5-1964

An Economic Study of Grain Corn, Sweet Corn, and Silage Corn in Northern Utah, 1962

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AN ECONOMIC STUDY OF GRAIN CORN, SWEET CORN, AND SILAGE CORN IN NORTHERN UTAH, 1962

by

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A thesis submitted in partial fulfillment
of the requirements for the degree

of

MASTER OF SCIENCE

in

Agricultural Economics

APPROVED:

UTAH STATE UNIVERSITY
Logan, Utah

1964

ACKNOWLEDGMENT

I wish to express appreciation to my thesis director, Professor E. M. Morrison, for his supervision and helpful suggestions in developing the data and in writing the manuscript. Gratitude is extended to members of my graduate committee who willingly gave of their time in counseling and in reading this manuscript.

Special thanks are offered corn producers who gave of their time to contribute the information used in this study.

To my parents is extended special appreciation for encouragement which has been a valuable asset throughout my college work. Appreciation is given to those who have done secretarial work and offered helpful suggestions.

Guy A. Erikson

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% of silage corn

INTRODUCTION

In 1959 there were 49,006 acres of corn grown in the state of Utah. Included in this were 4,232 acres of grain corn, 38,770 acres of silage corn, and 4,470 acres of sweet corn. The remaining 1,534 acres of corn were used for pasture, cut as fodder, or any miscellaneous use.

In 1959 the product from 44,536 acres of field corn, i.e., corn grown for silage, grain or feed, was valued at $4,684,676. This was an increase of 50 percent in acreage and an increase of 101 percent in dollar value of the product over the 29,746 acres of field corn grown in 1950. The increase in dollar value is accounted for by an increase in the yields of grain and silage of 108 percent and 34 percent respectively (7). Agricultural statistics report the price of all field corn in bushel value. The price of corn in Utah declined from $1.87 to $1.50 from 1950 to 1959 (1). From 1945 to 1959 there was a 97 percent increase in field corn acreage in Utah.

The sweet corn acreage in Utah increased from 2,229 acres in 1945 to 5,356 acres in 1950. In 1959 it had declined to 4,470 acres (7).

There were seven counties in Utah where farmers grew over 100 acres of grain corn in 1959, table 1. Of these, Davis County had 1,520 acres or 36 percent of the total Utah acreage of grain corn. Utah County had 16 percent of the total acreage. Duchesne and Emery each had over 400 acres planted to grain corn.

Table 1. Grain corn, silage corn, and sweet corn acreages in selected counties of Utah, 1959

County	Grain		Silage		Sweet	
	Acres	Percent of total	Acres	Percent of total	Acres	Percent of total
Beaver	4	*	1,011	2.6	4	*
Box Elder	61	1.4	5,712	14.7	483	10.8
Davis	1,520	35.9	3,750	9.7	217	4.8
Duchesne	478	11.3	2,305	5.9	6	*
Cache	---	---	2,823	7.3	1,059	23.7
Emery	443	10.5	1,399	3.6	2	*
Millard	13	*	3,136	8.1	---	---
Salt Lake	155	3.7	2,398	6.2	161	3.6
Seview	---	---	2,536	6.5	1	*
Uintah	166	3.9	1,356	3.5	8	*
Utah	667	15.8	5,272	13.6	2,468	55.2
Weber	329	7.8	3,084	7.9	41	*
Remaining counties	396	9.4	4,688	10.4	20	*
Total state	4,232	100.0	38,770	100.0	4,470	100.0

Source - United States Census of Agriculture, Vol. 7, Counties, Pt. 44. Utah. 1959.

* Less than 1%

There were over 100 acres of sweet corn grown in each of five counties in Utah. In 1959 Utah County farmers grew 2,468 acres of sweet corn. This represented 55 percent of the total Utah sweet corn acreage. Cache County had 23.7 percent of the total acreage and Box Elder County had 10.8 percent of the total. The other two counties where over 100 acres of sweet corn were reported were Davis and Salt Lake.

There were 12 counties in Utah where farmers produced at least 1,000 acres of silage. In 1959 farmers in Box Elder County grew 5,712 acres of silage corn which was 14.7 percent of the total silage corn acreage of the State. The acreage in Utah County for the same year was 5,232 acres. Davis, Millard, and Weber Counties all had over 3,000 acres of silage corn in 1959.

In 1959 there were 3,511 farmers in Utah who produced field corn. Using the 1959 prices and yields, the average value per farm for that crop was $1,334.28. Thus, corn was important to the economy of Utah. Field corn represented 6.6 percent of the total value of all crops harvested in Utah in 1959.

There have been no recent economic studies made in Utah that dealt with the production of corn, although such studies have been made for many of the other crops grown in Utah. In order to make rational management decisions pertaining to either practices followed within a corn enterprise or between a corn enterprise and alternative enterprises, it is advantageous for farmers to know the net return and the factors associated with success in the production of corn.

OBJECTIVES OF STUDY

The objectives of this study were: 1. to ascertain the 1962 physical and monetary requirements in the production of grain corn, sweet corn, and silage corn in Northern Utah; 2. to ascertain the returns from each of the three types of corn; and 3. to determine what rates of physical inputs or factors that were associated with financial success or failure for each of the various types of corn production.

REVIEW OF LITERATURE

Corn is one of the important crops in the United States, and there have been many economic studies made concerning corn production. These studies range in scope from general accounting procedures to specific phases of corn production for selected areas of the nation.

The intention here was not to review all economic studies of corn production but to choose a few which seemed to be somewhat representative of available literature. Some of the studies reviewed gave guides in budgeting and accounting techniques which have relevance to a 1962 Utah corn study. Others included cost and income from producing various types of corn. The following studies dealt with other areas or earlier dates but have relevance to a present economic study of Utah corn production.

In 1958 a cost study was made by Vollman & Blosser on grain corn in six Ohio counties (8). They found that the land cost when figured at 5 percent interest was $16.50 per acre. Fertilizer and manure cost was $15.50 per acre and the labor cost was $9.95. The power and equipment cost was $14.70 per acre. When all of the costs were figured including the above costs plus lime, seed and spray, it cost $58.85 per acre to produce a 75 bushel crop of corn. The receipts were figured at $1.00 per bushel - giving a net return of $16.15 per acre. The labor requirement was 6.5 man hours per acre and 5.7 tractor hours per acre.

In a farm accounting study, "Analytical Accounting Techniques", from American Milk Review, David Lewis grouped cost data into fixed cost and variable cost (4). He explained that costs which occurred in connection with more than one operation (joint costs) should be allocated to the individual operation and this could be done using any realistic basis including percent of use.

M. E. Pollard in a Farm Quarterly article, "Figuring Corn Cost", broke the cost of growing corn into four groups: direct cost, individual cost, implied cost, and internal transfers (6). He explained that direct cost was important in comparing two similar crops, since the other costs do not change for a one year period. He explained further that complete cost must be known to determine when and how much profit was made. From this study indications were given as to the type of cost encountered in agricultural production.

He also explained that it was necessary for the corn crop to pay for the use of land. This could be figured using an appropriate interest rate on a "fair value" for land.

In 1960, a study was made of the tillage cost for agricultural production in Utah by Davis and Phillips (3). The study was made on 119 farms located in Sevier, Sanpete, Cache, and Box Elder Counties. Eighty-eight of the farms grew corn for silage. It was found that the average cost of the tillage operations and the planting of corn was $20.20 per acre.

In 1946, a study, "Cost of Producing Sweet Corn in the Willamette Valley, Oregon", was made by G. B. Davis and D. Curtis Mumford (2).

This study was made on 57 fields with 32 of them irrigated. The total cost per acre was $110.50 with costs of labor, equipment, seed and fertilizer, taxes, interest, etc., being $54.40, $26.70, $11.80, and $17.60 respectively. The total cost per ton was $26.80. This study gave indications as to the type of inputs that might be expected in a Utah study.

The only economic study made in Utah on any of the three types of corn was by Morrison and Kearl in 1949 (5). Their study was made on cost of producing canning corn on 58 farms in Cache County, Utah. The average size of the enterprise was 5.3 acres of corn, and the size ranged from 1.5 acres to 15 acres. The farmers had an average investment of $325.00 per acre.

In the study it was found that cost of producing canning corn averaged $24.07 per ton and ranged from $12.47 to $78.40 per ton. Cost of production exceeded receipts on 53 percent of the farms. Power cost was found to be $32.87 per acre or $6.62 per ton. An interest charge of 5 percent was used for operating money invested in the crop, and for fixed capital in figuring overhead cost which was $26.78 per acre.

Materials cost $12.13 per acre. The most costly item was labor, which average $47.80 per acre when figured at $.94 per hour. The total cost was $119.56 per acre.

Receipts from the corn were $22.55 per ton and the value of the stover was $2.79 per ton of corn produced. Total receipts were $125.34 per acre or $25.34 per ton of corn produced. The resultant

net return was $6.28 per acre or $1.27 per ton.

Morrison and Kearl found that yield differences were not significant between small and large acreages. But cost per ton was $25.42 on the enterprises that averaged 2.5 acres while on enterprises that averaged 8.4 acres cost per ton was $22.34.

In 1949, it was found that late corn was more profitable than early corn because of increased yields. The study showed that as yield increased from 3.3 to 7.1 tons per acre, net return increased from a minus $8.00 to a plus $5.94 per acre.

A sort using number of man hours per acre showed that an average number of hours per acre was the most profitable level of labor. For low labor enterprises neglect was suggested as the reason for low income and over the optimum use of labor as the reason for income in high labor enterprises. Enterprises that averaged 82 hours per acre had a loss of $25.98 per acre. Those that averaged 34 hours per acre had a net return of $7.02 per acre while those that averaged 51 hours per acre had a net return of $28.03 per acre.

SOURCE OF DATA AND METHOD OF PROCEDURE

The data for this study came from a survey made of farmers who produced grain corn, silage corn, or sweet corn in 1962. Farmers from four counties were included in the survey. Counties included were in Northern Utah and had relatively large acreages of grain corn, sweet corn, and silage corn grown within their boundaries.

Data for grain corn came from schedules obtained from 26 producers in Davis and Weber Counties. There were 31 schedules taken in Box Elder and Cache Counties that were used for sweet corn data. The silage corn data were obtained from all four counties mentioned above. Forty-eight silage corn enterprise schedules were included in the study. Thirteen of the silage corn producers interviewed also grew grain corn and 10 grew sweet corn.

Corn producers were located through information received from county agents, equipment and supply dealers, residents of corn producing areas, and other corn producers. Each of the cooperating producers was visited by a trained enumerator who used a detailed questionnaire as a guide in obtaining and recording pertinent information. The survey was limited to individual farmers who produced corn in 1962.

Excluded from the study were enterprises with atypical inputs and operations. Institutional enterprises such as church farms and F.F.A. projects were considered to be of this type because of

inputs used. Also excluded was one large grain corn enterprise with 115 acres where the operator specialized in continuous grain corn, and one silage enterprise that was 300 acres in size.

Corn farmers were interviewed until a sufficient number of schedules were obtained so that those conducting the study believed that representative cultural practices, yields, and costs could be determined.

When the field survey was completed, schedules were summarized and checked. Data from schedules were summarized and recorded on tabulation sheets. Figures obtained from the tabulation sheets were used in analyzing each of the three types of corn enterprises.

To find gross assocations between rates of physical inputs or factors, corn enterprise schedules were sorted and grouped in such a way that differences in one factor would be minimized. No controls of variation were placed on the remaining factors. In the determination of number of schedules per group, the total number was divided in either halves or thirds, depending on the number of schedules, making an equal number for each group. Next, an adjustment was necessary so that schedules with identical sort factors values would not be separated. Comparisons were then made between the factor held relatively constant and factors measuring success.

Main emphasis of this study was on physical inputs, cost and net return to each of three types of corn. In the Receipts and Income sections, emphasis was changed. In these sections the assumption was made that farmers own all capital inputs in corn

production. Using this assumption, it was possible to study the contribution that each type corn enterprise made to family farm income.

GRAIN CORN

Grain corn was field corn from which, when harvested, only grain from the ears or whole ears were utilized. In areas studied there were little differences in methods used to plant or grow grain corn and silage corn. Both grain corn and silage corn were planted during the early part of May, after the soil had been fertilized, plowed, and tilled. Field corn was planted in rows using corn drills that were set for desired plant population. Some operators apply commercial fertilizer at the time of planting. After the corn had come up it was cultivated for weed control purposes and to make hills to facilitate irrigation. Weeds were also controlled by spraying with 2,4-D. Soil moisture for use of corn plants was controlled by the use of irrigation. For grain corn, the application of water was stopped relatively early in the season in order to facilitate ripening.

Some hybrid corn varieties were used for either production of grain corn or silage corn. In one-third of the grain corn enterprises no determination was made until near harvest time whether the corn would be cut for silage or harvested as grain. In such cases this decision was dependent on storage facilities, land conditions at harvest time, price of silage and grain, as well as expected yields.

Grain corn in Davis and Weber Counties was harvested after

the middle of October. Some fields of grain corn were still standing at the end of December due to excessive moisture of the corn. (Most years the harvesting of grain corn has been finished by the end of November.)

Acres and Investment

There are several ways size of farm enterprises can be measured. Number of acres is the most common measure and was used in this study. Number of acres on 26 grain corn enterprises ranged from 3 to 36 acres. The average size was 10.4 acres per enterprise.

To determine capital invested, land values and equipment values were added. Land values were determined using information from farmers concerning recent sales of land and from land value estimates made by farm operators. The resultant agricultural value of land was $474 per acre.

Farmers' estimates were used to determine equipment value and percent of time and use of the equipment devoted to growing corn. Investment in equipment used for growing corn was $3,751 per farm. The share which was allocated to growing grain was $895 per enterprise or $61 per acre. Investment in power equipment, tractor, and trucks averaged $30 per acre and was greater than investment in all other equipment, table 2.

Farms surveyed had a total investment of $145,253 in land and equipment which was allocated to grain corn production. This was an average investment of $5,586 per farm or $535 per acre.

Table 2. Investment in equipment used for growing grain corn on 26 farms, Northern Utah, 1962

Item	Average per farm	Charge to grain corn	
		Average per enterprise	Average per acre
	(dollars)	(dollars)	(dollars
Power equipment*	2,567	449	30
Tillage equipment**	744	188	13
Other equipment	440	258	18
Total	3,751	895	61

* Tractors and trucks

** Equipment used in land preparation

Labor Requirement

Labor requirement for 26 grain enterprises was divided into three classifications. First was land preparation, which included all operations until the land was prepared for seeding. Classified second was labor requirement for planting and growing grain corn; and third, was harvesting labor requirement. Labor requirement was summarized also by labor performed by hired labor and that performed by the operator and his family, table 3.

Total labor requirement for land preparation was 5.4* hours per acre. There were four different operators who reported the hiring of labor for land preparation. One operator used hired labor for plowing and fertilizing operations while three operators used hired labor for fertilizing operations. The remaining labor, 5.2 hours, was family labor.

Of various operations used in preparation of land for the seed bed, manuring took 2.0 hours and plowing took 1.2 hours of labor per acre. These two operations required man hours equal to one-fifth of total labor requirement.

Total labor for the growing season was 7.0 hours per acre. Three operators hired labor for drilling while hoeing, irrigation, and spraying were each hired on one enterprise. Hired labor

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* Farmers were asked during interviews to convert woman and child labor to man hours. Farmers' estimates were based on the time that they estimated it would have taken them to perform the particular jobs.

Table 3. Man hours of labor required to produce grain corn on 26 farms, Northern Utah, 1962

Item	Average man hours of family labor per enterprise	Average man hours of family labor per acre	Hired labor per acre	Total labor per acre
	(hours)	(hours)	(hours)	(hours)
Preparation:				
Manuring	21.0	2.0	-	2.0
Fertilizing	2.2	0.2	0.1	0.3
Plowing	11.5	1.1	0.1	1.2
Harrowing	7.8	0.7	-	0.7
Leveling	2.8	0.3	-	0.3
Disking	6.4	0.6	-	0.6
Digging	0.5	0.1	-	0.1
Ditching	2.3	0.2	-	0.2
Sub-total	54.5	5.2	0.2	5.4
Growing:				
Drilling	5.3	0.5	0.1	0.6
Cultivating	21.4	2.1	-	2.1
Spraying	2.4	0.2	*	0.2
Irrigating	38.3	3.7	*	3.7
Hoeing	2.3	0.2	0.1	0.3
Miscellaneous	1.3	0.1	-	0.1
Sub-total	71.0	6.8	0.2	7.0
Harvesting:	10.2	1.0	1.3	2.3
Total	135.7	13.0	1.7	14.7

* Less than .1 hours per acre

was 2.8 percent of the total growing labor. During the growing season, the operator and his family supplied 6.8 hours of labor.

Most time consuming of various growing operations was irrigating and cultivating. These required 3.7 and 2.1 hours respectively. Growing operations took 48 percent of the total grain corn labor requirement.

Harvesting grain corn took 2.3 hours per acre. This includes mechanical picking, hand picking ends, hauling, and unloading the grain corn. Hired labor was used on 22 out of 26 enterprises in grain corn harvesting operations. On twelve of these enterprises no family labor was used during harvest operations. Fifty-seven percent of the harvest labor or 1.3 hours per acre were hired.

Harvest labor averaged one hour of family labor per acre. Since the harvesting operations were all performed simultaneously and during a short period of time, no attempt was made to separate the picking and hauling operations for labor requirements.

Total labor requirement for producing grain corn was 1.7 hours of hired labor, 13.0 hours of family labor, with a sum of 14.7 hours of labor per acre of grain corn.

Cost of Production

Cost of production includes all costs, both cash and non-cash, that were incurred on 26 grain corn enterprises. These costs were classified as material, labor and equipment, taxes and interest, table 4.

Considered as material cost was cost of manure, commercial fertilizer, spray, and seed.

All manure is not of the same value and losses of value are not the same for all methods of handling manure. Value of manure was determined using a percentage analysis for N_2, P_2O_5 and K_2 of various types of manure. Average values of these elements were determined from costs of commercial fertilizers. The value of the fertilizer elements was adjusted using a plus consideration for value of organic matter which manure adds to the soil and minus consideration for losses and handling costs. The resulting manure cost was $1.50 per ton. Farmers were asked to report by years all manure applied in the three previous years on 1962 corn ground. A practice generally accepted and used in this study was to allocate 50 percent of manure value the year it was applied, 30 percent the following year, and 20 percent on the third year. This resulted in an average application of 3.4 tons per acre at a cost of $5.13. Manure cost was 4.6 percent of the total cost of producing corn. The cost of applying the manure was all charged to the year of application but as a part of labor cost.

Commercial fertilizer was most costly of all materials used. Commercial fertilizer cost was the cost of nitrogen and phosphate applied to corn ground. Nitrogen was valued at $83.75 per ton of 33 percent N_2 or 12.5 cents per pound of N_2. Phosphate was valued at $75.50 per ton of 45 percent analysis or 8.3 cents per

Table 4. Cost of producing grain corn on 26 farms, Northern Utah, 1962

Item	Quantity per acre	Per acre	Per bushel	Percent of total
		(dols.)	(dols.)	(percent)
Material:				
Manure	3.4 tons	5.13		4.6
Fertilizer	78 lbs N_2	9.72		8.7
Spray	1.5 pints	.74		.7
Seed	15.3 lbs	3.23		2.9
Sub-total	*	18.82	.20	16.9
Labor and equipment:				
Family labor	13 hrs.	16.66		15.0
Hired labor	1.7 hrs.	2.11		1.9
Owner machine	*	15.50		14.0
Hired machine	*	14.26		12.8
Sub-total	*	48.53	.50	43.7
Tax:				
Land	$474	5.97		5.4
Equipment	61	1.06		1.0
Water	*	8.60		7.7
Sub-total	*	15.63	.16	14.1
Interest:				
Land and equipment	$535 @ 5%	26.78		24.2
Working capital	21.50 @ 6%	1.29		1.1
Sub-total	*	28.07	.29	25.3
Total cost	*	111.05	1.15	100.0

* No common measurement

pound of available P_2O_5. In this study commercial fertilizer application for the 1962 crop constituted the total charge for commercial fertilizer. It is granted that there was residual value from commercial fertilizer applied in 1962 and in previous years, but no generally accepted measure has yet been developed that could be used to make that adjustment. It was assumed that 100 percent of commercial fertilizer applied in 1962 was used by the 1962 corn crop.

Of applications of commercial fertilizer on grain corn enterprises, 70 percent was nitrogen and 30 percent was phosphate. Average cost of these applications was $9.72 per acre and equalled an average of 76 pounds of available nitrogen per acre. Commercial fertilizer cost was 8.7 percent of the total cost of producing grain corn.

Spray, 2,4-D, was used to control weeds in grain corn. Price of 2,4-D was $3.90 per gallon. This price was determined using information from producers as well as farm supply dealers. Spray applications were 1.5 pints per acre at a cost of 74cents, or represented less than 1 percent of the total cost.

Seed price was obtained from seed dealers and farm operators. Grain corn seed averaged 21 cents per pound. There were 15.3 pounds of grain corn seed used per acre at a cost of $3.23. Seed represented 2.9 percent of the total cost of producing grain corn.

Materials used in grain corn production cost $1.97 per bushel of corn produced or $18.82 per acre. Material cost represented

16.9 percent of the total cost of corn production.

Labor and equipment cost includes value of family labor, cost of hired labor, cost of operating equipment, and cost of hired machines.

The value of family labor was determined using the most frequently occurring cost of hired labor of $1.25 per hour. With a labor input of slightly over 13 hours per acre, cost of family labor in grain corn production was $16.66 per acre. This represented 15 percent of total cost.

Hired labor cost for grain corn production was calculated using $1.25 per hour unless another rate was specifically specified by the operator. Cost of 1.7 hours of hired labor was $2.11 per acre or represented 1.9 percent of total production cost.

Owner machine cost includes depreciation, fuel, oil, and repairs. For depreciation cost, a charge of 10 percent of closing equipment inventory was used. A charge of 50 cents per operating hour was used in determination of fuel and oil costs for power equipment (3). Repair cost was equal to 2.6 percent of equipment value except in the case of specialized equipment. Repairs were higher on corn pickers and were figured on an hourly basis comparable to custom operators. Using the specified criteria, owner machine costs averaged $15.50 per acre or represented 14 percent of the total cost of producing grain corn.

Hired machine cost was taken directly from farmers' cost figures and from custom rates. Hired machines cost grain corn growers $14.26 per acre most of which was cost of harvesting and

shelling grain corn. Hired machine cost was 12.8 percent of total cost.

Total labor and equipment cost was $5.09 per bushel of grain corn produced or $48.53 per acre Labor and equipment cost was 43.7 percent of total cost.

In order to determine tax on land, 1962 mill rates for the county where a corn crop was grown were applied to assessed valuation for first class land. Tax rates were applied to assessed valuation of equipment which was assumed to be 20 percent of market value. This resulted in a land tax of $5.97 per acre and an equipment tax of $1.06 per acre.

Water cost was treated as a tax. Most operators owned water rights and were charged annual assessments for maintenance of distribution systems. Other operators rented specific quantities of water, in which cases water could have been better handled as a material. Water cost was $8.60 per acre or 7.7 percent of the total costs of producing grain corn.

Total tax was $15.63 per acre or 14.1 percent of total cost. Tax cost was $1.64 per bushel of corn produced.

A charge of 5 percent* was made against average equipment inventory and land value to determine interest on land and equipment investment. This was largest of all cost items and amounted to 24.2 percent of total cost. Interest charge for land and equipment investment was $26.78 per acre.

There was a cost for all types of capital used for corn

production. Cost for working capital includes interest on materials, labor, and money which was used during the producing season for grain corn production. A rate of 6 percent* was charged during time for which factors were employed. Working capital interest cost was $13.42 per enterprise or $1.29 per acre.

Total interest cost was $.29 per bushel of corn produced. This was 25.3 percent of the total cost of producing grain corn.

The total cost of producing grain corn was $1.16 per bushel of corn produced or $111.05 per acre.

Receipts and Returns

Receipts to grain corn production came from two sources. First and most important was corn grain which was valued at $1.40 per bushel, an average of values given by grain corn producers. Receipts from grain were $1,393.22 per enterprise and $133.42 per acre, table 6. The second source of income was value of stover left in the field after grain was harvested. This was valued at $5.00 per acre resulting in an enterprise value of $52.21. Stover value came from its use as livestock feed and its value as organic matter for improving soil structure. Average gross receipts from

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* Normally long term loans have lower interest rates than short term loans. This is due largely to the type of loaning institutions used for the two types credit. Usually, credit from supply dealers and short term loans from banks are high cost. Credit institutions offering long term mortgages such as F.H.A. and Land Banks have relatively low interest rates. Thus, 5 percent was used for long term type money and 6 percent for short.

Table 5. Receipts and returns from 26 grain corn enterprises, Northern Utah, 1962

Item	Per enterprise	Per acre	Per bushel
	(dols.)	(dols.)	(dols.)
Receipts from grain	1,393.22	133.42	1.40
Value of stover	52.21	5.00	.05
Gross receipts	1,445.43	138.42	1.45
Total cost	1,159.77	111.05	1.17
Net return to enterprise	285.66	27.37	.29
Value of family labor	174.06	16.66	.17
Management and family labor return	459.72	44.03	.46
Net return to enterprise	285.66	27.37	.27
Interest	293.09	28.07	.29
Capital and management return	578.75	55.44	.58
Value of family labor	174.06	16.66	.17
Return to family labor, capital, and management	752.81	72.10	.75

26 grain corn enterprises were $1,445.43 per enterprise, $138.42 per acre or $1.745 per bushel of corn produced.

Net return was the difference between total cost and gross receipts. Because there was no management cost included in this study, net return could be attributed to management of the enterprise. Net return was positive for 18 of 26 enterprises. Average net return was $285.66 per operator or $27.37 per acre.

Management and family labor return was value of family labor added to net return. This figure represented the value of man power, both physical and mental, which was put into growing grain corn by the operator and his family. Management and family labor return was $459.72 per enterprise or $44.04 per acre.

Capital and management return was net return plus the value of interest charged against grain corn for use of capital. In this study, interest and management was worth $55.44 per acre.

Under the assumption that all capital used in growing grain corn was owned by the operator, the return to family labor, capital, and management would be available to him as income. This return to 26 farm families averaged $752.81 per enterprise or $72.10 per acre.

Rates of Physical Inputs Associated With Success of the Grain Corn Enterprise

Three sorts of schedules of grain corn enterprises were used to determine gross association using cross tabular analysis. By this method the schedules were sorted on the basis of one factor and the

association with financial success and other measures noted. Acreage, yield, and pre-harvest labor were each held constant for different sorts allowing other selected factors to vary and measuring financial success by net return per acre.

Net return associated with size

Generally, it is accepted that size of enterprise permits an association with efficiency in use of factors of production. Enterprises can be too small to be efficient or they can be too large for the factors used. Economies of size operate since overhead, power equipment, and machinery inputs can often be used more efficiently. Diseconomies of size operate if such inputs are over used.

In order to determine the effect that enterprise size, when measured by acres, had on net return 26 grain corn enterprise schedules were divided into two groups. The first group contained 15 schedules with a range from 0 to 9.9 acres and averaged 5.2 acres per enterprise, table 6. The second group contained 11 schedules, had a range from 10 to 36 acres, and averaged 17.6 acres per enterprise. Net return increased from $23.73 to $29.68 per acre as size of enterprise increased.

Size of enterprise showed no influence on yield. Both groups had a yield of 95 bushels per acre which reflect gross receipts that are approximately equal. On the other hand, total cost was $5.84 per acre less for the enterprise group with 17.6 acres than the one with 5.2 acres. Part of this cost difference is due to labor.

Table 6. Relation of size of enterprise to net return and other factors on 26 grain corn enterprises in Northern Utah, 1962

Acres of corn			Per acre				
Range	Average	Enterprises	Yield	Labor	Capital invested in land & equip.	Total cost	Net return
(acres)	(acres)	(number)	(bushels)	(hours)	(dols.)	(dols.)	(dols.)
0-9.9	5.2	15	95	15.3	552	114.61	23.73
10-36	17.6	11	95	14.8	527	108.77	29.68
Total	10.4	26	95	15.0	535	111.05	27.37

The labor requirement was 15.3 hours for the small enterprise group and 14.8 hours per acre for the large, indicating relatively higher labor efficiency on large acreages.

Capital invested per acre in land and equipment was lower for the 17.6 acre group than for the small acreage group. This would reflect a lower interest cost for the large acreage group. Part of the cost difference was due to interest and taxes.

Equipment use and cost is reflected in the labor requirement. With lower labor requirement, equipment operating cost would be lower than if there were a high labor requirement, assuming the same type and size of equipment. Large field size helped to make equipment efficient, thus, the large acreage group would also have lower equipment operating cost.

Net return associated with yield per acre

In agricultural production, high yields are desirable for individual enterprises. Producers can largely affect levels of production by regulating timing and use of inputs such as fertilizer, seed, labor, etc. When these inputs are used to attain high yields, per unit cost of land is reduced since total fixed cost is constant and is not dependent upon yield. High yields result in high gross receipts and if marginal cost is not higher than price, a high net return.

Twenty-six grain corn schedules were grouped by yield to find any gross association between yield and net return. Two groups were made having ranges from 0 to 99.9 and 100 and more bushels per acre. The first group, schedules of 14 enterprises, had an average of 65 bushels. The other group, schedules of 12 enterprises had an average of 119 bushels per acre. Net return for 65 bushel corn was minus $9.45 per acre; for 119 bushels corn it was $54.05 per acre, table 7.

Gross receipts were $79.84 greater for the high yield group than for the low. Difference in total cost was $16.34, total cost of the high yield group being the greater. Material cost was $7.00 per acre greater for high yield than for low, which indicated that more fertilizers were used on high yield acreages, resulting in a high level of soil fertility. Also probable was better weed control, resulting in relatively high plant population per acre. The sum of these factors contributed to higher net returns.

Labor requirement was high for high yield enterprises. This

Table 7. Relation of yield to net return and other factors on 26 grain corn enterprises, Northern Utah, 1962

Yield			Per acre				
Range	Average	Enterprises	Material cost	Labor	Capital invested in land & equip.	Total cost	Net return
(bush.)	(bush.)	(no.)		(hours)	(dols.)	(dols.)	(dols.)
0-99.9	65	14	14.70	12	524	100.82	-9.45
100-up	119	12	21.69	17	541	117.16	54.05
Total	95	26	18.81	15	535	111.05	27.37

could partly contribute to high yields and partly be a result of high yields. Labor contributing to high yields was labor used during preparation and growing seasons. High harvest labor requirement was a result of high yield and perhaps inefficient labor methods and use. For high and low yield enterprises, labor requirements were 12 and 17 hours per acre respectively, resulting in a relatively high labor cost on an acreage basis for high yield corn.

The remainder of cost difference was due to equipment operating cost and to a relatively high investment in land and equipment.

The results of the costs and receipts show that net return was higher for high yielding corn than for low yielding corn.

Net return associated with labor input

Because labor cost was one of the large cost items and because

labor was a substitute for equipment and capital, it was reasonable to expect labor cost to have an effect on total cost and net return. If labor were substituting at an advantage for other inputs, additional labor would be cost reducing and increase net return. Another possibility was that labor was used at a disadvantage to other inputs. In this case additional labor would have been cost increasing and would have reduced net return.

Schedules of 26 grain corn enterprises were sorted on basis of hours of pre-harvest labor in order to reduce effect of yield on labor requirement. Three groups were made. The first group had 8 schedules with less than 8.0 hours per acre and averaged 7 hours of pre-harvest labor per acre. The second group, 9 schedules, ranged from 8.1 to 12.0 hours per acre and averaged 10 hours. The last group, 9 schedules, had 12.1 or more hours per acre and averaged 19 hours, table 8.

Total cost increased as labor inputs increased. Total cost was $91.74 per acre for the first group, increased to $112.68 for the second, and to $123.97 per acre for the third. Net return decreased from $28.64 per acre to $8.26 per acre and then increased to $43.49 per acre. This association with net return could be explained by constant yields of about 82 bushels per acre for the first two groups and a large increase in yield, 116 bushels per acre, for the third group.

The second group had the largest capital investment resulting in a high interest cost. It indicates along with an increase in labor

that there was a high use and cost of operating equipment for the second group.

Material cost was also constant for the first two groups, but for the third group it was doubled. This indicated that the large increase in labor for the third group was due to application of materials, mainly manure and commercial fertilizer. These materials had a positive effect on yield and gross return. The gross return increased more than did cost, resulting in a high net return for high labor inputs.

Table 8. Relation of pre-harvest labor requirements to net return and other factors on 26 grain corn enterprises, Northern Utah, 1962

Pre-harvest hours per acre			Per acre				
Range	Average	Enterprises	Material	Yield	Capital invested in land & equip.	Total cost	Net return
(hours)	(hours)	(no.)	(dols.)	(bu.)	(dols.)	(dols.)	(dols.)
0-8.0	7	8	13.56	82.4	487	91.74	28.64
8.1-12.0	10	9	13.70	82.7	586	112.68	8.26
12.1 up	19	9	27.30	116	531	123.97	43.49
Total	12	26	18.81	85	535	111.05	27.37

SWEET CORN

Sweet corn, also known as canning corn, was corn that was grown and sold under contract to processors for the purpose of producing canned corn. Field men hired by processors gave the producers guides in management and cultural practices. The seed bed for sweet corn was prepared using plows, harrows, and levelers. Sweet corn seed was planted in rows using corn drills. Processors owned drills and mechanical harvesters and made them available to producers who desired to rent them. Seed for sweet corn was of a type prescribed by the processors and was purchased from them. Most fertilizer was applied before planting corn, but in some cases it was banded at the time of planting and for some operations it was side dressed after the corn had started to grown. As a rule weeds were controlled by cultivating and hoeing although, in a few cases, weeds were sprayed. Sweet corn was irrigated to provide sufficient soil moisture for growth. Generally, irrigation water was run in furrows that were made when the corn was cultivated for weed control. On a few operations, sweet corn was irrigated by overhead sprinklers. Most of the sweet corn was harvested mechanically by equipment owned by processors and operated by men hired by them.

By-products of sweet corn processing were the unmarketable corn, cobs, husks, etc. which were delivered with marketable corn. These products were then ensiled. The processors stocked the silage

for producers at a cost. Producers were able to use the silage as they desired.

In some cases where the canning product was hand picked, the field aftermath was chopped and ensiled. Where the corn was harvested mechanically, the aftermath was grazed by livestock for feed or plowed under to increase the organic matter in the soil.

Acres and Investment

Enterprise size can be measured by acres. Thirty-one sweet corn enterprises studied had a total ot 412 acres planted to sweet corn. Individual enterprise acreage ranged from 3 to 55 acres and averaged 13.3 acres.

Farmers' estimates of values for agricultural land were used to compute investment in land on which sweet corn was produced. Land values averaged $432 per acre on sweet corn enterprises. Total value of equipment used on sweet corn enterprises averaged $6,422 per farm. Of the total equipment use, 15 percent was for sweet corn production. Value of equipment allocated to sweet corn on a useage basis was $969 per enterprise or $59 per acre, table 9. Investment in power equipment was $29 per acre or 48 percent of total equipment investment. Total investment in land and equipment was $491 per acre.

Labor Requirement

Labor requirement was studied on 31 sweet corn enterprises. This requirement was classified in three main groups - preparation,

Table 9. Investment in equipment used for growing sweet corn on 31 farms, Northern Utah, 1962

Item	Average per farm	Charge to sweet corn	
		Average per enterprise	Average per acre
	(dols.)	(dols.)	(dols.)
Power equipment*	4,654	470	29
Tillage equipment**	1,152	299	18
Other equipment	616	200	12
Total	6,422	969	59

* Tractors and trucks

** Equipment used in land preparation

growing and harvesting. Use of family labor and hired labor was obtained separately in the original questionnaires and later, added to report total labor requirement, table 10.

The preparation classification included all tillage and fertilizing operations performed on sweet corn enterprises before corn was planted. A total of 4.4 man hours* per acre were used in seed bed preparations. Of this, .1 of an hour was hired labor. Three farmers reported hired labor used for seed bed preparation of which two were for hauling manure and two were for ditching.

* See footnote page 15.

Table 10. Hours of labor required to produce sweet corn on 31 farms, Northern Utah, 1962

Item	Hours of family labor per enterprise	Hours of family labor per acre	Hired labor per acre	Total labor per acre
	(hours)	(hours)	(hours)	(hours)
Preparation:				
Manuring	18.0	1.4	0.1	1.5
Fertilizing	2.1	0.2	-	0.2
Plowing	14.8	1.1	-	1.1
Harrowing	9.1	0.7	-	0.7
Leveling	4.2	0.3	-	0.3
Disking	4.0	0.3	-	0.3
Digging	3.0	0.2	-	0.2
Ditching	0.9	0.1	*	0.1
Sub-total	56.1	4.3	0.1	4.4
Growing:				
Drilling	10.9	0.8	*	0.8
Cultivating	27.7	2.1	*	2.1
Spraying	0.6	0.1	*	0.1
Irrigating	37.8	2.8	0.5	3.3
Hoeing	2.7	0.2	0.3	0.5
Miscellaneous	3.4	0.3	-	0.3
Sub-total	83.1	6.3	0.8	7.1
Harvesting:	28.3	2.1	2.0	4.1
Total	167.5	12.7	3.0	15.6

* Less than .1 hour per acre

The remaining labor, 4.3 hours per acre, was family labor.

Of preparation operations, most time consuming were manuring and plowing using 1.5 and 1.1 hours respectively. Sixteen percent of the total labor was used for these two operations.

The growing classification included labor used during planting operations and all subsequent operations until harvest. Total labor for growing operation was 7.1 hours per acre.

During growing operations, .8 hours of labor per acre were hired. Ten different operators hired some labor. Hired labor was used on each growing operation at least once. Irrigating and hoeing required .5 hours and .3 hours of hired labor respectively.

Family labor inputs averaged 6.3 hours per acre. Irrigating and cultivating required 2.8 and 2.1 hours of family labor respectively.

Harvesting of sweet corn must take place at a rapid rate once sweet corn is ready in order to maintain the quality of the product. Because of this and because harvest operations were performed simultaneously no attempt was made to itemize the labor requirement for various harvesting and hauling operations.

On all enterprises, harvesting was performed mechanically except in three cases where it was performed by hand labor. Most operators used some hand labor to pick the corn from end rows in order to keep harvesting equipment from running over marketable corn.

A total of 4.1 hours of labor were employed in the harvest of sweet corn. Of this labor, 2.0 hours were hired and 2.1 hours were

family labor.

Total labor requirement was 15.6 hours with 2.9 hours hired and 12.7 hours family labor.

Cost of Production*

For determination of cost of producing sweet corn, 31 schedules were studied. All costs, both cash and non-cash, were included. These costs were classified into four major categories to aid in presentation of various individual items. These divisions were materials, labor and equipment, taxes and fees, and interest, table 11.

Material cost included cost of manure, commercial fertilizer, spray, and seed.

Manure cost was figured at a rate of $1.50 per ton. Information was obtained from farmers concerning quantities of manure applied on the sweet corn ground for 1960, 1961, and 1962 crop years. For quantities applied in 1960, 20 percent was charged to the 1962 crop year; for 1961 quantities applied 30 percent was charged; and for 1962 quantities of manure, 50 percent was charged against the current sweet corn crop. Using this method to figure manure, 2.7 tons per acre were applied at a cost of $4.09, which was 4 percent of the total cost, table 11.

Commercial fertilizer prices were received from dealers and farmers. Nitrogen was valued at $83.50 per ton of 33 percent N_2

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* For detailed information regarding the method of handling the cost of various inputs see cost section for grain corn, page 17.

Table 11. Cost of producing sweet corn on 31 farms, Northern Utah, 1962

Item	Quantity used per acre	Per acre	Per ton	Percent of total
		(dols.)	(dols.)	(percent)
Material:				
Manure	2.7 ton	4.09	1.01	4
Fertilizer	61 lbs N_2	7.67	1.90	7
Spray	.2 pint	.10	.02	*
Seed	10.8 lbs	4.66	1.15	5
Sub-total	**	16.52	4.08	16
Labor and equipment:				
Family labor	12.7 hours	14.34	3.54	14
Hired labor	2.9 hours	3.67	.91	3
Owner machine	**	15.00	3.71	14
Hired machine	**	12.00	2.96	11
Stacking silage	1.98 ton	7.93	1.96	8
Sub-total	**	52.94	13.07	50
Tax and fees:				
Land tax	$432	5.03	1.24	5
Equipment tax	$ 59	.66	.16	*
Water	**	3.30	.81	3
Association fees	$ 84 @1%	.84	.21	1
Sub-total	**	9.83	2.42	9
Interest:				
Interest on land and equipment	$491 @5%	24.53	6.06	23
Interest on working capital	24.66 @6%	1.48	.37	2
Sub-total	**	26.01	6.43	25
Total		105.30	26.00	100

* Less than 1 percent
** No common measure

or 12.5 cents per pound of N_2. Phosphate was valued at $75.50 per ton of 45 percent analysis or 8.3 cents per pound of available P_2O_5. Information on quantities of N_2 and P_2O_5 applied on 1962 sweet corn ground was obtained from producers. From this information quantities of commercial fertilizer were applied that would equal 61 pounds of available N_2 per acre at a cost of $7.67 or 7 percent of total costs.

Spray was used on weeds in sweet corn only in the case for severe weed conditions. There were .2 pints of 2,4-D used per acre at a cost of 10 cents per acre when 2,4-D was $3.90 per gallon.

A seed price of 43 cents per pound was charged sweet corn producers by the processors. Seeding rates averaged slightly over ten pounds per acre and resulted in a cost of $4.66 per acre or 5 percent of total costs.

Total material cost was $16.52 per acre or $4.08 per ton of sweet corn produced

Labor and equipment cost included value of family labor, cost of hired labor, cost of operating equipment, cost of hired equipment, and cost of stacking sweet corn silage.

Family labor was valued at $1.25 per man hour except where corn was hand harvested, then labor was valued at $3.90 per ton of corn picked. Producers reported 12.7 hours of family labor per acre at a cost of $14.34 per acre. Family labor represented 14 percent of total production cost.

Hired labor cost was determined using a value of $1.25 per

hour of hired labor except when producers indicated that wages were paid by the acre for hoeing or by the ton for picking corn. There were 3 hours of hired labor per acre at a cost of $3.67, representing 3 percent of total production cost.

Owner machine cost included depreciation, repairs, fuel, and oil. Depreciation and repairs were 12 percent of value of equipment used in sweet corn production. Fuel and oil cost was 50 cents per hour for equipment operating time (3). Owner machine cost was $15.00 per acre and was 14 percent of total cost.

In computing hired machine cost, custom machine rates were applied to physical data that were reported by sweet corn producers. Hired machine cost to sweet corn producers was $12.00 per acre.

A by-product of sweet corn production was unmarketable corn, cobs, and husks which was made into silage and averaged 1.98 tons per acre. This was stacked on the processor's property at the cannery for a cost to producers of $4.00 per ton. This cost was $7.93 per acre, and represented 8 percent of total cost.

Total labor and equipment cost of producing sweet corn was $52.94 per acre or $13.07 per ton of corn produced. This was 50 percent of total cost.

Tax and fees include taxes on land and equipment, water cost, and fees charged by a bargaining association. Taxes were figured by applying appropriate mill levies to assessed valuations. This resulted in a land tax of $5.03 per acre and an equipment tax of $.66 per acre.

Water cost was treated as a tax. Where producers owned water they were charged for upkeep of and improvements made to the distribution system. Interest on the investment was included with land investment. Where water was rented, the whole cost was included in this section. Water cost was $3.30 per acre.

Fees charged by the bargaining association were 1 percent of the value of the canning product sold. This cost was 84 cents per acre.

Total cost for tax and fees was $9.83 per acre or $2.42 per ton of sweet corn produced or 9 percent of total cost.

An interest charge was made against capital invested in producing sweet corn. An annual rate of 5 percent was charged against $491 per acre invested in land and equipment for their use in production. This cost was $24.53 per acre or 23 percent of total cost of producing sweet corn. Interest was also charged at an annual rate of 6 percent on $24.66 of working capital used during the production season and amounted to $1.48 per acre.

Total interest cost was $26.01 per acre, or $6.43 per ton of sweet corn produced or 25 percent of total cost.

Total cost of producing sweet corn averaged $105.30 per acre or $26.00 per ton of sweet corn produced.

Receipts and Income

Two sources of receipts were available from sweet corn enterprises. Most important of these was sale of sweet corn.

Sweet corn was valued at $21.00 per ton. Thirty-one enterprises had an average yield of $.05 tons per acre, resulting in receipts of $85.07 per acre. The second source of receipts was from value of by-products. Factory by-products were valued at $5.50 per ton and amounted to $10.87 per acre. Field aftermath was valued at a price livestock producers were willing to pay to utilize the stover, $4.85 per acre. Total value of by-products was $15.74 per acre or $3.88 per ton of canning products produced. Gross receipts were $1,339.74 per enterprise or $100.81 per acre. Gross receipts per ton of corn produced were $24.88, table 12.

Average total cost was greater than average gross receipts, resulting in a net return of minus $53.65 per enterprise or minus $4.49 per acre of sweet corn produced. Net return was positive for 13 of 31 sweet corn enterprises.

When the value of family labor was added to net return management and labor return was $136.93 per enterprise or $9.85 per acre. This figure represented value of family labor and management for growing sweet corn.

The return to capital and management was $285.60 per enterprise or $21.03 per acre. Where all capital used was owned by the operator, return to family labor, capital, and management was income to the farm family. Sweet corn production was worth $476.18 per enterprise or $35.37 per acre as income.

Table 12. Receipts and returns from 31 sweet corn enterprises, Northern Utah, 1962

Item	Receipts per enterprise	Receipts per acre	Receipts per 10 ton
	(dollars)	(dollars)	(dollars)
Receipts from canning products	1,130.61	85.07	21.00
Value of by-products	209.13	15.74	3.88
Gross receipts	1,339.74	100.81	24.88
Total cost	1,393.39	105.30	25.88
Net return to enterprise	-53.65	-4.49	-10.00
Value of family labor	190.58	14.34	3.54
Management & family labor return	136.93	9.85	2.54
Interest to enterprise	339.25	25.52	6.30
Net return	-53.65	-4.49	-1.00
Capital & management return	285.60	21.03	5.30
Value of family labor	190.58	14.34	3.54
Return to family labor, capital & management	476.18	35.37	8.84

Rates of Physical Inputs Associated With Success of the Sweet Corn Enterprise

Cross tabular analysis was used to find gross associations between factors. Three sorts were made of the enterprise schedules in order to determine the effect various factors had on financial success. Acreage, yield, and pre-harvest labor each were held constant in one sort. All factors other than the sort factors were allowed to vary. By using this technique, it was possible to determine associations with net return.

Net return associated with size

Size of enterprise in agricultural production often shows an association with net return because of economies or diseconomies of scale.* For sweet corn number of acres was used to measure the association that size had with net return and other factors. Sweet corn schedules were sorted with enterprises having less than 10 acres in one group and enterprises with 10 or more acres in the other group, table 13. Fifteen schedules were in the first group and averaged 6.2 acres per enterprise. In the second group were 16 schedules with an average of 19.9 acres.

Net return decreased from minus $1.66 per acre to minus $4.64 per acre as enterprise size increased from 6.2 to 19.9 acres. This type association indicates that some enterprises were too large and diseconomies of scale existed.

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* See more detailed discussion in grain corn section, page 25.

Table 13. Relation of size of enterprise to net return and other factors on 31 sweet corn enterprises, Northern Utah, 1962

Acres of corn			Per acre				
Range	Average	Enterprises	Yield	Labor	Capital investment	Total cost	Net return
(acres)	(acres)	(no.)	(ton)	(hours)	(dols.)	(dols.)	(dols.)
Less than 10	6.2	15	4.8	21	533	123.35	-1.96
10 or more	19.9	16	3.8	14	478	99.19	-4.64
Total	13.3	31	4.0	16	490	105.30	-4.49

Cost was low on high acreage enterprises. Total cost was $99.19 for high acreages and $123.35 for low acreages. Labor input was 21 hours per acre on small enterprises and 14 hours on large. Some of the difference in total cost and labor was attributed to lower yield and to incurred efficiency in use of labor and equipment. Capital investment for small enterprises was $533 per acre and $476 for large. This indicated that interest costs were low for large enterprises. It also indicated that equipment was used on more acres, thus lowering per acre costs of owning equipment.

Average yield was 3.8 tons per acre on large entprises and 4.8 tons per acre on small enterprises. (Some of this difference in yield was due to the fact that maturing time of sweet corn was shortened because of an early frost and part of the corn on some large enterprises was not picked while it was marketable.) It was possible that large sized enterprises had low yield because of the omission of some type of resource.

Net return associated with yield per acre

High yields in agricultural production are influential on financial success.* Schedules of 31 sweet corn enterprises were sorted to find effects of yield on financial success and other factors in producing sweet corn, table 14. In the first group were schedules of 17 enterprises with an average of 2.7 tons per acre. Enterprises with less than five tons per acre were in the first group. In the second group were 14 schedules that had five acres or more and averaged 5.9 tons per acre.

The difference in net return for the two groups was $41.36 per acre. Net return for the low yield group was minus $21.19 per acre and for the high yield group net return was $20.17.

Cost was greater for high yielding corn than for low Total cost was $91.62 per acre for low yields and $123.01 for high. Material cost showed a relation of the same type. Material cost was $15.51 and $17.97 per acre which indicates application of more fertilizer on high yield corn. Labor input was higher for high yielding corn than for low. High labor inputs are partly results of handling greater quantities of corn. They may also have resulted in higher yields due to better cultural practices.

Capital investment was greater for high yield corn than it was for low. For the two groups it was $504 and $480 per acre respectively. Larger investment in land and equipment resulted

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* See more detailed discussion in grain corn section, page 27.

Table 14. Relation of yield to net return and other factors on 31 sweet corn enterprises, Northern Utah, 1962

Yield			Per acre				
Range	Average	Enterprises	Material cost	Labor	Capital investment	Total cost	Net return
(ton)	(ton)	(no.)	(dols.)	(hours)	(dols.)	(dols.)	(dols.)
Less then 5	2.7	17	15.51	13	480	91.62	-21.19
5 or more	5.9	14	17.97	19	504	123.01	20.17
Total	4.0	31	16.53	16	490	105.30	-4.49

in more interest cost per acre for high yield corn. There was more use made of equipment on high yield corn than on low.

Net return associated with labor input

Labor, a large cost item in agricultural production, generally has influence on financial success.*

Schedules of 31 sweet corn enterprises were sorted into three groups using pre-harvest labor in hours per acre as the sort factor. The first group had 10 schedules with a range from 0 to 9.9 hours and averaged 7 hours per acre. The next group, 11 schedules, ranged from 10 to 16.9 hours per acre and averaged 14 hours. The third group had 10 schedules with 17 or more hours of pre-harvest labor per acre and an average of 20 hours.

Net return in each group was negative. Net return was minus $3.66

* See more detailed discussion, page 29.

in the first group and as hours of labor increased, net return increased to minus $2.50 per acre and then decreased to minus $5.81. A relation of this type indicated that labor was used more efficiently at the 14 hour per acre level than at either the lesser or the greater levels.

Total cost, material cost, and yield increased as labor input was increased. This indicated that some of the additional labor was used to apply materials which influenced the increase in yields.

Capital investment increased and then decreased. When compared to net return and labor, capital was a good substitute for labor. Low labor, low capital investment and low net return would suggest that physical input was not sufficient to attain profitable yield for the lowest labor group.

Table 15. Relation of pre-harvest labor requirement to net return and other factors for 31 sweet corn enterprises, Northern Utah, 1962

Pre-harvest hours per acre			Per acre				
Range	Average	Enterprises	Material cost	Yield	Capital investment	Total cost	Net return
(ton)	(ton)	(no.)	(dols.)	(ton)	(dols.)	(dols.)	(dols.)
Less than 10	7	10	15.00	3.4	464	87.41	-3.66
10-16.9	14	11	16.61	4.4	539	114.91	-2.50
17 or more	20	10	19.56	5.2	509	131.91	-5.81
Total	12	31	16.53	4.0	490	105.30	-4.49

SILAGE CORN

Field corn that was cut and ensilaged was known as silage corn. Most cultural practices were similar to those for grain corn. Corn that was grown for silage in Northern Utah was planted in rows, normally 36 inches wide, although some growers reported planting rows as narrow as 26 inches and others reported rows as wide as 40 inches. Plant spacings within these rows varied from 4 to 8 inches.

Because little aftermath was left on fields after corn silage, both barnyard and commercial fertilizers were applied. Manure was used to help retain organic matter in the soil. Both types of fertilizer were used to maintain soil fertility. Weeds were controlled through cultivating and spraying while soil moisture was maintained through irrigation. Farmers that were contacted reported that they had little if any insect problem in producing silage corn.

Harvesting of silage corn was performed by high powered field forage choppers which chopped and blew stocks, stems, ears, and leaves into trucks or wagons. The corn was then hauled to pits, trenches, or upright silos where it was ensiled.

Acres and Investment

Size of an enterprise can be measured by various methods. Most commonly used for crops is number of acres. In this study

48 silage corn enterprises totalled 772 acres. Average size of these enterprises was 16.1 acres with a range of 1.5 acres to 70 acres.

Estimates of value were obtained from farmers to determine agricultural value of land used in silage corn production. These estimates together with a knowledge of recent sales gave a basis for a land value of $470 per acre.

Total value of equipment and percentage for which it was used were determined using farmers' estimates. Value of equipment used was $6,331 per farm. Twenty-four percent of the use value of this equipment was assigned to silage corn production. Value of silage corn equipment was $1,525 per enterprise or $108 per acre. Investment in land and equipment was $578 per acre.

Labor Requirement

Labor requirement from 48 silage corn enterprises was used in this study. Labor requirement was classified in three groups: preparation, growing, and harvesting. Separate but comparable schedules of hired labor and family labor were taken from each producer. Totals of these give total labor requirement, table 17.

Land preparation took a total of 4.4 hours per acre, and of these 0.2 hours was hired labor. Labor was hired by one operator for each of the following operations: manuring, plowing, and digging. Four operators hired labor for spreading commercial fertilizer.

Family labor input was 4.2 hours for preparation operations. Two operations which required the highest input of family labor

Table 16. Investment in equipment used for growing silage corn on 48 farms, Northern Utah, 1962

Item	Average per farm	Charge to silage corn	
		Average per enterprise	Average
	(dols.)	(dols.)	(dols.)
Power equipment*	3,917	686	49
Tillage equipment**	1,127	256	18
Other equipment	1,287	583	41
Total	6,331	1,525	108

* Tractors and trucks

** Equipment used in land preparation

Table 17. Hours of labor required to produce silage corn on 48 farms, Northern Utah, 1962

Item	Man hours of family labor		Hired labor per acre	Total labor per acre
	Per enterprise	Per acre		
	(hours)	(hours)	(hours)	(hours)
Preparation:				
Manuring	25.6	1.6	0.1	1.7
Fertilizing	3.3	0.2	*	0.2
Plowing	15.3	1.0	*	1.0
Harrowing	10.9	0.7	-	0.7
Leveling	3.7	0.2	-	0.2
Disking	4.3	0.3	-	0.3
Digging	1.9	0.1	*	0.1
Ditching	2.2	0.1	-	0.1
Sub-total	67.2	4.2	0.2	4.4
Growing:				
Drilling	7.1	0.4	*	0.4
Cultivating	27.4	1.7	*	1.7
Spraying	3.2	0.2	*	0.2
Irrigating	59.8	3.7	*	3.7
Hoeing	1.2	0.1	-	0.1
Miscellaneous	2.6	0.2	-	0.2
Sub-total	101.3	6.3	0.1	6.4
Harvesting:	83.0	5.2	2.2	7.4
Total	251.5	15.7	2.5	18.2

* Less than .1 hours per acre

were manuring and plowing, with 1.6 and 1.0 hours of labor respectively. Fifteen percent of total labor input was used for spreading manure and plowing. Preparation operations accounted for 24 percent of total labor input.

Labor used during planting and growing season averaged 6.4 hours per acre. Hired labor used for planting and growing equalled 0.1 hours per acre. Hired labor was used by six operators for two different operations - planting and drilling. Hired labor was used by three operators for spraying silage corn. One operator reported hiring help for irrigation.

Family labor input was 6.3 hours per acre. Of this, 59 percent was used in the irrigation operation. This operation took 3.7 hours per acre. Cultivating also had a high labor input, equalling 1.7 hours per acre. Thirty-five percent of total labor input was during the planting and growing season.

Harvesting was the last classification of operations. Operations which took place during harvest, such as cutting, hauling, and unloading, were figured together. This was done since all harvesting operations were performed simultaneously, and because harvesting was a rush operation and performed in little calendar time.

A labor input of 7.4 hours per acre was used for harvesting. Of this, 2.2 hours were hired with the remaining labor, 5.2 hours, being credited as family labor. Forty-one percent of total labor input was harvest labor.

Total labor requirement was 18.2 hours per acre. Of this,

2.5 hours were hired and 15.7 were family labor.

Cost of Production

To determine cost of producing silage corn, schedules from 48 operators were used. The cost was classified and handled the same as in other sections of this study.* Both cash and non-cash costs were included and divided into four divisions: material, labor and equipment, tax, and interest, table 18.

In material cost was included cost of manure, commercial fertilizer, spray, and seed. Material cost represented 16 percent of silage corn production cost.

Manure cost was figured from information obtained from farmers. Tons of manure used on 1962 silage corn ground during three years, 1960, 1961, and 1962, were charged against silage at rates of 20, 30, and 50 percent respectively. A dollar value of $1.50 per ton was used for manure. There were 4.2 tons of manure per acre allocated to silage corn production. The cost was $6.34 per acre or 7 percent of total cost.

Cost of nitrogen to producers was $83.50 per ton of 33 percent N_2 or 12.5 cents per pound of N_2. For phosphate, the cost was $75.00 per ton of 45 percent P_2O_5 or 8.3 cents per pound of available P_2O_5. From this cost information and from physical data obtained from farmers, commercial fertilizer equivalent in value to 63 pounds of available N_2 was applied per acre at a cost of $7.93 per acre. This represented 7 percent of total cost.

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* For more detailed information on cost of various inputs, see page 17.

Table 18. Cost of producing silage corn on 48 farms, Northern Utah, 1962

Item	Quantities used per acre	Cost per acre	Cost per 10 ton	Percent of total cost
		(dols.)	(dols.)	(percent)
Material:				
Manure	4.2 tons	6.34		6
Fertilizer	63 lbs N_2	7.93		7
Spray	.9 pint	0.41		*
Seed	15.3 lbs	3.22		3
Sub-total	**	17.90	1.00	16
Labor and equipment:				
Family labor	15.7 hours	19.55		18
Hired labor	2.5 hours	3.06		3
Owner machine	**	17.76		16
Hired machine	**	3.95		4
Sub-total	**	44.32	2.47	41
Tax:				
Land tax	$470	5.65		5
Machine tax	$108	1.34		1
Water	**	9.55		9
Sub-total	**	16.54	.92	15
Interest:				
Land and equipment	$578 @ 5%	28.94		26
Working capital	26.66 @ 6%	1.60		2
Sub-total	**	30.54	1.70	28
Total	**	109.30	6.09	100

* Less than 1 percent
** No common measure

Applied on silage corn for weed control was .9 of one pint of 2,4-D. This was valued at $3.90 per gallon, resulting in a cost of $.41 per acre. This was less than 1 percent of total cost.

Seed prices were the same for silage corn as they were for grain corn. Seed cost was priced at $.21 per pound. There were 15.3 pounds of seed planted per acre at a cost of$3.22 per acre. Seed cost represented 3 percent of total cost.

Total material cost was $17.90 per acre; 16 percent of total cost; or $1.00 per ton of silage corn produced.

Labor and equipment cost included all cost of labor and operating equipment, both owned and hired. Labor and equipment cost was divided into four groups: family labor, hired labor, owner machine, and hired machine.

Family labor included all labor performed by the operator and his family. This labor was valued at $1.25 per man hour. The family labor requirement for silage corn was 15.7 hours per acre. When charged against silage corn, family labor cost was $19.55 per acre. This cost represented 18 percent of total cost.

Operators used 2.5 hours of hired labor per acre. Hired labor cost was figured at a rate of $1.25 per hour and resulted in a cost of $3.06 per acre. Hired labor cost was 3 percent of total cost.

Included in owner machine costs were depreciation, repairs, fuel, and oil. Depreciation and repair costs were 12 percent of the value of equipment used in silage corn production. A charge

of $.50 per operating hour was made to cover fuel and oil costs (3). This resulted in an ownership machine cost of $17.76 per acre or 16 percent of total cost.

Hired machine cost was computed using custom machine rates and physical data obtained from producers. This cost was $3.95 per acre, or 4 percent of total cost.

Total labor and equipment cost for producing silage corn was $44.32 per acre $2.47 per ton of silage or $1 percent of total cost.

Tax cost was the cost of property taxes on land and equipment and water cost. Tax on property was figured by applying appropriate mill rates to assessed valuations. Resulting land and equipment taxes were $5.65 and $1.34 per acre respectively.

Water cost for silage corn was treated the same as for grain and sweet corn. Where water was owned only the annual assessment was figured as a tax cost. Cost of ownership was figured with land value and was included in interest cost. In cases where water was rented, the whole cost was included as a tax. Water cost was $9.55 per acre.

Total tax was $16.54 per acre, $.92 per ton of silage produced, or 16 percent of total cost.

Interest charges were made against capital invested in silage corn production. An annual rate of 5 percent was charged against investment in land and equipment. This cost was $28.94 per acre. Interest on working capital was computed at a rate of 6 percent for

$26.66 capital used only during the production season. This cost was $1.60 per acre.

Total interest cost was $30.54 per acre or $1.70 per ton of silage produced. Interest cost was 28 percent of total cost.

Total cost of producing silage corn was $109.30 per acre or $6.09 per ton of silage produced.

Receipts and Returns

Receipts to silage corn were derived from feed value of corn which was ensiled. Silage from different enterprises varied and value of silage was dependent upon grain content and maturity of corn at harvest time. Rules of thumb were followed by many producers in determining silage value. One was that three tons of green silage are equal in value to one ton of hay. Another was that two tons of cured silage were equal to one ton of hay. For this study silage was valued at $7.25 per ton based on figures obtained from producers.

Gross receipts were $2,087.84 per enterprise and $129.77 per acre, table 19. Net return is the difference between gross receipts and total cost. Net return was positive in 29 out of 48 silage corn enterprises. Average net return was $330.30 per enterprise or $20.47 per acre. For one ton of corn, net return was $1.15.

A study of family income* showed that management and family labor return from silage corn was $40.02 per acre. Capital and

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* See family income discussion in grain corn section, page 23.

Table 19. Receipts and returns from 48 silage corn enterprises, Northern Utah, 1962

Item	Per enterprise	Per acre	Per ton
	(dollars)	(dollars)	(dollars)
Gross receipts	2,087.84	129.77	7.25
Total cost	1,757.54	109.30	6.10
Net return to enterprise	330.30	20.47	1.15
Value of family labor	314.51	19.55	1.09
Management & family labor return	644.81	40.02	2.24
Interest	490.72	30.54	1.70
Net return to enterprise	330.30	20.47	1.15
Capital & management return	821.02	51.01	2.85
Value of family labor	314.51	19.55	1.09
Return to family labor capital & management	1,135.53	70.56	3.94

management return was $51.01 per acre from silage corn and return to family labor, capital, and management was $70.56 per acre.

Rates of Physical Inputs Associated with Success of the Silage Corn Enterprise

Three sorts of enterprise schedules were made to find gross associations of net return with size of enterprise measured in acres, yields per acre, and hours of pre-harvest labor per acre. A separate sort was made for each casual factor grouping schedules into three groups. The result was to minimize the difference of one factor while all other factors varied and to show effect on net return.

Net return associated with size

Size of an enterprise is often related to financial success.* In order to determine effect that size had on success of silage enterprises, a sort was made using number of acres as the sorting factor. There were shcedules of 48 Northern Utah silage enterprises studied. These were divided into three groups. In the first group were 18 schedules with less than 8 acres and an average of 5 acres. In the second group, 16 schedules ranged from 8 to 19.9 acres and averaged 12.7 acres. Included in the last group were 14 schedules with 20 or more acres per enterprise and averaged 34.2 acres.

Net return was directly related to size of enterprise. As the size increased from 5 to 12.7 to 34.2 acres, net return per

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* For more detailed information, see page 25.

acre increased from minus $3.27 to $9.04 to $29.81. Yield also increased from 14.5 to 15.9 to 19.4 tons per acre as number of acres increased.

As acres increased, there was no direct or indirect relationship to total cost. Total cost was $108.87, decreased to $106.17, and increased to $110.70 as enterprise size increased, This indicated that some factor became more efficient and then less efficient as its use was expanded. Use of labor had an indirect relation to acres. As acre increased labor decreased from 20 to 18 to 17 hours per acre. This relation suggested that labor was used more efficiently on larger enterprises.

Table 20. Relation of size of enterprise to net return and other measures on 48 silage corn enterprises, Northern Utah, 1962

Acres of corn			Per acre				
Range	Average	Enterprises	Yield	Labor	Capital investment	Total cost	Net return
(acres)	(acres)	(no.)	(ton)	(hrs.)	(dols.)	(dols.)	(dols.)
Less than 8	5.0	18	14.5	20	559	108.87	-3.27
8-19.9	12.7	16	15.9	18	563	106.17	9.04
20 or more	34.2	14	19.4	17	589	110.70	29.82
Total	16.1	48	17.9	18	578	109.30	20.47

Capital investment per acre increased as acres increased. Capital investment increased from $559 to $563 to $589 per acre. This association may be explained by a tendency for less use of hired equipment and more use of owner equipment as more acres were devoted to silage corn production.

Net return associated with yield per acre

Since high yields are thought to be important in agricultural production, relations of yield to net return and other factors were studied using schedules of 48 silage corn enterprises.* The schedules were sorted into three groups. The first group contained 14 schedules with an average yield of 10.1 tons per acre. It included schedules with yields less than 15 tons per acre. The second group had 16 schedules which ranged from 15 to 18.9 tons per acre and averaged 16.3 tons per acre. The third group, 16 schedules, had 19 or more tons per acre and averaged 20.9 tons.

Net return increased as yield increased. The group that averaged 10.1 tons per acre had a net return of minus $31.36 per acre. Net return for each of the other two groups was positive and increased from $8.68 to $41.15 per acre as yield increased from 16.3 to 20.9 tons per acre.

Total cost increased slightly as yield increased. This increase was $5.40 per acre for the first and second groups and $.59 for the second and third groups.

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* See sort using yield, grain corn page 27.

A direct relation existed between yield and material cost. As yield increased, material cost increased from $14.13 to $15.34 to $20.35 per acre. Labor input was relatively constant between the groups. The first group used 19 hours of labor per acre. The next two each used 18 hours.

Capital investment first increased from $543.93 per acre to $588.38 and then decreased to $583.32. A result was an increase in interest cost and then a decrease. This reaction in capital investment was a result of high investment in corn equipment for high yield enterprises.

High yield showed relatively low total cost and relatively high net return.

Table 21. Relation of yield to net return and other factors for 48 silage corn enterprises, Northern Utah, 1962

Yield			Per acre				
Range	Average	Enterprises	Material cost	Labor	Capital investment	Total cost	Net return
(tons)	(tons)	(no.)	(dols.)	(hours)	(dols.)	(dols.)	(dols.)
Less than 15	10.1	14	14.13	19	544	104.89	-31.36
15-18.9	16.3	16	15.34	18	588	109-70	8.68
19 or more	20.9	18	20.35	18	593	110.29	41.15
Total	17.9	48	17.91	18	578	109.30	20.47

Net return associated with labor input

Efficiency in labor use has an effect on net return in agricultural production. If a small amount of labor is used, there is a chance of neglect, or it can mean that labor is being used efficiently. If too much is used, there is extra cost.* Labor was used as the final sort factor. Pre-harvest labor was used to minimize the effect of yield.

Schedules of 48 corn silage enterprises were sorted into three groups. In the first group were 14 schedules with less than 8 hours per acre. Average for this group was 6.4 hours. The second group averaged 11.1 hours with a range from 8 to 12.9 hours per acre. The final group had 13 or more hours per acre and averaged 16.8 hours. As pre-harvest labor increased, net return decreased from $32.02 to $25.04 to minus $7.10 per acre. This type relation suggested that at high input levels labor was used inefficiently. Material cost decreased from $20.59 to $16.12 from the low to the medium labor group and increased slightly to $16.39 for the high labor group. Yield decreased from 19.2 to 18.4 to 14.8 per acre, and total cost increased from $106.88 to $108.52 to $114.74 per acre as labor inputs increased. Relations of this type showed that too much labor was used for high labor groups.

Capital investments increased from $591 to $593 and decreased to $532 as labor inputs increased. Since capital investment

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* For more detailed information see page 29.

included mechanical equipment which was a substitute for labor, a relation of this type indicated that equipment was a good substitute for labor.

Silage corn enterprises with low labor inputs had high net return and were more successful financially than were enterprises with high labor inputs.

Table 22. Relation of pre-harvest labor input to net return and other factors for 48 silage corn enterprises, Northern Utah, 1962

Pre-harvest hours per acre			Per acre				
Range	Average	Enterprises	Material cost	Yield	Capital investment	Total cost	Net return
(hrs.)	(hrs.)	(no.)	(dols.)	(tons)	(dols.)	(dols.)	(dols.)
Less than 8	6.4	14	20.59	19.2	591	106.88	32.02
8-12.9	11.1	18	16.12	18.4	593	108.52	25.04
13 or more	16.8	16	16.39	14.8	532	114.74	-7.10
Total	10.5	48	17.91	17.9	578.86	109.30	20.47

SUMMARY

1. An economic study was made of production on corn enterprises in Northern Utah, 1962. Included in the study were schedules of 26 grain corn enterprises, 31 sweet corn enterprises, and 48 silage corn enterprises.

2. Average size of grain corn enterprises was 10.4 acres. Land values averaged $474. per acre. Average equipment value was $61 per acre.

3. Labor requirements for land preparation, growing, and harvesting averaged 5.4, 7.0, and 2.3 hours per acre respectively, resulting in a total labor requirement of 14.7 hours per acre to produce grain corn.

4. Average cost of production was $111.05 per acre. On a percentage basis, cost was: materials - 17 percent, labor and equipment - 44 percent, taxes - 14 percent, and interest - 25 percent.

5. Net return to grain corn production averaged $27.37 per acre. Management and family labor return was $44.03 per acre while the return to family labor, capital, and management was $72.10 per acre.

6. In the production of grain corn a direct relation was indicated between net return and size of enterprise and yield. As pre-harvest labor input increased, net return first increased and then decreased.

7. Average size of sweet corn enterprises was 13.3 acres. Land values averaged $432 per acre, and the average equipment value was $59 per acre.

8. Labor requirements for land preparation, growing, and harvesting averaged 4.4, 7.2, and 4.1 hours per acre respectively, resulting in a total labor requirement of 15.7 hours per acre to produce sweet corn.

9. Average cost of production was $105.30 per acre. On a percentage basis, cost was: materials - 16 percent, labor and equipment - 50 percent, taxes and fees - 9 percent and interest - 25 percent.

10. Net return to sweet corn averaged minus $4.49 per acre. Management and family labor return was $9.85 per acre while the return to family labor, capital, and management was $35.37 per acre.

11. In the production of sweet corn there was an inverse relation between size of enterprise and net return and a direct relation between yield and net return. As labor

inputs increased, net return increased and then decreased.

12. Average size of silage corn enterprises was 16.1 acres. Land values averaged $2,170 per acre, and the average equipment value was $108 per acre.

13. Labor requirement for land preparation, growing, and harvest averaged 4.4, 6.4, and 7.4 hours per acre respectively, resulting in a total labor requirement of 18.2 hours per acre to produce silage corn.

14. Average cost of production was $109.30 per acre. On a percentage basis, cost was: materials - 16 percent, labor and equipment - 41 percent, taxes - 15 percent, and interest - 28 percent.

15. Net return to silage corn production averaged $20.47 per acre. Management and family labor return was $40.02 per acre while the return to family labor, capital, and management was $70.56 per acre.

16. In the production of silage corn, direct associations were found between net return and size of enterprise and yields. There was an inverse relation between hours of pre-harvest labor and net return.

CONCLUSIONS

Production of grain corn seemed to be economically feasible in Davis and Weber Counties. The growing season in areas studied of these counties seemed sufficiently long to grow and mature grain corn. Insect damage to grain corn was negligible in these areas.

One problem which confronted producers was high moisture content of corn at harvest time in the case of adverse weather conditions. There are alternative methods which could be used to solve this problem. One was to harvest wet corn and either sell it at a reduced price, artificially dry the corn, or risk storing wet corn. Another alternative could be to postpone harvest until moisture content was reduced sufficiently to safely store grain corn.

Grain corn enterprises that had highest net return used the various factors of production most efficiently. Large acreages resulted in efficient use of labor and capital, which in turn resulted in low total costs. When yield was high, return per acre was high, consequently, use of inputs applied to an acre of land was efficient.

Sweet corn production in Cache and Box Elder Counties was profitable when more than average yield of canning product was produced and marketed. Low yield was associated with few hours of labor inputs, low material cost, low capital investment, and

low total costs, resulting in a negative net return. This result seemed to be due to insufficient variable inputs.

Large acreages of sweet corn were also combined with low capital investment, few hours of labor input, and low total cost, and resulted in a small yield and a high negative net return. This combination of results suggested that some input or combination of inputs should have been intensified to better utilize fixed factors.

A major problem of sweet corn production seemed to be the lack of ability to harvest large acreages with sufficient haste to eliminate deterioration of marketable corn. Adverse weather conditions tended to aggravate this problem in 1962.

This type of problem might be solved by the development of better and quicker harvest methods. Another possibility would be for the growers or the processors to make more harvesting equipment available to producers.

There seemed to be considerations other than income derived from corn which help some farmers to make the decision to grow sweet corn. It was indicated by a few farmers that one of these reasons was to increase organic matter in soil in which it was lacking.

Silage corn seems to be a crop that can logically, on an economic basis, be grown in Northern Utah conditions. Net return was favorable for most enterprises. Large acreage enterprises made the use of large, efficient equipment feasible and help reduce labor cost. Efficient use of equipment also helped to increase net return. High powered equipment helped to make use of good cultural practices which resulted

in high yield and high net return, even though cost was high. From this situation it might be concluded that most of the inputs, other than labor, used in silage corn production could have been intensified.

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