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Eastern South Dakota Irrigation Yields and Management

Cooperative Extension South Dakota State University

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FS 408

Eastern South Dakota IRRIGATION Yields and Management

(Survey Results)

Cooperative Extension Service
South Dakota State University
U. S. Department of Agriculture

Eastern South Dakota IRRIGATION Yields and Management

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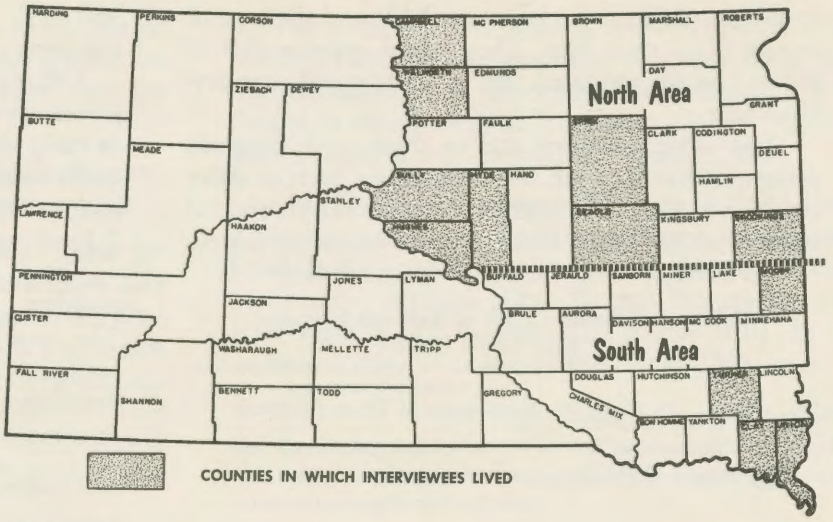

Changing from a dryland farm operation to irrigation means some major decisions. These decisions involve a considerable outlay of cash. Shifts are required in management practices. The kinds of equipment to buy, financing arrangements, labor needed and many other questions concern the prospective irrigator.

This publication was developed to help prospective irrigators make decisions more easily based on how present irrigators have solved or are solving some of these problems.

To accomplish this, a survey was taken of 54 present irrigators. The sample was from irrigators on and east of the Missouri River. Thirty-two were from northern counties and 22 from the south (see map).

About 30% of the surveys were completed by personal interview and the remainder in small meetings of 4 to 12 irrigators with one of the authors present. No attempt was made to include or exclude particular irrigators.

How Conclusions Are Drawn

This publication is divided into three parts for the purpose of analysis and drawing of meaningful conclusions.

Part I deals largely with data of general interest. It will have only limited effect on decisions made by prospective irrigators.

Part II shows yields obtained under irrigation and the shift in cropping patterns and livestock operations after irrigation was adopted.

Part III gives a correlation between actual yields harvested and actual management practices used to get these yields. It reflects the response of yield to management. It also compares current irrigated yields with the yields needed to make irrigation pay.

PART I

1. Age of Irrigators

The survey showed that irrigation is being practiced by the younger segment of farm operators. The average age of irrigators interviewed was 45 years with the median age being 42.

2. Irrigation Experience

Average years of irrigation experience of those interviewed was 6.3 years. However about 20% of them had only one year of experience.

3. Sources of Financing Irrigation Equipment

Financing arrangements used were as shown below.

	Number	Percent
1. Used no financing	7	13.0
2. Farm Home Administration	10	19.0
3. Production Credit Association	3	5.5
4. Local banks	24	44.5
5. Federal Land Bank	2	3.5
6. Private sources	3	5.5
7. Did not answer question	5	9.0
	54	100.0

Thirty-seven stated that financing had been adequate, three said it had not and fourteen did not answer the question.

Irrigation equipment capital investment should have long term financing. The capital investment for the equipment itself is only part of the cost. Operating expense will also rise since good management will require more fertilizer, seed, insecticides and herbicides than used under dryland. Irrigation power is an added cost. Short term financing may be used for operating costs.

4. Size of Unit

Interviewees were asked how much labor was available to them, both hired and family labor. Another question asked what size unit they felt they

could handle with the labor available and the type of system they now had. They could express this as either a totally irrigated unit or an irrigated plus dryland unit.

The older operators and/or those with livestock programs having high labor demands, such as dairy or swine, showed a preference for totally irrigated units or units with a small dryland operation added.

An average of the estimates appear in table 1-1.

Table 1-1. Estimates Made of Acreages Irrigators Felt They Could Handle

	Average of Estimates (Considering All Types of Systems)
Combination of Irrigated and Dryland	152 acres irrigated and 369 acres dryland per man available during irrigation season
Irrigated only	168 acres irrigated land per man available during the irrigation season

Averages in table 1-1 were arrived at assuming that the operator and hired labor, if any, were available 100% of the time during the irrigation season. Family labor was assumed available on a 60% basis since much of the family labor reported consisted of children not yet in their teens.

Availability of labor must receive major consideration in the decision making of prospective irrigators. It will influence the type of system purchased, acres to be developed for irrigation and water supply needed. The type of system is particularly significant.

5. Types of Irrigation Equipment

The following types of irrigation equipment were being operated by irrigators interviewed.

Type	Number
Boom	12
Tractor Tow	16
Self Propelled*	8
Hand Move	7
Side Move-Tow	6
Gated Pipe	12
Siphon Tubes	4
Total†	65

*All self propelled units were center pivot.
†Ten interviewees owned more than one type of system.

Self propelled center pivot systems have the least labor demands but have a high initial cost. Hand move and siphon tube systems have the highest labor demands and the lowest initial cost. The tendency in recent years has been to invest in low labor demand systems.

6. Off Season Irrigation

Twenty-one of the interviewees irrigated in late fall and 17 in early spring. Only five of these were in the southern area. The average amount of water applied was 3 inches, with 6 inches being the maximum and 1¼ inches the least. Alfalfa was the most common crop irrigated in the off season.

Off season irrigation should be considered by prospective irrigators. Filling the soil profile in late fall or early spring levels out the work load and makes it easier to keep up with water demands of crops during summer months. It works particularly well on alfalfa.

7. Problems Encountered

When asked what was their biggest irrigation problem, interviewees responded as shown below. The type of system being operated is also shown opposite each problem category since there may be a correlation between type of system and main problem in some cases.

Main Problems	Types of Systems
Labor (14)	Boom (6), Tow (1), Gated Pipe (4), Side Move-Tow (2), Siphon (1)
Mud (3)	Boom (2), Gated Pipe (1)
Wind (2)	Tow (1), Self Propelled (1)
General Management (2)	(No Apparent Correlation)
Choosing Crop Varieties (1)	(No Apparent Correlation)
Weeds (1)	(No Apparent Correlation)
Water Supply (3)	(No Apparent Correlation)
Drainage (1)	(No Apparent Correlation)
Power Source (1)	(No Apparent Correlation)
Slope (1)	(No Apparent Correlation)
Soil (2)	(No Apparent Correlation)
Crop Storage (1)	(No Apparent Correlation)

Twenty-two stated that they had encountered no particular problems or did not answer the question.

Many new types of systems have appeared on the market in the last few years. Each prospective irrigator should very carefully select the type that will best fit his soils, shape of fields, water supply, labor available and type of farming operation desired.

8. Soil Moisture

Thirty-four answered the question regarding method used to measure soil moisture. Of these, 25 used a soil probe along with the "feel" test. Six irrigated by time schedule, one used tensionometers and two went by the appearance of the crop and soil.

Every irrigator should adopt some method of determining soil moisture. Use of a soil probe along with the feel test is the most common and is a good method that requires very little equipment. This method and others are described in Extension Fact Sheet No. 177, "Don't Wait—Irrigate."

PART II

Table 2-1 shows the average of actual yields under irrigation as reported by irrigators. Table 2-2 shows the changes in land use after adoption of irrigation and Table 2-3 shows changes in livestock operations after adoption of irrigation.

Interviewees were asked to give yields in the last two cropping years. About 15% of the irrigators were interviewed before the 1967 harvest and therefore used yield figures from 1965 and 1966. Eleven irrigators were just starting and therefore had only 1967 figures. The remainder used 1966 and 1967 figures.

Since 1967 was a poor crop year for reasons other than moisture, the average figures may be slightly low.

Table 2-1. Average Yields of Main Crops as Reported by Irrigators Interviewed

	South Area			North Area		
	Average	High	Low	Average	High	Low
Corn for grain (Bu)	109	140	80	89.5	135	60
Alfalfa for hay (T)	6	7	5	4.05	5	2.5
Soybeans (Bu)	33.8	48	17	-----	-----	-----
Sorghum for grain (Bu)	-----	-----	-----	69.3	100	40
Wheat	-----	-----	-----	36.5	40	33
Barley	-----	-----	-----	51.0	80	38

Table 2-2. Changes in Land Use After Adoption of Irrigation

Change Reported	South Area Number Reporting Change	North Area Number Reporting Change
Dropped Rented Land	2	3
Added Alfalfa Acres	1	2
Added Speciality Crop	2	2
Dropped Small Grain	4	2
Added Corn Acres	2	7

Table 2-3. Changes in Livestock Operations After Adoption of Irrigation

Livestock Operation	South Area *Net Change (Head)	North Area *Net Change (Head)
Cow—Calf	+ 135	+ 219
Feeders Fed Out	+ 555	+ 445
Hogs Fed Out	+1100	+3080
Ewes Lambing	-----	+ 350
Feeder Pigs Bought	-----	+ 65
Dairy Cows Bought	-----	+ 30
Lambs Bought and Fed Out	-----	+ 200

*Some interviewees increased certain livestock operations while others decreased them. Figures here show net change among all interviewees after all increases and decreases in each operation have been considered.

Comments on Tables

Table 2-1 shows that the average yield of corn for grain in the south was 109 bushels while the north area averaged 89.5 bushels. This difference may be partly due to the fact that a larger percentage of irrigators in the north are just starting and are therefore less experienced. However, some difference will continue to exist due to the difference in climatic conditions, frost free days and other growing conditions. As will be seen in Part III below, however, northern irrigators have a greater *relative* advantage than do southern irrigators.

Irrigated soybeans in the south do not appear to be competitive with irrigated corn considering present prices of each.

In both areas alfalfa appears to be competitive with corn as a cash crop if a market exists for the alfalfa. A contract arrangement for alfalfa may remove some of the cash market risk.

Irrigated sorghum for grain does not appear to be competitive with corn under irrigation in the north area. Wheat does not compete with corn using present prices and varieties. Barley, at current yields, does not appear competitive, however, some new barley varieties show promise under irrigation.

Table 2-2 shows that the main change in land use was toward addition of corn acres, especially in the north. The dropping of rented land indicates a movement toward smaller, more intensively cultivated operations. The speciality crops added were potatoes, green beans and sweet corn seed production.

In Table 2-3 the fact that all shifts in livestock operations showed a net gain is in itself significant, especially in the increases in swine and cattle feeding. Assured feed supplies is the reason given, especially in the north.

PART III

Chart 1 in this section shows the *response of corn for grain yields to management practices used* in the northern area. Also shown on chart 1: (1) average yield obtained under irrigation, (2) the yield necessary to make irrigation profitable, (3) the average dryland yields being obtained in counties surveyed, and (4) the break-even yield for dryland operations.

Chart 2 shows the same data for the southern area.

The method used in arriving at the response of yields to management practices is not included here. Persons wishing these details may obtain them from the authors. Briefly stated, the method consists of dividing management into four categories: water applied, fertilizer applied, insect control and weed control. An index value was assigned to each of these practices. The yields obtained and the sum of the indexes of management practices used were then plotted on a graph.

How to Interpret Charts 1 and 2

The *Response of Yield to Management* curve on the charts shows that the pattern of dots works its way up on the yield scale as the index of management increases.

The individual dots, which represent the relationship of yield to management for each irrigator, are more scattered in the northern area than in the south. This is probably due to a higher percentage of first year irrigators in the north.

(concluded on page 5)

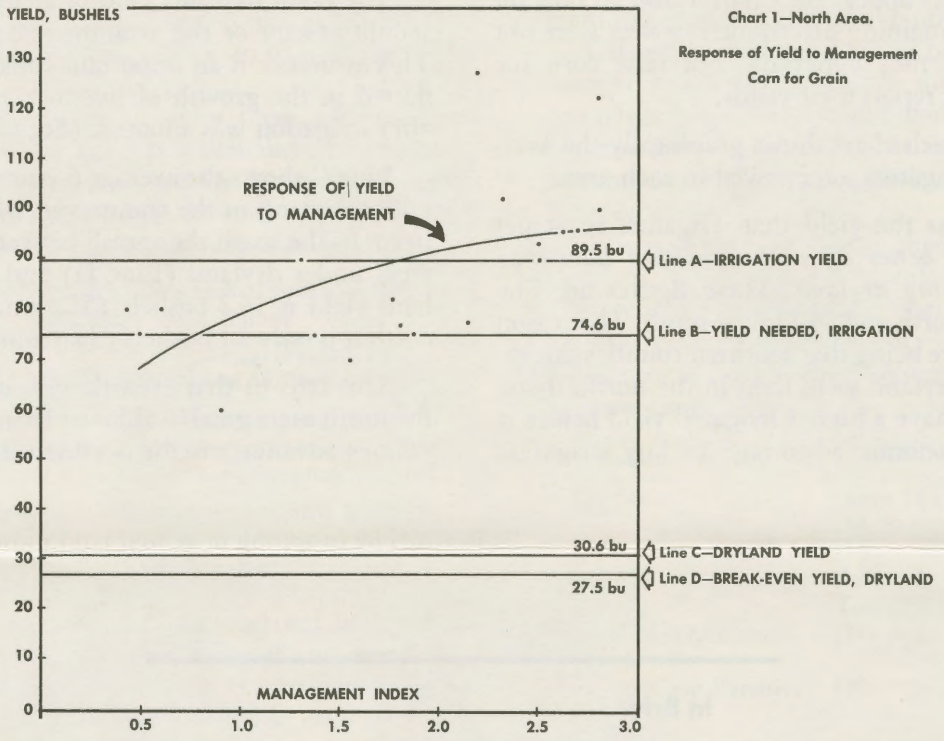

Chart 1—North Area.

Response of Yield to Management

Corn for Grain

KEY for Chart 1 (above) and Chart 2 (below).

Line A—Average yield of irrigators interviewed.

Line B—Yield where it becomes an economic advantage to own irrigation equipment (see Extension Circular 655, "Irrigation Costs and Returns").

Line C—Average 6-year dryland yields in counties surveyed (from South Dakota Crop & Livestock Reporting Service).

Line D—(North) Break-even yield under dryland (see EC 655).

Line D—(South) Break-even yield under dryland. (Break-even yield is higher than in the north because of higher land charge and more fertilizer, seed, etc.).

NOTE: Dots indicate 2-year average yields for each irrigator except those just starting in 1967.

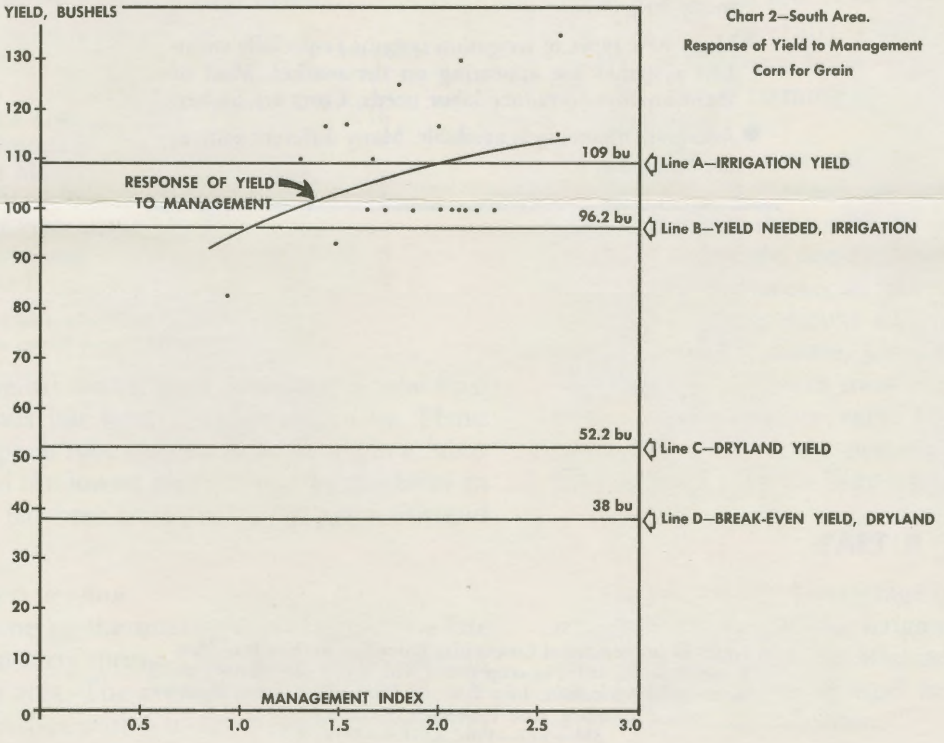

Chart 2—South Area.

Response of Yield to Management

Corn for Grain

Nineteen dots appear on Chart 1 and 20 dots on Chart 2. The remaining fifteen interviewees were not plotted because they either did not raise corn for grain or did not report their yields.

Line A on each chart shows graphically the average yields of irrigators interviewed in each area.

Line B shows the yield that irrigators must get *before they are better off with irrigation than they would be farming dryland*. These figures are 74.6 bushels in the north and 96.2 in the south. The reason for the difference being that southern counties can expect a higher dryland yield than in the north, therefore they must have a higher irrigated yield before it becomes an economic advantage to buy irrigation equipment.

The point that this kind of analysis ignores is the stability factor or the assurance of a crop each year. This assurance is an important consideration as is reflected in the growth of livestock numbers handled after irrigation was adopted. (See table 2-3)

Line C shows the average 6-year yield (1961-1966) under dryland in the counties in which interviewees lived. In the south the spread between the break-even yield under dryland **(Line D)** and the average dryland yield is 14.2 bushels (52.2 minus 38.0). In the north it is only 3.1 bushels (30.6 minus 27.5).

This tells us that even though irrigated yields in the north are a good deal lower than in the south, the *relative* advantage to the northern irrigator is greater.

In Brief . . .

- Adoption of irrigation does tend to change cropping patterns and land use.
- Adoption does tend to increase livestock operations, especially feeding of cattle and swine.
- There is a definite response in irrigated yields as related to good management practices used.
- Irrigated yields in the south are greater than in the north and probably will remain so. The relative advantage of irrigation however is greater in the north.
- Labor is still considered the Number 1 problem with many irrigators.
- Many new types of irrigation systems (especially sprinkler systems) are appearing on the market. Most of them attempt to reduce labor needs. Costs are higher.
- Adequate financing is available. Many different sources are being use.

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