MACHINE HARVEST COSTS

TOMATO - 1969

YOLO COUNTY

CASH COSTS

LABOR

MACHINE

MISC.

OVERHEAD COST

=

COST PER TON

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Yolo County

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1969 MACHINE HARVEST COSTS - PROCESSING TOMATOES

YOLO COUNTY

Compiled by Mel Zobel, Farm Advisor
Reviewed by Phil Parsons, Ag. Extension Economist

INTRODUCTION

The 1969 tomato harvest season was a difficult one. 1969 could be characterized as an early season with high temperatures at harvest and with quotas interfering with an orderly harvest.

Even with reduced acreage statewide, strict quotas were imposed by most processors. A number of growers also were limited in the tonnage that could be delivered from their acreage.

Because of quotas and forced delays in harvest, conditions were frequently poor and much overripe fruit was being harvested. Some of the overripe fruit was classified as sunscald.

In most cases, yields were better than expected. Good fruit setting weather occurred that resulted in more fruit per cluster than usual. Without quotas and without herbicide injury that occurred in many fields, the average yields would have been much, much higher.

BACKGROUND

Machine harvest performances and cost studies have been conducted for a number of years. The basis of these studies are surveys of performances and costs of actual machine harvest operations. Each year the data as found in the survey was averaged and the more pertinent information is compared in Table I. The averages determined from the survey served, with adjustments, as a base for the more detailed cost analysis.

TABLE I

	1961	1963	1965	1966	1967	1968	1969
Average Yield - Tons/A	17	23.2	20.1	23.0	18.1	23.2	25.2
Sorters/Machine	11	11.8	14	15.1	13.4	15.0	14.6
Average Tons/Hour	3.7	6.8	6.8	7.4	7.6	9.7	11.6
Average Tons/Machine	1000	1168	2537	3447	3200	3502	3276
Average Days Operated	36	18	39	48	36.8	57.5[1]	41.4[1]
Average Acres/Day	2.2	2.8	3.1	3.3	3.9	3.6	3.9
Average Acres/Machine	80	50	122	152	156	159	133
Calculated Cash Cost/Ton	$ 9.50	$5.81	$ 7.26	$7.01	$7.36	$ 8.19	$ 7.64
Calculated Overhead Cost/Ton	$ 4.64	$4.11	$ 3.08	$1.96	$2.15	$ 1.96	$ 2.29
Calculated Total Cost/Ton	$14.14	$9.92	$10.34	$8.97	$9.51	$10.15	$ 9.93

[1] Reflects the delivery quota situation and part days worked.

1969 STUDY BASIS

For the 1969 study, like the previous study, a questionnaire was sent to a large number of growers to obtain information on their operations. Information was obtained on operations throughout the county. A good cross section of the Yolo tomato growing industry was represented.

Various sized operations and experience; multiple machine operations to single machines, experienced operators to second year operators, all were included in the survey.

The information from the total operation was used and the data calculated down to a one machine basis. Individual items were accumulated into totals and then averaged. Averages found are presented in Tables II through IV along with ranges, when ranges are of interest or value.

For the detailed study, Tables V through VII show the assumed performances. These assumed performances are based on the survey findings. Some adjustments were made to make a workable unit. The detailed study is assumed to be a single machine operation. The study also assumes a no quota situation.

TABLE II

Average machine harvest operation and performance data found in the survey. Ranges also shown. (Figures may not be in exact agreement because averages used).

Machines per operation - 3.2 (Range 1 to 12)
Acres represented in study - 8,331
Tons represented in study - 207,600
Tons per acre - 25.2 (Range 14 to 36)
Tons per year per machine - 3,276 (Range 1,137 to 5,662)
Tons per hour - operating time 11.6 (Range 6 to 17)
Days operated 41.4 (Range 21 to 59)
  Full days - 28.7 (Range 12 to 56)
  Part days (Quota days) 12.7 (Range 3 to 35)
Acres per day per machine 3.9 (Range 2.2 to 5.7)
  Acres per day per machine (Quota days) 2.4 (Range 1.2 to 3.6)
Acres per machine 133 (Range 50 to 219)
Hours per day operating - 9.7 (Range 8.5 to 11.0)
  Hours per day - (Quota days) 5.8 (Range 5 to 7)
Trailers per machine - 2.1
Forklifts per operation - 2 (Range 1 to 6) (47% used only 1)
Sorters per machine 14.6 (Range 11 to 20)
Swampers used in 73% of operations
Sorter supervisors used in 68% of operations
Operation supervisors used in 84% of operations
Mechanics used in 57% of operations (some only part-time)

TABLE III

Machine Harvest Labor - Hours, and ranges found.

Hours/day/employee - Average		
Operator	10.6	Range - 8 to 13
Trailer men	9.4	Range - 8 to 10
Forklift	10.0	Range - 8 to 11
Sorters	9.1	Range - 8 to 10
Swampers	9.3	Range - 8 to 10
Mechanic	12.3	Range - 8 to 14
Sorter supervisor	9.4	Range - 8 to 12
Operation supervisor	11.0	Range - 8 to 14

Wages paid = Cash + Benefits and Bonuses = Total Costs

Operator	$ 2.18	+	$ .48	=	$ 2.66	(Range $2.46 to $ 3.01)
Tractor	1.77	+	.35	=	2.12	(Range $1.99 to $ 2.66)
Forklift	2.06	+	.36	=	2.42	(Range $2.08 to $ 2.91)
Sorters	1.65	+	.28	=	1.93	(Range $1.94 to $ 2.05)
Swampers	1.68	+	.27	=	1.95	(Range $1.92 to $ 2.14)
Mechanics	3.09	+	.54	=	3.63	(Range $2.42 to $ 5.75)
Sorter supervisors	1.82	+	.39	=	2.21	(Range $2.02 to $ 2.41)
Operation supervisors	3.15	+	.55	=	3.70	(Range $2.42 to $ 5.75)

TABLE IV

Miscellaneous information found in survey of operations.

Varieties used - 100% of the operations used VF145-7879 on all or part of their acreage. In 40% of the operations, VF145-7879 was the only variety reported as used. Other varieties reported as also planted were VF13L, VF198, VF145-F5, VF145-21-4P, VF145-21-4S, Castlemor, Pickmaster, and several very minor varieties.

Miscellaneous Harvest Preparation (Headlands, Loading areas, sprinkle roads, etc.) @ $125/year/machine.

Toilet Facilities - 1.2 per machine @ $60 per year = $72/year/machine.

Drinking Water Supplies - $173/operation (Range $20 to $555)

Bin Rental - if any @ 40¢/Ton; 100% paid bin rent on all or part of contracts.

Rest Period Break Time - Average - 15 min. (Range 10 to 20 minutes)

Operational Breakdown Time - Average 5.7 hours/machine (Range 1 to 25 hours)

Miscellaneous Supplies - Soda, goggles, etc. - $267/operation (Range $20 to $1,000)

Fruit per bin - Average 943 lbs - (Range 845 to 1060)

Rejected Loads - 95% had 1 or more (Range 0 to 15; Average 1.3/machine.)

Cause for rejected loads - Sunscald, overripe, 85%; Mold, 10%; Miscellaneous causes - 5%.

Reconditioning of rejected loads - Yes, 58%; No, 42%.

Years Experience - Average 4.9 (Range 10%, 9 years; 5%, 8 years; 5%, 6 years; 35%, 5 years; 25%, 4 years; 15%, 3 years; 5%, 2 years).

Growers - Off the cuff estimate cost per ton - Average $9.00 (Range $4.50 to $22.50)

Twin Row vs Single Row - 40% twins, 55% single, 5% both.

Hand Thin vs Machine Thin vs Plant to Stand - 55% hand, 10% Machine, 15% planted to stand, 20% both or mixture of methods.

Unharvested or Lost Acreage - 20.1 acres overall average - (Range 0 to 100) Of those with acres lost - 31 acre average.

Going to Expand - 68% indicated expansion plans if possible; 32% - No.

Most frequently indicated problem - Quota, delivery, overripe.

TABLE V

Assumed and projected specifications for machine cost study based on survey findings.

(ONE MACHINE BASIS)

Tons per acre	24.5	Number of sorters	15
Acres per machine	135	Number of trailers	2
Tons harvested	3300	Bin rental charge	$ .40
Days operated	41	Inspection fees per ton	$ .20
Tons per hour - operating	12	Toilet facilities per acre (2 units)	$ .55
Tons per hour - paid time	8.9	Drinking water per acre	$ 1.30
Hours per day	9.0	Misc. supplies per acre	$ 2.00
Acres harvested per day	3.3	Pickup charge per acre	$ 3.00
Tons harvested per day	80	Misc. equip. use per acre	$ .90

TABLE VI

Assumed equipment costs, life, fuel usage, repairs and percent of time used on harvest.

	New Cost	Life Yrs.	Fuel/Day (gal)	Repairs/Yr.	% Use On[1] Tomato Harvest
Harvester	$ 23,500	5	30	$2,000	100
Trailer	1,000	10	-	60	100
Tractor	5,000	10	20	600	40
Forklift	6,000	10	20	500	70
Wash.Equipment	1,500	5	2	100	60
Total	37,000			$3,260	

[1]Tractors, forklifts and washing equipment used for other operations also.

TABLE VII

Assumed labor specifications - Number of, hours per day, wages per hour

	No. of	Hrs./Day	Wages/Hour Cash + Benefits = Total
Operator	1	10.5	$2.15 + $ .50 = $2.65
Trailer men	2	9.5	1.75 + .35 = 2.10
Forklift	1	10.0	2.00 + .35 = 2.35
Sorters	14	9.0	1.65 + .25 = 1.90
Swampers	1	9.0	1.70 + .25 = 1.95
Sorter supervisor	1	9.0	1.75 + .30 = 2.05
Supervisor/Mechanic	1	11.0	3.00 + .55 = 3.55

DETAILED BREAKDOWN OF HARVEST COSTS
(Single Machine & Supporting Equipment)

CASH OPERATING COSTS

	Per Day	Per Ton
Labor - (1)		
Sorters - 14 @ $1.65 - 9 hrs.	$ 207.90	
Sorter supervisors - $1.75 - 9 hrs.	15.75	
Machine operator - $2.15 - 10.5 hrs.	22.58	
Trailer men - 2 @ $1.75 - 9.5 hrs.	33.26	
Forklift Man - $2.00 - 10 hrs.	20.00	
Swamper - $1.70 - 9 hrs.	15.30	
Supervisor/Mechanic - $3.00 - 11 hrs.	33.00	
Additional Wages (1) - benefits	57.90	
Labor Manager Fees (2) - 16 men @ $2.50	40.00	
Total Labor Costs	*$ 445.69*	
Total Labor Costs/Ton ($445.69 ÷ 80 tons)		*$ 5.57*

(1) Additional wages shown as benefits (Table VII). Social Security, Workmen's Compensation, Insurance, bonuses, etc.

(2) Temporary or seasonal labor supplied by labor manager - @ $2.50/day/man - sorters, swamper, one trailer man.

MACHINE OPERATION

Fuel -		
Harvester - 30 gal @ $ .22/gal	$ 6.60	
Tractor - 2 x 20 gal. @ $ .16/gal (Diesel)	6.40	
Forklift - 20 gal. @ $ .22/gal	4.40	
Washing Equipment - 2 gal. @ $ .22/gal	.44	
Repairs (includes parts, oil, lubrication)		
Harvester - $2,000 ÷ 41 days	$ 48.78	
Trailer - 2 x $60 ÷ 41 days	2.92	
Tractor - 2 x $600 ÷ 41 x 40% of time	11.70	
Forklift - $500 ÷ 41 days x 70% of time	8.53	
Washing Equipment - $100 ÷ 41 days x 60% of time	1.46	
Total Machine Cash Costs	*$ 91.23*	
Total Machine Cash Cost/Ton ($91.23 ÷ 80 tons)		*$ 1.14*

MISCELLANEOUS OPERATING COSTS

Bin Rental @ 40¢ per ton		$ .40
Inspection fees @ 20¢/ton		.20
Toilet Facilities $120/yr. (2 units-2 mo. @ $30/mo/unit)	$ 2.92	
Drinking Water Supplies	4.29	
Misc. supplies - soda, goggles, etc.	6.60	
Pickup use in harvest operation.	9.90	
Misc. equipment use - scraper, disc, etc. -	2.97	
Total Misc. operating costs $25.58	*$ 26.68*	
Total Misc. cost/ton ($26.68 ÷ 80 tons + 60¢ fixed cost)		*$ .93*
Total Cash Operating Costs	*$ 563.60*	*$ 7.64*

OVERHEAD COSTS	Per Year	Per Ton
Harvester Investment - $23,500 (Includes Sales Tax)		
Depreciation - 5 yr. life $23,500 - $500 Salvage = $23,000 $23,000 ÷ 5 years = $4,600	$ 4,600.00	
Interest on Investment $23,500 + $500 Salvage = $24,000 $24,000 ÷ 2 = $12,000 Average Value $12,000 x 8% = $960.00	$ 960.00	
Taxes, Insurance and Storage Costs @ 2.5% of Average Value $12,000 x 2.5% = $300.00	$ 300.00	
Total Harvester Cost per Year	*$ 5,860.00*	
Total Harvester Cost per Ton ($5,860 ÷ 3,300 tons)		*$ 1.78*
Trailer Investment = @ $1,000 each (Includes Sales Tax)		
2 Trailers @ $1,000 = $2,000 Depreciation - 10 years - (10 year life) $2,000 ÷ 10 = $200.00	$ 200.00	
Interest on Investment $2,000 ÷ 2 = $1,000 Average Value $1,000 x 8% = $80.00 per year	$ 80.00	
Taxes, Insurance & Storage @ 2.5% of Avg. Value $1,000 x 2.5% = $25.00 per year	$ 25.00	
Total Trailer Overhead Cost	*$ 305.00*	
Total Trailer Overhead Cost per Ton ($305.00 ÷ 3,300 tons)		*$ .09*
Tractor Investment (Includes Sales Tax)		
2 - 30 H.P. Diesel Wheel Tractors @ $5,000 each = $10,000		
Depreciation - 10 years life - $10,000 - $800 Salvage Value ($400 ea.) = $9,200 $9,200 ÷ 10 year life - $920 per year	$ 920.00	
Interest on Investment $10,000 + $800 Salvage Value - $10,800 $10,800 ÷ 2 = $5,400 Average Value $5,400 x 8% = $432.00 per year	$ 432.00	
Taxes & Insurance Storage $5,400 x 2.5% = $135.00 per year	$ 135.00	
Total Tractor Overhead Cost per Year	*$ 1,487.00*	
Tractors are used for harvest only 40% of total yearly time. $1,487 x 40% = $594.80	$ 594.80	
Total Tractor Overhead Cost	*$ 594.80*	
Tractor Overhead Cost per Ton ($594.80 ÷ 3,300 ton)		*$ .18*

Forklift Investment - $6,000 (Includes Sales Tax)	Per Year	Per Ton
Depreciation - 10 yr. life $6,000 - $400 Salvage Value = $5,600 $5,600 ÷ 10 years = $560.00	$ 560.00	
Interest on Investment $6,000 + $400 Salvage = $6,400 $6,400 ÷ 2 = $3,200 Average Value $3,200 x 8% = $256.00	$ 256.00	
Taxes, Insurance & Storage $3,200 x 2.5% = $80.00	$ 80.00	
Total Forklift Overhead Cost	*$ 896.00*	
Forklift used elsewhere. 70% of yearly use is for tomato harvest $896.00 x 70% = $627.20	$ 627.20	
Total Forklift Overhead Cost for Tomato Harvest	*$ 627.20*	
Forklift Overhead Cost/Ton ($627.20 ÷ 3,300 tons)		*$ .19*

Washing Equipment Investment - $1,500 (Includes Sales Tax)		
Depreciation - 5 yr. life $1,500 - $500 Salvage = $1,000 $1,000 ÷ 5 years = $200.00 per year	$ 200.00	
Interest on Investment $1,500 + $500 Salvage = $2,000 $2,000 ÷ 2 = $1,000 Average Value $1,000 x 8% = $80.00	$ 80.00	
Taxes, Insurances and Storage $1,000 x 2.5% = $25.00	$ 25.00	
Total Overhead Costs for Washing Equipment	*$ 305.00*	
Washing Equipment used 60% of total yearly time on tomato harvest $305 x 60% = $183.00	$ 183.00	
Overhead costs washing equipment for tomato harvest	*$ 183.00*	
Overhead costs/ton ($183.00 ÷ 3,300 tons)		*$ .05*
Total Overhead Costs - Equipment ($7,570.00 ÷ 3,300 tons)	*$ 7,570.00*	*$ 2.29*

TABLE VIII

Summary of Investment & Overhead Costs of Assumed Operation

Machine	New Cost	Years Life	Depreciation[1]	Interest	Tax, Ins. Storage	Total Overhead
Harvester	$23,500	5	$4,600.00	$ 960.00	$300.00	$5,860.00
Trailer - 2	2,000	10	200.00	80.00	25.00	305.00
Tractor - 2-40%	10,000	10	368.00	172.80	54.00	594.80
Forklift - 60%	6,000	10	392.00	179.20	56.00	627.20
Wash.Equip.	1,500	5	120.00	48.00	15.00	183.00
TOTAL	*$43,000*		*$5,680.00*	*$1,440.00*	*$450.00*	*$7,570.00*

[1]Salvage value figured on all equipment except trailers. Example: Harvester $23,500 less $500 salvage = $23,000 ÷ 5 year life = $4,600.

TABLE IX

Summary of cost per ton for the assumed tomato harvest operation

Overhead		
Machine	$ 1.78	
Trailer	.09	
Tractor	.18	
Forklift	.19	
Washing Equipment	.05	
TOTAL	*$ 2.29*	*$ 2.29*
Cash		
Labor	$ 5.57	
Machine & Equipment	1.14	
Misc. operating	.93	
TOTAL CASH	*$ 7.64*	*$ 7.64*
TOTAL ALL COSTS		*$ 9.93*

FIGURING COSTS UNDER OTHER CONDITIONS

Your operation is probably sufficiently similar to this assumed operation so that your costs could be roughly interpreted from the following cost table (Table X). Or, if you know what your cash costs and overhead costs are, you can set up your own table and calculate costs for your operation under differing conditions. Add cash costs to overhead costs to find the total cost. Different rates of harvest and different total tons harvested can result in many combinations and thus different total costs.

Under the conditions of this study it was found that cash costs were $62.62 per hour to operate. Yearly overhead for equipment was $7,570.00. There was a rigid or fixed cost of 60¢ per ton (bin rental and inspection) regardless of rate or number of tons harvested.

For example, when using Table X, if the harvest rate was 6 tons per hour (3 truck loads per 10 hour day) and 3000 tons were harvested during the season, the cost would be $11.03 + $2.52 or $13.55 per ton. As another example - using the same rate, 6 tons per hour but more tons were harvested - 5,000 tons - the cost then would be $11.03 + $1.51 or $12.54. A third example, changing the rate to 10 tons per hour and 3,000 tons harvested the cost would be $6.86 + $2.52 or $9.38 total. See Table XI for more combinations and examples.

TABLE X

Calculated Costs Under Varying Conditions

Tons/Hour	Cash Cost/Ton (60¢ rigid cost included)	Tons Harvested	Overhead Cost/Ton
4	$16.25	500	$15.14
5	$13.12	1000	$ 7.57
6	$11.03	2000	$ 3.78
7	$ 9.54	3000	$ 2.52
8	$ 8.42	*3300	$ 2.29
9	$ 7.55	4000	$ 1.89
10	$ 6.86	5000	$ 1.51
12	$ 5.81	6000	$ 1.26
15	$ 4.77	7000	$ 1.08
20	$ 3.73	8000	$ .94

*Used in study.

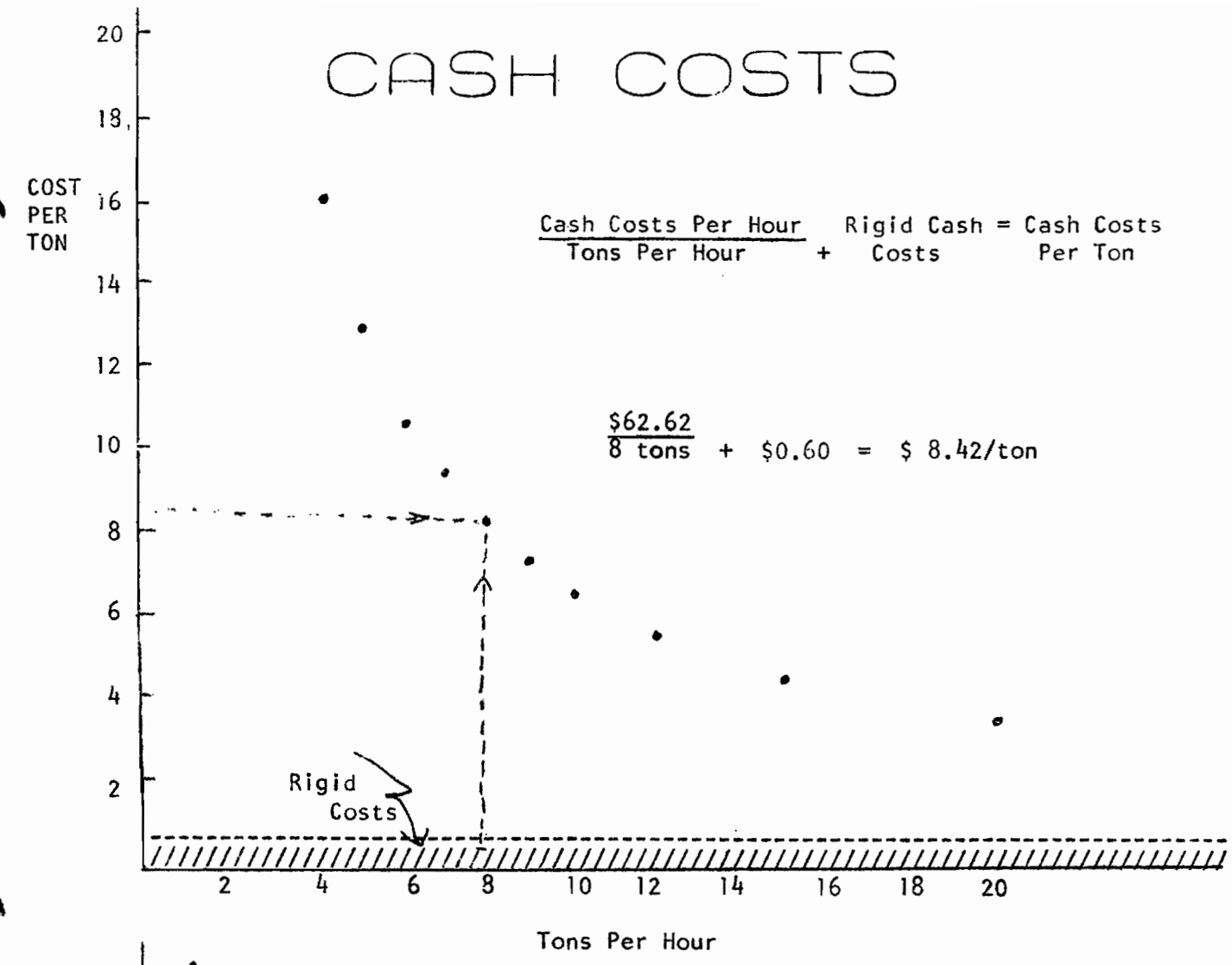
TABLE XI

Cost per ton at 4 harvest rates and
4 quantities of total tons harvested.
(Compiled from Table X)

Harvest Rate Tons Per Hour	Total Tons Per Year	Cash Costs Per Ton	Overhead Costs Per Ton	Total Cost Per Ton
4	2,000	$ 16.25	$ 3.78	$ 20.03
4	3,000	16.25	2.52	18.77
4	4,000	16.25	1.89	18.14
4	5,000	16.25	1.51	17.76
6	2,000	11.03	3.78	14.81
6	3,000	11.03	2.52	13.55
6	4,000	11.03	1.89	12.92
6	5,000	11.03	1.51	12.54
8	2,000	8.42	3.78	12.20
8	3,000	8.42	2.52	10.94
8	4,000	8.42	1.89	10.31
8	5,000	8.42	1.51	9.93
10	2,000	6.86	3.78	10.64
10	3,000	6.86	2.52	9.38
10	4,000	6.86	1.89	8.75
10	5,000	6.86	1.51	8.37
12	2,000	5.81	3.78	9.59
12	3,000	5.81	2.52	8.33
12	4,000	5.81	1.89	7.70
12	5,000	5.81	1.51	7.32
15	2,000	4.77	3.78	8.55
15	3,000	4.77	2.52	7.29
15	4,000	4.77	1.89	6.66
15	5,000	4.77	1.51	6.28
20	2,000	3.73	3.78	7.51
20	3,000	3.73	2.52	6.25
20	4,000	3.73	1.89	5.62
20	5,000	3.73	1.51	5.24

The line graphs on the following pages present a picture of how the costs rise and fall under differing output and usage conditions. Using the formula shown with the graphs, and using your figures, a similar diagram can be developed for your operation. This diminishing cost curve is similar for all operations. The location of the lines depends on the cost inputs and harvest outputs.

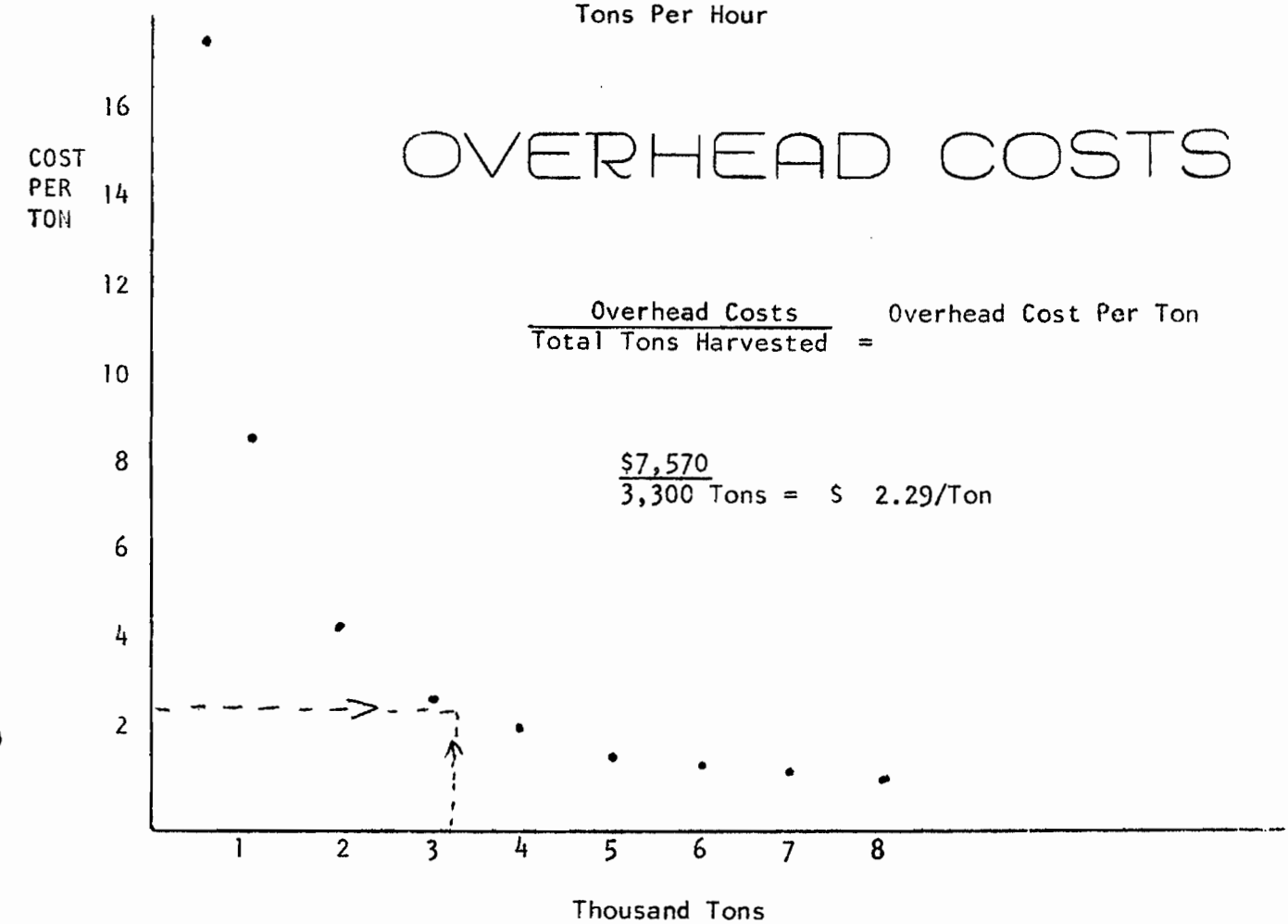
CASH COSTS



$$\frac{\text{Cash Costs Per Hour}}{\text{Tons Per Hour}} + \text{Rigid Cash Costs} = \text{Cash Costs Per Ton}$$

$$\frac{\$62.62}{8 \text{ tons}} + \$0.60 = \$\ 8.42/\text{ton}$$

OVERHEAD COSTS



$$\frac{\text{Overhead Costs}}{\text{Total Tons Harvested}} = \text{Overhead Cost Per Ton}$$

$$\frac{\$7,570}{3,300 \text{ Tons}} = \$\ 2.29/\text{Ton}$$