter seasons. Conventional farms had significantly higher hired labor costs/acre than their mixed-type and sustainable counterparts. However, no significant differences were found in the number of hours of labor family members contributed to the farms (Table 3). The average total number of hours per week in summer was 119 for conventional farm families, 121 for mixed type farm families, and 117 for sustainable farm families. The average total number of hours per week in winter for conventional, mixed-type, and sustainable families was 56, 69, and 51, respectively (Table 3).

TABLE 3. FAMILY LABOR REQUIREMENTS, BY FARMER TYPE, NORTH DAKOTA, 1989.

	Conventional	Mixed	Sustainable	F value
Number of responses	157	44	25	
Summer hours per week	119	121	117	0.03
Winter hours per week	56	69	51	1.06
Total hours per acre	7.6	12.8	11.4	2.76
Hired labor expense ($/hr/acre)[a]	3.55	0.40	0.70	6.62*
Respondent labor - hours per week				
winter (mean)	33.0	35.6	35.1	0.89
summer (mean)	69.8	60.8	72.6	2.76
Spouse farm labor - hours per week				
winter (mean)	18.8	22.0	12.1	1.65
summer (mean)	34.3	33.4	27.1	0.38
Son ≥ 17 years old Farm labor - hours per week				
winter (mean)	17.2	30.7	12.7	2.05
summer (mean)	49.1	67.8	48.2	2.47
Daughter ≥ 17 years old Farm labor - hours per week				
winter (mean)	12.2	10.2	4.0	0.34
summer (mean)	22.4	20.4	15.0	0.23
Son ≤ 16 years old Farm labor - hours per week				
winter (mean)	2.9	5.2	4.9	2.05
summer (mean)	13.1	14.1	17.1	0.37
Daughter ≤ 16 years old Farm labor -hours per week				
winter (mean)	4.2	3.5	2.3	0.30
summer (mean)	9.4	8.2	6.1	0.14

[a]Significant difference between conventional and mixed.
*Significant at the 0.01 level.

Off-farm Employment

Off-farm employment was common among all three groups, and a large segment of the sample could be defined as multiple job-holding farm households. The sustainable group had the largest proportion of multiple job-holding farm households - 81 percent, followed by the mixed-type at 59 percent and the conventional at 58 percent.

Data from the survey indicated that net farm income and off-farm employment were not significantly related (Pearson $r=-0.10$; $p=0.056$). Younger respondents were more likely to work off the farm (Pearson $r=-0.22$; $p=0.0004$), and the respondent's spouse was more likely to work off the farm as the debt-to-asset ratio increased (Pearson $r=0.19$; $p=0.0006$), although these relationships were weak.

The data also indicated a weak relationship between the respondent's off-farm employment and the spouse's off-farm employment (Pearson $r=0.11$; $p=0.03$). Sustainable farmers were more likely than conventional farmers to work off the farm ($Chi^2=11.54$; $p=0.003$). The sustainable respondents were younger than the other two groups, and their average debt-to-asset ratio was slightly higher than the conventional farmers' debt-to-asset ratio (Table 2).

The greater rate of off-farm employment and greater debt-to-asset ratio in the sustainable group may be mostly attributable to their relative youth.

The groups differed little in the percentage of respondents who had full-time, off-farm employment. A larger difference in part-time employment was found. Forty-four percent of the sustainable group, 26 percent of the mixed-type farmers, and 17 percent of the conventional farmers worked part time off the farm (Table 4).

TABLE 4. OFF-FARM EMPLOYMENT FOR RESPONDENT AND SPOUSE, BY FARMER TYPE, NORTH DAKOTA, 1989

	Conventional		Mixed		Sustainable		
	N	%	N	%	N	%	Chi² [a]
Full-time farming households	72	41.6	20	40.8	5	18.5	
Multiple job-holding households	101	58.4	29	59.2	22	81.5	
Total	173	100.0	49	100.0	27	100.0	5.33
Respondent off-farm employment							
Full-time	12	27.3	4	22.2	2	14.3	
Part-time	32	72.7	14	77.8	12	85.7	
Total	44	100.0	18	100.0	14	100.0	1.02
Respondent off-farm employment type							
Farm	1	2.3	2	11.1	1	7.7	
Professional	8	18.6	0	0.0	0	0.0	
Technical/sales	15	34.9	8	44.4	4	30.8	
Service	4	9.3	1	5.6	3	23.1	
Trade	5	11.2	1	5.6	2	15.4	
Equipment operator	10	23.3	6	33.3	3	23.1	
Total	43	100.0	18	100.0	13	100.0	11.83
Spouse off-farm employment							
Full-time	27	34.2	6	35.3	6	50.0	
Part-time	52	65.8	11	64.7	6	50.0	
Total	79	100.0	17	100.0	12	100.0	1.14
Spouse off-farm employment type							
Professional	26	32.9	4	23.5	6	50.0	
Technical/sales	29	36.7	9	52.9	4	33.3	
Service	20	25.3	3	17.6	1	8.3	
Trade	1	1.3	0	0.0	1	8.3	
Equipment operator	3	3.8	1	5.9	0	0.0	
	79	100.0	17	100.0	12	99.9	7.94

[a]None of the statistics were significant at the 0.05 level.
Note: Percentages may not add up to 100% due to rounding.

Nearly one-third (30.8 percent) of the sustainable respondents worked in technical/sales, 23.1 percent in service, 23.1 percent as equipment operator, and 15.4 percent in the trades. The remainder worked on other farms. Of the conventional farmers who worked off the farm, over one-third worked in technical/sales (34.9 percent) and 23.3 percent worked as equipment operators. Nearly 19 percent had professional positions, and only 2.3 percent worked on other farms. The largest portion of the mixed-type respondents worked in either technical/sales (44.4 percent) or as equipment operators (33.3 percent), while 11.1 percent worked on farms. It is noteworthy that the sustainable farmers dominated the service and trade categories while the conventional farmers had the only respondents in the professional category of off-farm employment.

The three groups did not vary significantly in off-farm employment for spouses. The sustainable group had the highest overall percentage of spouses who worked off the farm (52.2 percent) with an even split between full-time and part-time employment. Next highest was the conventional group, with 45.2 percent of the spouses working off the farm -- 30.4 percent full time and 15.8 percent part time. Of the mixed-type spouses, 39.5 percent worked off the farm -- 25.6 percent full time and 14.0 percent part time.

Half of the jobs held by the sustainable spouses were professional (50.0) and 33.3 percent technical/sales, while the remainder was divided evenly between services and trades. The jobs the spouses in the conventional group held were divided across three categories: technical/sales (36.9 percent), professional (32.9 percent), and service (25.3 percent). Over half (52.9 percent) of the spouses in the mixed-type group worked in technical/sales, and 23.5 percent were professional.

Few of the respondents in the sustainable and conventional groups who had off-farm jobs worked more than three months (Table 5). Seventy-one percent of the sustainable farmers and 63 percent of the conventional farmers worked four hours or more off the farm 91 days or less. Forty-seven percent of the mixed-type who worked off the farm worked 91 days or less. None of the sustainable farmers worked more than 182 days off the farm, while 12 percent of the conventional farmers and 24 percent of the mixed-type farmers with off-farm jobs worked more than 182 days off the farm. On the average, the mixed-type farmers worked the most days off the farm (123 days) followed by the conventional farmers (87 days) and the sustainable farmers (64 days).

TABLE 5. TIME WORKED FOUR HOURS OR MORE OFF-FARM, BY FARMER TYPE, NORTH DAKOTA, 1989

	Conventional		Mixed		Sustainable		
	N	%	N	%	N	%	Chi² [a]
Respondent							
Less than 3 months	28	63.6	8	47.1	10	73.3	
3 to 6 months	11	25.0	5	29.4	4	26.7	
6 to 9 months	3	6.8	1	5.9	0	0.0	
9 to 12 months	2	4.6	3	17.7	0	0.0	
Total	44	100.0	17	100.1	14	100.0	6.191
Spouse							
Less than 3 months	22	28.2	4	23.5	3	25.0	
3 to 6 months	28	35.9	6	35.3	6	50.0	
6 to 9 months	27	34.6	7	41.2	3	25.0	
9 to 12 months	1	1.3	0	0.0	0	0.0	
Total	78	100.0	17	100.0	12	100.0	1.616

[a]None of the statistics were significant at the 0.05 level.
Note: Percentages may not add up to 100% due to rounding.

The spouses in all three groups worked more days off the farm than their mates. The mixed-type spouses who worked of the farm worked an average 149 days followed by the conventional group at 143 days and the sustainable group at 132 days. Forty-one percent of the mixed-type spouses, 35 percent of the conventional spouses, and 25 percent of the sustainable group spouses with off-farm employment worked more than 182 days off the farm. Fifty percent of the sustainable group spouses with off-farm employment worked from 92 to 182 days off the farm in 1989, while 38 percent of the conventional group spouses and 35 percent of the mixed-type spouses worked that many days. About one-

fourth of the spouses in all three groups who had off-farm employment worked 91 days or less.

Future Expectations

Although no statistically significant differences were found, in general, respondents classified as sustainable had higher future farming expectations that the other groups. Half of the sustainable respondents (50.0 percent) believed they would be farming more acres in five years (Table 6). One-fourth (25.0 percent) believed they would be farming the same amount, and one-fourth (25.0 percent) believed they would be farming fewer acres. The expectation of expanding their operations seemed reasonable, as the data on average family labor used and off-farm employment in the sustainable group showed more labor was available. However, if farm labor requirements increased, either off-farm employment or leisure time for one or more family members would have to be reduced, and these trade-offs would have to be considered.

TABLE 6. EXPECTATION OF ACRES TO BE FARMED IN FIVE YEARS, BY FARM TYPE, NORTH DAKOTA, 1989

	Conventional	Mixed	Sustainable	F value[a]
Fewer acres %	37.6	36.9	25.0	
Same acres %	30.4	41.3	25.0	
More acres %	32.0	21.7	50.0	
Acres operated in future (mean)	1,761	1,409	1,235	1.13

[a]None of the statistics were significant at the 0.05 level.
Note: Percentages may not add up to 100% due to rounding.

A greater percentage of the respondents in the sustainable group were optimistic about remaining on the farm. All of the sustainable respondents expected to be on the farm in the future, while 92.0 percent of the conventional and 95.8 percent of the mixed-type expected to be on the farm in the future. This may be due more to the greater average age of the conventional and mixed-type respondents than to other factors.

The sustainable respondents seemed optimistic about their offspring remaining on the farm (Table 7). Of the sustainable respondents having sons aged 17 years or older, 83.3 percent believed their son would be on the farm in the future compared to 60.4 percent for the conventional and 58.3 percent for the mixed-type. Two-thirds of the sustainable respondents (66.7 percent) said their daughters age 17 or older would be on the farm in the future, compared to 11.1 percent of the conventional and none of the mixed-type.

The same pattern was observed for the respondents' spouses. The vast majority of the sustainable group (95.4 percent), 92.3 percent of the mixed group, and 85.5 percent of the conventional group believed their spouse would be on the farm in the future.

TABLE 7. EXPECTATION OF BEING ON FARM IN THE FUTURE, BY FARMER TYPE, NORTH DAKOTA, 1989

Household member	Conventional		Mixed		Sustainable		Chi^2
	N	%	N	%	N	%	
Respondent							
Yes	148	92.0	46	95.8	27	100.0	
No	13	8.0	2	4.2	0	0.0	
Total	161	100.0	48	100.0	27	100.0	3.02
Spouse							
Yes	135	89.5	36	92.3	21	95.5	
No	16	10.5	3	7.7	1	4.5	
Total	151	100.0	39	100.0	22	100.0	0.99
Son ≥ 17 years old							
Yes	26	60.5	7	58.3	5	83.3	
No	17	39.5	5	41.7	1	16.3	
Total	43	100.0	12	100.0	6	100.0	1.27
Daughter ≥ 17 years old[a,b]							
Yes	1	11.1	0	0.0	2	66.7	
No	16	88.9	6	100.0	1	33.3	
Total	17	100.0	6	100.0	3	100.0	10.25*
Son ≤ 16 years old							
Yes	45	63.4	19	70.4	12	80.0	
No	26	36.6	8	29.6	3	20.0	
Total	71	100.0	27	100.0	15	100.0	1.71
Daughter ≤ 16 years old[a,b]							
Yes	23	39.4	9	39.1	12	92.3	
No	45	60.6	14	60.9	1	7.7	
Total	68	100.0	23	100.0	13	100.0	16.70*

[a]Significant difference between conventional and sustainable.
[b]Significant difference between mixed and sustainable.
*Significant at P≤0.01.
Note: Percentages may not add up to 100% due to rounding.

Education

Respondents were asked what was the highest level of education they and their spouse completed. Although the differences in educational levels were not statistically significant, Nearly 45 percent of the sustainable group completed a high school degree, and 41.5 percent attended college (Table 8). Only 4.4 percent of their spouses did not complete a high school degree, 30.4 percent graduated from high school, and 30.4 percent attended college. Only 13.7 percent of the sustainable respondents received a college degree; however, 34.9 percent of their spouses completed a college degree.

Thirteen percent of the conventional farmers did not finish high school. One-third (33.3 percent) indicated that their highest level of education was high school, nearly one-third (31.7 percent) attended some college, and 18.3 percent received a college degree. Of their spouses, 5.8 percent did not complete high school, 35.7 percent completed high school, 32.8 percent attended college, and 25.7 percent received a college degree.

TABLE 8. HIGHEST LEVEL OF EDUCATION COMPLETED BY RESPONDENT AND SPOUSE, BY FARMER TYPE, NORTH DAKOTA, 1989

	Conventional		Mixed		Sustainable		Chi² [a]
	N	%	N	%	N	%	
Respondent							
Didn't finish high school	25	13.4	12	22.2	0	0.0	
High school	62	33.3	17	31.5	13	44.8	
Attended college	59	31.7	16	29.6	12	41.4	
College degree	34	18.3	7	13.0	2	6.9	
Postgraduate education	6	3.2	2	3.7	2	6.9	
Total	186	100.0	54	100.0	29	100.0	12.14
Spouse							
Didn't finish high school	10	5.9	7	15.9	1	4.4	
High school	61	35.7	17	38.6	7	30.4	
Attended college	56	32.8	13	29.6	7	30.4	
College degree	36	21.1	6	13.6	7	30.4	
Postgraduate education	8	4.7	1	2.3	1	4.4	
Total	171	100.2	44	100.0	23	100.0	8.06

[a]None of the statistics were significant at the 0.05 level.
Note: Percentages may not add up to 100% due to rounding.

Conclusions

In this research, little difference was found among farm families who use sustainable agricultural practices and those who do not. Fewer of the sustainable farmers were married than the conventional farmers. Both the sustainable farmers and their spouses were nearly eight years younger on average than their conventional counterparts. They had also farmed an average of 16 years compared with 24 years for conventional farmers. Few differences were found between the amount of family farm labor and off-farm employment for sustainable and conventional farm families.

Given these findings, we would expect few changes to farm families in North Dakota given a shift from conventional to sustainable farming practices.

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