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Cost and Efficiency of Producing Canning Peas in Cache and Box Elder Counties, Utah, 1951

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COST AND EFFICIENCY OF PRODUCING CANNING PEAS

IN CACHE AND BOX ELDER COUNTIES, UTAH, 1951

by

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ACKNOWLEDGMENT

TABLE OF CONTENTS

INDEX OF TABLES

Page

INTRODUCTION

The production of canning peas has an important place in the economy of Utah, particularly in the counties along the western slopes of the Wasatch Mountains. The enterprise is one which adds intensity to Utah's small farms. This intensification is accomplished with little additional equipment or labor other than that owned or supplied by the farm operator and his family. The crop is seeded in early spring and harvested in early summer leaving the ground available for summer fallowing or planting to a short-season crop such as grain pasture. Peas are a satisfactory nurse crop for small-seeded legumes such as alfalfa.

Of the canning crops grown in Utah during 1951 the canning pea enterprise, valued at $1,309,000 was second only to the tomato enterprise in value of product (table 1).

Table 1.- Acreage and value of canning crops produced in Utah, 1951 1/

Crop	Acres	Percent of total acres	Value thousand	Percent of total value
	Acres	Percent	Dollars	Percent
Snap Beans	600	2	223	4
Sweet Corn	6000	25	690	14
Peas	9300	39	1309	26
Tomatoes	7600	32	2749	55
Green Lima Beans, Beets, and Cucumbers	510	2	71	1
Total	24010	100	5042	100

Utah Crop Report 1951
1/ All figures are preliminary.

Approximately 3500 acres of canning peas were produced in Cache and Box Elder Counties in 1951 with an estimated value of $600,000.

Utah with nearly 12,000 acres producing peas in 1950 ranked seventh in acreage of canning peas in the United States (4,p.250). The states which in 1950 produced more acres than did Utah were Wisconsin, Washington, Oregon, Minnesota, Illinois, and New York.

Table 2.- Acreage, production, and value of canning peas in Utah, 1922-1951

Year	Acres	Tons of shelled peas		Price per ton	Total value thousand
		Total	Per acre		
	Acres	Tons	Tons	Dollars	Dollars
1922	6,660	9,300	1.4	57.68	536
1923	7,260	10,900	1.5	58.60	639
1924	10,360	12,400	1.2	57.75	716
1925	10,750	17,200	1.6	56.05	964
1926	9,510	12,400	1.3	58.27	723
1927	8,460	10,152	1.2	53.84	547
1928	10,150	13,018	1.3	60.00	781
1929	11,670	13,158	1.1	56.00	737
1930	13,070	17,971	1.4	56.00	1006
1931	7,200	7,344	1.0	52.00	382
1932	6,500	7,080	1.1	46.40	329
1933	9,300	9,070	1.0	41.50	376
1934	10,500	11,020	1.0	53.00	584
1935	13,600	22,640	1.7	49.40	1118
1936	12,700	12,060	.9	47.60	574
1937	13,960	18,500	1.3	52.50	971
1938	14,250	20,660	1.4	54.20	1120
1939	9,100	11,880	1.3	46.10	548
1940	12,400	13,760	1.1	48.20	663
1941	13,500	19,170	1.4	46.90	899
1942	15,200	21,200	1.4	58.00	1230
1943	16,200	25,350	1.6	74.60	1891
1944	16,200	24,300	1.5	78.60	1910
1945	15,300	24,020	1.6	76.70	1842
1946	13,700	17,260	1.3	76.50	1320
1947	11,800	18,880	1.6	86.90	1641
1948	8,900	10,320	1.2	83.30	860
1949	10,300	16,070	1.6	86.90	1396
1950	11,500	15,980	1.4	72.60	1160
1951 1/	9,300	14,000	1.5	93.50	1309

1/ Preliminary.
Agricultural Statistics.

Yield expressed in tons of shelled peas per acre has been relatively constant during the period of 1922-1951 (table 2). An average of the yields per acre for the period was 1.4 tons of shelled peas per acre with a range from 0.9 tons to 1.6 tons.

OBJECTIVES AND SCOPE OF THE STUDY

The objectives of the study were: (1) to determine the units of physical inputs used in the production of canning peas, (2) to calculate the costs and returns of canning pea production based on 1951 level of prices, and (3) to discover by analysis of the data those factors or combination of factors associated with profitableness of the enterprise.

Information showing the inputs of labor and capital required to produce a crop of canning peas is valuable. When the input requirements are known it is possible to calculate cost of production for a current period by adjusting the money costs of the inputs to current levels of prices. Relative profitableness of the crop may be ascertained for any year by adjusting prices of inputs and outputs.

The data on which this study was based were collected in Cache and Box Elder Counties, Utah, from growers of canning peas who produced during 1951 at least one acre of canning peas on contract with a canning company.

REVIEW OF LITERATURE

Several research studies on economic aspects of canning pea production have been conducted in various sections of the United States. Three studies are reviewed herein to present some of the pertinent data from each.

The first study to be reviewed was made in Cache and Box Elder Counties, Utah, for the crop years 1946 and 1947 (3). The study was based on 100 enterprise records obtained by the survey method in Cache and Box Elder Counties for the year 1946. The 1947 data were obtained from a survey made in the two county area to note changes which would affect the costs and returns of the enterprise. The study reported a labor requirement of 25.9 hours and total cost of $86.31 per acre in 1946. The 1947 data indicated a 5.5 percent increase in costs over 1946. The net return per acre which was calculated by subtracting total costs from total receipts for the two years was $50.00 and $53.89 respectively. The study reported an average size of 5.7 acres. Factors that were associated positively with success in the enterprise were size of the enterprise and yield per acre. When the records were sorted on the basis of hours of man labor per acre net returns increased at first and then decreased as man labor increased. A similar relationship was noted when the records were sorted on the basis of average grade of peas delivered as measured by average price per ton.

A study made in three canning pea producing areas in Wisconsin for the 1944 crop year reported per acre costs of $45.45 in one area, $42.78 in a second area, and $50.92 in the third area. Net returns, which included

the return to land, were $40.25, $21.15, and $22.80 for the three areas
(5). The study was based on interviews with 216 farmers and indicated an
average labor requirement of about 16 hours. The peas were grown without
irrigation in all three areas with yields less than a ton per acre.

The costs of producing an acre of peas in Maryland, as reported by
a study made in that state for the years 1925, 1926, and 1927 were $42.94,
$42.42, and $45.81 respectively (1). The cost of production figures do
not include interest charges for the use of money invested in the crop.
The net income, which was calculated by subtracting expenses of growing
the crop from cash receipts, from an acre of canning peas was $28.46
in 1925, $11.45 in 1926, and $27.24 in 1927. The peas were grown without
irrigation in Maryland also. Labor requirement per acre was about 30 hours.

There is, of course, considerable difference between the production
of canning peas in Utah and Eastern states such as Wisconsin and Maryland.
The differences in the areas limit the application of studies made in the
Eastern states to Utah conditions.

METHOD OF PROCEDURE

The data for this study were obtained by the survey method from 92 producers of canning peas in Cache and Box Elder Counties. Forty-eight records were obtained in Cache County and 44 records in Box Elder County. Trained personnel interviewed each producer and with the aid of a schedule obtained detailed information about inputs of labor and capital, cultural methods and practices, and receipts from the enterprise.

A stratified cross-section sample was obtained in the two county area. The growing areas were outlined geographically according to community and the relative importance of each producing area was established. Following these preliminary steps enough growers were contacted to obtain a sample proportional to the universe (table 3). Inquiries were made in an area until finding a grower of canning peas who was willing to cooperate with the study. They obtained the information needed and then asked which was the next farm that had grown canning peas during 1951. The enumerator then went to the next farm and talked to the grower to obtain his cooperation.

After the data were collected the records were edited and summaries made and checked. All pertinent information was tabulated to obtain totals and averages.

To discover relationships which were present in the data sorting was done by grouping the records by one factor (causal) and noting the association of that factor with success as measured by net returns per acre. Changes in other pertinent factors were also noted.

Table 3.- Location and number of canning pea records, Cache and Box Elder
Counties, 1951.

Area or community	No. of records
Cache County:	
Avon, Paradise, and Hyrum	8
Wellsville and Mendon	3
Providence, Nibley, and College Ward	10
Benson	6
Smithfield	7
North Logan and Hyde Park	7
Newton	3
Richmond	4
Subtotal	48
Box Elder County:	
Bear River City	9
Honeyville and Deweyville	6
Garland and East Garland	11
Riverside and Fielding	7
Tremonton and Bothwell	11
Subtotal	44
Total	92

ANALYSIS AND PRESENTATION OF DATA

The data were analyzed to determine the quantities and costs of
inputs and to determine total receipts from shelled peas and the vines.
The results of this analysis are presented first and are followed by an
analysis of various factors which were found to be important in determin-
ing profitableness of the enterprise.

Description of the enterprise

Canning peas are grown in Cache and Box Elder Counties, under
contract to canning companies, on farms having a variety of soil and water
conditions. The land is fertilized before plowing and the seedbed is
prepared by harrowing and floating as is necessary.

The pea seed is made available to the grower by the canning company at
a uniform price. The peas are planted with a grain drill at an average rate
of 4 to 5 bushels of seed per acre. During the growing season the land is
generally flood irrigated two or three times to provide adequate moisture
for growth. Some fields are subirrigated where conditions favor this method
of irrigation. Dusting is done by the canning company at a standard rate
of $4 per acre on fields which are threatened by insects.

The vines were cut with a mowing machine on about 90 percent of the
enterprises. Those not mowed were pulled with a tractor or truck operated
power fork. The vines that were mowed were either loaded by hand labor
with a pitchfork or were loaded with a trail-type hay loader. About 25
percent of the records indicated the use of loaders to load vines that had
been mowed. The vines that were pulled with a power fork were
elevated to the load by the power fork. The vines were delivered to the
viner station and unloaded by farmer. As the vines passed through the viner

the peas were shelled, fanned, and boxed for delivery to the canning factory, and the vines and other refuse were conveyed to a stack near the viner shed. The canning crops associations were responsible for stacking the vines and for allocating and weighing the silage. A charge was made to pay the costs of this service.

Analysis of man labor requirements

The average labor requirement was about 25 hours per acre. This is the amount of labor required to perform the operations usually performed to prepare the land, plant, grow, and harvest the crop. The farmer and his family supplied approximately 22 hours or 88 percent of the total labor required to produce an acre of canning peas.

Man labor requirements were classified into three classes which were: (1) preparing the land, (2) planting and growing the crop, and (3) harvesting the crop (table 4).

The operations performed to prepare the land include manuring, spreading commercial fertilizers, plowing, harrowing, leveling, ditching, and miscellaneous operations performed prior to planting. As a group the above operations required 6.8 hours of man labor. Considering all records the average man labor requirement for manuring was 2.5 hours, plowing 1.7 hours, harrowing 1.2 hours, leveling 0.7 hours, ditching 0.5 hours, and commercial fertilizing 0.2 hours.

The operations of drilling and irrigating were grouped together under planting and growing. The labor required to perform these operations was 4.9 hours with irrigation accounting for about 86 percent of the total labor requirements for the class.

The harvesting operations include cutting or pulling, loading, hauling, and unloading of the vines. The harvesting operations must be performed within a relatively short period of time when the peas are at the proper

Table 4.- Total hours of man labor required to produce an acre of peas, Cache and Box Elder Counties, Utah, 1951.

Operation	Man hours per acre		Percent each is of the total		Percent each is of group classification	
	Hours	Hours	Percent	Percent	Percent	Percent
Preparation:						
Manuring	2.5		10.2		36.8	
Fertilizing	.2		.8		2.9	
Plowing	1.7		6.9		25.0	
Discing and harrowing	1.2		4.9		17.6	
Leveling	.7		2.8		10.3	
Ditching	.5		2.0		7.4	
Subtotal		6.8		27.6		100
Planting and growing:						
Drilling	.7		2.8		14.3	
Irrigating	4.2		17.1		85.7	
Subtotal		4.9		19.9		100
Harvesting:						
Cutting or pulling	1.7		6.9		13.2	
Loading	5.0		20.4		38.7	
Hauling	1.6		6.5		12.4	
Unloading	4.6		18.7		35.7	
Subtotal		12.9		52.5		100
Grand total labor		24.6		100.0		100

stage of maturity. The labor required for harvesting was 52 percent of the total labor requirements for an acre of canning peas. The operations of loading and unloading averaged 10 hours of man labor per acre, cutting or pulling 1.7 hours, and hauling 1.6 hours.

Analysis of cost factors

The inputs of canning pea production and their costs at 1951 level of prices were analyzed and are presented in four groups as follows: (1) material costs, (2) overhead costs, (3) labor costs, and (4) power and machine costs (table 5).

Material costs. The cost of materials included cost for seed, fertilizers, and fees. Seed cost per acre was 69 percent of the cost of

Table 5.- Cost of producing canning peas, Cache and Box Elder Counties, Utah, 1951.

Item	Cost per acre	Cost per ton	Percent of total cost per acre	Percent each is of group cost per acre
	Dollars	Dollars	Percent	Percent
Material costs:				
Manure	8	4	6.8	20.5
Com. fertilizer	3	2	2.6	7.7
Seed	27	15	23.1	69.2
Fees	1	1	.8	2.6
Total	39	22	33.3	100.0
Overhead costs:				
Int. on money in crop	1	1	.8	3.3
Int. on cap. investments	21	12	17.9	70.0
Land taxes	3	1	2.6	10.0
Water and drainage taxes	2	1	1.7	6.7
Misc. overhead	3	1	2.6	10.0
Total	30	16	25.6	100.0
Labor costs:				
Operator and family	23	13	19.7	92.0
Hired	2	1	1.7	8.0
Total	25	14	21.4	100.0
Power costs:				
Tractor	17	10	14.6	73.9
Truck	4	2	3.4	17.4
Horses	2	1	1.7	8.7
Total	23	13	19.7	100.0
Grand total	117	65	100.0	

materials. The average seeding was 4.4 bushels of pea seed per acre. The canner sold the seed to the grower at a contract price of $6.185 per bushel and made recommendations as to the planting rate.

Manure cost per acre was next in importance as a material cost. Manure was valued in the corral at $1.30 per ton. An application of manure usually has beneficial effects for several years. The enterprise which receives the benefits should stand the costs of the manure. Data

were obtained relative to manure applications for the two years preceeding 1951 and the value of manure was charged to the canning pea enterprise on the following basis; 50 percent of the 1951 application, 30 percent of the 1950 application, and 20 percent of the 1949 application. Manure cost averaged eight dollars per acre.

The cost of commercial fertilizers was charged at the market price for the kind and quality applied. Farm operators applied approximately twice as much phosphorus as they did nitrogen to the canning pea enterprise. The total cost of the 1951 application which averaged 87.4 pounds per acre was $3.

The grower authorizes the canner to withhold and pay to the canning crops association a fee equal to 1 percent of his gross receipts from shelled peas less the cost of seed. The average deduction for fees was $1 per acre.

Overhead cost.   Overhead costs were second in importance as a group of costs. Interest charges for operating capital and capital investment, taxes, and miscellaneous overhead costs make up the total overhead costs. Interest on capital investment was $21 per acre which represents a charge of 5 percent interest on a $420 investment. The average value of farm land as estimated by the farm operators was about $408 per acre.

Interest was also charged for money used in growing the crop. Money used in the production of canning peas was not available for use by the farmer for other purposes until after harvest, therefore an interest charge of 5 percent was made for the number of months the money was used. For example, costs incurred at the time of preparing the land were charged interest for a longer period of time than were costs incurred later. The average interest charge as calculated was $1 per acre.

The average land taxes per acre were $3 while water charges averaged

$2 per acre.

Depreciation rates charged to machine sheds and horse-drawn machinery were 3 percent and 10 percent respectively and were comparable to the rates farmers used for income tax purposes. Only the proportionate share of the depreciation costs were charged against the canning pea enterprise. Horse-drawn equipment repairs were treated in a similar manner. Some items of overhead cost are difficult to assign to any one particular enterprise of a diversified farm. A charge equal to 10 percent of the total of all other overhead charges for the enterprise was added to the overhead costs to offset any use of farm capital which was not directly chargeable to the canning pea enterprise.

Labor cost.   Labor costs are directly related to the number of hours of labor required. There was more variation in number of hours of man labor used than in the rate per hour. Labor costs were obtained by asking the canning pea growers how many hours of man labor were required to perform each operation and the rate charged for that particular type of labor. The growers estimates were based on what he would have paid had he hired labor or what he could have made in alternative types of employment.

Canning peas were produced with family labor primarily. The average labor cost was $25 per acre with 92 percent of the labor cost being accounted for by the grower or his family.

Power and machine costs.   Total power and machine costs were calculated by adding together all tractor, truck, and horse costs.

Tractor costs represent charges for the tractor, its attachments and tractor drawn implements. The rate charged for the various operations was the custom rate for the area. The farmer told the enumerator how long

each operation would take in hours and what he would have to pay to hire the work done or what he would charge to do the same work for others. The value of the tractor operators time was classified as a labor cost.

Tractors were quite generally used as a source of power for the canning pea enterprise. Costs for the use of tractors were $17 per acre which is approximately three-fourths of the total power costs per acre charged to the enterprise.

Truck costs were incurred to haul the vines to the viner station. The average truck cost per acre amounted to $4. The rate charged for trucks was determined from farmers estimates similar to the way tractor costs were determined.

Horse costs represent charges to the enterprise for the use of horses as a source of power. The rate charged represented the value of the horse labor only and does not include the value of horse-drawn equipment. The charge for horse-drawn equipment was a part of overhead costs as explained previously.

Receipts

Total receipts were calculated by adding the net value of the vines as silage to the value of the shelled peas (table 6). The value of the shelled peas was obtained from records showing the number of pounds, grade, and price of the peas delivered. The price of the peas was based on a tenderometer reading of a sample from each load delivered to the viner. The contract prices ranged from $60.00 to $130.00 per ton. All canning peas harvested in Utah were sold by grade based on tenderometer readings. The tenderometer measures relative tenderness of the peas by determining the pounds of pressure or pull required to crush a sample of the shelled peas. The average price per ton in 1951 in Cache and Box Elder

Table 6.- Total receipts, costs, and net return from canning peas, Cache and Box Elder Counties, Utah, 1951.

Item	Per acre	Per ton of shelled peas
	Dollars	Dollars
Receipts from peas	164	94
Value of vines as silage	11	6
Total receipts	175	100
Total costs	117	67
Net return	58	33

Counties was $94 which was approximately the price for number 7 grade peas. The tenderometer reading for number 7 grade peas was 104, 105, or 106 pounds.

The net value of the vines as silage was determined by the feeding value of the silage less the charges made by the canning crops association for stacking the vines, and measuring, allocating, and weighing the silage. In Cache County the farmer was alloted a certain weight of silage for each ton of shelled peas delivered based on the size of the stack at each viner in relation to the number of tons of shelled peas removed from the pods at that particular viner. In Box Elder County the canning crops association pays the farmer for his silage at the rate of $3.50 per ton less the charges for stacking, measuring, allocating, and weighing. The grower had first opportunity to purchase the silage at $3.50 per ton if he so desired.

Net return

Total receipts less total costs equal net return. Net return per acre ranged from a minus $79 to $201 with an average of $58. Eighteen records showed a negative net return per acre. The net return as

calculated may be considered as a return to management since returns to the other factors of production have been included in the calculation of costs.

Returns to operator and family labor, capital, and management

The canning pea enterprise in addition to earning a net return of $58 per acre also provided employment for the operator and family labor and capital (table 7). Although labor and capital costs were charged to the enterprise they were returns to the farmer and his family as wages and as interest to the extent that he owned the capital which he used.

Table 7.- Return to operator and family labor, capital, and management from canning peas, Cache and Box Elder Counties, Utah, 1951.

Item	Per acre	Per ton
	Dollars	Dollars
Net return	58	33
Cost of operator and family labor	23	13
Return to operator and family labor and management	81	46
Charge for use of capital	22	13
Total return to capital and management	80	46
Return to capital, operator and family labor, and management	103	59

When the cost of the operator and family labor was added to the net return there was an average return to the operator and his family for labor and management of $81 per acre (table 4). By adding to the $81 return an interest charge for both operating and fixed capital, a return to the operator and his family's labor and management and to capital resulted. No determination was made as to what percent of the capital used in the enterprise was owned by the farmer and his family, making it impossible to determine exactly what part of the return to capital was actually retained by the operator and his family. Except for the return

to borrowed capital, if any, $103 per acre represents cash which the operator and family received from the canning pea enterprise, for their labor, capital, and management.

Factors associated with success in the production of canning peas

By classifying or sorting the data into groups according to one factor and calculating averages of other factors it is possible to discover and analyze relationships that are present in data.

Several sorts were made of the canning pea records to discover factors which were important in determining success in the enterprise.

Size of enterprise.   Workers in the field of Farm Management have noted that generally the larger farms are associated with higher net returns than the small farms (2,p.68-91). The above statement of principle assumes that favorable economic and agricultural conditions are existent or that a measure of size has been used which compensates for unfavorable conditions. The advantages of large farms accrue primarily from economies in the use of the factors of production - labor and capital -, economies in financing, reduction of risk, use of by-products, and advantages in buying and selling.

Since the above principle exists in the total farm business a similar relationship may exist on an enterprise basis. To the extent that there is a relationship between the size of the farm and the size of the enterprise on the farm, the same association would be expected to exist. Of the advantages enumerated above it is expected that economies in the use of the factors of production - labor and capital - are the only ones which might accrue to the individual enterprise. Economies in the use of labor and capital would accrue from larger fields which would lend themselves to the use of machines thereby reducing the number of hours of man labor per acre (table 8).

Table 8.- Relationship of acres per enterprise and net returns and other factors, Cache and Box Elder Counties, Utah, 1951.

Range in acres per enterprise	Acres of peas	Number of farms	Tons shelled peas per acre	Average price per ton of shelled peas	Man hours per acre	Degree harv. mech.	Cost of fert. per acre	Total receipts per acre	Total cost per acre	Net returns per acre
	Acres	No.	Tons	Dollars	Hours	Percent	Dollars	Dollars	Dollars	Dollars
Less than 4.0	2.5	22	1.5	101.00	33.8	94	11.41	157	130	27
4.0 - 5.9	4.5	30	2.0	91.20	26.7	92	10.40	188	118	70
6.0 - 9.9	7.4	23	1.8	95.00	25.6	90	10.92	178	122	56
10.0 and over	13.2	17	1.7	95.20	20.3	98	8.64	169	109	60
All farms	6.4	92	1.8	93.60	24.6	93	10.48	175	117	58

By grouping the records according to the number of acres of canning peas it was possible to note the association of size of the enterprise with net returns per acre from the enterprise.

There was no consistent association between the size of the canning pea enterprise, as measured by number of acres, with net returns per acre, total receipts per acre, or total costs per acre. There was, however, a consistent negative relationship between number of acres in the enterprise and the number of hours of man labor per acre. Farms with less than 4.0 acres of canning peas averaged 33.8 hours of man labor per acre whereas farms with 10.0 acres or more of peas used 20.3 hours of man labor per acre.

There was no association between the size of the enterprise and tons of shelled peas per acre or between the size of the enterprise and the tenderness of the shelled peas as measured by tenderometer values.

Harvesting in each instance was 90 percent or more mechanized. The range was from 90 percent to 98 percent mechanization with an average mechanization for all farms of 93 percent. Mechanization expressed as a percentage was measured by dividing truck and tractor costs by total truck, tractor and horse costs and the quotient multiplied by 100. There was no association between the size of the enterprise and the degree of mechanization.

There was a negative association of the cost of fertilizers, including manure, applied by farm operators to the canning pea enterprise as size of the enterprise increased. It was evident that the farm operators on the farms with larger pea enterprises did apply more commercial fertilizers to canning peas on a per acre basis than did the farm operators on the farms which had the smaller canning pea enterprises.

Tons of shelled peas per acre.   High yields per acre are an important

factor in determining success in farming. A positive relationship exists between high productivity per acre and success in farming (2,p.109-124).

Yield affects costs and receipts. Some costs remain relatively constant regardless of yield i.e., it takes nearly the same inputs of labor and capital to produce a high yield as to produce a low yield. Some operations do require more labor and capital for high yields as compared to low yields but costs increase less than proportional compared to the increase in receipts. Yield has a direct affect on receipts since production per acre multiplied by price per ton is receipts per acre. It is evident that yield through its effect on receipts and also on costs is related to net returns.

A similar relationship could be assumed to exist in the canning pea enterprise and the data presented in table 6 support this supposition.

By grouping the records according to tons of peas produced per acre it was possible to note the affect of yields per acre on net returns per acre (table 9). It was also possible to note association or lack of association between yield and the other factors included in the table.

The farms with a per acre production of 0.5 tons had a minus $54 net returns per acre as compared with $120 per acre for the high yield class which had a production of 2.6 tons per acre. The classes between the high and low yields indicated a consistent increase in net returns per acre as yields per acre increased.

There was a consistent decrease in the average price per ton for shelled peas as yield per acre increased. This is indicative that the farm operators on the farms with higher yields were harvesting peas of a lower grade than farm operators on farms with lower yields were harvesting. Peas gain in weight as they become more mature.

Table 9.– Relationship of yield and net returns and other factors, canning peas, Cache and Box Elder Counties, Utah, 1951.

Range in tons per acre	Average tons per acre	Number of farms	No. of acres per Enterprise	Average price per ton of shelled peas	Man hrs. labor prep. per acre	Man hrs. labor growing per acre	Man hrs. labor harv. per acre	Man hrs. labor total per acre	Fert. cost per acre	Net returns per acre
	Tons	No.	Acres	Dollars	Hours	Hours	Hours	Hours	Dollars	Dollars
Less than 0.9	.5	8	3.6	102.20	7.3	3.1	9.5	19.9	7.43	-54
0.9 - 1.3	1.1	15	8.2	100.20	8.0	2.6	11.7	22.3	10.31	- 2
1.4 - 1.7	1.6	24	5.1	96.80	6.8	2.9	15.4	25.1	8.84	50
1.8 - 2.2	2.0	26	7.4	94.00	8.1	1.8	16.0	25.9	12.90	78
2.3 and over	2.6	19	6.3	88.20	8.5	2.9	14.0	25.4	10.64	125
All farms	1.8	92	6.4	93.60	7.7	2.7	14.2	24.6	10.48	58

As yields per acre increased there was an associated increase in the total hours of man labor required per acre. When considering the preparing, growing, and the harvesting operations separately it was noted that there was very little change in the hours spent in preparing the ground prior to planting between the low and the high yields. This can be partially explained by the fact that the pea seed is a relatively large seed and does not require as fine or as compact a seedbed as is required by smaller seeds. Farmers should and apparently do prepare an adequate seedbed, but further refinement beyond the point of adequacy only adds to the cost with no compensation in the receipts.

There was no association between yield and the time required to perform the growing operations. It requires the same amount of time to plant and irrigate low yield peas as it does high yield peas. Some costs of production are relatively constant regardless of yield.

There was a positive relationship between yield and the number of hours of man labor required to harvest the crop. On enterprises with yields of 0.5 tons per acre, 9.5 hours of man labor were required to harvest each acre of peas while on enterprises with yields of 1.6 tons or more per acre approximately 15.0 hours were required to perform the harvesting operations.

The increase in the time required to harvest the higher yielding acres is due apparently to a heavier or thicker growth of vines rather than a better set of pods on the vines. The heavier vine growth resulted in more loads per acre which must be loaded, hauled, and unloaded and as a result the hours required for harvesting increased.

There was no association between yield and size of the enterprise which indicates that large acreages were not an important factor in accounting for the variation in yields per acre.

There was no relationship between yield per acre and the cost of fertilizers applied to the land by the farm operators. Average cost of fertilizers was $10.48 per acre.

Grade of peas delivered.   Many agricultural products are sold on the basis of quality which is often designated by a grade number. Other things being equal the better grades of a particular product sell for more per unit than do lower grades of the same product. The farmer is confronted with the problem of what grade to produce. He should consider the relationship between costs and returns for the various grades. Under some conditions it may be advisable for him to produce a medium grade rather than either the extreme high or low grades.

Canning peas are sold on the basis of grade in Utah. Each load delivered is graded on the basis of a sample by use of a tenderometer. The tenderometer measures relative tenderness by determining the pounds of pressure or pull required to crush the peas. Current unpublished research of the Utah Agricultural Experiment Station has indicated that there is an association between tenderness and the other factors such as color, starch content, etc. which are also measures of quality.

Peas are graded numerically from 1 to 12 with the number 1 grade indicating the most tender peas. Prices per ton ranged from $130 for number 1 peas to $60 for number 12 peas.

As a general rule, the tons of peas produced per acre increase as the average tenderness decreases and the grade number increases. It is the problem of balancing volume against grade that must be solved by the farm operator.

By grouping the records according to grade it was possible to note changes in net returns per acre as price per ton changed (table 10).

Table 10.- Relationship of grade and net returns and other factors, Cache and Box Elder Counties, Utah, 1951.

Grade	Average price per ton	No. of farms	No. of acres per Enterprise	Yield per acre	Fert. cost per acre	Man hrs. labor harv. per acre	Man hrs. labor total per acre	Total receipts per acre	Total costs per acre	Net returns per acre
	Dollars	No.	Acres	Tons	Dollars	Hours	Hours	Dollars	Dollars	Dollars
Less than 5	113.20	14	4.3	1.5	11.39	14.6	29.1	179	125	54
5	105.00	11	6.3	2.1	10.00	16.4	26.8	234	118	116
6	100.80	15	7.8	1.5	10.04	13.9	23.6	156	117	39
7	95.00	17	6.8	1.6	13.33	14.7	26.3	158	123	35
8	90.20	12	6.0	1.8	7.70	12.6	23.0	130	113	67
9	85.20	12	7.9	1.9	11.07	13.8	21.6	171	110	61
More than 9	72.40	11	5.1	2.2	8.35	12.8	22.6	174	110	64
All farms	93.60	92	6.4	1.8	10.48	14.2	24.6	175	117	58

Net returns increased as grade number increased through number 8 and then decreased with the exception of grade number 5 which was influenced by three enterprises having high yields of relatively tender peas.

As the grade increased i.e., the peas became less tender, the yield per acre increased. This supports the conclusion reached when the records were sorted on the basis of yield which indicated a consistent negative relationship between yield per acre and average price per ton. Peas increase in weight as they become more mature which is accompanied by a decrease in tenderness.

There was a tendency for cost per acre to decrease as the grade of peas delivered increased.

Efficiency. Efficiency in the use of labor and capital is very important in production. The relationship of inputs to outputs determines to a considerable degree the financial success of the farm business. The farmer who makes the most productive use of labor and capital makes a success of farming.

The records were sorted on the basis of the number of man hours of labor per acre to note association of that factor with net returns (table 11). As man labor increased from about 15 hours to 45.4 hours the net returns per acre tended to increase and then decrease. Net returns reached a high of $103 when about 27 hours of man labor were used per acre.

A negative relationship was noted between man hours of labor per acre and size of the enterprise. Small enterprises tended to use larger quanties of man labor. There was a positive and consistent relationship between the total number of man hours of labor and the man hours of labor for preparing the land, for performing the growing operations, and for performing the harvesting operations. The increase in the number of hours of man labor was distributed over all three general classifications of labor

Table 11.- Relationship of hours of man labor per acre and net returns and other factors, Cache and Box Elder Counties, Utah, 1951.

Range in hours per acre	Average hours man labor per acre	Hours man labor prep.	Hours man labor growing	Hours man labor harv.	No. of farms	Acres per enterprise	Power and mach. costs	Yield per acre	Average price per ton	Total costs per acre	Net returns per acre
	Hours	Hours	Hours	Hours	No.	Acres	Dollars	Tons	Dollars	Dollars	Dollars
Less than 18.2	15.2	4.2	2.8	8.2	16	9.5	20	1.6	88.80	103	46
18.2 - 20.9	20.0	5.0	4.0	11.0	15	7.2	17	1.6	94.20	102	59
21.0 - 24.4	23.1	6.0	4.9	12.2	15	6.6	23	1.7	97.40	113	55
24.5 - 30.9	26.7	6.7	4.6	15.4	16	5.8	22	2.1	96.20	121	103
31.0 - 36.9	34.6	9.5	7.3	17.8	15	5.7	28	1.8	96.60	140	45
37.0 and over	45.4	15.3	9.4	20.7	15	3.2	31	1.8	98.60	153	37
All farms	27.4	7.7	5.5	14.2	92	6.4	24	1.8	95.20	117	58

usage. Enterprises which used more man labor than average spent more time on all phases of production.

There was a tendency for yields to increase as the average number of hours of man labor increased. The same relationship was noted when the records were sorted on the basis of yield.

Average price per ton as a measure of grade indicated that as man hours of labor per acre increased the price per ton increased. This may be the result of better timing or greater care in performing the growing and harvesting operations.

Hours of man labor were associated positively with total costs. The increase in total costs was greater than the increase in labor cost assuming an average wage rate of about $1 per hour. This is indicative of an inter-relationship among factors. The increase in man labor was accompanied by an increase in the use of capital as reflected by power and machine costs per acre.

Another grouping of the records according to power and machinery cost was made to show the association between that cost factor and total cost per acre (table 12). As power and machinery cost per acre increased from $15 per acre to $37 per acre there was noted a consistent increase in total cost per acre. Total cost per acre changed from $100 to $148 while the power and machine cost increased from $15 to $37. There was a negative association between power and machinery cost per acre and degree of mechanization. The farms more completely tractor and truck mechanized had less cost per acre than those relying to a greater extent on horse power.

There was a positive association between power and machinery cost and hours of man labor per acre which subtantiates the results noted when the records were sorted according to man hours of labor per acre.

Table 12.- Relationship of power and machinery cost per acre and net returns and other factors, Cache and Box Elder Counties, Utah, 1951.

Range in power and mach. cost per acre	Average power and mach. cost per acre	No. of farms	Average acres per enterprise	Yield per acre	Average price per ton	Degree mech. total	Market value of land per acre	Hours man labor per acre	Total receipts per acre	Total costs per acre	Net returns per acre
	Dollars	No.	Acres	Ton	Dollars	Percent	Dollars	Hours	Dollars	Dollars	Dollars
Less than $18	15	25	7.3	1.5	85.80	94	391	19.6	156	100	56
$18 - $23	20	26	6.3	1.7	92.00	93	404	25.2	157	114	43
$24 - $28	26	20	6.9	2.1	95.20	91	390	24.1	215	118	97
$29 and over	37	21	5.0	1.7	98.80	86	410	32.9	184	148	36
All farms	24	92	6.4	1.8	93.60	91	399	24.6	175	117	58

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Table 13.- Relationship of number of factors better than average and net
returns and other factors, Cache and Box Elder Counties, Utah
1951.

No. of factors better than average	No. of farms	No. of acres per enterprise	Yield per acre	Average price per ton	Degree mech. total	Man hours labor per acre	Power and mach. cost per acre	Net returns per acre
	No.	Acres	Tons	Dollars	Percent	Hours	Dollars	Dollars
1 or less	18	3.5	1.5	95.40	85	36.9	31	18
2	25	4.5	1.8	96.00	87	31.3	25	51
3	36	7.8	1.7	93.20	96	21.6	21	69
4 or more	13	9.9	1.9	99.40	97	22.6	18	63
All farms	92	6.4	1.8	93.60	91	24.6	24	58

acre and power and machinery cost per acre decreased as the number of factors
better than average increased. Size of the enterprise, tons of peas per
acre, and average price per ton of shelled peas increased as the number of
factors better than average increased for the same reason.

The records were also sorted into two groups according to net returns
per acre (table 14). A comparison was made between the averages of the
most profitable group, the least profitable group, and the average of all
enterprises.

The most profitable enterprises were larger than enterprises in either
of the other groups. They excelled in yield per acre, labor requirements,
and they had lower costs of production per acre.

There was relatively little difference in the grade of peas delivered
between the two groups.

It is apparent that the success of the most profitable enterprises
is the result of the factors which have been reviewed above to show their
association with success. They are larger enterprises with more complete
mechanization which results in lower man labor requirements and lower

Table 14.- Comparison of averages of most profitable third, least profitable
third, and average of all enterprises, Cache and Box Elder
Counties, Utah, 1951.

	Unit	Most prof. third	Least prof. third	Average all enterprises
Receipts per acre	Dollars	228	115	175
Costs per acre	Dollars	111	126	117
Net returns per acre	Dollars	117	- 11	58
Receipts per ton	Dollars	101	105	100
Costs per ton	Dollars	49	114	67
Net returns per ton	Dollars	52	- 9	33
Acres per enterprise	Acres	7.6	5.8	6.4
Yield per acre	Tons	2.2	1.1	1.8
Market value of land per acre	Dollars	378	431	399
Hours man labor per acre-total	Hours	24.6	28.7	24.6
Hours man labor per acre-prep.	Hours	5.8	8.9	7.7
Hours man labor per acre-harv.	Hours	14.1	13.3	14.2
Average price per ton	Dollars	96	99	94

total costs for producing an acre of canning peas. Lower costs and higher

receipts as a result of higher yields have resulted in their being the most

profitable enterprises.

CONCLUSION

The importance of the canning pea enterprise in the future will
depend on its relative profitableness. Canning peas compete with other
crops for the use of land and capital. To successfully compete they must
earn at least as high per acre return for the operator and his family
as do competing enterprises. Information available indicates that over
a period of years canning peas are as profitable as sugar beets, more
profitable than canning corn, and nearly as profitable as canning tomatoes.1 /
The risk in the canning pea enterprise of obtaining a crop seems to be
higher for individual years on individual farms but the average profitable-
ness is favorable.

Cache and Box Elder Counties have favorable conditions for the
production of canning peas. Yields in the two county area were high enough
to allow the average producer to pay all costs and make a net return of
$58 per acre. The vines as silage have value as a livestock feed in the
area.

Labor cost appears to offer the greatest possibility for increasing
returns from the enterprise. In a problem of this type yield per acre
and price per ton must be assumed to be fixed. The only way that net
returns can be increased is to decrease costs of production. Material
cost per acre of which 69 percent was accounted for by seed cost is
relatively fixed. The same may be said regarding overhead costs. Labor
costs, however, offer an opportunity for increasing efficiency, especially
in the harvesting operations which accounted for 52 percent of the total

1 / Unpublished research of the Dept. of Agr. Economics U. S. A. C.

labor requirement. The hand operations of loading and unloading are particularly time-consuming and appear to offer an opportunity for reducing labor requirements either by more productive hand labor or by changing the methods of handling the vines after cutting. There is no reason to conclude that present hand labor is of low quality but by changing the method of handling the peas a considerable saving may be possible. Combine harvesting machines which cut and thresh the pea vines are experimental at present in this area but will undoubtedly be improved until their use is practical. Any changes made which reduce labor costs will affect power and machinery costs since more machine labor will be used to replace part of the hand labor which is used at present. Lower costs of production will result from such a shift only when the increase in power and machine cost is less than the decrease in labor cost. Adjustments in size of field and in the method of curing or using the vines may be necessary. Future developments of this order will tend to make peas relatively more profitable or at least to prevent the loss of their present position of profitableness.

Yield is an important determinant of financial success in the canning pea enterprise. High yields should be the goal of each producer providing they can be produced efficiently. Yield is increased as peas become more mature. The farm operator must decide at what stage he should harvest his peas. Medium grades of peas were the most profitable for the farmer in 1951 than were either the extreme high or low grades. Prices for the various grades of shelled peas should be established relative to the desired grade for processing i.e., if small more tender peas are desirable then the price must be increased to offset the loss in potential weight which occurs when the young peas are harvested.

Balance is important in the canning pea enterprise. It is better to achieve high efficiency in all factors than to excel in only one or a few factors.

SUMMARY

1.   A stratified cross section sample of canning pea growers' costs and
returns in Cache and Box Elder Counties was obtained by the survey method
for the 1951 crop. Ninety-two records formed the basis of this report.
Forty-eight records were obtained in Cache County and 44 records were
obtained in Box Elder County.

The size of the enterprise ranged from 1 acre to 30 acres with an
average size of 6.4 acres. All enterprise records indicated that the peas
had been grown with the application of irrigation water.

2.   The average man labor requirement for growing canning peas was 24.6
hours per acre. The harvesting operations accounted for 52.5 percent of
the total man labor requirements.

3.   The average cost of producing an acre of canning peas was $117 per acre
or $65 per ton. Material cost accounted for one-third of the total costs
while overhead costs were about one-fourth of the total cost and labor
costs and power costs approximately one-fifth each of the total cost.

4.   Average total receipts per acre were $175 and average net returns
$58 per acre. Total receipts were calculated by adding the receipts from
shelled peas and the net value of the silage. Net returns were calculated
by subtracting total costs from total receipts.

5.   Assuming that the farm operators owned the capital which was used in
the enterprises studied the average return to the farm family was $103
per acre.

6.   There was no consistent association between the size of the canning
pea enterprise as measured by acres and net returns per acre. Size of
enterprise was associated negatively with number of hours of man labor

required.

7.   Within the range of this study the enterprises with highest production of shelled peas per acre made greatest net returns per acre. There was a consistent positive association between the two factors. As yield per acre increased there was a consistent decrease in the average price per ton of shelled peas delivered indicating that the heavier yields consisted of less tender peas.

8.   Efficient use of labor and capital is important in the canning pea enterprise. Enterprises that used approximately 27 hours of man labor and had power and machine costs of approximately $25 per acre were the most successful as measured by net returns per acre.

9.   The number of factors better than average was associated positively with net returns per acre. Net returns per acre increased from $18 per acre for the group with one factor or less better than average to more than $60 per acre for the enterprises with three or more factors better than average.

10.   The larger enterprises which were more completely mechanized had lower labor requirements and lower total costs for producing an acre of canning peas. The larger enterprises had higher net returns per acre.

LITERATURE CITED

(1) DeVault, S. H. and Walker, Wm. Paul An economic study of the production of sweet corn and peas. Md. Agri. Exp. Sta. Bul. 305. 1929

(2) Hart, V. B., Bond, M. C., and Cunningham, L. C. Farm Management and Marketing. New York: John Wiley and Sons, Inc. 1942

(3) Morrison, E. M. Cost and efficiency of canning pea production in Cache and Box Elder Counties, Utah. Utah Agr. Exp. Sta. Bul. 331. 1948

(4) U. S. Dept. of Agr. Agricultural Statistics. Washington D. C.: Gov. Printing Office. 1951

(5) Wilcox, Walter W. and Bowditch, John B. Economic aspects of canning peas in Wisconsin. Wisc. Agr. Exp. Sta. Bul. 158. 1945

APPENDIX

CANNING PEA ENTERPRISE SURVEY
UTAH AGRICULTURAL COLLEGE EXP. STATION
DEPARTMENT OF AGRICULTURAL ECONOMICS

_____(Crop Year)_____   _____Record No._____

Operator_____ Town_____

           County_____ Post Office_____

Acres in peas_____ Value per acre_____ Total value_____

What is the assessed valuation of this land_____ Mill levy_____

Machinery and Buildings

Kind	Age	Beg. value	Repairs	Deprec.	End value	Avg. value	Charged to peas			
							Percent	Value	Repairs	Deprec.
Spreader		$	$	$	$	$		$	$	$
Plow										
Harrow										
Disk										
Level										
Ditcher										
Drill										
Mower										
Wagon										
Sprayer										
Duster										
All other		XXX	XXX	XXX	XXX				XXX	XXX
Total										
Machine shed										
Other bldgs.										
Total										

	Operation	No. x over	Kind and size of equipment used	Man		Tractor		Truck		Horse		Total
				Hrs	Am't	Hrs	Am't	Hrs	Am't	Hrs	Am't	Am't
Planting & Preparation	Manuring											
	Fertilizing											
	Plowing											
	Harrowing											
	Planting											
	Ditching											
	Sub-total:											
Growing	Drilling											
	Irrigating											
	Insect control											
	Sub-total:											
Harvesting	Loading											
	Hauling											
	Unloading											
	Sub-total:											
	Total											

Convert childrens labor to man hours on the following scale: 16 and over equals 1 man, 15-16 equals 7/8, 14-15 equals 3/4, 13-14 equals 5/8, 12-13 equals 1/2, 11-12 equals 1/4. If because of the type of operation a boy under 16 years is just as productive in performing all of the requirements of that operation, the rate may be adjusted upward accordingly.

	Operations	No. x over	Kind and size of equipment used	Man		Tractor		Truck		Horse		Total Am't
				Hrs	Am't	Hrs	Am't	Hrs	Am't	Hrs	Am't	
Planting & Preparation	Manuring											
	Fertilizing											
	Plowing											
	Harrowing											
	Floating											
	Ditching											
	Sub-total:											
Growing	Drilling											
	Irrigating											
	Insect Control											
	Sub-total:											
Harvesting	Loading											
	Hauling											
	Unloading											
	Sub-total:											
	Total hired											
	Total operator & op. family											
	Grand total											

MATERIAL COSTS					INTEREST ON MONEY IN CROP			
Item	Time	Quant.	Price	Cost	Item	Amount	Time	Int.
Fertilizers:					Labor			
					Preparation			
					Planting and growing			
					Harvesting			
					Fertilizers			
Seed								
Fees								
Spray or dusting					Spray or dusting			
Other					Seed			
					Fees			
					Other			
TOTAL	XXX	XXX	XXX	$	TOTAL			$

Fixed Overhead Charges Assigned to Pea Enterprise				Summary		
Interest on money in crop			$	Total received		$
Interest on capital investment				Material costs		
Building upkeep				Overhead costs		
Building depreciation				Operator & family labor costs		
Equipment repair				Hired labor costs		
Equipment depreciation				TOTAL COSTS		
Taxes: Land						
Drainage				Net return from enterprise		
Water				Net return to operator & family		
				Number of acres		
				Number of tons		
TOTAL FIXED COSTS				Total man hours		
Income from Pea Enterprise				Net return per man hour		
Product by Grade	Amount	Price	Receipts	Net return per ton		
				Total received per acre		
				Net return per acre		
				Total cost per acre		
				Total cost per ton		
Return from vines				Total man hours per acre		
TOTAL				Total man hours per ton		

43

Item	1951	1950	1949	1948
*Crop in this land				
*Manure Total Amt.				
Quality				
*Lbs. of commercial fertilizer				

*These items refer to the land growing peas in 1951.

Plant disease or insects infested peas this year badly_____, slightly_____, not at all_____. Did you spray or dust?_____. What insect or disease was troublesome?_____.

Notes:

_____ _____ _____
Enumerator   Date   Checked by