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Economic and Agronomic Analysis of Silage and Grain Corn Production in 15 Counties of Utah 1972

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ECONOMIC AND AGRONOMIC ANALYSIS OF SILAGE AND GRAIN CORN PRODUCTION IN 15 COUNTIES OF UTAH 1972

by

Juan Zenteno

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Juan Zenteno

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Economic and Agronomic Analysis of Silage and Grain

Corn Production in 15 Counties of Utah 1972

by

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This study estimated the 1972 costs and returns, and analyzed the physical response and economic relationships of corn hybrids for silage and grain production in some counties of Utah.

Average size of enterprise, land value and equipment value were estimated for silage and grain corn production in Utah.

Labor requirements for land preparation, growing and harvesting of silage and grain corn production were averaged. Net returns and costs (variable and fixed) for silage and grain corn production were computed in 30 farms of 15 counties of Utah to find the total production cost.

Yields, total cost, total revenue and economic profit for the hybrid seed varieties for silage and grain corn trials established in 1971 and 1972 are presented in the corresponding tables.

(64 pages)

INTRODUCTION

Livestock production has been an integral part of Utah's economy since its early settlement by the pioneers.

During the period of 1950 to 1972 annual cash receipts from farm marketings in Utah, for cattle and calves, sheep and lambs, and dairy products increased from 80 to 240 million dollars annually. This represented more than 60 percent of total farm receipts for these years.

The value of corn silage production in Utah in 1971 amounted to more than $12 million.

Feed is one of the most important costs in the production of milk or beef. Increased per acre yields of corn silage and corn grain resulting from proper selection of the new corn hybrids could result in reduced feed costs. Production of corn silage in Utah is increasing and was a record high 1,243,000 tons in 1971. This was 17 percent more than the quantity produced in 1969. Yield was 17.5 tons per acre on 71,000 acres in 1971 compared with 18.0 tons per acre on 59,000 acres in 1970.

Consequently, there is a real need to determine which varieties of corn will best accommodate the various environmental conditions encountered throughout the State. With the new hybrid varities there is a possibility to increase the yields from 20 to 25 tons of green weight per acre, and from 7 to 8 or more tons of dry weight per acre.

Estimates of grain corn acreage and yields were discontinued in Utah. The number of acres of grain corn planted and harvested in Utah, decreased from 1940 until 1966, since that time the acreage has increased especially along the Wasatch Front in Utah, Salt Lake and Box Elder counties.

From 1967 to 1971 the acreage of corn harvested for grain is included with corn for silage, actually the number of acres harvested for grain in 1972, was estimated at more than 7,000 acres.

Expansion in production of corn for grain in the past few years has been associated with the new hybrid varieties and encouraged by the installation of corn dryers at several locations.

The average yield of grain corn per acre in Utah is about 100 bushels, and could be increased to 150 bushels per acre, at 15.5 percent moisture content, with improved varieties and management.

Increased yields on a green weight basis will increase the marginal cost of production due to increased costs of harvesting, transport, seed, and interest on variable costs. Consequently, studies need to be made of the physical and economic relationships between the yields both on a green weight and on a dry weight basis.

The added revenue and the added cost of the hybrids in the various grain and silage corn trials for 1971 and 1972 will provide the basis for improved decision making by farm producers in Utah.

Objectives of the Study

The objectives of the present economic and agronomic study are:

1. To determine the 1972 costs and returns from corn silage and grain corn production in Utah.
2. To analyze the physical response and economic relationships of selected corn hybrids for silage and grain production in Utah.

REVIEW OF LITERATURE

Corn is a major crop in the United States. Not only does this country devote about 25 percent of its crop land to corn, but it produces more than one-half of the world's crop, a total of 5.0 billion bushels annually. Consequently there have been many economic studies made concerning corn production. These studies range in scope from general to specific phases of corn production for selected areas of the United States including Utah.

The intention here is not to review all the agronomic and economic studies of corn production, but to choose a few which seemed to be somewhat representative of the available literature. Some of the studies reviewed gave general guides in cultivation, hybrids, budgeting and accounting techniques. Others include costs and returns from producing various types of corn.

In 1958 a cost study was made by Vollman and Blosser on grain corn in six Ohio counties (10). 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 costs were figured including the above costs plus seed and spray, the total production cost was $58.85 per acre to produce a 75 bushel crop of grain corn or $.78 per

bushel. The receipts were estimated at $1.00 per bushel, resulting in a net return of $0.22 per bushel or $16.50 per acre. The labor requirement was 6.5 man hours per acre and 5.7 tractor hours use per acre.

In 1963, M.E. Pollard in a Farm Quarterly article, "Figuring Corn Cost," analyzed the costs of growing corn in four groups: direct cost, individual cost, implied cost, and internal transfers (8). He explained that direct costs are important in comparing two similar crops, since the other costs do not change during one year period. He also argued that it was necessary for corn crops to pay the fixed cost of land use. This could be figured using an appropriate interest rate on the "fair value" of land.

In 1960 a study was made of the tillage costs for agricultural production in Utah by Davis and Phyllips (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 1962 Morrison (5) made a study of field corn production for grain and silage in Northern Utah; he found that the average size of grain field was 10.4 acres. Land values averaged $474 per acre. Average equipment value was $61.00 per acre. Labor requirements for land preparation, growing and harvesting averaged 5.4, 7.0, and 2.3 man hours per acre respectively, and resulted in a total labor requirement

of 14.7 man hours per acre to produce grain corn. The average cost of production was $111.05 per acre. On a percentage basis, costs were: materials 17 percent, labor and equipment 44 percent, taxes 14 percent and interest 25 percent. Net return to grain corn production averaged $27.37 per acre. Return to management and family labor was $44.03 per acre, while the return to family labor, capital and management was $72.10 per acre.

In the production of corn silage Morrison also found that the average size enterprise was 16.1 acres. Land values averaged $470.00 per acre, and the average equipment value was $108.00 per acre. Labor requirement for land prepration, growing and harvesting averaged 4.4, 6.4 and 7.4 man hours per acre respectively, resulting in a total labor requirement of 18.2 man hours per acre to produce silage corn. Average cost of production was $109.30 per acre. On a percentage basis, costs were: materials 16 percent, labor and equipment 41 percent, taxes 15 percent and interest 28 percent. Net return to silage corn production averaged $20.47 per acre. Return to management and family labor was $40.02 per acre while the return to family labor, capital, and management was $70.56 per acre.

In 1969 Aldrich and Leng (1) published Modern Corn Production and explained the importance of hybrids. They established that no one can judge the performance of hybrid corn by the looks of the seed. The requirements today are entirely different from those in "Grandpa's days,"

when the careful farmer took time in the fall to select the best ears from good standing stalks in the field, then carefully stored them to use for seed the next spring. Aldrich and Leng said that many farmers did not bother with seed selection, they just took some ears from the crib, shelled them and planted the grain as it came. Rarely did anyone buy seed. Most farmers thought this a poor business practice. When hydrid seed corn became available in the 1930's the picture changed dramatically. Today it is hard to find farmers who bother to save and use their own seed. The farmer must find out which hybrid best fits his special needs. He is concerned about maturity, yield, adaptability, economic profit, etc. To obtain answers to these requirements, researchers make use of trials or test plots from which information can be summarized for a final decision about the specific hybrid to be planted.

SOURCE OF DATA AND METHOD OF PROCEDURE

The data needed to accomplish Objective one of this study were obtained by personal interviews with 30 representative farmers in 15 counties who produced silage and grain corn. Others assisting included extension specialists, equipment and supply dealers and other technicians in Utah. The counties included in the study were Beaver, Box Elder, Cache, Davis, Emery, Iron, Millard, Juab, Morgan, Salt Lake, Sevier, Uintah, Utah, Wasatch and Weber.

The information obtained included data on required labor, machinery, size of enterprise, cultivation practices, fertilization, necessary water to irrigate the crops, other input costs, yields, and revenues.

Each of the producers included in the study were personally interviewed and a detailed questionnaire was used in obtaining and recording pertinent information.

When the field survey was completed, schedules were summarized, checked and recorded on tabulation sheets.

Previous studies on corn silage and grain corn costs and returns made by the Utah Agricultural Experimental Station were used to compare and complement the results of this study and to insure that representative cultural practices, yields and costs were being considered.

The data for the agronomic analysis came from silage and grain corn trials established with the cooperation of 18 representative farmers in the following Utah counties: Uintah, Utah, Sanpete, Iron, Weber, Morgan, Wasatch, Millard, Salt Lake and Box Elder, during 1971 and 1972.

The information collected was about yields (green and dry), planting and harvesting dates, fertilizing and row spacing. The higher yielding varieties were recorded and data are presented in Tables 4 to 23 for silage corn trials and in Tables 28 to 31 for grain corn trials. Seven trials were subjected to a statistical analysis of variance, to determine the statistical significance of yield difference between the hybrids tested. The results of this analysis are presented in Tables 12, 14, 16, 18, 20, 22, and 24.

Total costs, total receipts and economic profits were also calculated to determine whether the hybrids with higher yields also resulted in greater economic returns.

In the cost of production section the assumption was made that all cultural practices were performed at custom-rate costs, making all costs of performing these practices variable costs.

Labor was costed at $2.00 per hour and was subtracted from the custom rate for each practice to estimate the cost of labor associated with the production process. The remainder of the cost was assigned as power and machinery costs.

Fixed costs included taxes on land, interest on land and other minor items such as insurance, depreciation on fences and buildings.

RESULTS OF STUDY WITH SILAGE CORN

The most important influence in silage corn production over the past 20 years has been the increase in yield productivity relative to that of hay. The development of hybrid corn increased yield potential and shortened the required growing season of new varieties of corn silage.

The relatively low cost and high profits of corn silage compared to other roughages has encouraged the expansion of corn silage.

The most restrictive factor upon corn silage production is its excess weight. Because of the high water content of corn silage, the transportation cost per unit is high and therefore discourages corn silage movements over long distances.

Another restricting factor is Utah's short growing season. However, new varieties of hybrid seed have partially removed the handicap of the short season.

Total revenue, total cost and the economic profit for each hybrid are presented in the various tables of this study and were estimated under the basis of the average receipts, costs and returns for silage corn production (Table 3), which consider an average yield of 20 tons per acre of green weight and 6.66 tons per acre of dry matter. Estimates of marginal cost of seed for each hybrid were made. The cost of interest at 8 percent on the variable cost was calculated for a 6 months period.

Acres and Fixed Investment

The size of the enterprise was defined in this study in terms of the number of acres planted to silage corn. The average size of the enterprise was 40 acres with a range from 16 to 165 acres.

Estimates of value of land were obtained from farmers, County Agents and previous studies to determine agricultural value of land used in corn silage production. These estimates together with a knowledge of recent sales gave a basis for an estimated land value of $500.00 per acre.

Total value of equipment used was $9,600.00 per farm. Twenty-five percent of the total value of this equipment was assigned to the use of silage corn production. The average value of silage corn equipment was $2,400.00 per enterprise or $60.00 per acre, Table 1. Investment in land and equipment was estimated to be $560.00 per acre.

Labor Requirement

Labor required was classified into three categories: preparation, growing and harvesting. Separate but comparable data for both hired labor and family labor were estimated for each producer. The sum of these gives the total labor requirement, Table 2.

Land preparation took a total of 2.65 hours per acre, of this total 0.10 hours was hired labor. Labor was hired mainly for plowing; family labor input was 2.55 hours per acre for preparation operations. The

two operations which required the highest input of family labor were harrowing and plowing, with 0.70 and 0.80 hours of labor respectively. Preparation operations accounted for 18.86 percent of total labor input.

Labor used during the growing season averaged 5.40 hours per acre. Of this irrigating was the operation that required the highest labor input, equalling 4.0 hours per acre. Labor input used during the growing season was 39.40 percent of the total labor.

Harvesting operations, such as cutting, hauling and unloading, were calculated together. This was done since all harvesting operations are normally performed simultaneously, and because harvesting costs are confined to a short period of the year during which speed of completion is important to the operation.

Table 1. Investment in equipment used for growing silage corn in Utah 1972

Item	Charged to Silage Corn		
	Average per Farm for all Crops ($)	Average per Farm ($)	Average per Acre ($)
Power Equipment[a]	6,400.00	1,600.00	40.00
Tillage Equipment[b]	1,600.00	400.00	10.00
Other Equipment	1,600.00	400.00	10.00
Total	9,600.00	2,400.00	60.00

[a] Tractors and trucks.
[b] Equipment used in land preparation.

Table 2. Estimated hours of labor used to produce silage corn in Utah 1972

Item	Family Labor/Acre (Hours)	Hired Labor/Acre (Hours)	Total Labor/Acre (Hours)
Preparation:			
Plowing	0.80	0.10	0.90
Harrowing	0.70	-	0.70
Leveling	0.50	-	0.50
Fertilizing	0.30	-	0.30
Ditching	0.25	-	0.25
Sub Total	2.55	0.10	2.65
Growing:			
Planting	0.40	0.10	0.50
Cultivating	0.40	0.20	0.60
Spraying	0.20	0.10	0.30
Irrigating	3.70	0.30	4.00
Sub Total	4.70	0.70	5.40
Harvesting:	4.00	2.00	6.00
Total:	11.25	2.80	14.05

A labor input of 6.0 hours per acre was estimated for harvesting of this 2.0 hours were hired with the remaining 4.0 hours, being charged to family labor. The labor input used in harvesting totaled 6 hours and 42.70 percent of total labor. The total labor requirement for corn production was 14.05 hours per acre. Hired labor represented 2.80 hours and family labor was 11.25 hours per acre.

Cost of Production

The average variable cost of producing silage corn was determined by averaging costs incurred by the farmers involved. Both, cash and non-cash costs were included and were divided as follows: Materials and Services, Power and Machinery, and Labor (Table 2).

Materials and Services costs were $41.42 per acre or 23.40 percent of the total costs of production. Fertilizer was the highest cost with $60.00 per ton of 33.5 percent available nitrogen, applied at the rate of 200 pounds of available nitrogen per acre, or a cost of $17.92 per acre. Farmers also used 45 pounds per acre of available phosphate, which represents a cost of $4.00 per acre ($80.00 per ton of 45 percent available phosphate). The total fertilizer cost represented 12.37 percent of the total cost of production.

Weedicide cost was $0.50 per acre, which accounted for less than 1 percent of total cost.

Table 3. Average receipts, costs, and net return from silage corn production in 15 counties of Utah, 1972

Item	Labor	Power and Machinery	Materials and Services	Total
		$/acre		
Receipts				
Corn silage, 20 ton $10.00/ton				200.00
Variable Costs				
Plowing	1.80	5.54		7.34
Harrowing	1.40	3.00		4.40
Leveling	1.00	6.34		7.34
Fertilizing	0.60	1.15		1.75
Ditching	0.50	0.50		1.00
Fertilizer				
200 lbs. av. N. $60/ton			17.92	17.92
45 lbs. av. P $80/ton			4.00	4.00
Seed 20 lbs.			8.00	8.00
Planting	1.00	2.00		3.00
Cultivating	1.20	6.14		7.34
Spraying	0.60	1.24	0.50	2.34
Irrigating	8.00			8.00
Water Cost (Operation and Maint.)			6.00	6.00
Harvesting (Chopping, Hauling, Packing)	12.00	34.80		46.80
Interest 8% on Var. Cost for 6 months			5.00	5.00
Total Variable Costs:	28.10	60.71	41.42	130.23
Fixed Costs				
Interest on Land ($500 @ 7%/year)			35.00	35.00
Land Tax			5.00	5.00
Other			7.00	7.00
Total Fixed Cost:				47.00
Total Cost of Production				177.23
Net Return to Management				22.77
Return to Management, Family Labor and Land				80.27

Seed costs averaged 40 cents per pound, with 20 pounds of seed planted per acre resulting in a cost of $8.00 per acre. Seed cost represented 4.51 percent of the total costs.

Water cost and interest were also included in the Materials and Services. This cost totalled $11.00 per acre and represented 6.20 percent of the total production cost.

Power and Machinery costs for producing silage corn were $60.71 per acre or 34.25 percent of the total cost.

Costs were computed using custom machine rates which on the average were $9.00 per hour for the preparation, growing, and harvesting stages of the crop. The land preparation step was divided into plowing with an equipment cost of $5.54 per acre; leveling was performed twice at an equipment cost of $6.34 per acre, and harrowing, fertilizing and ditching were accomplished at a cost of $3.00, $1.15 and 0.50 per acre. The Power and Machinery cost of the preparation stage was $16.53 per acre or 9.33 percent of total production cost. Planting, cultivating and spraying, were included as growing costs which amounted to $2.00, $6.14 and $1.24 respectively, and totalled $9.38 per acre which represents 5.30 percent of the total production cost. The total harvesting costs for Power and Machinery was $34.80 per acre or 19.63 percent of total cost.

Labor cost for the three stages (preparation, growing and harvesting) was $28.10 per acre or 15.85 percent of the total cost. This was divided into two parts: family labor and hired labor. Family labor

included all labor performed by the operator and his family. This labor and the hired labor was valued at $2.00 per man hour. Irrigation had the highest labor cost in the growing stage with $8.00 per acre, and labor for harvesting was $12.00 per acre.

Total Labor and Machinery cost for producing silage corn was $88.81 per acre or $4.44 per ton which represented 50.11 percent of the total production cost.

The fixed cost per acre was divided into interest on land, land cost taxes and other miscelaneous costs, such as Fencing, Insurance, Tools, etc. Fixed costs totaled $47.00 which was 26.50 percent of the total production cost per acre.

Water cost in this study had a wide variation, the range was from $3.00 to $14.00 per acre. The average cost was $6.00 per acre or 3.38 percent of the total production cost.

Interest charges were made for capital invested in production of silage corn. An annual rate of 8 percent for 6 months was charged for the total variable cost. This interest cost was $5.00 per acre.

Total costs of producing silage corn was $177.23 per acre or $8.86 per ton of green silage. The cost of producing silage corn is considered completed when the silage was placed in the silo.

The price of corn silage varied from farm to farm and was dependent upon grain content and maturity of the corn at harvest time. The value of silage corn averaged $10.00 per ton.

Gross receipts were $200.00 per acre based on an average yield of 20 ton per acre. Average net return to management was $22.77 per acre or $1.13 per ton. The return to family labor and land was $22.50 and $35.00 per acre, respectively. The total net return to management, land and family labor was $80.27 per acre or $4.01 per ton of silage corn, green weight.

Characteristics of the Corn Silage Hybrid Seed Trials

The field corn silage testing program conducted by Utah State University for many years was terminated at the close of 1966. Due to numerous requests, it was started again in 1970.

In 1971, seed companies supplied hybrid corn seed lots, which they thought suitable for particular trial locations. Differences in elevation, season length and ultimate use of the crop were considered in selection of hybrids as they differ greatly.

Corn, grown for silage in Utah, is planted in 2 rows, normally from 26 to 36 inches apart. Plant spacings within these rows vary from 4 to 8 inches and the plant stands vary from 20,000 to 50,000 plants per acre.

Because little aftermath is left on fields after corn silage, commercial fertilizers are generally applied, the quantities per acre applied by producers included in the study averaged 200 pounds of available nitrogen and 100 pounds of available phosphorous. Manure was used in a few

cases to help retain organic matter in the soil. Weeds are controlled through cultivating and spraying while soil moisture is maintained through irrigation. The fields of the farmers who were contacted in the study had very few insect and disease problems.

The plots were harvested with a field chopper, cutting two rows the length of the field. The chopped corn was blown into a farm wagon and weighed on commercial scales. Twenty pound samples were dried in a forced-air dryer to determine the dry weight percentage. Maturity was estimated by examining the kernel development of 10 to 15 random ears at harvest time.

Cropping history, fertilizer treatments and economic value are shown at the bottom of each trial report.

In 1971, eight silage corn trials were established on private land in Cache, Iron, Salt Lake, Sanpete, Uintah, Utah, Wasatch and Weber counties.

Data from Cache, Salt Lake and Wasatch counties were not included in the results of this study due to poor stands, excessive weeds, abnormally early frosts, uneven fertilizer distribution, shortage of water at a critical time or a combination of these factors (4).

The use of farmer equipment to plant and harvest these tests necessitated a simplified procedure which excluded randomization and replication. Therefore, field differences could not be tested statistically.

Results of the 1971 silage corn trials are shown in Tables 4, 5, 6, 7, and 8.

In 1972, 11 silage corn trials were established with the cooperation of representative farmers in the following counties: Weber, Wasatch, Utah, Morgan, Box Elder, Millard, Emery, Iron, and Salt Lake counties. Results from Emery and Iron county trials were not included in the present study, due to poor stand and lack of uniformity.

The results and analysis of variance for the 1972 study are shown in Tables 9 to 23. Whenever replication and randomization permitted, analysis of variance of the hybrids tested are given.

Trial Results, 1971

Table 4. Silage corn trial in Maeser-Uintah County 1971

No.	Hybrid	Yields - Tons/acre Green Weight	Dry Weight	$ Per Acre Total Rev.	Total Cost	Economic Profit
1	Portwalco 425 A	23.31	8.28	248	190	58
2	Funks G-4455	28.41	8.52	255	202	53
3	Portwalco 450 A	26.04	7.81	234	187	47
4	Funks G-4465	30.84	8.79	263	209	54
5	Utahybrid 30-50	27.70	7.48	224	201	23
6	NK-KE 449	27.76	8.74	262	191	71
7	Utahybrid 544 A	28.59	8.43	252	203	49
8	NK-KE 497	15.60	6.55	196	171	25
9	Utahybrid 330	24.32	8.39	251	191	60
10	Double Circle S 205	21.06	7.48	224	194	30

Trial planted May 4, 1971 and harvested September 22, 1971.
Row spacings are 36 inches, with 2 rows per plot 612 feet long.
Manured with 60 tons per acre in the past years.
The hybrid with the highest yield in tons per acre of dry weight was Funks G-4465.
The hybrid with the highest economic profit per acre was NK-KE 449.

Table 5. Silage corn trial in Wilson - Weber County 1971

No.	Hybrid	Yield - Tons/acre Green Weight	Yield - Tons/acre Dry Weight	$ Per Acre Total Rev.	$ Per Acre Total Cost	$ Per Acre Economic Profit
1	Funks G-5757	34.82	8.88	266	194	72
2	NK PX 616	27.71	7.76	232	201	31
3	Utahybrid 680	29.44	8.68	260	205	55
4	Funks G-4465	22.40	6.72	201	188	13
5	Utahybrid 54-50	21.82	7.53	225	186	39
6	Utahybrid 544 A	28.61	7.87	236	202	34
7	Portwalco 90	22.59	6.78	203	189	14
8	Portwalco 120	28.99	7.54	226	204	22
9	NK KT 626	31.80	7.47	224	211	13
10	Double Circle D 212	29.31	7.33	219	205	14

Trial planted May 4, 1971 and harvested September 8, 1971.
Row spacings are 34 inches, with 2 rows per plot 600 feet long.
Fertilized with 200 pounds of available nitrogen per acre.
The hybrid with the highest yield in tons per acre of dry weight was Funks G-5757.
The hybrid with the highest economic profit was also Funks G-5757.

Table 6. Silage corn trial in Palmyra - Utah County 1971

No.	Hybrid	Yield - Tons/acre Green Weight	Yield - Tons/acre Dry Weight	$ Per Acre Total Rev.	$ Per Acre Total Cost	$ Per Acre Economic Profit
1	DeKalb XL 363	27.33	6.90	207	200	7
2	NK KT 626	29.91	7.24	217	206	11
3	Utahybrid 680	31.18	8.53	255	209	46
4	Utahybrid 54-40	26.67	7.58	227	198	29
5	NK PX 616	33.95	8.04	241	216	25
6	DeKalb XT 664	32.50	9.06	271	212	59
7	Portwalco 120	29.42	8.05	241	205	36
8	Double Circle D 212	34.19	8.81	264	216	48
9	Portwalco 90	26.66	7.86	235	198	37
10	Portwalco 100	27.59	6.83	204	200	4
11	Funks G-5757	34.06	7.71	231	216	15
12	Funks G-4465	26.07	8.37	251	196	55
13	PAG 348	29.79	8.94	268	206	62

Trial planted May 7, 1971 and harvested September 21, 1971.
Row spacings are 32 inches, with 2 rows per plot 880 feet long.
Fertilized with 136 pounds of available nitrogen plus 46 pounds of available phosphate per acre.
The hybrid with the highest yield in tons per acre of dry weight was DeKalb XT 664.
The hybrid with the highest economic profit per acre was also DeKalb XT 664.

Table 7. Silage corn trial in Axtel - Sanpete County 1971

No.	Hybrid	Yield - Tons/acre		$ Per Acre		
		Green Weight	Dry Weight	Total Rev.	Total Cost	Economic Profit
1	Utahybrid 330	15.53	5.05	152	170	-18
2	Utahybrid 544 A	17.07	5.46	163	174	-11
3	Funks G-4240	21.57	5.93	178	185	- 7
4	NK KM 589	23.04	6.45	194	189	5
5	Utahybrid 30-50	24.06	5.77	174	191	-17
6	Funks G-4465	24.12	6.03	181	192	-11
7	DeKalb XL 316	20.98	6.40	192	184	8
8	Double Circle S 201	21.69	6.40	192	186	6
9	NK PX 610	26.23	8.00	240	196	44
10	Portwalco 450 A	20.88	5.95	179	183	- 4
11	Portwalco 425 A	20.36	5.80	174	182	- 8

Trial planted May 6, 1971 and harvested September 21, 1971.
Row spacings are 30 inches, with 2 rows per plot 900 feet long.
Fertilized with 170 pounds of available nitrogen per acre.
The hybrid with the highest yield in tons per acre of dry weight was NK PX 610.
The hybrid with the highest economic profit per acre was also NK PX 610.

Table 8. Silage corn trial in New Castle - Iron County 1971

No.	Hybrid	Yield - Tons/acre Green Weight	Yield - Tons/acre Dry Weight	$ Per Acre Total Rev.	$ Per Acre Total Cost	$ Per Acre Economic Profit
1	Double Circle S 201	13.66	3.62	109	166	-57
2	DeKalb XL 363	17.07	4.18	126	173	-47
3	Portwalco 425 A	16.04	4.49	135	171	-36
4	Portwalco 444	16.90	3.80	114	174	-60
5	NK KM 589	14.19	3.63	109	166	-57
6	DeKalb TX 644	20.24	4.35	131	182	-51
7	Portwalco 450 A	16.34	4.17	126	172	-46
8	Utahybrid 680	17.46	4.89	147	175	-28
9	Funks G-4455	15.88	4.84	146	171	-25
10	NK KT 626	16.93	4.74	143	174	-31
11	Funks G-4465	13.99	4.62	139	166	-27
12	Utahybrid 54-40	11.94	3.64	110	162	-52
13	Funks G-4240	18.29	6.03	181	177	4

Trial planted May 5, 1971, and harvested September 20, 1971.
Row spacings are 30 inches, with 2 rows per plot 1317 feet long.
Fertilized with 112 pounds of available nitrogen and 140 pounds of available phosphate per acre.
The hybrid with the highest yield in tons per acre of dry weight was Funks G-4240.
The only hybrid with positive economic profit per acre was Funks G-4240.

Results of Trials, 1972

Table 9. Silage corn trial in Ogden - Weber County 1972

No.	Hybrid	Yields - Tons/acre		$ Per Acre		
		Green Weight	Dry Weight	Total Rev.	Total Cost	Economic Profit
1	Utahybrid 680	18.89	5.66	170	179	- 9
2	NK KT 626	20.79	6.87	207	179	28
3	NK PX 616	24.30	6.19	186	191	- 5
4	Jacques JX 403	23.81	5.12	154	191	-37
5	Jacques JX 1205	23.69	5.92	178	190	-12
6	Jacques JX 303 A	22.65	6.12	184	187	- 3
7	Trojan M 114	26.99	6.75	202	197	5

Trial planted May 16, 1972, and harvested September 12, 1972.
Row spacings are 30 inches, with 2 rows per plot.
Fertilized with 132 pounds of available nitrogen and 90 pounds of available phosphate per acre.
The hybrid with the highest yield in tons per acre of dry weight was NK KT 626.
The hybrid with the highest economic profit per acre was NK KT 626.

Table 10. Silage corn trial No. 1 in Palmyra - Utah County 1972

No.	Hybrid	Yields - Tons/acre		$ Per Acre		
		Green Weight	Dry Weight	Total Rev.	Total Cost	Economic Profit
1	Coop D-212	30.95	8.67	260	207	53
2	Coop T-308	38.23	10.96	328	224	104
3	DeKalb XK 363	23.26	7.29	218	189	29
4	DeKalb 664	33.31	8.88	266	213	53
5	Funks G-5207	16.45	6.03	205	173	32
6	Funks G-5757	35.25	9.40	282	217	65
7	NK PX 610	24.49	7.35	220	192	28
8	NK PX 616	26.95	8.44	253	198	55
9	NK 1248	36.33	8.48	254	220	34
10	PAG 315	23.98	7.19	215	191	24
11	PAG 7333	21.52	6.89	206	185	21
12	Pioneer 3369A	30.18	8.45	253	215	38
13	Pioneer 3571	23.11	7.24	217	189	28
14	Portwalco 425A	22.55	6.91	207	187	20
15	Portwalco 450A	24.29	7.29	219	191	28
16	Trojan TX 118	22.08	6.62	199	186	13
17	Utahybrid 680	28.13	7.50	225	200	25
18	Utahybrid 54-40	29.26	9.17	275	203	72
19	Utahybrid 54-50	29.41	8.23	247	204	43

Trial planted May 3, 1972 and harvested September 16, 1972.
Row spacings are 38 inches, with 2 rows per plot 796 feet long.
Fertilized with 123 pounds of available nitrogen and 45 pounds of available phosphate per acre.
Three reps were planned for this trial but there was only space for one.
The hybrid with the highest yield in tons per acre of dry weight was Coop T-308.
The hybrid with the highest economic profit per acre was also Coop T-308.

Table 11. Silage corn trial in Morgan - Morgan County 1972

No.	Hybrid	Yields - Tons/acre		$ Per Acre		
		Green Weight	Dry Weight	Total Rev.	Total Cost	Economic Profit
1	DeKalb 442	38.21	7.12*	213	226	-13
2	Nk KE 449	22.60	5.85	175	187	-12
3	PAG 45	28.25	6.28	188	200	-12
4	Trojan TXS 85	21.31	5.65	170	185	-15
5	Trojan M 90	27.18	6.46	195	199	- 4
6	Utahybrid 330	32.63	7.61**	228	215	13
	$\bar{X}$ (Mean)-- ---------- ----		6.49			
	L.S.D. 0.05 ----------		0.61			
	L.S.D. 0.01 ----------		0.88			

*Significant at 0.05 level.
**Highly significant at 0.01 level.

Table 12. Analysis of variance - silage corn trial in Morgan 1972

No.	Source	DF	S Sq.	M Sq.	F Value	Tabled F 0.05	Tabled F 0.01
6	Hybrids	5	8.4361	1.6872	7.27	3.33	5.64
3	Reps.	2	2.6334	1.3167	5.67	4.10	7.56
	Error	10	2.3194	0.2319			
18	Total	17	13.3889				

Trial planted May 1, 1972, and harvested September 8, 1972.
Row spacings are 34 inches, with 2 rows per plot 1,000 feet long.
Fertilized with 166 pounds of available nitrogen per acre.
The differences between hybrids were highly significant at 0.01 and 0.05 percent, and the significance among reps was significant only at 0.05 percent.
Hybrids with a yield in tons per acre of dry weight above 7.10 are significant (*) at 0.05 percent and above 7.37 are highly significant (**) at 0.01 percent.
The only hybrid with positive economic profit per acre was Utahybrid 330.

Table 13. Silage corn trial No. 2 in Palmyra - Utah County 1972

No.	Hybrid	Yields - Tons/acre Green Weight	Yields - Tons/acre Dry Weight	$ Per Acre Total Rev.	$ Per Acre Total Cost	$ Per Acre Economic Profit
1	Coop D-212	20.20	6.54**	196	182	14
2	Coop T-308	16.35	5.25	158	172	-14
3	DeKalb XL 363	18.44	6.15	185	178	7
4	DeKalb 664	21.05	6.24*	187	184	3
5	Funks G-5207	12.36	5.07	152	159	- 7
6	Funks G-5757	22.00	6.53**	196	186	10
7	NK PX 610	17.25	6.04	181	175	6
8	NK PX 616	19.91	6.70**	201	177	24
9	NK KT 626	19.51	5.85	176	176	0
10	NK 1284	26.19	5.85	176	197	-21
11	PAG 315	17.85	6.12	184	175	9
12	PAG 7333	14.45	5.50	166	169	- 3
13	Pioneer 3369A	21.25	6.76**	203	184	19
14	Pioneer 3571	16.45	5.65	170	172	- 2
15	Portwalco 425A	15.51	5.43	163	170	- 7
16	Portwalco 450A	17.82	6.12	184	175	9
17	Trojan TX 118	15.89	5.08	153	171	-18
18	Utahybrid 54-40	17.81	6.26**	188	175	13
19	Hybrid 54-50	16.86	5.73	172	172	0
	$\bar{X}$ (Mean)		5.94			
	L.S.D. 0.05		0.26			
	L.S.D. 0.01		0.30			

Table 14. Analysis of variance - silage corn trial No. 2 in Palmyra 1972

No.	Source	DF	S Sq.	M Sq.	F Value	Tabled F 0.05	Tabled F 0.01
19	Hybrids	18	9.7100	0.5394	4.89	2.21	3,10
2	Reps	1	0.1848	0.1848	1.67	4.41	8.29
	Error	18	1.9839	0.1102			
38	Total	37	11.8787				

Trial planted May 6, 1972, and harvested September 18, 1972.

Row spacings are 32 inches, with 2 rows per plot 970 feet long.

Fertilized with 66 pounds of available nitrogen and 46 pounds of available phosphate per acre. An extra 100 pounds of available nitrogen per acre would have increased the yield considerably.

The differences among hybrids were highly significant at 0.05 and 0.01 percent, while the difference between reps were not significant at any percentage.

Hybrids with a yield in tons per acre of dry weight above 6.20 are significant at 0.05 percent and above 6.24 are significant at 0.01 percent.

The hybrid with the highest economic profit per acre was NK PX 616.

Table 15. Silage corn trial in Center Creek - Wasatch County 1972

No.	Hybrid	Yields - Tons/acre Green Weight	Yields - Tons/acre Dry Weight	$ Per Acre Total Rev.	$ Per Acre Total Cost	$ Per Acre Economic Profit
1	Coop D-200	18.90	4.38	132	179	-47
2	Funks G-4465	21.05	4.83	145	184	-39
3	Funks G-5207	15.73	3.65	110	170	-60
4	NK PX 446	16.47	4.24	128	172	-44
5	NK KE 449	17.38	4.40	133	175	-42
6	NK KE 497	18.84	4.50	135	178	-43
7	NK PX 610	17.16	3.60	108	175	-67
8	PAG 46	20.75	4.98	150	182	-32
9	PAG 58	20.46	4.33	130	182	-52
10	Pioneer 3571	23.70	5.30	159	190	-31
11	Pioneer 3773	24.10	5.07	152	191	-39
12	Portwalco 425A	23.80	5.23	157	190	-33
13	Trojan M 90	16.52	4.28	129	172	-43
14	Utahybrid 330	19.49	4.68	141	179	-38
15	Utahybrid 544A	28.78	4.25	128	202	-74
	$\bar{X}$ - (Mean) ----------		4.54			

Table 16. Analysis of variance - silage corn trial in Center Creek 1972

No.	Source	DF	S Sq.	M Sq.	F Value	Tabled F .05	Tabled F .01
15	Hybrids	14	7.2635	0.5188	1.36	2.46	3.66
2	Rep.	1	1.6474	1.6474	4.34	4.60	8.86
	Error (HXR)	14	5.3109	0.3793			
30	Total	29	14.2218				

Trial planted May, 1972, and harvested September 2, 1972.
Row spacings are 28 inches, with 2 rows per plot of various lengths.
Fertilized with 100 pounds of available nitrogen per acre plus chicken manure.
The differences among hybrids were not significant.
The hybrid with the highest yield, tons per acre of dry weight was Pioneer 3571.
None of the hybrids had positive economic profit per acre.

Table 17. Silage corn trial in Delta - Millard County 1972

No.	Hybrid	Yields - Tons/acre		$ Per Acre		
		Green Weight	Dry Weight	Total Rev.	Total Cost	Economic Profit
1	Coop S-205	15.39	5.24	158	170	-12
2	Coop T-308	14.34	5.03	151	168	-17
3	DeKalb XL 363	17.33	6.07**	182	175	7
4	DeKalb 442	17.33	6.36**	191	175	16
5	Funks G-5207	11.00	5.00	150	159	- 9
6	Funks G-5757	19.66	5.77	173	179	- 6
7	NK PX 610	16.00	6.26**	188	172	16
8	NK PX 626	13.92	4.97	149	165	-16
9	NK 1284	19.00	4.84	145	178	-33
10	PAG 58	13.86	5.76	173	165	8
11	PAG 7333	12.52	5.00	150	164	-14
12	Pioneer 3571	14.70	5.60	168	168	0
13	Pioneer 3773	11.50	5.50	165	160	5
14	Portwalco 425A	16.00	6.15**	185	171	14
15	Portwalco 540A	16.00	6.06**	182	171	11
16	Trojan TXS 102	12.17	5.00	150	164	-14
17	Utahybrid 544A	12.00	5.31	160	163	- 3
18	Utahybrid 680	13.92	5.52	166	165	1
	$\bar{X}$ (Mean)----------		5.52			
	L. S. D. 0.05 ----------		0.31			
	L. S. D 0.01 ----------		0.42			

Table 18. Analysis of variance - silage corn trial in Delta 1972

	Source	DF	S Sq.	M Sq.	F Value	Tabled F .05	Tabled F .01
18	Hybrid	17	13.2644	0.7803	3.46	1.97	2.44
3	Reps.	2	6.5590	3.2795	14.54	2.28	5.30
	Error	34	7.6657	0.2254			
54	Total	53	27.4891				

Trial planted April 27, 1972, and harvested September 26, 1972.
Row spacings are 28 inches, with 2 rows per plot 1320 feet long.
Fertilized with 161 pounds of available nitrogen, 26.7 pounds of sulfur and 133 pounds of available phosphorous per acre.
The differences between hybrids and Reps were highly significant at 0.01 and 0.05 percent.
Hybrids with a yield in tons per acre of dry weight above 5.83 are significant at 0.05 percent and above 5.94 are significant at 0.01 percent.
The hybrid with the highest economic profit per acre was DeKalb 442.

Table 19. Silage corn trial in Ogden - Weber County 1972

No.	Hybrid	Yields - Tons/acre		$ Per Acre		
		Green Weight	Dry Weight	Total Rev.	Total Cost	Economic Profit
1	Coop D-212	24.54	7.46	224	193	31
2	Coop T-308	24.20	7.15	214	193	21
3	Funks G-5207	19.48	7.65	229	174	55
4	Funks G-5757	35.16	8.63**	259	217	42
5	Jacques JX 403	28.00	8.53**	256	201	55
6	NK PX 610	22.14	7.51	225	187	38
7	NK PX 616	28.31	7.84	235	201	34
8	NK KT 626	28.80	8.09	243	202	41
9	NK KT 665	32.50	7.92	238	212	26
10	NK 1284	35.43	8.68**	260	219	41
11	PAG 46	16.41	5.99	180	172	8
12	PAG SX 69	18.47	6.85	205	178	33
13	Pioneer 3369A	32.05	8.49**	255	211	44
14	Pioneer 3571	26.40	8.27**	248	198	50
15	Portwalco 444	16.91	5.85	175	172	3
16	Trojan M 114	27.66	8.36**	251	200	51
17	Trojan TX 118	26.43	7.85	235	198	37
18	Utahybrid 680	27.00	7.62	228	200	28
19	Utahybrid 54-50	27.08	7.70	231	200	31
	$\bar{X}$ (Mean)		7.71			
	L.S.D. 0.05		0.40			
	L.S.D. 0.01		0.54			

Table 20. Analysis of variance - silage corn trial in Ogden 1972

No.	Source	DF	S Sq.	M Sq.	F Value	Tabled F 0.05	Tabled F 0.01
19	Hybrids	18	34.8886	1.9382	5.15	1.94	1.86
3	Reps.	2	0.0929	0.0464	0.123	2.28	5.22
	Error	36	13.5315	0.3758			
57	Total	56	48.5130				

Trial planted May 1, 1972, and harvested September 12, 1972.
Row spacings are 30 inches, with 2 rows per plot 600 feet long.
Fertilized with 200 pounds of available nitrogen, and 40 tons of manure per acre.
The differences among hybrids were highly significant at 0.01 and 0.05 percent but the differences among Reps. are not significant.
Hybrids with a yield, tons per acre of dry weight above 8.11 are significant at 0.05 and above 8.25 are significant at 0.01 percent.
NK 1284 produced the highest yield but the ears were not mature at harvest time.
The hybrids with the highest economic profit per acre were Funks G-5207 and Jacques JX 403.

Table 21. Silage corn trial in Draper - Salt Lake County 1972

No.	Hybrid	Yields - Tons/acre Green Weight	Dry Weight	$ Per Acre Total Rev.	Total Cost	Economic Profit
1	Coop D-212	22.09	5.70	171	186	-15
2	Coop T-308	19.85	5.22	157	179	-22
3	DeKalb XL 15A	14.77	5.70	171	168	- 3
4	Funks G-5207	10.30	3.99	120	157	-37
5	Funks G-5757	21.10	5.14	154	186	-32
6	NK PX 610	15.79	4.90	148	170	-22
7	NK PX 616	18.63	5.45	164	178	-14
8	NK KT 626	20.60	5.44	163	180	-17
9	NK 1284	27.83	5.62	169	200	-31
10	PAG SX 69	19.30	6.17	185	179	6
11	PAG 315	20.61	5.97	179	180	- 1
12	Pioneer 3369A	25.88	6.85	206	195	11
13	Pioneer 3571	21.00	5.70	171	184	-13
14	Portwalco 425A	17.90	5.38	162	177	-15
15	Portwalco 450A	19.23	5.00	150	179	-29
16	Trojan TX 118	21.30	5.64	170	184	-14
17	Utahybrid 680	21.21	5.91	177	184	- 7
18	Utahybrid 54-50	22.18	5.59	168	186	-18
	$\bar{X}$ (Mean)----------		5.51			

Table 22. Analysis of variance - silage corn trial in Draper 1972

No.	Source	DF	S Sq.	M Sq.	F Value	Tabled F 0.05	Tabled F 0.01
18	Hybrids	17	17.8780	1.0506	1.28	1.96	2.61
3	Reps	2	11.1190	5.5595	18.75	3.25	5.26
	Error	34	10.0789	0.2964			
54	Total	53	39.0759				

Trial planted May 2, 1972, and harvested September 20, 1972.
Row spacings are 30 inches, with 2 rows per plot 790 feet long.
Fertilized with 200 pounds of available nitrogen and 45 pounds of available phosphate per acre.
The differences among hybrids were not significant.
The hybrid with the highest yield, tons per acre of dry weight was Pioneer 3369A.
The hybrid with the highest economic profit per acre was also Pioneer 3369A.

Table 23. Silage corn trial in Thatcher - Box Elder County 1972

No.	Hybrid	Yields -Tons/acre Green Weight	Yields -Tons/acre Dry Weight	$ Per Acre Total Rev.	$ Per Acre Total Cost	$ Per Acre Economic Profit
1	Coop D-212	25.12	6.47	194	194	0
2	Coop T-308	27.00	7.21	216	198	18
3	Funks G-4465	22.66	6.49	195	188	7
4	Funks G-5757	31.50	7.37	221	209	12
5	NK PX 610	23.50	6.64	199	190	9
6	NK PX 616	27.17	7.40	222	199	23
7	NK KT 626	21.82	7.02	210	186	24
8	PAG 315	25.43	7.27	216	194	22
9	PAG 7333	22.52	6.83	204	187	17
10	Pioneer 3369A	30.80	8.01	240	208	32
11	Portwalco 450A	25.76	6.96	208	195	13
12	Trojan M 114	27.74	7.89	236	201	35
13	Trojan TX 118	26.84	7.29	219	198	21
14	Utahybrid 54-40	29.53	7.91	237	204	33
15	Utahybrid 680	29.80	8.40	252	196	56
	$\bar{X}$ (Mean)----------		7.27			

Table 24. Analysis of variance - silage corn trial in Thatcher 1972

No.	Source	DF	S Sq.	M Sq.	F Value	Tabled F 0.05	Tabled F 0.01
15	Hybrids	14	13.9877	0.9991	1.91	2.05	2.77
3	Reps.	2	2.0329	1.0164	1.95	3.34	7.64
	Errors	28	14.5765	0.5206			
45	Total	44	30.5971				

Trial planted April 26, 1972, and harvested September 22, 1972.
Row spacings are 28 inches, with 2 rows per plot 2,540 feet long.
Fertilized with 167 pounds of available nitrogen and 135 pounds of available phosphate per acre.
The differences among hybrids were not significant.
The hybrid with the highest yield, tons per acre of dry weight was Utahybrid 680.
The hybrid with the highest economic profit per acre was also Utahybrid 680.

RESULTS OF STUDY WITH GRAIN CORN

Studies about grain corn are important in Utah because with the closing of sugar beet processing plants, some farmers have begun raising corn instead of sugar beets. Hybrid comparisons and economic analysis for grain production are therefore pertinent to those farmers producing grain corn.

Another important factor that encourages the production of grain corn in Utah is the actual concentrate or grain feed deficit related to the number of livestock (beef and dairy) raised in Utah (4).

One restricting factor in the production of grain corn is Utah's short growing season, however, with the hybrids which are available there is a good possibility to obtain improved yields and economic profits.

Tables 28 to 31 present grain yield, total revenue, total cost and economic profit for each hybrid. Economic profit was estimated on the basis of the average receipts and average costs and returns for grain corn production (Table 27) which consider an average yield of 100 bushels of grain per acre with a 15.5 percent moisture content.

To estimate marginal cost, increased seed cost was determined and interest at 8 percent of the variable cost, for a 6 month period.

Acres and Fixed Investment

The number of acres on 8 grain corn enterprises ranged from 5 to 80 acres. The average size was 20 acres per enterprise.

The average agricultural value was the same as for silage corn—$500.00 per acre.

Farmer's estimates, were used to determine equipment value and percent of time and use of the equipment devoted to growing grain corn. Total value of equipment used for all crops was $9,600.00 per farm. Twelve and a half percent of the total value of this equipment was assigned to the use of grain corn production. Value of grain corn equipment was $1,200.00 per enterprise or $60.00 per acre, Table 25. Fixed investment in land and equipment was $560.00 per acre.

Labor Requirement

Labor requirement for grain enterprises was divided into three classifications. First the land preparation, which included all operations until the land was prepared for planting, second was labor requirement for growing grain corn and third, was harvesting labor requirement. Labor was further classified as hired labor and that performed by the operator and his family, Table 26.

Total labor requirement for land preparation and growing stages had the same figures per acre, as in the silage corn production, or 2.65 hours of labor per acre for the land preparation stage and 5.40 hours of

Table 25. Investment in equipment used for growing grain corn in Utah 1972

Item	Average Per Farm For All Crops ($)	Average Per Farm ($)	Average Per Acre ($)
Power equipment	6,400.00	800.00	40.00
Tillage equipment	1,600.00	200.00	10.00
Other equipment	1,600.00	200.00	10.00
Total	9,600.00	1,200.00	60.00

labor per acre for the growing stage. Harvesting grain corn used 2.0 hours of labor per acre. This includes mechanical picking, hauling and unloading the grain corn. Harvest labor averaged one hour of family labor and one hour of hired 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.

Total labor requirement for producing grain corn was 1.80 hours of hired labor, 8.25 hours of family labor, with a sum of 10.05 hours of labor per acre of grain corn.

Table 26. Estimated hours of labor used to produce grain corn in Utah 1972

	Family Labor/Acre (man hours)	Hired Labor/Acre (man hours)	Total Labor/Acre (man hours)
Preparation:			
Plowing	0.80	0.10	0.90
Harrowing	0.70	-	0.70
Leveling	0.50	-	0.50
Fertilizing	0.30	-	0.30
Ditching	0.25	-	0.25
Sub Total	2.55	0.10	2.65
Growing:			
Planting	0.40	0.10	0.50
Cultivating	0.40	0.20	0.60
Spraying	0.20	0.10	0.30
Irrigating	3.70	0.30	4.00
Sub Total	4.70	0.70	5.40
Harvesting:	1.00	1.00	2.00
Total:	8.25	1.80	10.05

Cost of Production

The total variable cost of producing grain corn was determined in the same way as silage corn, or averaging the cost incurred by the 30 farmers involved in the study. Costs were divided as follows: Materials and Services, Power and Machinery and Labor, Table 27.

Materials and Services also include water cost and interest which totaled 40.92 per acre or 24.87 percent of the total cost of production.

Fertilizer was the highest cost item, its cost was $17.92 per acre, for 200 pounds of available nitrogen and $4.00 per acre for 45 pounds of available phosphate; total fertilizer cost was $21.92 per acre, which represents 13.32 percent of the total cost of production. Herbicide was less than one percent of total cost. Seed cost was $8.00 per acre and represents 5.25 percent of the total.

Power and Machinery costs included both owned and hired equipment and totaled $56.51 per acre or 34.34 percent of the total production cost. Costs for producing grain corn, using custom rates which averaged $9.00 per hour for the preparation and growing stages of the crop, and $16.60 per acre for the harvesting operation, and 25 cents per hundred pounds for the drying.

The Power and Machinery costs for the preparation stage was $16.53 per acre or 10.04 percent of the total cost. The growing stage was

Table 27. Average receipts, costs, and net return from grain corn production in 3 counties of Utah 1972

Item	Labor	Power and Machinery	Materials and Services	Total
		$/Acre		
Receipts:				
Grain Corn (100 bu.) $3.00 Cwt.				168.00
Variable Costs:				
Plowing	1.80	5.54		7.34
Harrowing	1.40	3.00		4.40
Leveling	1.00	6.34		7.34
Fertilizer				
200 lb. av. N. $60.00/ton			17.92	17.92
45 lb. av. P. $80.00/ton			4.00	4.00
Fertilizing	0.60	1.15		1.75
Seed 20 lb. 40¢/lb.			8.00	8.00
Planting	1.00	2.00		3.00
Cultivating	1.20	6.14		7.34
Spraying	0.60	1.24	0.50	2.34
Ditching	0.50	0.50		7.00
Irrigating	8.00			8.00
Water (Operation and Maint.)			6.00	6.00
Harvesting (Combine, Hauling)	4.00	16.60		20.60
Drying 25¢/cwt		14.00		14.00
Interest 8% on Var. Cost for 6 months			4.50	4.50
Total Variable Costs:	20.10	56.51	40.92	117.53
Fixed Costs:				
Interest on Land ($500 @ 7%/year)			35.00	35.00
Land Tax			5.00	5.00
Other			7.00	7.00
Total Fixed Cost:				47.00
Total Cost of Production				164.53
Net Return to Management				3.47
Return to Management, Family Labor and Land				54.97

$9.38 per acre or 5.70 percent of the total cost. The harvesting cost was $30.60 per acre or 18.60 percent of total production costs.

Labor cost for the three stages (preparation, growing and harvesting) was $20.10 per acre or 12.23 percent of the total cost of production. Family labor had a value of $16.50 per acre and hired labor was $3.60 per acre.

The fixed cost per acre was the same as for silage corn with a cost of $47.00 per acre or 28.56 percent of the total cost of production.

Interest on variable cost was calculated at an annual rate of 8 percent, but the money was only used for 6 months resulting in an interest cost for grain corn of $4.50 per acre.

Total cost for producing grain corn was $164.53 per acre or $1.645 per bushel.

Gross receipts for grain corn are increasing and were $168.00 per acre and the average net return to management was $3.47 per acre. The return to land, family labor and management was $54.97 per acre or $0.549 per bushel of grain corn with a 15.5 percent moisture content.

Characteristics of the Grain Corn Hybrid Seed Trials

Grain corn was planted during the early part of May, after the soil had been plowed, tilled and fertilized. Field corn was planted in rows normally from 26 to 36 inches wide, using corn drills that were set for desired plant population. After the corn had come up it was cultivated for

weed control purposes and to make ridges to facilitate irrigation. Weeds were also controlled by spraying, mainly with Atrazine.

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.

In most of the grain corn farms studied no determination of whether the corn would be cut for silage or grain was made until near harvest time.

Grain corn was harvested from the middle of October to the end of November.

Seed companies selected two or three hybrids thought to be best adapted to each test area and furnished the seed. Cropping history and fertilizer treatments are shown at the bottom of each trial report.

In 1971, three grain corn trials were established on private land in 1) Box Elder County, 2) Utah County, and 3) Uintah County. The results of these trials are shown in Tables 28, 29, and 30.

In 1972, the number of hybrids increased and one trial was established at Riverton, Salt Lake County. The results of this trial are shown in Table 31.

Table 28. Grain corn trial in Corrine - Box Elder County 1971

No.	Hybrid	Yield Bu/A 15.5% Moisture	$ Per Acre		
			Total Rev.	Total Cost	Ec. Profit
1	Funks G-4444	143	240	187	53
2	Double Circle S 205	144	242	189	53
3	Funks G-4240	131	220	182	38
4	Portwalco 90	119	199	177	22
5	Portwalco 120	133	223	183	40
6	Portwalco 100	118	198	178	20
7	Utahybrid 544A	111	186	174	12
8	Utahybrid 30-50	139	233	185	48
9	NK PX 20	116	194	176	18
10	NK PX 20	144	242	189	53
11	Utahybrid 330	114	191	175	16

Trial planted May 12, 1971, and harvested November 10, 1971.
Rows spacings are 30 inches, with 4 rows per plot 1,000 feet long.
Fertilized with 238 pounds of available nitrogen per acre.
The hybrid with the highest yield in bushels per acre, 15.5 percent of moisture were NK PX 610 and Double Circle S 205.
The hybrids with the highest economic profit per acre were Funks G-4444, Double Circle S 205 and NK PX 610.

Table 29. Grain corn trial in Benjamin - Utah County 1971

No.	Hybrid	Yield Bu/A 15.5% Moisture	$ Per Acre		
			Total Rev.	Total Cost	Ec. Profit
1	Funks G-4240	127	213	180	33
2	Utahybrid 54-40	116	194	176	18
3	Portwalco 100	114	191	175	16
4	Portwalco 90	128	215	181	34
5	Utahybrid 330	134	225	184	41
6	Portwalco 444	118	198	177	21
7	Utahybrid 680	105	176	172	4
8	PAG 271	138	231	185	46
9	NK PX 50	148	248	189	58
10	DeKalb XK 363	140	235	186	49
11	NK PX 610	152	255	191	64
12	PAG 5X 52	157	263	193	70
13	DeKalb XL 45	152	255	191	64
14	Funks G-4263	146	245	188	57
15	Funks G-4444	174	292	200	92
16	Double Circle S 205	140	235	184	51

Trial planted May 5, 1971, and harvested November 3, 1971.
Rows spacings are 30 inches, with 4 and 8 rows per plot of various lengths.
Fertilized with 200 pounds of available nitrogen per acre.
The hybrid with the highest yield in bushesl per acre, 15.5 percent of moisture was Funks G-4444.
The hybrid with the highest economic profit per acre was Funks G-4444.

Table 30. Grain corn trial in Naples - Uintah County 1971

No.	Hybrid	Yield Bu/A 15.5% Moisture	$ Per Acre Total Rev.	Total Cost	Ec. Profit
1	Funks G-4180	114	192	175	17
2	Portwalco 425A	98	165	168	- 3
3	Utahybrid 544A	104	175	171	4
4	Nk PX 446	111	187	174	13
5	Portwalco 450A	78	131	159	-28
6	Utahybrid 330	99	166	169	- 3
7	Double Circle D-200	87	146	163	17
8	Funks G-4360	67	113	154	-41
9	Utahybrid 216	77	130	159	-29
10	NK KE 449	80	135	161	-26

Trial planted May 7, 1971, and harvested November 24, 1971.
Rows spacings are 30 inches, with 8 rows per plot 1225 feet long.
Fertilized 80 pounds of available nitrogen and 4 tons sheep manure per acre.
The hybrid with the highest yield in bushels per acre, 15.5 percent of moisture was Funks G-4180.
The hybrids with the highest economic profit per acre were Funks G-4180 and Double Circle D-200.

Results of Trials, 1972

Table 31. Grain corn trial in Riverton - Salt Lake County 1972

No.	Hybrid	Yield Bu/A 15.5% Moisture	$ Per Acre		
			Total Rev.	Total Cost	Ec. Profit
1	Coop S-102	168	282	197	85
2	Coop S-201	180	302	203	99
3	DeKalb XL 15A	170	285	198	87
4	Funks G-4343	172	288	199	89
5	Funks G-4444	182	305	203	102
6	NK PX 420	164	275	196	79
7	NK PX 448	172	288	199	89
8	PAG SX 53	172	288	199	89
9	PAG 7333	141	236	186	50
10	Pioneer 3571	171	287	198	89
11	Pioneer 3773	150	252	190	62
12	Portwalco 450A	147	246	189	57
13	Trojan M 114	143	240	187	53
14	Utahybrid 54-40	142	238	187	51

Trial planted April 24, 1972, and harvested in various dates.
Rows spacings are 30 inches, with 6 rows per plot 2000 feet long.
Fertilized with 265 pounds of available nitrogen and 90 pounds of available phosphate per acre.
The hybrid with the highest yield in bushels per acre, 15.5 percent of moisture was Funks G-4444.
The hybrid with the highest economic profit per acre was also Funks G-4444.

SUMMARY AND CONCLUSIONS

The objectives of this study were to estimate the 1972 costs and returns from silage and grain corn production in Utah, and to analyze the physical response and economic relationships of selected corn hybrids for silage and grain production in Utah.

Average size of the silage corn enterprises was 40 acres. Land values averaged $500.00 per acre. Average equipment value was $60.00 per acre.

Labor requirement for land preparation, growing and harvesting of silage corn averaged 2.65, 5.40 and 6.00 man hours per acre respectively, resulting in a total labor requirement of 14.05 man hours per acre.

Total variable costs and total fixed costs of silage corn production were $130.23, and $47.00 per acre respectively.

The total cost of production for silage corn was $177.23 per acre. On a percentage basis, costs were: Materials and Services $41.42 per acre or 23.40 percent of the total cost of production, Power and Machinery $60.71 per acre or 34.25 percent of total cost of production, and labor was $28.10 per acre or 15.85 percent of total.

Net return to management for silage corn production was $59.08 per acre, and return to family labor, land and management was $80.27 per acre.

In the 1971 silage corn trials the hybrid with the highest yield (tons per acre of dry weight) and economic profit (dollars per acre) were: Funks G-5757 in Weber county, DeKalb KT-664 in Utah county, NK PX 610 in Sanpete county and Funks G-4240 in Iron county. In Uintah county Funks G-4465 was the highest yielding variety and NK PX 610 had the highest economic profit.

In the 1972 silage corn trials the hybrids with the highest yields (tons per acre of dry weight) and economic profit (dollars per acre) were: NK KT 626 in Weber county, Coop T-308 in Utah county, Utahybrid 330 in Morgan county, DeKalb 442 in Millard county, Pioneer 3369 A in Salt Lake county and Utahybrid 680 in Box Elder county. In a second trial at Utah county the hybrid with a highest yield was Pioneer 3369 A and the hybrid with the highest economic profit was NK PX 616. In Wasatch county none of the hybrids had economic profit and the highest yielding variety was Pioneer 3571. In Weber county the hybrid with the highest yield was NK 1248 but the hybrids with the highest economic profit were Funks G-5207 and Jacques JX 403.

For the grain corn enterprises the average size of farm was 20 acres and averaged $500.00 per acre. Average equipment value was $60.00 per acre. Labor requirement for land preparation, growing and harvesting averaged 2.65, 5.40 and 2.00 man hours per acre respectively, resulting in a total labor requirement of 10.05 man hours per acre to produce grain

corn. Total variable costs and total fixed costs of grain corn production were $117.53 and $47.00 per acre respectively.

The total cost of production for grain corn was $164.53 per acre. Analysis of costs showed Materials and Services $40.92 per acre or 24.87 percent of the total production costs, Power and Machinery $56.51 per acre or 34.34 percent of total production costs, and Labor $20.10 or 12.23 percent of the total costs of production.

Net return to management for grain corn production was $3.47 per acre, and return to family labor, land and management was $54.97 per acre.

In the 1971 grain corn trials the hybrids with the highest yield (bushels per acre at 15.5 percent moisture) and the highest economic profit (dollars per acre) were: Funks G-4444, Double Circle S-205 and NK PX 610 in Box Elder county, Funks G-4444 in Utah county and Funks G-4180 and Double Circle D-200 in Uintah county.

In the 1972 grain corn trial, Funks G-4444 in Salt Lake county, was the hybrid with the highest yield and the highest economic profit.

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