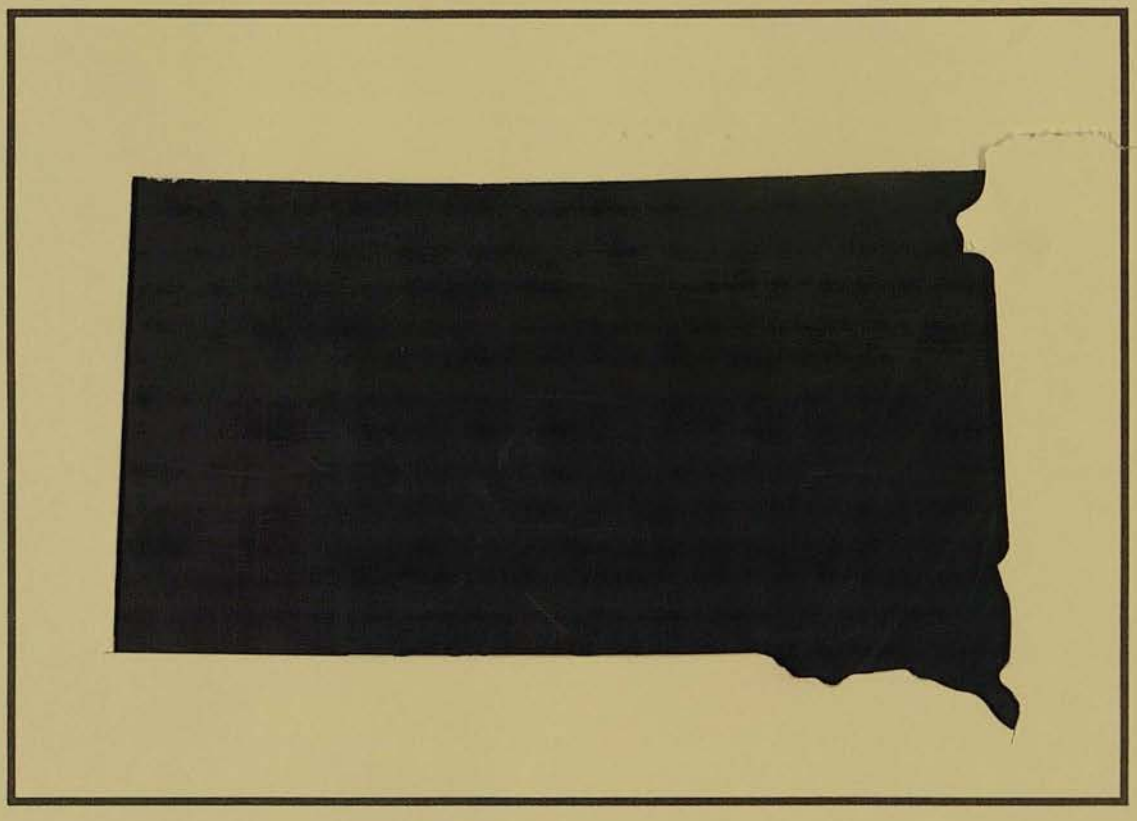

ECONOMICS DEPARTMENT

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Agricultural Producer Responses To Water Quality Issues, Proposed Water Quality Policy Options, and Related Farm Management Practices

by
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Agricultural Producer Responses To Proposed Water Quality Issues, Proposed Water Quality Policy Options and Related Farm Management Practices

Farmers are becoming increasingly aware of the environmental consequences of farming practices that have become "conventional" over the last 30 to 40 years. As agricultural producers, they are expressing concern about erosion, ground water contamination, and personal health considerations from chemical use. At the same time, farmers are concerned about the economic viability of their operations. Farmers cannot afford to sacrifice net farm income in order to meet stricter environmental regulations. A software package named Planetor has been developed that can be used to examine the interrelationships between economic sustainability and environmental safety. Researchers working on the Big Sioux Aquifer (BSA) demonstration project at South Dakota State University were among the first to have used this new software package.

The BSA is a shallow glacial outwash aquifer underlying approximately 1000 square miles of prime agricultural land in eastern South Dakota. This aquifer is extremely important to the region as it supplies water for domestic as well as agricultural use. The importance and varied use of the water from this aquifer has increased the demand to ensure that this source of water is of high quality. The BSA demonstration project is to implement Best Management Practices (BMPs) on agricultural land and develop other measures at the local level to protect private and public water supplies and shallow ground water aquifers from contamination (Big Sioux Demonstration - Project Summary, 1991).

Best Management Practices for agricultural land became a focus issue when farmers, policy makers, and the general public began to be aware of the environmental impacts of farming practices. Today, the BMPs of farmers are judged by both economic and environmental criteria. Concern is being expressed about erosion, groundwater contamination, and personal health considerations from chemical use and other farming practices. Additionally, concern is being raised about the economic viability of the farming operations. Farmers are continually examining ways to meet environmental standards without sacrificing net farm income considerations.

In the effort to manage their operations, farmers have had to examine their attitudes and beliefs about water quality issues in South Dakota. The attitudes and opinions of farmers are important to researchers and policy makers in that, without knowing what these attitudes and beliefs are, alternative operating plans could be suggested, or required, that will never be implemented because farmers hold a contrasting attitude. If farmers are neither financially able nor willing to adjust farming practices to improve water quality, then improved water quality "prescriptions" will not be effective.

To determine farmer's attitudes, beliefs, and management practices related to water quality, a survey was conducted of farmers who own land over the Big Sioux Aquifer. The results of that survey are summarized in this paper. The survey was conducted by the Cooperative Extension Service in February 1992. A questionnaire was sent to 428 selected agricultural producers and the response

rate was 19%. The survey was designed to solicit specific information by asking questions in specific categories. Those categories were: **Issues and Attitudes Concerning Water Quality, Sources of Information Dealing With Water Quality Issues, Farm Information and Size, Cultural Practices - Fertilizer, Cultural Practices - Manure, Cultural Practices - Pesticides, Record Keeping** and **Demographics**. The survey findings are summarized by categorical groupings. It should be noted that with this survey, as with many mail-out surveys, not every participant responded to every survey question.

Issues and Attitudes Concerning Water Quality

Most people (84%) believed that the groundwater pollution in the nation as a whole was "somewhat serious" or "very serious" (Table 1). Sixty-four percent thought that it was "somewhat serious" in South Dakota. However, 21% believed that it was "not at all serious" in South Dakota. Sixty-five percent thought that it was "serious" in their own county. For their own farm, 43% thought that it was "somewhat serious", another 43% thought it was "not at all serious," and only 6.5% thought it was "very serious."

In order to compare, the average degree of serious was calculated (see Table 1). It is shown that when the responses were reflective of the situation closer to their own farm, a lower degree of seriousness was perceived by the respondents. This may reflect the fact that the ag-producers know more detail about their own farms or counties than about the state or nation as a whole. It may also reflect that farmers regard themselves as good or acceptable environmental stewards.

Table 1

Areas of groundwater pollution	Number and Percent of Responses for Each Answer								Average Degree of Seriousness
	Not at All Serious		Somewhat Serious		Very Serious		Not Sure		
	No	%	No	%	No	%	No	%	
Nation	6	7.4	33	41	35	43	7	8.6	2.39
South Dakota	16	21	50	64	9	12	3	3.8	1.91
Home County	21	27	42	54	9	12	6	7	1.83
Own Farm	33	43	33	43	5	6	6	8	1.61

Survey respondents were asked to rank the priority of issues of concern for South Dakota producers. For this question, survey participants were asked to rank issues on a scale of low degree of priority to high degree of priority. Survey participants were given a five-point scale, from a low degree to a high degree of priority, from which to choose as their response. Table 2 indicates the results. "Profitability in Agriculture" was regarded to be the top priority of concern by South Dakotans. "Quality of Drinking Water in South Dakota" and "Schools and Educational System" were regarded to be the second priority. However, "Economic Development to Create Jobs" was ranked to be one of the last two priorities to South Dakotans.

Table 2 also shows the evaluations from ag-producers in the different counties covered by the survey. The average degree for all terms is calculated and is shown in the last line. Minnehaha County has the highest average degree, Moody County has the second, and Brookings County has the third. Since the evaluations were most probably based on the local situations, the responses could reflect a general evaluation for each county also.

Table 2

Issues of Concern to South Dakotans	Average Degree of Priority			
	Brookings County	Minnehaha County	Moody County	Average Degree of Priority
Profitability in Agriculture	4.61	4.29	4.13	4.3
Agricultural Health and Safety	3.87	4.14	3.79	3.8
Controlling Soil Erosion	3.78	4	4.03	3.9
Economic Development to Create Jobs	3.52	3.86	3.59	3.6
Schools and Educational System	3.91	4	4.15	4.05
Quality of Drinking Water in South Dakota	3.91	4.43	4.03	4.06
Maintaining and improving Highways and Bridges	3.26	3.5	3.49	3.4
Average Degree for All Issues	3.84	4.03	3.89	---

When asked to what extent various factors were a threat to water quality, most respondents (81.5%) believed that "pollution by town residences" and "nitrogen fertilizer" were the two most serious factors threatening water quality in South Dakota (Table 3). Herbicides, insecticides and feedlot run-off were also listed to be serious factors that threaten water quality. Geographic differences and urban influences were apparent in survey responses indicating the degree of seriousness of factors that threaten water quality in South Dakota (Table 4). All of the producers in Minnehaha County and most (87%) producers in Brookings County believed that "pollution by town residences" was the most serious problem to the water quality. In Moody County, however, most (79.5%) respondents believed that herbicides was the most serious problem.

Table 3

Factors That Threaten Water Quality in South Dakota	Average Degree of Seriousness	Percent of Respondents Who Believed Serious
Pollution by Town Residences	2.29	81.5%
Others	2.25	75%
Insecticides	2.19	73.8%
Herbicides	2.19	80.2%
Nitrogen Fertilizer	2.14	81.5%
Feedlot Run-off	2.03	79%
Phosphate and Potash	1.71	55.6%
Pasture Run-off	1.43	35.8%
Acid Rain	1.43	30%

Soil erosion has been considered as a contributing factor to reduced water quality. The survey asked about different agronomic management practices that can help reduce soil erosion. More than half of the survey respondents believed that "reduced tillage" was the most desirable way to help reduce soil erosion for South Dakota farmers (see Table 5). "Taking vulnerable land out of crop production" and "rotating crops" were the other two ways that respondents felt were desirable for South Dakota farmers to reduce soil erosion.

Table 4

Factors that Threaten Water Quality in SD	Percent of Responses		
	Brookings	Minnehaha	Moody
Nitrogen Fertilizer	82.6%	92.8%	74.4%
Phosphate/Potash	43.4%	64.3%	61.5%
Insecticides	78.3%	71.5%	71.8%
Herbicides	82.6%	78.5%	79.5%
Pasture Run-off	34.8%	28.6%	41%
Feedlot Run-off	82.6%	85.7%	71.8%
Pollution by Town Residences	87%	100%	74.4%
Acid Rain	22.7%	35.7%	30.7%
Others	17%	0%	10.3%

Table 5

Methods to Reduce Soil Erosion	Number of Responses	Percent of Responses
Reduced Tillage	44	54.3%
Taking Vulnerable Land out of Crop Production	37	45.7%
Rotating Crops	30	37%
Contour Planting	14	17.3%
No Till	14	17.3%
Strip Cropping	9	11%
Extensive Terracing	7	8.6%
Fewer Row Crop Acres	4	4.9%
Total Ag-producers	81	-

Relating to the issue of soil erosion, survey respondents were asked to indicate if they were concerned that run-off from their land was contributing to water quality problems in South Dakota. Approximately 32% of the respondents (26) to the survey indicated that they were concerned that run-off from their land may be adding to the contamination problems of water in South Dakota. Only 11.5% indicated that they were "very concerned" (Table 6).

Table 6

Degree of Concern	Number of Responses	Percent of Responses
Very Concerned	3	11.5%
Concerned	9	34.6%
Somewhat Concerned	9	34.6%
Not Very Concerned	5	19.2%
Total	26	100%

The survey listed several examples of policies that were being discussed by various individuals or groups about water quality issues. Survey participants were asked to indicate the extent they opposed or favored these policy choices. Participants were given five response choices: 1. strongly oppose; 2. somewhat oppose; 3. neutral; 4. somewhat favor; 5. strongly favor. The average point for each policy example was calculated and is used to represent the general attitude of the survey respondents towards various policy choices (Table 7).

Table 7

Example of Policies	Average Point	Percent of Respondents	
		Oppose	Favor
Making tighter restrictions on using farm pesticides	2.83	45%	42.5%
Making tighter restrictions on using farm fertilizers	2.59	50.6%	29.7%
Making tighter restrictions on urban use of pesticides and fertilizers	3.17	29.6%	49.4%
Taxing fertilizers and pesticides levels appropriate for yield of soils	1.57	85.1%	7.4%
Restricting nitrogen applications for yield of soils	3.24	31.3%	52.5%
Developing incentives for banded herbicides applications and thereby decreasing broadcast applications	3.09	32.5%	46.2%
Substituting reduced chemical inputs rather than idling land in order to qualify for government programs	2.7	46.9%	34.5%
Restricting chemical inputs by developing programs that guard against weather conditions that may limit effectiveness of chemical	2.71	33.8%	23.8%

As shown in the table, "restricting nitrogen applications to levels appropriate for yield of soils" is the most acceptable policy. It was favored by more than half of the ag-producers and its average point is 3.24. Two other acceptable policies are "making tighter restrictions on urban use of pesticides and fertilizers" and "developing incentives for banded herbicides applications and thereby decreasing broadcast applications." In contrast, "taxing fertilizers and pesticides levels to discourage usage" is the most unacceptable policy -- opposed by most respondents (85.1%).

Survey respondents were also asked about the extent that they believed various factors detracted from efforts to protect water quality or to encourage sound management of agricultural chemicals. Survey respondents were again given a choice of responses. Table 8 indicates those responses which show that "lack of market incentives to change current practices" and "conflicting information about viable management alternatives" are the most important factors detracting from implementing policies for protecting water quality or for encouraging sound management of agricultural chemicals.

Table 8

Factors Detract From Protecting Water Quality	Average Point	Percent of Respondents		
		Not at all	Somewhat	A Great Deal
General belief that existing problems are not very serious	2.15	10.3%	60.3%	24.4%
General belief that chemical management is already effective and near optimum	2.03	19%	54.4%	21.5%
Lack of market incentives to change current practices	2.39	11.5%	32.1%	46.2%
Lack of government policy to change current practices	1.89	30.8%	41%	20.5%
Inadequate research and information on viable management alternatives	1.97	20.5%	55.1%	17.9%
Inadequate communication and information about viable management alternatives	2.13	13%	55.8%	24.7%
Conflicting information about viable management alternatives	2.32	6.5%	48.1%	35.1%

The quality of the water was considered to be a important concern for the ag-producers because it is used not only for their crop and livestock enterprises, but is also used as their drinking water. The survey questioned producers about their sources of drinking water and the quality and use of that water. Approximately 42% (33) of the respondents answered that they had wells as their drinking water source. The depth of the wells varied from 15 to 400 feet. Forty feet was the average depth of the wells. The distribution of different well depths is shown in Table 9. More than half of the survey respondents (56.7%) had a well which was between 20 and 30 feet deep.

Table 9

Depth of Wells	Number of Responses	Percent of Responses
Less than 20 feet	6	20%
20-30 feet	17	56.7%
More than 30 feet	7	23.3%
Total	30	100%

Other respondents (47%, 37 responses) indicated that they had rural water as their drinking water source. Only 11% (9 respondents) said that they had another source for drinking water.

More than half (52.6%) of the respondents to the survey stated that their drinking water had been tested for chemical contamination in the past three years. The general information for this question is shown in Table 10. Eighteen respondents said that they had "nitrate" test for their drinking water and only 12 reported the result. Seven of the respondents reported under 10 parts per million (which represented safe), four reported between 10 to 19 parts per million (not safe) and only one was extremely high - up to 36 parts per million.

Eleven producers reported that they had "bacteria" test for their drinking water. Nine of these reported a "safe" test result, one was marginal and one was unsafe. In addition, seven producers said that they had "ag pesticides" test and five said they had "other chemicals" test.

Table 10

Test Results	Number and Percent of Respondents for Each Answer			
	Yes	No	Don't know	Total
Nitrate	18 (56%)	3 (9%)	11 (34%)	32
Bacteria	11 (34%)	8 (25%)	13 (41%)	32
Ag Pesticides	7 (21%)	13 (38%)	14 (41%)	34
Other Chemicals	5 (16%)	13 (41%)	14 (44%)	32

When questioned about their recent use of ground water, most respondents (73%) said that there had been no changes in their families' use of ground water over the last three years. Only 14 (18%) reported that they increased the use and the other 7 (9%) said they had decreased the use of ground water.

The survey also asked a general question concerning the importance to the respondent that a solution be found to the problem of water contamination in South Dakota. Most respondents (77.2%) thought that it was very important or important to find a solution for the problem of water contamination (Table 11). Very few respondents (5.1%) thought that is "not at all important".

Table 11

Extent of Importance	Number of Responses	Percent of Responses
Very Important	22	27.8%
Important	39	49.4%
Somewhat Important	14	17.7%
Not At All Important	4	5.1%
Total	79	100%

Sources of Information Dealing with Water Quality Issues

When dealing with issues of water quality, it is important to understand where producers are getting the information on which they base their decisions and which influence their attitudes towards the concerns of water quality in South Dakota. To determine which information sources agricultural producers were using to obtain information, the survey asked respondents to indicate the two sources of information that had the most influence on how they viewed the problems associated with water quality and the use of agricultural chemicals. Possible sources of information dealing with water quality issues were listed in the survey. The possible choices from which respondents could select their responses is given in the following table.

The data in the Table 12 show that almost 51% of the respondents obtained their information from personal observations and experiences. This was the response selected most often by survey participants. In addition, "farm magazines and farm newspapers" and "education/research reports (Extension Service, SCS)" were chosen by more people as their most important information sources.

Table 12

Sources of Information	Number of Respondents	Percent of Respondents
Personal observations and experiences	41	50.6%
Friends and neighbors	14	17.3%
Newspaper, radio and television news	25	30.9%
Farm magazines and farm newspapers	28	34.6%
Farm chemical industry information	6	7.4%
Regulatory agency information reports (EPA, DNR)	16	19.8%
Education/research reports (Extension services, SCS)	26	32.1%
Other	2	1.2%
Total	81	--

Ag-producers were asked what sources were useful to them in other areas besides water quality issues. The responses summarized in Table 13 indicate that most agricultural producers thought that "Soil Conservation Service" and "South Dakota Extension Service" were the two sources of information that were most useful in solving tillage and soil erosion problems. In addition, "neighbors and friends" and "seed/chemical/fertilizer dealers and companies" were chosen by more people as their most useful information sources.

Table 13

Sources of Information	Number of Respondents	Percent of Respondents
Soil Conservation Service	42	51.9%
South Dakota Extension Service	29	35.8%
Machinery dealers and companies	12	14.8%
Seed/Chemical/Fertilizer dealers and companies	24	29.6%
Neighbors and friends	27	33.3%
Other	13	16.1%
Total	81	--

More than half (56.2%) of those agricultural producers responding to the survey said that during the past three years they used the Extension Service as a source of information for crop production decisions (Table 14). Additionally, 48.7% (39 respondents) said that they used the Extension Service as a source of information for soil conservation decisions. Most respondents (64.4% for crop production and 59% for soil conservation) said that they obtained their information by "reading newsletter/news article or from the media".

Table 14

Ways to get Information	Crop Production Decisions		Soil Conservation Decisions	
	# of Responses	% of Responses	# of Responses	% of Responses
Extension meetings	19	42.2%	13	33.3%
Visit to extension office	22	48.9%	13	33.3%
Attended tour or demonstration	16	35.6%	12	30.8%
Read newsletter /news article or obtained from media	29	64.4%	23	59%
Total	45	--	39	--

When asked, fifty-three percent (43 respondents) of those agricultural producers surveyed were aware of special tillage, fertilizer, or herbicide demonstration plots, projects, or tours being conducted in their county in 1992. Most respondents thought that those activities were sponsored by "seed companies" and "SD Extension Service and Experiment Station." (Respondents could select more than one sponsor for such activities.) Of the agricultural producers who answered the question "how likely is it you will visit the plots or attend any tours?", 32% answered "very likely," 48% said "possibly," and the other 20% said "not very likely."

Table 15

Activity Sponsors	Number of Respondents	Percent of Respondents
Seed companies	25	58.1%
Chemical dealers and companies	19	44.2%
Local FFA	1	2.3%
SD Extension Service and Experiment Station	22	51.2%
Other	8	18.6%
Not Sure	4	9.3%

Farm Information and Size

It was believed to be important to know specific information about the farm operations of the survey respondents. Survey questions asked about farm type (discussed later in the report), specific cropping characteristics, type and size of livestock enterprises, and land management practices. Many of these questions were unanswered by survey respondents. Other survey responses that were received were incomplete or inconsistent. Therefore, no data was available from the survey on specific types of certain farm information and therefore, no analysis relating producers' attitudes with farm characteristics was possible.

In the farm information section of the survey, participants were asked what percent of their farmland was over the Big Sioux Aquifer. Twenty one agricultural producers said that they "don't know," and one respondent did not answer this question. Among the other fifty nine agricultural producers who answered this question, two had zero percent and twenty three had 100% their farmland over the Big Sioux Aquifer. More than half (52.5%) of the respondents had 80% or more of their farmland over the Big Sioux Aquifer.

Table 16

Percent of Farmland Over the Big Sioux Aquifer	Number of Respondents	Percent of Respondents
< 50%	12	20.3%
50% - 79%	16	27.1%
> = 80%	31	52.5%
Total	59	100%

Related to an earlier question on soil erosion, the survey asked agricultural producers whether any of the acres they operated were classified as highly erodible by the Soil Conservation Service. Approximately 70% (55) of the producers responding to this question said that none of their acres they operate were classified as highly erodible by the Soil Conservation Service, 7% (6) said that they had no idea about their land classification, and the other 23% (18) answered "yes" they had some acres classified as highly erodible. The largest reported number of highly erodible acres was 750 acres and the smallest was 10 acres. The average number of highly erodible acres was fifty-one acres (not including the one outlying report of 750 acres). The distribution of ag-producers who had different amounts of highly erodible farmland is shown in the following table. Fifty percent of those producers reporting highly erodible acreage had less then 50 acres and 38.9% had 50 acres or more of highly erodible land.

Table 17

Acres Classified as Highly Erodible	Number of Responses	Percent of Responses
< 50 acres	9	50%
50 - 99 acres	3	16.7%
> = 100 acres	4	22.2%
Missing	2	11.1%
Total	18	100%

Further analysis of the responses to this question shows that there is a geographical difference by county. From Brookings County there were no producers reporting highly erodible farmlands. In contrast, more than half (57%) of the producers in Minnehaha County had highly erodible farmlands and with an average of 80 acres. In addition, 18% ag-producers in Moody county responded that they had highly erodible farmlands but the average was only 32 acres.

Table 18

Have Highly Erodible Farmland?	Number and Percent of Responses and Average (Ave) Acres of Highly Erodible Farmlands								
	Brookings County			Minnehaha County			Moody County		
	No.	%	Ave	No.	%	Ave	No.	%	Ave
Yes	0	0%	0	8	57%	80*	7	18%	32
No	22	96%	-	5	36%	-	27	71%	-
Don't Know	1	4%	-	1	7%	-	4	11%	-
Total	23	100%	-	14	100%	-	38	100%	-

* Average does not include the unusual report of 750 acres.

The survey questions on farm characteristics were designed to allow cross tabulations of survey responses. The cross tabulations intended were to compare the number and type of livestock enterprises with different cultural practices of manure handling, to compare producer attitudes and opinions among different sizes and classification of farm operations, and to compare attitudes and opinions among farm operations based on cropping practices and cropping history. As indicated earlier in this section of the report, most of cropping and livestock data was unusable. However, data provided by survey participants did allow for some general farm characteristic data analysis.

Survey participants were asked to report their gross income, total assets and total liabilities in 1991. For the 47 responses for gross income, the average gross income was $124,009, the minimum was $2200, and the maximum was $600,000 (Table 19). For the 36 responses to the total assets, the average total assets was $7,373,907, the minimum value was $0 and the maximum value was $253,000,000. The average liabilities reported for the 41 responses was $162,832, the minimum value was $0 and the maximum value was $2,240,000. While the maximum values reported to the survey are possible, the authors question the reliable of those maximum reported values for total assets and total liabilities.

Table 19

Classifications of Values in 1991	Average	Minimum	Maximum
Gross Income	$124,009	$2200	$600,000
Total Assets	$737,3907	$15,000	$253,000,000
Total Liabilities	$162,832	$0	$2,240,000

Table 20 gives the distribution of producers classified according to different gross income levels. The number of producers who had a gross income equal to or less than $50,000 is almost same to the number who had a gross income equal to or more than $100,000.

Table 20

Gross Income Level	Number of Respondents	Percent of Respondents
< $20,000	10	21.3%
$20,000 - $50,000	11	23.4%
$50,001 - $99,999	4	8.5%
$100,000 - $200,000	12	25.5%
> $200,000	10	21.3%
Total	47	100%

More than half (62%) of those producers responding to the survey said their operations included livestock enterprises. Further analysis of the farm characteristic data classified farms into two types: Type I farms being a cash grain farm and Type II farms as those which respondents regarded as livestock farms or as a combination livestock and grain farm. The data show that Type II operations had a much higher average gross income, $168,423 than Type I operations which reported an average gross income of $69,935. In addition, more than half (59.3%) of the Type II operations had a gross income equal to or more than $100,000. For Type I operations however, only 33.3% were in this gross income level.

Table 21

Gross Income Level	Number of Respondents		Percent of Respondents	
	Type I	Type II	Type I	Type II
< $20,000	5	4	27.8%	14.8%
$20,000 - $50,000	5	5	27.8%	18.5%
$50,001 - $99,999	2	2	11.1%	7.4%
$100,000 - $200,000	5	7	27.8%	26%
> $200,000	1	9	5.5%	33.3%
Total	18	27	100%	100%
Average Gross Income	$169,935	$168,423	-	-

Cultural Practices - Fertilizer

In the Cultural Practices - Fertilizer section of the survey the first question asked respondents to report their typical rates of nitrogen fertilizer application for different crops in different crop rotations. It was desired to be able to compare this data with the crop yield history data requested in the farm characteristics section of the survey. Again, the responses to this question were either unusable or so limited that no analysis was possible.

Survey participants were asked on what information they based their rates of fertilizer application. Most producers responded that they based their fertilizer rates on "soil tests" and yield goals." "Past experiences" was also an important base for them to decide the fertilizer rates.

Table 22

Bases of Fertilizer Rate	Number and Percent of Respondents			
	For Nitrogen		For Potash and Phosphate	
	No.	%	No.	%
Soil Tests	49	60.5%	45	55.6%
Yield Goals	34	42%	29	35.8%
Fertilizer Dealer	11	13.6%	10	12.3%
Past Experiences	19	23.5%	12	14.8%
Other	3	3.7%	2	2.5%
Total	81	--	81	--

Soil tests to determine proper rates of fertilizer application is the recommended agronomic practice. When asked how often they soil tested, most producers (67.2%) said that they did soil test "annually" or "every other year." However, there were a few people (10%) who never did soil test.

Table 23

Times of Soil Testing	Number of Respondents	Percent of Respondents
Annually	30	42.9%
Every other Year	17	24.3%
Every three years	7	10%
Four or More Years between tests	9	12.9%
Never	7	10%
Total	70	100%

Related to soil testing is the proper collection of soil samples for analysis. When asked about soil sample collections, most producers (72.3%) indicated that they had used "farm supply / elevator" and "crop consultant" to collect their soil samples. Only 26% producers collected soil samples by themselves.

Table 24

Persons who collect Soil Test	Number of Respondents	Percent of Respondents
Self	19	26%
Farm supply / Elevator	33	45.2%
Crop Consultant	20	27.4%
Other	1	1.4%
Total	73	100%

The survey also asked if producers were aware of a new late-spring nitrogen soil test and if they were aware of the test, if they would be interested in using the test. Twenty-two (27.2%) producers said that they were aware of the new late-spring nitrogen soil test. Five of them were very interested in using it, another 16 had "some interest" or " a little interest" in using it, and only one used it in 1991 for 500 acres.

The survey also questioned producers about their fertilizer management practices related to different crop rotation considerations. For the 67 responses to this question, 70.1% indicated that they adjusted nitrogen rates on crops following soybeans and alfalfa. Four of the respondents said they increased the nitrogen rate and another 29 said they decreased it. On the average, four producers increased the rate by 83#/acre. The minimum amount that they increased was 20#/acre and the maximum amount was 150#/acre. In contrast, 29 producers decreased the rate by an average amount of 34#/acre. The minimum amount that they decreased the rate was 2#/acre and the maximum amount was 100#/acre. Most (79.4%) of the producers responding decreased the rate of application by 20# - 50#/acre.

Table 25

Nitrogen Rates Decreased Per Acre	Number of Respondents	Percent of Respondents
Less than 20 Lbs	3	10.3%
20 lbs - 50 lbs	23	79.4%
More than 50 lbs	3	10.3%
Total	29	100%

Cultural Practices - Manure

Livestock waste run-off is regarded as a contaminant to water quality. Additionally, sustainable agricultural systems research has shown that livestock waste can be substituted for commercial fertilizer to meet at least a portion of the fertilizer needs for crop production. The survey asked producers about their manure management practices. Twenty-two producers indicated that they did not distribute manure on their crop lands, but another 40 indicated they did. The amount of crop acres they distributed manure on was varied among different producers. The minimum was 2 acres, the maximum was 750 acres, and the average acres was 64. The following table shows the number of producers who distributed manure and the differing amount of crop acres on which manure was distributed. More than half (55%) of the respondents distributed manure on 20 to 50 crop acres.

Table 26

Acres of Crop	Number of Respondents	Percent of Respondents
< 20 acres	10	25%
20 - 50 acres	22	55%
51 - 99 acres	3	7.5%
> = 100 acres	5	12.5%
Total	40	100%

Survey respondents were asked about the manure distribution system that they used. Most producers (86%) used "periodic scrape and haul" manure distribution system. None used "concrete bunker/distribution" system.

Table 27

Manure Distribution System	Number of Respondents	Percent of Respondents
Daily scrape and haul	2	4.7%
Periodic scrape and haul	37	86%
Liquid storage/distribution	2	4.7%
Concrete bunker/ distribution	0	0%
Other	2	4.7%
Total	43	100%

When asked what percent of the farm's annual output of manure was incorporated into the soil within one week of distribution, close to half (48%) of the producers responding stated that they did not incorporate any manure into soil at all. About 20% producers incorporated only 10% to 30% of their farm's annual output of manure into the solid, another (8.7%) incorporated over 80%. For the 42 responses to this question, 35.7% said that they applied manure on mostly the same fields every year and the other 64.3% said they rotated to different fields.

Twenty-six producers (57.8% of the 45 responses) said that they adjusted the fertilizer rate to a field following an application of manure. Approximately 96% of those producers decreased the amount of commercial fertilizer applied and only 4% of them increased the amount applied. The other 19 producers (42.2% of the 45 responses) said that they did not adjust the fertilizer application rate to a field following an application of manure. However, 71.4% of respondents indicated that they would change the rate applied if they could accurately determine the fertilizer contribution of the manure application to the next crop.

Cultural Practices - Pesticides

In a separate section of the survey, farmers were asked to respond to questions related to their pesticide management practices. The first question asked dealt with the amount of acres treated with herbicide as it applied to different crops. Of the farmers responding, on average 260 acres of corn, 219 acres of beans, 73 acres of small grain, 31 acres of hay, and 83 acres of pasture were treated. The following table shows the average maximum and minimum responses to the question by crop and by county.

Table 28

County		Corn	Soybeans	Small Grain	Hayland	Pasture
Brookings	Average	315.06	297.38	96.67	32.5	91.67
	Maximum	1050	1200	300	50	200
	Minimum	26	26	22	15	30
Moody	Average	182.45	151.71	31.86	31	104.6
	Maximum	850	850	60	35	300
	Minimum	0	0	20	27	20
Minnehaha	Average	283.27	206.64	90	30	53
	Maximum	1000	1000	120	30	100
	Minimum	24	12	50	30	20
All Counties	Average	260.26	218.58	72.86	31.17	83.09

The next question in the survey dealt with insecticides and solicited responses as to the number of acres of various crops treated with insecticides. Survey responses indicate that the number of acres on which insecticides were used was significantly less than the number of acres being treated with herbicide. On average only 134 acres were treated with insecticide. Survey responses to this question were often not completed and respondents may have only responded to this question by giving reaction to one particular crop. For the analysis, all crop responses were combined to derive the comparative analytics.

Survey respondents were asked for their estimation of the decline in average corn yield if herbicides were banned. Farmers responding to this question indicated that if corn herbicides were restricted they would realize a decline in corn yields of approximately one-third. There was very little variation in survey responses from the different counties of the survey area.

Surveyed farmers were asked about the number of acres on which "restricted-use" products were applied and the number of acres on which herbicides were banded rather than broadcast applied. Most survey respondents indicated that they did use restricted use products. Interpreting the data by comparing the number of acres on which restricted use products were used and the number of acres reported as having banded applications, it can be concluded that broadcasting herbicides was a more common method of application. The survey responses are shown in the following table.

Table 29

County		Acres of Restricted Use Herbicide	Acres of Banded Application
Brookings	Average	443.62	173.4
	Minimum	2000	400
	Maximum	26	26
Moody	Average	268.89	199.64
	Minimum	1800	500
	Maximum	0	34
Minnehaha	Average	722.25	210
	Minimum	2000	400
	Maximum	47	20
All Counties	Average	478.25	194.34

Surveyed farmers were also asked about pesticide practices. When asked about the treatment of corn acres for rootworms, 57% of the survey respondents indicated that they did treat their corn acres for rootworms. Survey respondents also indicated that when it came to pesticide applications, 43% indicated that they applied the pesticide themselves. A combination of the individual farmers and a custom applicator applying pesticides occurred 34% of the time. Custom applications were hire by 16% of the farmers to be the sole applicator of pesticides. 7% of the farmers neither applied pesticides themselves nor hired a custom applicator.

Surveyed farmers were also asked about their scouting of production concerns in their fields. Of the farmers responding to the survey, 70% indicated that they walk their fields specifically to check for the presence of insects, weeds, diseases or other problems 1 to 3 times a year. 15% of the farmers said they check the fields 4-6 times a year, 12% check 7 or more times a year and 3% don't check their fields at all. Survey respondents were also asked if they systematically scout fields and vary treatment based on different problems in different areas of the field. Before applying pesticides to their fields, respondents always or most of the time systematically scout and then very the treatment 77% of the time. 28% of the farmers sometimes or seldom scout the field for problems and 5% of the farmers never do.

Survey participants were asked about their use of hired consultants for a list of services. 61% of the farmers have hired a consultant for pest scouting, soil sampling, fertilizer recommendations, recommendations on variety selection and cultural practices. For the most part farmers were satisfied with the services.

Record Keeping

In a separate section of the survey, farmers were asked to respond to questions regarding the record keeping practices on their operations. With the requirement that chemical application records be kept, it was felt to be an important issue to first understand who and how records were currently being kept on farm operations before any recommendations for adjusting current practices were suggested. Of the farmers responding to the survey, 67% said that they kept the farm records while 20% of the respondents indicated that the record keeping responsibilities were shared between the operator and their spouse. Additionally, 9% of the survey respondents indicated that the spouse was the record keeper while 4% indicated that they had hired out the record keeping functions for their operations.

In responses to record keeping systems, respondents indicated that the most popular system of record keeping was a file of receipts and canceled checks sorted and added at the end of the year, 44% of the respondents. The second most popular system, used by 22% of the respondents, was personally developed hand record systems recording transactions in a ledger. Other respondents, 32%, indicated that they utilized a commercial farm account record book or a home based computer system while 2% of the respondents sought professional service for record keeping.

Farmers were asked about the detail of the records they keep. A majority of survey respondents (72%) indicated that they do keep as part of their records detailed, field based, cost of production, yield and profit information about their farm. However, 49% of the respondents indicated that they do not keep detailed livestock enterprise cost of production and profit information although 31% of the respondents did keep the detailed livestock records and 20% of the respondents indicated that they did not have any livestock enterprises on their operations.

Demographics

Demographic information was solicited from the survey respondents. All survey respondents were male and 81% of the respondents indicated that their primary household residence was rural. Survey respondents indicated that, on average, the number of years farmed on the present land was 25 years, the number of years farmed in South Dakota was 26 years and the total number of years farmed was 29 years. Other demographic information is shown in the following tables.

Table 30

Age of Respondent	Percent of Responses
Less than 25 years old	1 %
25 - 34 years old	6 %
35 - 44 years old	27 %
45 - 54 years old	20 %
55 - 64 years old	34 %
65 years old and older	12 %

Table 31

Education of Respondent	Percent of Responses
Some High School or Less	4 %
High School Graduate	32 %
Vocational Training	15 %
Some College Education	15 %
College Graduate or More	34 %

Table 32

County	Percent of Responses
Brookings	32 %
Moody	49 %
Minnehaha	19 %

Also asked in the survey was the issue of off-farm employment. Of those farmers responding to these survey questions, 38% indicated that they would have an off-farm job in 1992. Additionally, 54% of the survey respondents indicated that their spouse would have an off-farm job in 1992 either part-time of full time. The presence of an off-farm job still did not diminish the importance of the farm in supporting the family. The majority of the survey respondents (64%) indicated that the family net income still came directly from the farm operation.

Conclusion

This survey has helped to answer questions concerning producer attitudes and opinions towards water quality and towards policies designed to increase water quality in South Dakota. Also gained by this survey was insight to how producers are managing their resources in efforts to improve water quality. This survey will be helpful to economists studying farm-level responses to different water quality policy proposals. The survey is also helpful to policy makers as they seek an understanding of which policies are most likely to be successfully implemented in efforts to improve water quality in South Dakota.

Additional insight into the sensitivity of the water quality issues was gained from the non-useable responses to the survey. Some respondents indicated that they refused to answer the survey as they believed it only an attempt to discredit farmers as environmental stewards. The opinions of farmers related to the issues of water quality are diverse and held very strongly. Continued work in the area of water quality and on policies to improve water quality in South Dakota will be necessary. Researchers are cautioned that the issues are sensitive to many farmers and that research efforts will need to be prefaced with an understanding that the work is to help all people of the state and is not targeting such efforts towards agricultural producers with the belief that they are the primary contributors to declining water quality in South Dakota.