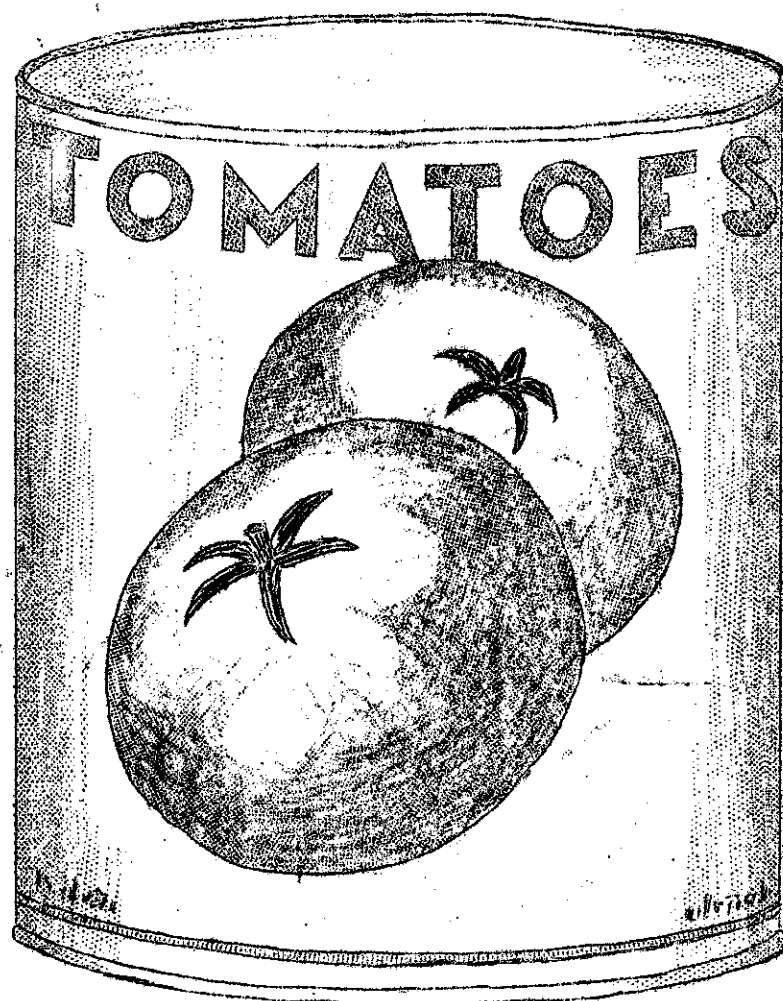$ ¢ $ ¢ $ ¢ $ ¢ $ ¢ $ ¢ $ ¢ $ ¢ $ ¢ $ ¢ $ ¢ $ ¢ $ ¢ $ ¢ $ ¢ $

Costs and Returns in Growing and Harvesting

CANNING FACTORY

TOMATOES

Prepared by
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COSTS AND RETURNS IN GROWING AND HARVESTING

CANNING FACTORY TOMATOES

Donald B. Ferguson*

The importance of canning crops as a source of food for the Armed Forces, for our Allies, and for our civilian population was recognized early in this war. Steps were made to increase production of those crops. So that growers and administrators of the food program might better know the costs of producing these crops, the Department of Agricultural Economics of the New York State College of Agriculture made a survey early in the summer of 1942 of growers of the four major canning crops. The survey covered the costs and returns of the 1941 crops.

This report on tomatoes grown for canning is one of four developed from the survey; and is based on a farm-to-farm survey of 86 growers in Chautauqua County [1] and 79 growers in Orleans County, New York.

Canning Factory Tomatoes in New York State and U. S.

Canning factory tomatoes are one of the most important vegetable crops grown in New York State. From 1936 to 1940 the New York acreage of tomatoes for canning averaged 19,500 acres (table 1). In 1941 a total of 18,300 acres were planted in New York. The United States acreage during the five years, 1936 to 1940, averaged about 406,000 acres and in 1941 totaled 460,450 acres.

TABLE 1.   ACREAGE, YIELD, PRODUCTION, AND FARM PRICE OF CANNING FACTORY TOMATOES IN NEW YORK AND THE UNITED STATES, 1936-1940, 1941, AND 1942

Year	Acres	Yield tons	Production tons	Farm Price
- - -New York- - -				
1936-40 av.	19,500	7.5	145,800	$ 12.12
1941	18,300	9.4	172,000	15.20
1942	22,500	7.6	171,000	19.00
- - -United States- - -				
1936-40 av.	406,052	4.9	1,986,420	$ 12.41
1941	460,450	6.1	2,802,200	15.06
1942	590,070	5.3	3,152,700	19.37

* This study was started by C. A. Becker, now Lt. (j.g.) USNR, who made up the field blanks and directed the field work with the collaboration of the writer.

1. Includes 2 growers in the adjoining area of Erie County.

Yields of tomatoes for canning average higher at 7.5 tons per acre in New York than in any other state except Utah. The 1936-1940 average yield in the United States was reported at 4.9 tons per acre. The year 1941 was an exceptionally favorable year for tomato production. The average yields of 9.4 tons per acre in New York and of 6.1 tons per acre in the United States were the highest on record.

Prices of tomatoes for canning in New York generally have averaged about the same as those in the United States. In 1941, the price in New York averaged $15.20 per ton as compared with an average of $12.12 during the five years, 1936-40. The average price for tomatoes for canning in the United States in 1941 was $15.06. Prices for tomatoes were supported at a higher level for the crops of 1942 and 1943 by the United States Department of Agriculture to encourage a continued high rate of production at a time when costs have risen.

Rates for Power and Machinery

Flat rates were used in calculating the costs of power and machinery for growing tomatoes on these farms (tables 2 and 3). Horse work was charged at the rate of $0.19 per hour. This was the average cost per hour of horse work on New York cost account farms for 1940. The average costs of operating tractors of the different sizes on New York cost account farms for the years 1938 to 1940 were used. These costs averaged $0.43 per hour for one plow tractors, $0.48 per hour for two plow tractors, and $0.64 per hour for the three plow tractors.

TABLE 2.	RATES CHARGED FOR POWER	
Item	Size	Rate Used
Horse work (per hour)		$ 0.19
Tractor work (per hour)	1 plow	.43
	2 plow	.48
	3 plow	.64
Truck use (per mile)	1 ton or smaller	.045
	1½ ton or larger	.063
Automobile (per mile)		.04

The 1938-1940 average cost of operating trucks on New York cost account farms was charged for the use of trucks on these farms. This amounted to $ 0.045 per mile for trucks, 1 ton or smaller in size, and to $ 0.063 per mile for 1½ ton or larger trucks. A rate of $0.04 per mile was charged for automobile use.

Charges for the use of machinery were based upon information obtained by Prof. J. P. Hertel in a survey of the costs of operating farm machinery on 438 farms in Chenango and Ontario Counties (table 3).

TABLE 3.   COST OF OPERATING FARM MACHINERY *

Implement	Rate per Acre	Implement	Rate per Acre
Walking plow	$ 0.33	Lime sower	$ 0.23
Tractor plow, one bottom	.85	Roller	.04
Tractor plow, two bottom	.49	Horse-drawn cultipacker	.07
Horse-drawn disk	.13	Tractor-drawn cultipacker	.06
Tractor-drawn disk	.11	Cultivator, 1 horse	.08
Harrow, spring tooth	.05	Cultivator, 2 horse	.17
Harrow, spike tooth	.04	Cultivator, tractor	.36
Grain drill	.26	Tomato transplanter	1.07

Manure spreader - $ 0.10 per ton

* Hertel, J. P., Cost of Operating Equipment on New York Farms, 1936, A.E.209

AVERAGE COSTS AND RETURNS

Description of Farms

The eighty-six growers from whom records were obtained in Chautauqua County grew an average of 6 acres of tomatoes per farm in 1941 (table 4). Their average yield was 9.4 tons per acre. The seventy-nine growers surveyed in Orleans County grew an average of 8.2 acres of tomatoes per farm and had an average yield of twelve tons per acre. The yield of those growers in Orleans County exceeded the state average yield in 1941 by 2.6 tons per acre, whereas the yield of the Chautauqua County growers was the same as the state average. The yield per acre in Chautauqua County varied between farms from 3.8 tons to 21.3 tons per acre. In Orleans County the range in yield was from 5.8 tons to 24 tons per acre.

An average of 188 man hours of labor were required to grow and harvest an acre of tomatoes on these Chautauqua County farms. Sixty hours were spent growing an acre of tomatoes in Chautauqua compared with 38 hours in Orleans County. Part of the difference was accounted for by the fact that 44 per cent of the Chautauqua growers transplanted by hand, whereas 90 per cent of the Orleans growers used a transplanter. It took about 24 hours for the Chautauqua growers to set an acre of tomatoes by hand compared with about 13 hours with a transplanter.

An average of 128 hours of labor were required to harvest an acre of tomatoes in Chautauqua County as compared with 107 hours in Orleans County even though the yield per acre in Orleans County was higher. A ton of tomatoes was picked in 13.6 hours on the Chautauqua farms and in 8.9 hours on the Orleans farms. Normally it takes less time to pick a ton where the yield is high than where it is low, but the difference in yield between the two Counties does not explain all of the difference. Labor apparently was more efficient both in growing and harvesting tomatoes on the Orleans farms than on those in Chautauqua County.

TABLE 4.   FACTORS IN GROWING CANNING FACTORY TOMATOES
                CHAUTAUQUA AND ORLEANS COUNTIES, 1941

	86 Farms Chautauqua County	79 Farms Orleans County
Acres per farm	6.6	8.2
Average yield per acre (tons)	9.4	12.0
Plants per acre	3236	3103
Fertilizer per acre (pounds)	657	640
Manure per acre (tons)	3.0	4.1
Man hours per acre, growing	60	38
Man hours per acre, harvesting	128	107
Total man hours per acre	188	145
Average price per ton	$ 17.06	$ 15.58
Average cost per ton	14.17	9.80
Net returns per ton	$ 2.89	$ 5.78
Returns per acre	$ 159.83	$ 187.32
Total costs per acre	132.74	117.84
Net returns per acre	$ 27.09	$ 69.48
Returns per hour of labor	$ 0.52	$ 0.86

The cost to grow and harvest a ton of tomatoes in Chautauqua County averaged $14.17 and in Orleans County $9.80. The returns per ton were also higher in Chautauqua County, averaging $17.06 compared with $15.58 in Orleans County. The net returns per ton averaged $2.89 for the Chautauqua growers as compared with $5.78 for the Orleans growers.

The total returns per acre averaged $159.83 in Chautauqua and with the higher yield per acre $187.32 in Orleans County. The total cost of $132.74 per acre in Chautauqua and $117.84 in Orleans County left a net return per acre of $27.09 for the Chautauqua growers and $69.48 for the Orleans growers.

Returns per hour of man-labor averaged $0.52 per hour for the eighty-six Chautauqua County growers and $.86 per hour for the seventy-nine Orleans County growers covered by the survey.

Costs Per Acre

Growing costs per acre of tomatoes averaged $78.20 on the Chautauqua County farms and $72.84 on the Orleans farms (table 5). Harvesting costs averaged $54.54 per acre on the Chautauqua County farms as compared with $45.00 per acre on the Orleans County farms, even though the yield per acre was higher in Orleans County.

TABLE 5. COST PER ACRE TO GROW AND HARVEST CANNING FACTORY TOMATOES CHAUTAUQUA AND ORLEANS COUNTIES, 1941

Expense	Chautauqua County		Orleans County	
	Cost per Acre	Per cent	Cost per Acre	Per cent
Growing Costs:				
Labor	$ 23.39	17.6	$ 13.96	11.8
Horse Work	5.17	3.9	4.83	4.1
Tractor Work	3.56	2.7	2.49	2.1
Equipment	2.88	2.2	3.28	2.8
Plants	14.91	11.2	17.42	14.8
Fertilizer	11.82	8.9	11.50	9.8
Manure	4.59	3.4	11.11	9.5
Green Manure	.66	0.5	.98	.8
Land	9.00	6.8	5.94	5.0
Other, including interest	2.22	1.7	1.33	1.1
Total Growing Costs	$ 78.20	58.9	$ 72.84	61.8
Harvesting Costs:				
Labor	$ 48.09	36.2	$ 41.07	34.9
Trucking and Other	6.45	4.9	3.93	3.3
Total Harvesting Costs	$ 54.54	41.1	$ 45.00	38.2
Total Growing and Harvesting Costs	$132.74	100.0	$117.84	100.0

Man labor represented the most important single cost of growing and harvesting tomatoes. Man labor for growing represented 17.6 per cent and for harvesting 36.2 per cent or together a total of 53.8 per cent of the total cost of growing and harvesting an acre of tomatoes in Chautauqua County. Man labor represented 46.7 per cent of the total cost of growing and harvesting tomatoes in Orleans County.

The cost of plants was the second most important item in the cost of growing and harvesting tomatoes in both Counties, representing 11.2 per cent of the costs in Chautauqua County and 14.8 per cent in Orleans County. This was followed by fertilizer representing 8.9 per cent in Chautauqua County and 9.8 per cent of the total cost in Orleans County. The relative

importance of the cost of manure and the use of land varied between the
Counties. Trucking and other costs connected with the marketing of tomatoes
represented 4.9 per cent of the total cost in Chautauqua County and 3.3 per
cent of the total cost in Orleans County.

Amounts per Acre and Cost of Materials and Labor

An average of 3 tons of manure per acre was charged to tomatoes in
Chautauqua County and 4.1 tons per acre in Orleans County (table 6). The
manure was valued at $1.51 per ton in Chautauqua County and $2.69 per ton
in Orleans County. This value per ton included the value of the manure as
estimated by growers and also the cost of applying it. In determining the
charge for manure, 40 per cent of that applied to the tomato land in 1941,
30 per cent of that applied in 1940, 20 per cent of that applied in 1939, and
10 per cent of that applied in 1938 was used.

TABLE 6. AMOUNTS PER ACRE AND COST OF MATERIALS AND LABOR IN GROWING AND
HARVESTING CANNING FACTORY TOMATOES, CHAUTAUQUA AND ORLEANS COUNTIES, 1941

	86 Farms Chautauqua County	79 Farms Orleans County
	- - -Amount per Acre- - -	
Manure (tons)	3.0	4.1
Fertilizer (pounds)	657	640
Plants	3236	3103
Man labor (hours)	188.0	145.0
Horse work (hours)	28.4	25.9
Tractor work (hours)	7.7	5.3
	Cost Per Unit	
Manure (per ton)	$ 1.51	$ 2.69
Fertilizer (per ton)	35.98	35.94
Plants (per thousand)	4.61	5.61
Man labor (per hour)	.38	.38
Horse work (per hour)	.19	.19
Tractor work (per hour)	.46	.47

The amount and cost of the fertilizers used varied only slightly between
the two Counties. An average of 657 pounds per acre was used in Chautauqua
County and 640 pounds per acre in Orleans County. In both Counties the cost
per ton averaged nearly $36.00.

An average of 3,236 plants were used per acre in Chautauqua while an
average of 3,103 plants were used in Orleans County. The average cost of

plants per thousand in Chautauqua County of $4.61 was $1.00 less than the average cost in Orleans County. Northern grown plants were not greatly different in price between the two Counties, but 16 of the Chautauqua County growers bought southern plants at an average cost of about $2.00 per thousand which brought the average cost of all plants used in Chautauqua County below the average in Orleans County.

An average of 188 hours of man-labor in Chautauqua and 145 hours in Orleans County were required to grow and harvest an acre of tomatoes. The average cost for this labor in both Counties was $.38 per hour. Labor hired especially for tomatoes was charged at the rate actually paid by each grower. The cost of the other labor or regular farm labor was calculated for each farm and charged at that rate. This calculation included the cash wages and also the cash value of room, board, and privileges.

An average of 28.4 horse hours and 7.7 tractor hours were required in growing and harvesting an acre of tomatoes in Chautauqua County. This compared with 25.9 horse hours and 5.3 tractor hours used in Orleans County. The more efficient use of power and machinery in Orleans County is partly accounted for by the fact that the acreage of tomatoes per farm was larger.

Kind of Fertilizer Used

Commercial fertilizers with a wide variety of analyses were used on tomatoes in the two Counties. Many growers used a combination of fertilizers and also a starter solution. A 4-16-4 analysis fertilizer was used by 19 Chautauqua and 23 Orleans County growers (table 7). Super phosphate also was used extensively in both Counties. Fertilizers with an analysis of 5-10-5, 4-14-6, 5-20-5, and 10-20-10 were used commonly in both Counties.

TABLE 7. KINDS OF FERTILIZER USED FOR CANNING FACTORY TOMATOES
CHAUTAUQUA AND ORLEANS COUNTIES, 1941

Fertilizer Analysis	Chautauqua County			Orleans County		
	Number of Farms*	Pounds	Cost	Number of Farms*	Pounds	Cost
4 - 16 - 4	19	64,725	$1179	23	100,806	$1836
5 - 10 - 5	27	76,325	1220	9	29,000	458
4 - 14 - 6	5	35,500	637	9	36,801	609
5 - 20 - 5	5	36,200	732	6	24,400	465
10 - 20 - 10	15	40,700	1098	4	15,850	408
Super phosphate	10	42,700	435	19	73,844	751
Other	37	77,006	1415	44	133,375	2918
None	---	---	---	---	---	---
Total	86	373,156	$6716	79	414,076	$7445

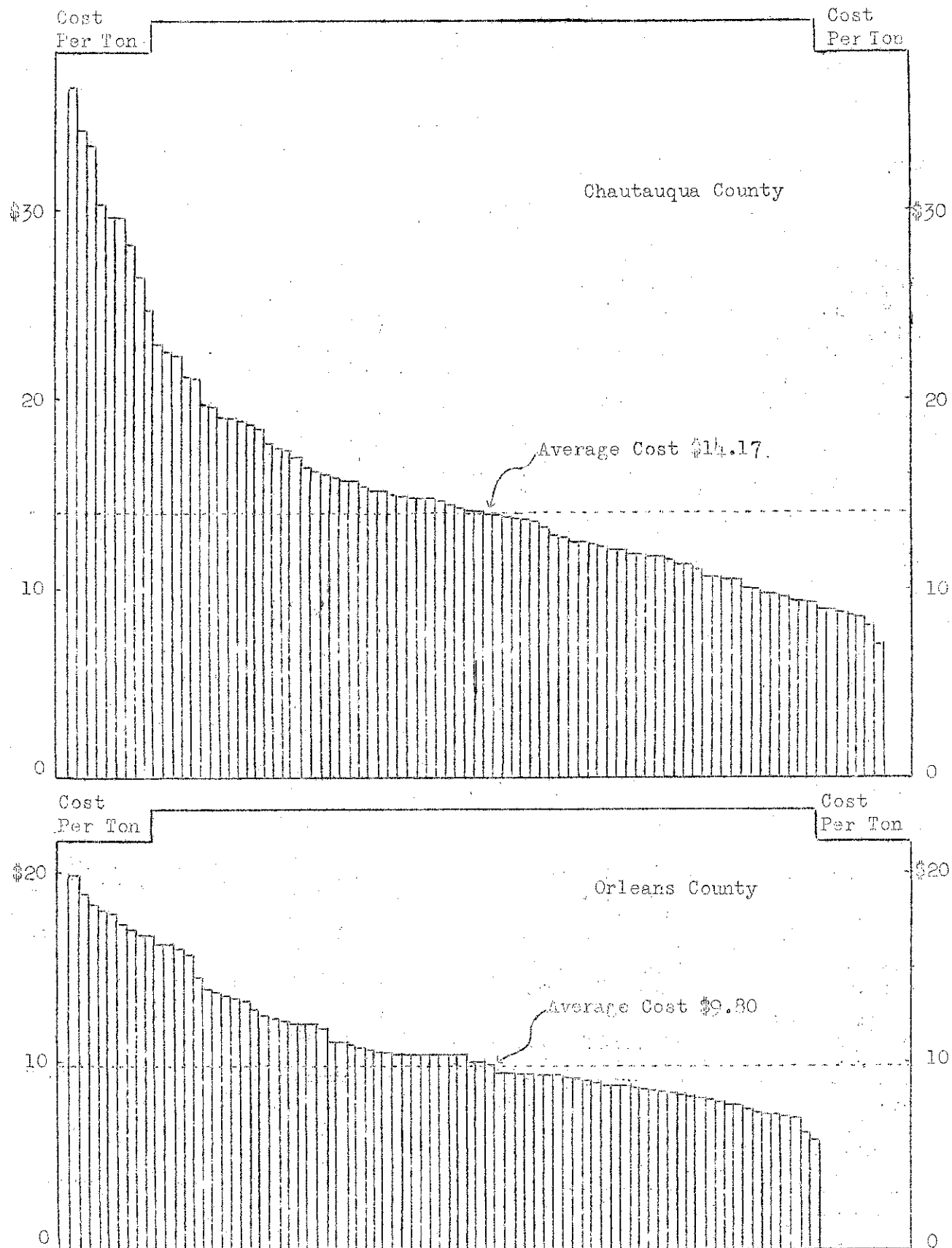* Some growers used more than one kind of fertilizer.

FIGURE 1. COST TO GROW AND HARVEST A TON OF TOMATOES FOR THE CANNING FACTORY,
86 CHAUTAUQUA AND 79 ORLEANS COUNTY FARMS, 1941

The height of each bar represents the cost on one farm.

Variation in Cost Per Ton

The average cost to grow and harvest a ton of tomatoes in Chautauqua County was $14.17 and in Orleans County $9.80. But the variation in costs between growers was wide and few of the growers produced their tomatoes at approximately average costs in either of the Counties. The range in the cost of growing and harvesting tomatoes in Chautauqua County was wider than in Orleans County and varied from $7.02 to $36.54 per ton (figure 1). The range in Orleans County was from $5.92 to $19.91 per ton.

Of the Chautauqua growers 44 had costs above the average and 42 below the average of $14.17 per ton. In Orleans County 44 growers had costs above the average of $9.80 per ton while 35 produced tomatoes at costs below the average.

The cost to grow and harvest a ton of tomatoes was closely associated with the yield per acre. In Chautauqua County, the farm with the highest yield per acre had the lowest cost per ton. In both Counties, the groups of farms with lower than average costs per ton had higher than average yields per acre; and those farms with higher than average costs per ton had lower than average yields per acre (table 8).

TABLE 8.   ACREAGE, YIELD, AND PERCENTAGE OF PRODUCTION OF CANNING
FACTORY TOMATOES PRODUCED AT DIFFERENT COSTS
CHAUTAUQUA AND ORLEANS COUNTIES, 1941

Cost per ton to grow and harvest	Chautauqua County			Orleans County		
	Acres	Yield per acre, tons	Per cent of production	Acres	Yield per acre, tons	Per cent of production
Less than $8	.5	22.0	.2	97.5	15.1	18.9
$8 - 9.99	70.0	13.6	17.9	246.3	13.8	43.6
$10 - 11.99	94.5	11.1	19.8	169.0	10.8	23.4
$12 - 13.99	87.1	9.7	15.9	68.0	9.0	7.9
$14 - 15.99	134.5	9.0	22.6	7.0	8.1	.7
$16 - 17.99	44.2	8.8	7.3	42.0	7.5	4.1
$18 and more	137.5	6.3	16.3	17.5	6.3	1.4
Total	568.3	9.4	100.0	647.3	12.0	100.0

Nearly two-thirds or 62⅓ per cent of the tomatoes produced on these farms in Orleans County were grown at a cost of less than $10 per ton, while only about 18 per cent were grown at a cost of less than $10 per ton on the Chautauqua County farms. About one-sixth of the tomatoes in Chautauqua County were grown at a cost of $18 or more per ton, while in Orleans County only 1.4 per cent were grown at as high a cost.

Variation in Labor Returns

The returns per hour of labor also varied greatly as did the cost. The average returns per hour of labor on tomatoes on the Chautauqua County farms was $0.52; but the returns to individual growers varied from -- $0.02 to $1.93 per hour (figure 2). In Orleans County the variation between individual growers was from $0.12 to $2.27 per hour. Only one of the 86 Chautauqua growers failed to get any return for the time spent on the enterprise after allowing for all other costs such as for use of land, manure, fertilizer expense, plants, machinery and farm power costs. Twenty-five of the Chautauqua County growers and twelve of the Orleans County growers obtained some return for their time spent on the enterprise but not enough to cover all of the labor costs involved. Ten of the Chautauqua County growers and twenty-four of the Orleans County growers made returns of over $1.00 per hour of labor expended on the enterprise.

In each County growers who had the lowest returns per hour of labor had the highest growing cost per ton. The yield of tomatoes per acre probably is the most important factor determining the return per hour of labor because the return per ton of tomatoes varies only slightly and the cost of growing an acre does not vary nearly as much as does the yield. The growers with the high yields usually obtained the highest return per hour of labor spent on the enterprise.

Relation of Yield of Tomatoes to Cost

The yield of tomatoes per acre is one of the most important factors affecting the total cost per ton of growing tomatoes. Although the growing cost per acre tends to increase with the higher yield, the increase is relatively small compared with the increase in yield and so the cost of growing and the total cost per ton decreases markedly with the increase in yield (table 9).

TABLE 9.   RELATION OF YIELD OF TOMATOES TO COSTS
CHAUTAUQUA AND ORLEANS COUNTIES, 1941

Yield of Tomatoes per acre, tons		Number of Farms	Cost per Acre		Cost per Ton	
Range	Average		Growing	Total	Growing	Total
Chautauqua County						
Less than 9	7.0	33	$77	$128	$10.90	$18.10
9 to 11	9.9	27	75	126	7.60	12.70
12 or more	14.4	26	87	157	6.00	10.90
Orleans County						
Less than 10	7.6	23	$64	$ 97	$ 8.50	$12.80
10 to 13	11.8	35	73	119	6.20	10.10
14 or more	15.8	21	79	133	5.00	8.40

$200

Chautauqua County

1.50

1.50

1.00

1.00

Average Returns Per Hour = $0.52

.50

.50

0

0

-.25

-.25

$2.00

Orleans County

$2.00

1.50

1.50

Average Returns Per Hour = $0.86
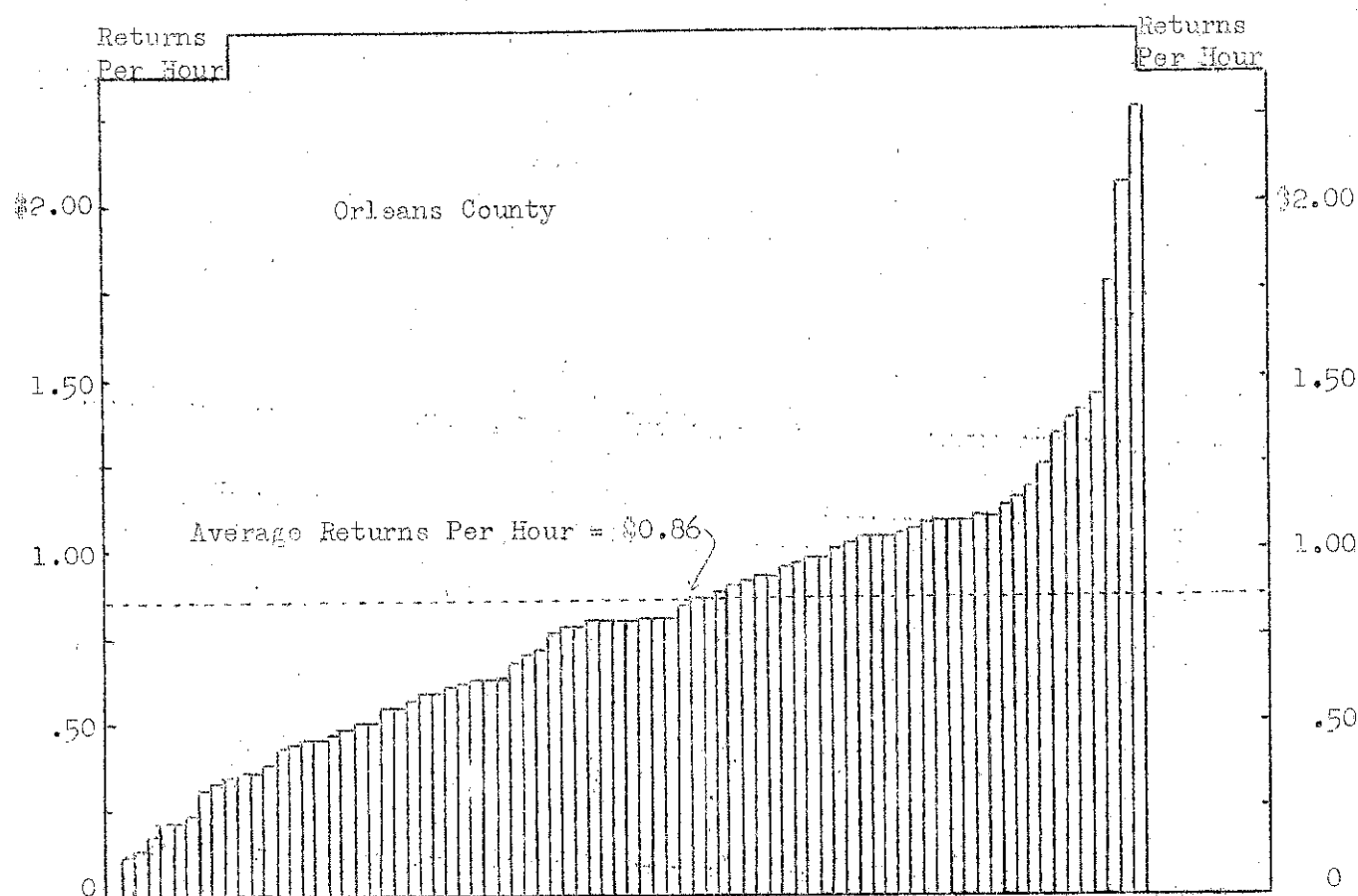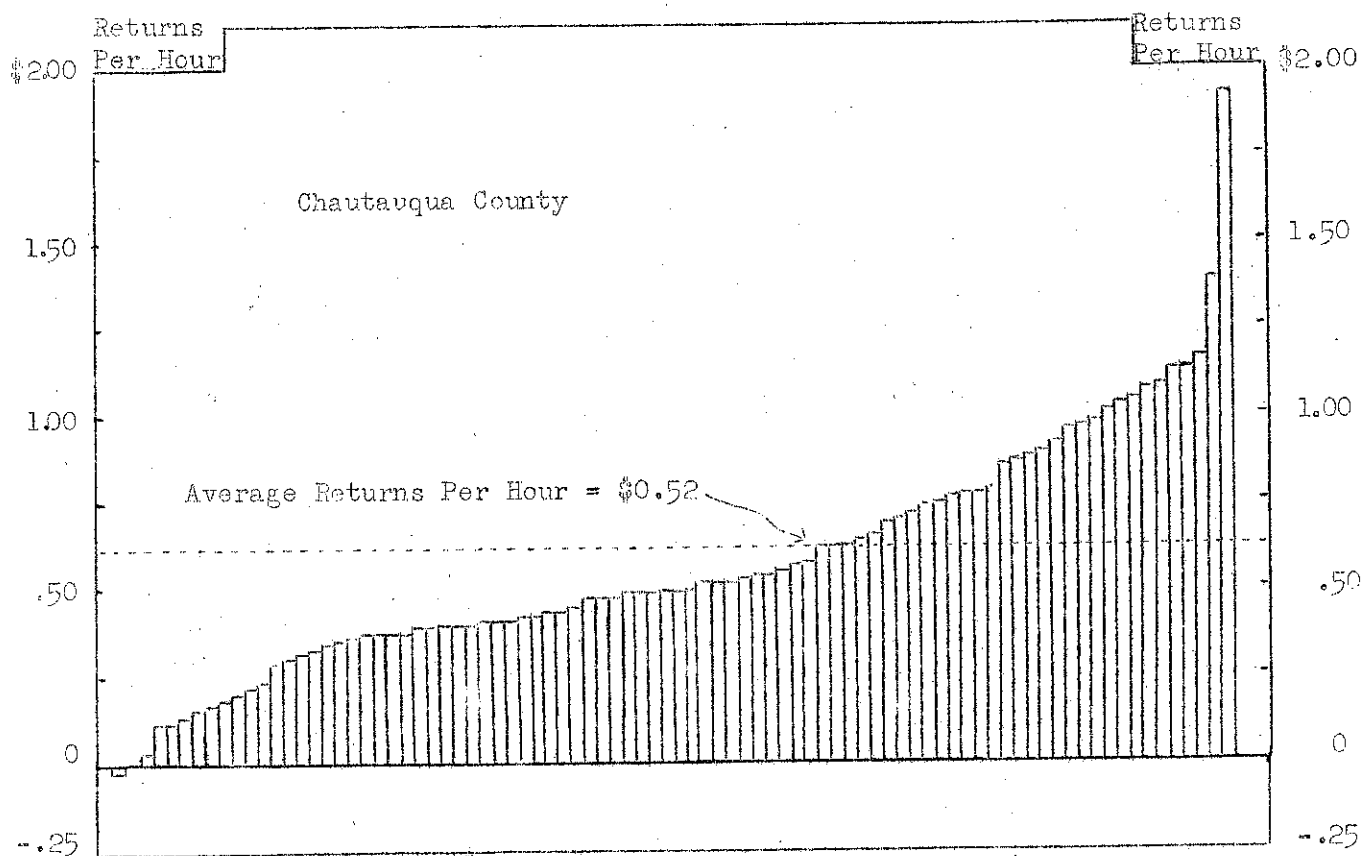
1.00

1.00

.50

.50

0

0

FIGURE 2. RETURNS PER HOUR OF LABOR FROM TOMATOES,
86 CHAUTAUQUA AND 79 ORLEANS COUNTY FARMS, 1941

The height of each bar represents the returns on one farm.

Growing costs are made up largely of costs which tend to vary only slightly, regardless of yield. In Chautauqua County the growers that had an average yield of less than 9 tons per acre had a growing cost of $10.90 per ton while the growers that had an average yield of more than 12 tons per acre had a growing cost of only $6 per ton. In Orleans County the average growing cost per ton decreased from $8.50 on farms with a yield of less than 10 tons an acre to an average of $5 per ton on farms with a yield of 14 tons or more per acre.

The harvesting costs per ton vary less than do the growing costs, because they are made up largely of labor costs which tend to vary with the size of the crop. The 26 growers in Chautauqua County that had a yield of 12 tons or more per acre grew and harvested tomatoes at an average cost of $10.90 per ton as compared with an average cost of $18.10 for the 33 growers who had a yield of less than 9 tons per acre. In Orleans County the total cost per ton varied from an average of $8.40 for the group having the highest yield to an average of $12.80 per ton for the group having the lowest yield.

Relation of Yield of Tomatoes to Labor Requirements

The total man hours to grow and harvest an acre of tomatoes increases as the yield per acre increases (table 10). The total hours per ton, however, decreases markedly with higher yields. There was no apparent relationship between the yield of tomatoes and the hours of man labor spent in growing an acre of them. Therefore, the time spent growing a ton is least where the yield is highest. The total hours of man labor required to grow and harvest an acre increases because of the larger tonnage of tomatoes that must be harvested.

TABLE 10. RELATION OF YIELD OF TOMATOES TO LABOR REQUIREMENTS
CHAUTAUQUA AND ORLEANS COUNTIES, 1941

Yield of Tomatoes per acre, tons		Acres per Farm	Man Hours per Acre		Man Hours per Ton	
Range	Average		Growing	Total	Harvesting	Total
Chautauqua County						
Less than 9	7.0	8.6	58	177	17.0	25.2
9 to 11	9.9	6.3	63	184	12.3	18.6
12 or more	14.4	4.4	60	221	11.2	15.3
Orleans County						
Less than 10	7.6	6.7	38	122	11.0	16.1
10 to 13	11.8	8.3	36	146	9.3	12.3
14 or more	15.8	9.6	39	161	7.8	10.2

Labor is more efficient in harvesting a high yielding field of tomatoes than in harvesting a field with a low yield. In Chautauqua County it took only 11.2 hours or two-thirds as much labor to harvest a ton of tomatoes on fields yielding 12 tons or more per acre than it did on the fields yielding less than 9 tons per acre (table 10). The same relationship existed in Orleans County. There, an average of 7.8 hours of labor were required to harvest an acre of tomatoes where the yield was 14 tons or more per acre as compared with 11 hours of labor to harvest an acre where the yield was less than 10 tons per acre.

The growers having the low yields in Chautauqua County spent an average of 25 hours of labor per ton to grow and harvest their tomatoes as compared with an average of 15 hours per ton spent by growers having a yield of 12 tons or more per acre. In Orleans County the growers having the high yields spent an average of only about 10 hours of labor per ton as compared with 16 hours of labor spent by those having the low yields.

Relation of Yield of Tomatoes to Returns

The growers with the highest yields of tomatoes had the highest returns per acre and also the highest returns per hour of labor spent on tomatoes (table 11). Since the growing costs per ton increased only slightly as the yield increased, the net returns per acre increased markedly with the increased yield. In Chautauqua County the growers with a yield of less than 9 tons per acre had an average net return per acre of - $9 as compared with a net return per acre of $94 for those growers with a yield of 12 tons or more per acre. In Orleans County the net returns per acre averaged $15 for growers having a yield of less than 10 tons per acre as compared with $114 per acre for those having a yield of 14 or more tons per acre.

TABLE 11.   RELATION OF YIELD OF TOMATOES TO RETURNS
             CHAUTAUQUA AND ORLEANS COUNTIES, 1941

Yield of Tomatoes per acre, tons		Returns per Ton	Total Returns per Acre	Net Returns per Acre	Returns per Hour of Labor
Range	Average				
Chautauqua County					
Less than 9	7.0	$ 16.83	$ 119	-$ 9	$ 0.34
9 to 11	9.9	16.96	167	42	.59
12 or more	14.4	17.43	251	94	.80
Orleans County					
Less than 10	7.6	$ 14.76	$ 112	$ 15	$ 0.48
10 to 13	11.8	15.79	186	68	.84
14 or more	15.8	15.65	246	114	1.10

The average return per hour of labor in Chautauqua County varied from $0.34 per hour for growers having a yield of less than 9 tons per acre to $0.80 per hour for those having a yield of 12 tons or more per acre. In Orleans County the returns per hour of labor varied from an average of $0.48 for growers having a yield of less than 10 tons per acre to $1.10 per hour for those having 14 tons or more per acre.

Relation of Acres of Tomatoes Per Farm to Costs

The acreage of tomatoes grown per farm surveyed in Chautauqua County varied from .5 of an acre to 30 acres. In Orleans County the variation was from 2 to 39 acres per farm. No definite relationship is shown between the acres of tomatoes grown and the yield per acre (table 12). The average yield of tomat es on the Chautauqua County farms having the largest acreages of tomatoes was somewhat lower than on the farms having the smaller acreages; but in Orleans County the farms having the large acreages of tomatoes had a somewhat higher yield than did those having the smaller acreages.

TABLE 12. RELATION OF ACRES OF TOMATOES PER FARM TO COSTS
CHAUTAUQUA AND ORLEANS COUNTIES, 1941

Acres of Tomatoes per farm		Number of Farms	Average Yield, tons	Costs per Acre		Total Cost per Ton
Range	Average			Growing	Total	
Chautauqua County						
4 or less	2.6	33	11.0	$ 86	$ 149	$ 13.60
4.1 to 8	6.2	35	10.2	.85	144	14.20
8.1 or more	14.8	18	8.2	.70	118	14.40
Orleans County						
4 or less	3.3	23	11.4	$ 80	$ 125	$ 10.90
4.1 to 8	6.0	30	11.2	71	112	10.10
8.1 or more	15.0	26	12.5	72	119	9.50

In both Counties, the growing costs per acre tended to be higher on the farms having the smaller acreages of tomatoes than on the farms having the larger acreages of tomatoes. There was no definite relationship between the acreage of tomatoes per farm and the total cost per ton. The yield per acre was a more important factor in determining the cost per ton than was the acreage of tomatoes per farm.

Relation of Acres of Tomatoes Per Farm to Labor Requirements

Thirty-three growers in Chautauqua County who had four or less acres
of tomatoes in their enterprise used an average of 77 hours of man labor in
growing their tomatoes as compared with an average of 51 hours of labor used
by those growers who had more than eight acres of tomatoes (table 13). The
same relationship was found between the acres of tomatoes grown per farm in
Orleans County and the labor requirements per acre in growing them. The
most efficient use of labor in growing tomatoes was obtained on the farms
where the acreages were larger than the average.

RELATION OF ACRES OF TOMATOES PER FARM TO LABOR REQUIREMENTS
TABLE 13.   CHAUTAUQUA AND ORLEANS COUNTIES, 1941

Acres of Tomatoes per Farm		Man Hours per Acre		Man Hours per Ton	
Range	Average	Growing	Total	Harvesting	Total
Chautauqua County					
4 or less	2.6	77	223	13.3	20.3
4.1 to 8	6.2	63	195	13.0	19.2
8.1 or more	14.8	51	171	14.6	20.8
Orleans County					
4 or less	3.3	48	151	9.0	13.2
4.1 to 8	6.0	39	141	9.2	12.7
8.1 or more	15.0	35	146	8.8	11.6

The results from this survey indicate no relationship between the
man hours required to harvest a ton of tomatoes and the size of the tomato
enterprise. The harvesting was done about as efficiently on the farms with
the small acreages of tomatoes as on those with a large acreage. Because
of the variation in yield between the farms with the large and small acreages
there was little relationship between the acreage of tomatoes per farm and
the total man hours required per ton of tomatoes.

Relation of Acreage of Tomatoes Per Farm to Returns

Since the returns per ton of tomatoes varied only slightly between
farms, the returns per acre varied more directly in relation to the yield
per acre than in relation to the acres of tomatoes per farm. And, since
the farms with the larger acreages of tomatoes in Chautauqua County had low-
er yields than those with smaller acreages, they also had lower returns per
acre (table 14). In Orleans County the farms with larger acreages of toma-
toes had the higher yields and also the higher returns per acre.

TABLE 14.   RELATION OF ACRES OF TOMATOES PER FARM TO RETURNS
CHAUTAUQUA AND ORLEANS COUNTIES, 1941

Acres of Tomatoes per Farm		Returns per Acre	Net Returns per Acre	Returns per Hour of Labor
Range	Average			
Chautauqua County				
4 or less	2.6	$ 194	$ 45	$ 0.58
4.1 to 8	6.2	173	29	.54
8.1 or more	14.8	138	20	.48
Orleans County				
4 or less	3.3	$ 175	$ 50	$ 0.71
4.1 to 8	6.0	171	58	.78
8.1 or more	15.0	197	78	.92

Since the cost per acre varied less than did the returns per acre, the net returns per acre also were related to the yield per acre. In Chautauqua County the farms with the larger acreages of tomatoes and the lower yield per acre had a somewhat smaller return per hour of labor than did those with the smaller acreages of tomatoes. In Orleans County the growers having the larger acreages of tomatoes also had the higher yields per acre so their returns per hour of labor exceeded those of growers having the smaller acreages of tomatoes per farm.

Relation of Value of Fertilizer Applied to Costs,
Yields and Returns

Factors other than the amount of fertilizer applied per acre appeared to be more important in determining the yield and returns per hour of labor in Chautauqua County. Growers who applied less than $9 worth of commercial fertilizer per acre obtained yields as high as did those who applied $12.50 worth or more per acre (table 15). The returns per hour of labor showed little variation.

In Orleans County the growers who applied less than $9 or an average of $6.20 worth of commercial fertilizer obtained an average yield of 10.4 tons of tomatoes per acre. This compared with an average yield of 13.5 tons per acre obtained by those growers who applied $12 worth or more of fertilizer or an average of $15.40 worth. In Orleans County the returns per hour of labor increased as the amount of fertilizer applied per acre increased. The 27 growers who applied $12 worth or more of fertilizer per acre had an average return per hour of labor of $0.95 as compared with a return of $0.66 per hour for growers who applied less than $9 worth of fertilizer per acre.

RELATION OF VALUE OF FERTILIZER APPLIED TO COSTS, YIELDS, AND RETURNS
TABLE 15.   CHAUTAUQUA AND ORLEANS COUNTIES, 1941

Value of Fertilizer Applied per Acre		Number of Farms	Acres of Tomatoes per Farm	Growing Cost per Acre	Yield per Acre, tons	Net Re-turns per Acre	Returns per Hour of Labor
Range	Average						
Chautauqua County							
Less than $ 9	$ 7.10	30	4.7	$ 77	9.4	$ 30	$ 0.53
$ 9 to $ 12.49	10.80	30	7.1	80	9.6	25	.51
$ 12.50 or more	15.90	26	8.3	77	9.1	27	.54
Orleans County							
Less than $ 9	$ 6.20	19	6.4	$ 74	10.4	$ 47	$ 0.66
$ 9 to $ 11.99	10.20	33	8.2	69	11.4	65	.86
$ 12 or more	15.40	27	9.4	76	13.5	85	.95

Relation of Value of Fertilizer and Manure Applied to
Costs, Yields, and Returns

As the combined value of commercial fertilizer and manure applied per acre increased, the yield per acre of tomatoes tended to increase. In Chautauqua County, growers who applied less than $12 worth of manure and fertilizer per acre had an average yield of 8.8 tons as compared with an average yield of 10 tons obtained by those who applied manure and fertilizer valued at $18 or more per acre (table 16). In Chautauqua County the value of the increased yields obtained by the application of larger amounts of fertilizer and manure just about balanced the cost of the fertilizer and manure, so that there was little relationship between the net returns per acre or the returns per hour of labor and the varying quantities of fertilizer and manure applied.

RELATION OF VALUE OF FERTILIZER AND MANURE APPLIED TO COSTS, YIELDS AND RETURNS
TABLE 16.   CHAUTAUQUA AND ORLEANS COUNTIES, 1941

Value of Fertilizer and Man-ure, per Acre		Number of Farms	Acres of Tomatoes per Farm	Growing Cost per Acre	Yield per Ac-re, tons	Net Re-turns per Acre	Returns per Hour of Labor
Range	Average						
Chautauqua County							
Less than $12	$ 9.20	28	6.5	$ 71	8.8	$ 27	$ 0.51
$ 12 to $ 17	14.10	30	6.5	79	9.2	25	.54
$ 18 or more	25.50	28	6.9	84	10.0	29	.52
Orleans County							
Less than $ 15	$ 11.20	18	8.7	$ 61	9.2	$ 42	$ 0.68
$ 15 to $ 24	19.90	29	7.1	68	11.9	73	.93
$ 25 to $ 34	28.70	25	10.0	81	13.8	83	.93
$ 35 or more	45.20	7	5.2	97	12.9	44	.66

In Orleans County increased applications of fertilizer and manure produced increased yields, increased net returns per acre and returns per hour of labor up to a point where an application of manure and fertilizer valued at from $25 to $35 per acre was made. Applications of fertilizer and manure valued at more than $35 per acre did not bring as high net returns per acre or returns per hour of labor as did somewhat smaller applications. The yield obtained, although higher than where $15 to $25 of fertilizer and manure was applied, did not compensate for the increased cost. The growers applying more than $35 worth of manure and fertilizer obtained an average net return per acre of $44 compared with an average net return of $88 per acre obtained by those applying from $25 to $34 worth.

Relation of Methods of Transplanting to Costs, Yields, and Returns

A total of 38 or 44 per cent of the Chautauqua County growers transplanted their tomatoes by hand (table 17). They used an average of 69 hours of man labor per acre for growing their tomatoes as compared with an average of 54 hours used by growers who transplanted their tomatoes with a transplanter. The total growing costs per acre were about the same for both groups; but those who transplanted with a machine obtained a higher yield which, combined with fewer hours spent growing the tomatoes, resulted in a higher return per hour of labor.

TABLE 17. RELATION OF METHOD OF TRANSPLANTING TO COSTS, YIELDS, AND RETURNS CHAUTAUQUA AND ORLEANS COUNTIES, 1941

Method of Transplanting	Number of Farms	Acres of Tomatoes per Farm	Hours Labor per Acre Growing	Growing Costs per Acre	Yield per Acre	Returns per Hour of Labor
Chautauqua County						
By hand	38	5.8	69	$ 79	8.8	$ 0.47
Transplanter	48	7.3	54	78	9.8	.56
Orleans County						
By hand	8	5.1	45	$ 77	13.9	$ .96
Transplanter	71	8.5	37	73	11.9	.85

Only 8 of the Orleans County growers transplanted their tomatoes by hand. In general, they were the growers with smaller acreages. They grew an average of 5.1 acres of tomatoes as compared with an average of 8.5 acres grown by those who used a transplanter. Those who transplanted by hand used an average of 45 hours of man labor in growing an acre as compared with 37 hours used by those who transplanted with a machine. In both Counties the difference in labor requirements in growing an acre of tomatoes is accounted

for by the difference in time required to transplant the tomatoes. In Or-
leans County the growers who set by hand had the highest yield and so the
highest returns per hour of labor. The evidence here from the two Counties
indicates no marked relationship between the method of setting and the grow-
ing costs, yields, and returns per acre from tomatoes. The difference is
largely a question of the amount of labor required by the two methods. A
transplanter saves many hours of labor; and, where a large acreage is involv-
ed, may mean getting the plants set at an earlier date and thus increasing
the chances for a good yield.

Effect of Watering Tomatoe Plants at Time of Setting

About one-third of the Chautauqua County growers and about 57 per
cent of the Orleans County growers watered their tomatoes at the time of
setting (table 18). The majority of the growers who watered their plants
also used a starter solution. For both Counties, the yield per acre for
those growers who watered their plants at time of setting was about a ton
larger than for those who did not water them. The returns per hour of labor
were $0.18 per hour higher in Chautauqua County and $0.13 per hour higher in
Orleans County for those growers who watered their tomatoes at the time of
setting than for those who did not.

TABLE 18. EFFECT OF WATERING TOMATO PLANTS AT TIME OF SETTING
CHAUTAUQUA AND ORLEANS COUNTIES, 1941

Practice	Number of Farms	Acres per Farm	Cost per Acre Growing	Yield per Acre Tons	Returns per Hour of Labor
Chautauqua County					
Plants watered	27	6.8	$ 72	10.0	$ 0.65
Plants not watered	59	6.5	81	9.1	.47
Orleans County					
Plants watered	45	8.4	$ 75	12.5	$ 0.91
Plants not watered	34	7.9	71	11.4	.78

Effect of Replacing Missing Plants After Time of Setting

About two-thirds of the growers filled in the missing plants a few
days after time of setting. This practice of filling in had no apparent
effect on yields in Chautauqua County but in Orleans County growers who fol-
lowed this practice obtained average yields about 2 and one-thirds tons
higher than did those who did not replace the missing plants. Probably fac-
tors other than replacing the missing plants caused some of the difference in
yields in Orleans County. Because of the higher yields obtained by the

Orleans growers who replaced the missing plants, their returns per hour of labor averaged $0.11 higher than for those who did not replace the missing plants (table 19).

EFFECT OF REPLACING MISSING PLANTS AFTER TIME OF SETTING
TABLE 19.   CHAUTAUQUA AND ORLEANS COUNTIES, 1941

Practice	Number of Farms	Acres per Farm	Man Hours per Acre, Growing	Cost per Acre, Growing	Yield per Acre	Returns per Hour of Labor
Chautauqua County						
Missing plants replaced	60	6.5	61	$ 78	9.4	$0.51
Missing plants not replaced	23	6.8	55	78	9.5	.57
Orleans County						
Missing plants replaced	49	8.9	38	$ 75	12.7	$ 0.88
Missing plants not replaced	28	7.0	37	69	10.4	.77

Relation of the Time of Transplanting to Yields of Tomatoes

The data obtained from this survey indicates that there is an advantage in getting the tomatoes transplanted at an early date. In both Chautauqua and Orleans Counties the yields obtained by growers who transplanted before May 24 were higher than those obtained by growers who transplanted at later dates (table 20). The specific date of May 24 is not necessarily the deadline for any one year. Some seasons are earlier than others, and frosts come later some years than others. The important thing is to give the plants as many days as possible before frost to produce their crops.

RELATION OF TIME OF TRANSPLANTING TO YIELDS OF TOMATOES
TABLE 20.   CHAUTAUQUA AND ORLEANS COUNTIES, 1941

Time of Transplanting	Number of Acres	Yield per Acre
Chautauqua County		
May 24 or earlier	225.6	10.1
May 25 to 28	168.8	8.6
May 29 or later	173.6	9.4
Orleans County		
May 24 or earlier	171.3	14.7
May 25 to 28	289.5	11.1
May 29 or later	186.5	11.0

SUMMARY

This report gives the results of a farm-to-farm survey of the costs and returns from producing tomatoes on 86 Chautauqua and 79 Orleans County farms in 1941.

The cost of growing and harvesting tomatoes on these farms in 1941 averaged $14.17 per ton in Chautauqua County and $9.80 per ton in Orleans County. The year 1941 was favorable for tomato production. Yields on these farms averaged 9.4 tons per acre in Chautauqua and 12 tons per acre in Orleans County. Prices per ton averaged $17.06 in Chautauqua and $15.58 in Orleans County for tomatoes grown on these farms in 1941. Labor represented about one-half of the cost of growing and harvesting a ton of tomatoes. An average of 188 hours were used in Chautauqua and 145 hours in Orleans County to grow and harvest an acre. The results indicate that:

1. Yield per acre is the most important factor affecting costs per ton and net returns. Higher than average yields result in lower costs per ton and higher than average returns.

2. The size of the enterprise as measured by acreage of tomatoes had no apparent effect on yield, cost per ton, or returns per acre or per hour. Less labor was used to grow an acre, however, on farms with the larger acreages than on those with the smaller acreages.

3. Growers who made heavier than average applications of manure and fertilizer obtained yields and returns above average.

4. No relation was found between the method of setting and yields and returns. But growers who set their plants with a machine used about 20 per cent less labor in growing an acre of tomatoes than did those who set by hand. It took about 24 hours of labor to set an acre by hand in Chautauqua County compared with about 13 hours by machine.

5. Growers who watered their tomato plants at time of setting obtained higher yields than those who did not water them. Most of those who watered their plants used a starter solution.

6. There appears to be an advantage in setting the tomatoes as soon as the soil is in condition after the danger of frost is past. Growers who transplanted early had higher than average yields in 1941.