1961

EC612-715 1960 Report of Irrigation Field Demonstrations

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E.C. 61-715

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Central and Southwestern Nebraska

EXTENSION SERVICE
UNIVERSITY OF NEBRASKA COLLEGE OF AGRICULTURE
AND U. S. DEPARTMENT OF AGRICULTURE
COOPERATING
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SUMMARY

1. Cost of producing corn averaged $61.31 per acre or 64¢ per bushel on 15 irrigated field units totaling 626 acres.

2. Net returns @ $1.00 per bushel averaged $34.49 per acre with a high of $60.89.

3. Yield per acre was the most important factor affecting net returns. The five high net return group, averaging $43.48 per acre, averaged 117 bushels, compared with 70.7 bushels for the low return group which reported only $15.00 net return per acre.

4. Average fertilizer use was 119 pounds of nitrogen and 13 pounds of P_2O_5.

5. Average water use was 18.32 acre inches per acre. Labor in water application averaged .63 hours per acre, per irrigation. Average water cost was 83¢ per acre inch. This does not include application labor.

6. Based upon relative percent of production costs; labor, machinery and power rated highest with 29.7%, followed in order by irrigation at 26.0%, fertilizer 21.5%, land 18.0%, and 4.8% for other costs.

7. Net live-weight beef gains of 532 and 588 pounds per acre were reported by Harlan and Webster County pasture units, respectively.

8. Sugar beets @ 20.08 tons per acre showed a net return of $106.00 per acre, to lead all field units.

9. Five tons of barnyard manure adequately replaced zinc on a sandy land unit in Harlan County.

10. Nine pounds of zinc increased corn yields 15 bushels per acre on sandy soil in Hall County.

11. Irrigation lateral loss was 5% in a 2200 foot lateral in Hall County.

12. No significant yield difference was observed in dry, liquid, or gas fertilizer applied to grain sorghum in the irrigation water -- Merrick County.

13. Irrigation intake rate increased 26% in one trial by planting corn with minimum tillage method in Kearney County.

*District Extension Irrigationists at St. Paul and Hastings, Nebraska, respectively. Special credit is due the cooperating farmers and county agents of the several counties involved in this report. Valued assistance was rendered by Work Unit Conservationists.

INTRODUCTION

Irrigated field units have been used effectively as irrigation demonstrations in central and southwestern Nebraska for the past three years. They were selected by county Extension agents as physical demonstrations on special development or production problems with consideration for spread of influence in the community.

Operation of the irrigation demonstration unit is conducted by the farm operator. Technical service is available regarding special problems.

Results reported are based upon practical field operations and are not to be interpreted as controlled experiments. Single reports of special crops or enterprises are included to show actual performance under conditions experienced, with no inferrence as to how representative they might be.

Contained in this circular are reports of 27 irrigated field demonstration units cooperating in the program in 1960. Distribution of the field units is shown in Figure 1.

PHYSICAL DEMONSTRATIONS

Soil and water resources were considered of primary importance on all field demonstrations. A determination of these resources received first consideration. Soils classification by the soil conservation service was basic and the cooperation of S. C. S. technicians was secured for problems involving land development.

Complete engineering tests for water capacity and plant efficiency were made for all pump units.

Soil and water interaction was determined by water intake and/or distribution tests.

Irrigation plans and recommendations for each unit were based upon the above data which are summarized in Table 1.

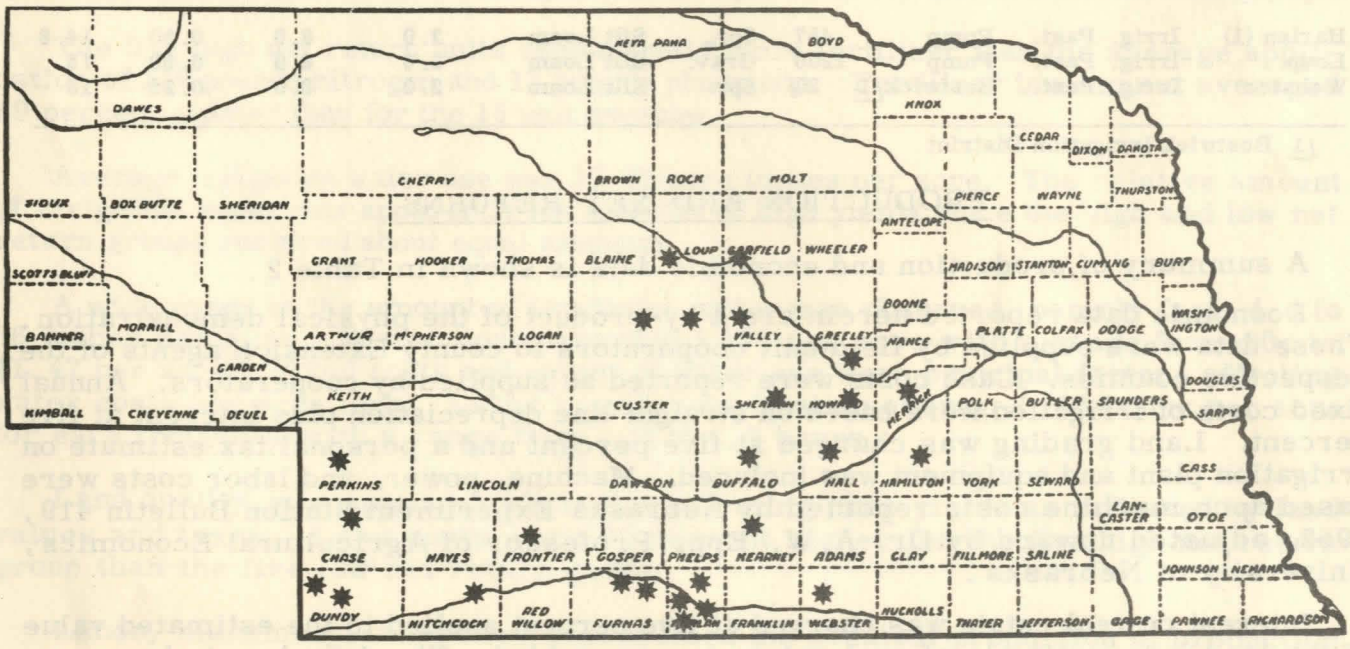


Figure 1 - Distribution of Irrigated Field Demonstrations - 1960

Table 1 - Summary of Irrigated Field Units - Soils and Water

County	Water Supply Source	Water Supply Amount/1	Irrig. Method	Soil Class	Water Capacity Inches Water per foot	Water Capacity Total Inches	Water Capacity Intake Rate/2	Acres
				CORN FIELDS				
Chase	Pump	560	Gravity	Sandy Loam	1.5	9.0	0.40	80
Dundy (1)	Pump	944	Sprinkler	Sandy Loam	1.5	9.0	0.51	21
Dundy (2)	Pump	1001	Sprinkler	Sandy Loam	1.5	9.0	0.60	20
Dundy (3)	Pump	800	Gravity	Fine Sandy Loam	1.75	10.0	0.32	56
Furnas	F-C/3	4Q	Gravity	Silt Loam	2.00	11.5	0.40	25
Harlan	Pump	1140	Gravity	Sandy Loam	1.5	9.0	0.40	6.7
Hitchcock	F-C	4Q	Gravity	Sandy Loam	1.5	9.0	0.60	10
Hall	Pump	900	Pump	Loamy Sand	1.25	6.0	--	25
Hamilton	Pump	1050	Pump	Silt Loam	2.0	12.0	0.054	10
Kearney	Pump	3Q	Gravity	Silt Loam	2.0	12.0	0.21	15
Merrick	Pump	700	Gravity	Loamy Sand	1.2	4.8	--	15
Buffalo	Pump	945	Gravity	Silt Loam	2.0	12.0	0.11	85
Custer (1)	Pump	705	Sprinkler	Loamy Sand	1.3	7.5	0.42	60
Custer (2)	Pump	1025	Gravity	Fine Sandy Loam	1.5	9.0	0.175	52
Garfield	NL-Irrig.	3Q	Gravity	Silt Loam	2.0	11.0	0.16	23
Howard (1)	Pump	570	Gravity	Very Fine Sandy Loam	2.0	12.0	0.50	60
Howard (2)	Pump	955	Gravity	Loamy Sand	1.3	7.0	1.84	27
Sherman	Pump	885	Gravity	Silt Loam	2.0	11.5	0.33	95
Valley	Pump	528	Gravity	Silt Loam	2.0	12.0	0.40	5.8

/1 Pump Units reported in gallons per minute, Canal flow Q (1Q = 450 gpm)
/2 Acre inches per hour
/3 Frenchman-Cambridge Irrigation District

Table 1 - Continued - with special crops

County	Crop	Water Supply Source	Water Supply Amount	Irrig. Method	Soil Class	Water Capacity Inches Water per foot	Water Capacity Total Inches	Water Capacity Intake Rate	Acres
Furnas	Sugar Beets	F-C	4Q	Grav.	Silt Loam	2.0	9.0	0.58	24
Harlan (3)	Soybeans	F-C	4Q	Grav.	Silt Loam	2.0	9.0	--	5
Harlan (4)	New Alfalfa	Pump	460	Grav.	Silt Loam	2.0	12.0	0.50	32
Perkins	Gr. Sorghum	Pump	800	Spr.	Sandy Loam	1.5	7.5	0.50	152
Frontier	Irrig. Past.	Pump	500	Spr.	Silt Loam	2.0	8.0	0.40	17
Harlan (1)	Irrig. Past.	Pump	457	Spr.	Silt Loam	2.0	8.0	0.50	14.8
Loup	Irrig. Past.	Pump	1200	Grav.	Silt Loam	2.0	8.0	0.50	15
Webster	Irrig. Past.	Bostwick/1	2Q	Spr.	Silt Loam	2.0	8.0	0.25	18

/1 Bostwick Irrigation District

PRODUCTION AND NET RETURNS

A summary of production and economic data is shown in Table 2.

Economic data reported herein are a by-product of the physical demonstration. These data were supplied by field unit cooperators to county Extension agents of the respective counties. Cash costs were reported as supplied by cooperators. Annual fixed costs of irrigation were based on straight line depreciation plus interest at five percent. Land grading was charged at five percent and a personal tax estimate on irrigation plant and equipment was included. Machine, power, and labor costs were based upon machine costs reported by Nebraska Experiment Station Bulletin 419, 1952, adjusted upward by Dr. A.W. Epp, Professor of Agricultural Economics, University of Nebraska.

Interest on real estate was charged at five percent applied to the estimated value of the land. An estimate of real estate tax was added. The data do not, however, include any portion for "overhead" expense.

Table 2 - Summary of Economic data and Production Factors, 15 Irrigated Corn Field Units - 1960

Item	Av. of 15	5 High	5 Medium	5 Low
Acres	626.5	278.0	175.8	172.7
Production Bushels	60046	32053	15783	12210
Yield/acre, bushel	95.8	117.0	89.7	70.7
Gross return @ $1.00/bu.	$95.80	$117.00	$89.70	$70.70
Cost/acre	$61.31	$63.55	$62.90	$55.73
Net Return/acre	$34.49	$53.45	$26.80	$14.97
Labor, Machinery & Power	$18.11	$19.16	$20.07	$14.71
Water	15.97	15.57	16.69	15.86
Fertilizer	13.03	14.35	10.69	13.28
Land	11.04	11.52	12.42	8.86
Other Costs	3.16	2.95	3.03	3.02
Cost/bushel of Corn	.64	.55	.70	.79
Cost/acre inch of Water	.83	.74	1.19	.76
Acre inches of Water	18.32	20.20	12.75	20.90
Fertilizer/acre	119-13-0	128-18-0	110-7-0	116-10-0

Economic Analysis

Costs of producing corn averaged $61.31 per acre on 15 irrigated fields located in 11 central and southwestern counties involving 626 acres of irrigated land. Costs ranged from $47.86 to $76.82 per acre. Costs per bushel averaged 64¢, with a range from 49 to 87¢.

Net returns averaged $34.49, with a high of $60.89. Costs and net returns are shown graphically in Figure 2 for the 15 units, the five high net return units and the five low net return units. Net returns on the above groupings were $34.49, $53.45, and $14.97, respectively.

Yield per acre was the most important factor affecting net returns. The five high net return group showed an average yield of 117 bushels per acre. This was 22 percent higher than the average and 65 percent greater than the five low net return group.

The five high net return units used slightly more fertilizer than the average application of 119 pounds nitrogen and 13 pounds phosphate. Fertilizer investment averaged 19 percent greater than for the 15 unit average.

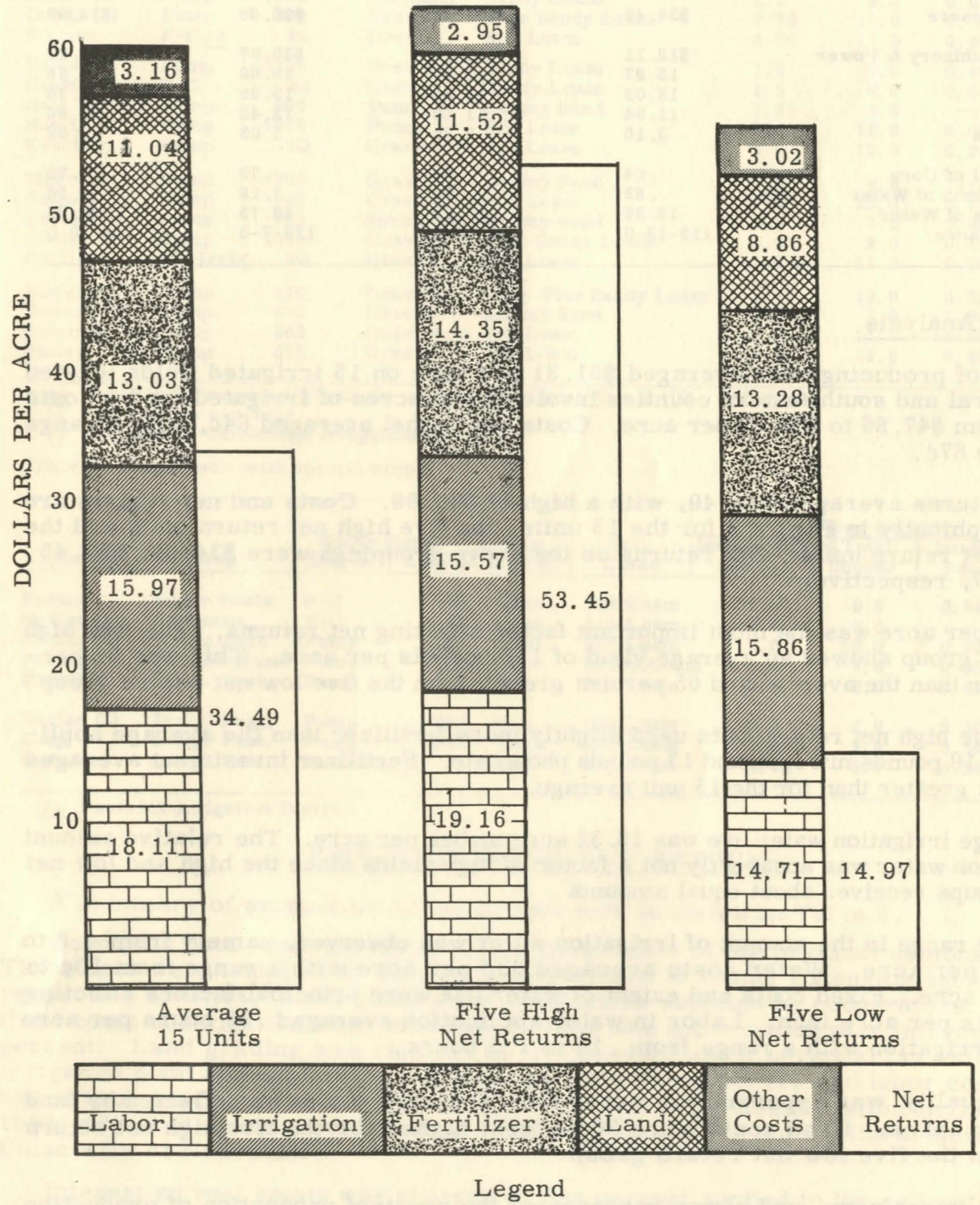
Average irrigation water use was 18.32 acre inches per acre. The relative amount of irrigation water was apparently not a factor of high yields since the high and low net return groups received about equal amounts.

A wide range in the amount of irrigation water was observed, namely from 4.8 to 36 inches per acre. Water costs averaged 83¢ per acre with a range from 30¢ to $1.47 per acre. Fixed costs and extent of water use were principal factors affecting water costs per acre inch. Labor in water application averaged .63 hours per acre for each irrigation with a range from .14 to 1.5 hours.

Land quality was apparently a factor affecting crop yields as reflected by land values and taxes. Land costs were 30 percent higher for the five high net return group than the five low net return group.

Labor, machinery, and power represented the greatest proportion of production costs, at 29.7 percent. On the basis of percent of costs, irrigation followed at 26 percent, fertilizer at 21.5 percent, land, 18 percent, and other costs at 4.8 percent.

Figure 2 - Costs and Returns, Fifteen Corn Field Demonstration Units



In addition to the 15 corn units reported above, detailed information is available from 1960 on three irrigated pasture utilization units, one new pasture seeding and one unit each of sugar beets, soybeans, new alfalfa, and grain sorghum.

The relative value of irrigated pasture as a high return crop under irrigation is indicated by the summary of pasture units in Table 3. As indicated, good irrigated pasture properly managed may be expected to yield a return of 500 to 600 pounds of live-weight beef per acre.

On the basis of net returns per acre, a sugar beet field with a yield of 20.08 tons per acre and net returns of $106.00 received top rating. Harvest weights indicated a beet top yield of 12.6 tons per acre, evaluated for this report at $2.00 per ton of beet silage which compares favorably with the customary formula of $1.00 per beet ton.

Cost of establishing new alfalfa was $28.54 per acre, based on land preparation, seeding, seed costs, and phosphate fertilizer, prorated over a 6 year period. On contract with a dehydrator plant, this unit lacked only $3.46 per acre of paying its way in the first year.

Table 3 - Summary of Irrigated Pasture Utilization

Description	Webster County	Harlan County
Acres	18.0	14.8
Year Established	1956	1959
Kind	Grass-legume	Grass-legume
Livestock	74 steers	38 calves
Grazing period days	150	139
Gains per head	250	243.7
Gains per acre	1028	625.7
Grain fed per day Pounds	7.3 /1	2.5 /2
Est. pounds credit	107	93
Net pasture gains per head	143	150.7
per acre	588	532
Gross pasture value @ $20.00/cwt	117.60	106.40
Other Pasture Credit per acre		37.00 /3
Total Value per acre	$117.60	$143.40

/1 Estimated 8.2 pounds of corn per pound of gain. 7.3 pounds daily of ground ear corn. Feed requirements estimates by Nebraska Extension Animal Husbandry Department.

/2 Estimated 6.2 pounds of corn equivalent required per pound of gain at this level of feeding. Grain fed was ground milo, supplement, molasses, and ground corn cobs.

/3 Includes 108 pounds seed and .68 tons of hay per acre.

Soybeans, at 27 bushel per acre showed a loss of $15.45, and grain sorghum at 55.1 bushels showed a loss of $3.00 per acre at current prices. Neither of these two latter units were considered representative. The relatively low yield of soybeans, together with a high fertilizer cost, were responsible factors for the poor showing of soybeans. In respect to the sorghum field lack of adequate irrigation was primarily responsible for the poor yield of this unit.

FIELD STUDIES AND DEMONSTRATIONS

Sandy Land Management (Harlan County)

Comparisons of starter fertilizer, starter fertilizer with zinc, and manure treatment were made with corn on sandy land in Harlan County. Materials used were 100 pounds per acre of 8-32-0, 6-24-0 + 7 percent zinc, and barnyard manure at five tons per acre. All treatments were made with 150 pounds of nitrogen.

Yield comparisons made by weighing loads in the field direct from the picker were rather inconsistent, but indicated clearly that the manure treatment adequately replaced zinc.

At this demonstration and at a similar sandy land corn field in Hitchcock County, a July seeding of 16 pounds of Madison vetch per acre was made as a green manure crop for soil fertility comparisons the following year.

(Hall County)

Water losses in farm laterals, fertility plots, and using tensiometers as a guide for starting irrigation were demonstrated.

The fertility plots on corn compared different rates of nitrogen, nitrogen and phosphorous, nitrogen phosphorous potassium, and nitrogen phosphorous and trace elements. The plots containing zinc gave an increase of 15 bushels per acre. Top yield was made from 93 pounds of nitrogen, 32 pounds of phosphorous and 9 pounds of zinc. A yield of 98 bushels per acre was achieved with no fertilizer of any kind. This was probably due to carryover from previous years' fertilizer.

Irrigation lateral losses were 5 percent from evaporation and percolation. Test was made on a lateral of 2200 feet in length, after the water had been running two days. This test was made on a Hall fine sandy loam soil.

Dry, Liquid, and Gas Fertilizer in Irrigation Water (Merrick County)

Liquid, gas and dry fertilizers were applied in the irrigation water to grain sorghum on a Cass loamy sand soil by gravity irrigation.

Ninety pounds of NH_3 was applied as a preplant, and then 10 pounds of N per acre was put in at 3 different irrigations. There was no apparent yield difference between any of the three fertilizer carriers. In fact, in this demonstration there was no increase in yields from the nitrogen added in the irrigation water over the plot which had only preplant fertilizer. This was apparently due to leaching.

Irrigation Intake Rates Comparing Minimum Tillage and Conventional Planted Corn, Kearney and Hamilton Counties.

Irrigation intake rates were taken in Kearney and Hamilton Counties on Holdredge silt loam soil. The checks were made in the first and second irrigations. The minimum tilled plots had no ground preparation prior to planting other than cutting stalks. The conventional plots were disked, plowed, disked, and harrowed before planting. One field showed an increase of irrigation intake of 26 percent in favor of minumum tillage, while the other showed no appreciable difference.