AN ABSTRACT OF THE THESIS OF

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Title An Evaluation of Methods of Estimating 1953 Costs of Producing Strawberries

Abstract approved George B Davis
(Major Professor)

The purpose of this thesis was to evaluate two methods of estimating 1953 costs of producing strawberries. To accomplish this the following steps were taken:

1. To estimate production costs in 1953 by using 1947 input data and 1953 prices for those inputs, (Method 1);

2. To compare the results of the preceding method with the index number method of revising the cost data, (Method 2);

3. To evaluate the two methods of revising the cost data.

By the use of Method 1 the production cost per pound was 16.4 based on an average yield of 3,609 pounds per acre. This amounted to an average total cost of $590.30 per acre. Considerable variation existed among the 53 producers whose records were used, with the higher yielding producers tending to have lower costs. When the index number method was used, the cost was 16.5 cents per pound. This is only 0.1 cents more than costs revised with the actual prices paid for the inputs. Because these costs are nearly identical, no significant difference appears to exist between the results of the two methods. However, it must be noted that this comparison is for only one crop and one crop year. Different results may be obtained for different crops and for different years.

The following conclusions were drawn with respect to the two methods:

1. Method 1 is based on prices paid to produce the crop. This is in contrast to costs revised with indices which include items not actually used in the production of strawberries.

2. With Method 1 only prices prevailing in the production area are used. On the other hand, costs revised with index numbers are affected by state and/or national prices for commodities which may or may not be used to produce strawberries.

3. More computations are necessary to revise the costs in Method 1 than Method 2. Costs revised by Method 1 require about 25 computations to revise each producer's data plus about 20 more to determine the sample average. By contrast, only six computations are necessary to revise cost data with index numbers.

4. By using the principles of both methods it may be possible to retain some of the advantages of both methods. A cost index based on local prices would be more realistic than more general indices and would retain the simplicity of the index number method now used.

APPROVED:

George B Davis

Professor of Agricultural Economics

In Charge of Major

Grover E Blanch, Acting

Head of Department of Agricultural Economics

Henry Hartman

Chairman of School Graduate Committee

H P Hansen

Dean of Graduate School

Date thesis is presented March, 1955

Typed by Shirley Foust

4/16/55

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CHAPTER I

INTRODUCTION

Like any other businessman, the strawberry producer must obtain a profit in the long run to remain in production. However, Oregon producers have been experiencing increased difficulty in obtaining a profit during the past five years as a result of decreasing strawberry prices and increasing production costs.

Strawberry prices decreased 2.2 cents from the 1949-51 average of 17.7 to 15.5 cents per pound in 1953. One of the reasons for the decline is the increased production elsewhere in the nation, most of which is attributed to the Pacific coast states. As shown in the data below, Oregon production increased approximately 61.5 percent from the 1949-51 average to 1953, but California and Washington production increased by 120.8 and 92.0 percent respectively in the same period.

Price is determined not only by supply but also by the anticipated demand for the crop to be harvested. The seasonal price is highest during April when the harvest is begun but declines in May to a low where it remains during the remainder of the season (6, p.5). The major

Total strawberry production for processing and fresh consumption[1]

State	1949-1951 3-year Av.	1952	1953
	(1,000 pounds)		
California	42,912	68,544	94,752
Oregon	27,144	38,760	43,848
Washington	17,064	26,400	32,760
Michigan	20,664	24,000	25,200
Louisiana	14,976	9,048	17,280
Tennessee	14,664	17,952	12,384
Arkansas	21,312	18,360	8,160
Florida	8,088	6,552	5,616
All states	249,600	283,056	298,440

portion of Oregon's crop ripens and is harvested in the late season (6, p.8) after the price has reached the season low.

Since the price is determined by national supply and demand conditions, the individual producer has little control over the price which he receives. However, Oregon's producers are attempting to form organizations to promote their interests and cope with marketing problems, such as decreasing prices, which cannot be handled by the individual producer.

In addition to a decreasing price trend, Oregon's producers have been subjected to increasing production costs. The major portion of these increases is due to

1. Data obtained and converted to pounds from the USDA, Agricultural Marketing Service, Crop Production Report, December 17, 1953.

higher machinery costs and wages paid to farm labor. Indices (11) for machinery prices indicate increases varying from 25 to 50 percent. Wages for Oregon's farm labor increased about 20 percent or approximately 15 cents per hour. Because of these increasing costs, Oregon producers have become cost conscious and are interested in obtaining cost of production information for their industry. Unlike price, which tends to prevail throughout a particular market area, production costs vary among the producers during a particular year as well as between years for a particular producer. Since the individual producer is not able to obtain cost figures representing the entire industry, the Oregon Agricultural Experiment Station is called frequently to make estimates of the cost of production.

In order to correct the production costs from year to year, the station's economists devised a method of revising the costs summarized from a 1947 survey by using index numbers.[2] This method not only furnished current cost figures but also saved the time and money needed to

2. The index numbers used are those issued periodically by the USDA, AMS, Washington, D. C. in "Agricultural Prices" and "Farm Labor" (quarterly). (See numbers 10 and 12 in the Bibliography.)

conduct new surveys annually. However, the accuracy of this method has been questioned because the index numbers represent the combined change for many commodities. For example, the parity index (US) includes prices paid for livestock, feed, machinery, etc., as well as interest, taxes, and wages. The composite wage index for Oregon includes wages paid for all types of farm labor throughout the state. Since these indices represent price changes for many commodities and in such a large area, a verification of the accuracy of the index method appears to be warranted.

Therefore, the following objectives are established for this thesis:

(1) To compute the estimated cost of producing Oregon strawberries in 1953 from (a) physical input data collected in 1947 and (b) costs of these inputs in 1953.

(2) To compare the results obtained from computing the costs by the index number method and the method described in objective Number one above.

(3) To evaluate the two methods of revising cost data.

CHAPTER II

DEFINITION OF TERMS

The terminology used in this thesis is intended to mean the same as that used in the original study (5). In a few cases, the terms are used to explain the general rather than the specific point of discussion. These exceptions are defined in the paragraphs which follow.

The total cost to establish the stand and to produce the crop is the sum of all costs resulting directly and indirectly from the production of strawberries for those farmers who are included in the sample. The only variable which differs between the two operations is the length of time over which the costs are accrued. The cost to establish the stand includes costs of the cover crops and the fertilizers applied to the soil in preparation for planting the crop. The cost to produce the crop includes the expenses for one production year only. This cost includes an allocation of one-third the preharvest cost of establishing the stand since it was assumed a stand would produce three crops.

The average total cost is a weighted average and is computed by dividing the total expenses of all producers by the total product resulting from the operation. The average total cost to establish the stand is allocated equally among the expenses for three production years as stand depreciation. The average total cost of production is computed on the basis of one pound and is intended to represent the average cost for a particular year.

The average total cost is sub-divided into preharvest and harvest costs[3] according to the season in which the major portion of the cost's total is incurred. A cost item is classified as a preharvest cost if the larger portion of its total is accrued prior to the harvest season. Harvest costs are the labor, both supervisory and picking, needed to get the crop from the field to the market. For example, producers use their automobiles and trucks for both preharvest and harvest phases of production. Preharvest uses consist of hauling hoeing laborers to and from work daily for about two months, implements from one location to another, supplies from the store to the farm, etc. Harvest uses consist of hauling pickers

3. Preharvest costs are similar to fixed costs in that the total preharvest costs do not vary as the yield varies. Harvest costs are similar to variable costs because their total varies directly as the yield varies. Cost items have been classified as preharvest and harvest costs instead of fixed and variable costs to avoid confusion.

to and from work for about a month and usually one trip daily to the market place to deliver the strawberries. Therefore, the auto and truck expense is classified as a preharvest cost since most of its total is derived from use during that portion of the production period.

CHAPTER III

REVIEW OF PREVIOUS PUBLICATIONS

In 1949, Oregon State College published Experiment Station Bulletin No. 469, "Cost of Producing Strawberries for Processing in the Willamette Valley" (5). The first step toward determining the costs in the report was to compute the average cost to establish one acre of the crop. Data were assembled from 68 farms and the cost of each operation was totalled for all producers. The weighted average was then computed by dividing the total cost by the number of acres established. The average total cost per acre, based on three production years, was $108.83 per annum (5, p.27).

The next step consisted of computing the cost to produce and harvest the crop. Data were collected from 99 farms whose acreage in strawberry production ranged from three to 140 acres. The weighted average for each item of cost was derived by the same method described above with the exception that the costs were averaged over the total yield instead of the acreage. The average total cost was 15.07 cents per pound (5, p.21).

In the analysis, an itemized comparison was made of the high-cost producers (the one-third having the highest costs), the low-cost producers (the one-third having the lowest costs), and the average expenses incurred by all producers. The preharvest cost which was composed largely of fixed expenses averaged 8.87 cents per pound, and represented 58.8 percent of the total production cost. The average yield for the sample was 3,529 pounds per acre. Preharvest costs for the low-cost producers amounted to 5.80 cents per pound or 49.2 percent of the total cost when the yield was 4,863 pounds per acre. These costs for the high-cost producers amounted to 17.58 cents per pound or 72.6 percent of the total with a yield of 1868 pounds per acre.

Picking and other harvest costs per pound remained relatively constant for all three groups regardless of yield. These costs averaged 6.20 cents per pound for the study; 5.99 cents for the low-cost group; and 6.61 for the high-cost group (5, p.21). The proportion of the total cost which the latter figures represent was 41.2 percent for the study average, 50.8 percent for the low-cost group, and 27.3 percent for the high cost group. In other words, the low-cost producers had low preharvest costs and the high-cost producers had high preharvest costs on a per pound basis.

Prior to the 1947 study, one other cost of production survey for strawberries had been completed and published by the Oregon Agricultural Experiment Station. This study was published in 1929. The reasons why this study is not relevant at the present time are: (1) fertilizing practices have changed; (2) farm power has shifted from the use of horses to the use of tractors; and (3) the data used for the 1947 study are the only available data that are complete in detail.

CHAPTER IV

METHODS OF REVISING THE DATA

The data for this thesis are the original input data collected for the 1947 study "by the survey method" (5, p.27). County agents assisted in selecting only those producers within their respective counties who sold strawberries for processing rather than for fresh market consumption. The sample included small producers having less than five acres as well as large producers with more than twenty acres. "Each cooperating grower was visited at the end of the year for the purpose of obtaining a complete business record on the bearing strawberry acreage....A comparable record was also obtained on the cost of establishing strawberries" (5, p.27).

The Index Number Method of Revising Costs

As indicated previously,[4] index numbers have been used to revise 1947 cost data. The computation is simplified by summarizing the average total costs under four cost items. The total for each item is multiplied by the ratio between the 1953 and the 1947 index numbers.

4. Page three of this thesis.

The sum of the revised costs represents the average total cost for 1953. For example, the "other costs" in Table 1 below amounted to 5.7 cents per pound in 1947. The ratio between the 1953 and the 1947 parity index (US) for July is 279/239 or 116.3. When the 1947 cost (5.7 cents) is multiplied by the revised index (116.3), the revised cost for 1953 is 6.7 cents per pound. The other three items are revised in the same manner.

Table 1. Ratios of 1947, index numbers, costs and yields to 1953 index numbers, costs and yields.

Item	1947	1953	Ratio
Average yield per acre	3,609	3,609	--
Composite wage index, Oregon	461[5]	521[5]	113.0
Parity index (US) for July	239[5]	279[5]	116.3
	Average cost per pound (cents)	Average cost per pound (cents)	
Other costs	5.7	6.7	116.3
Other labor	3.3	3.7	113.0
Picking labor	5.0	5.0	--
Other harvest costs	1.0	1.1	113.0
Total	15.0	16.5	--

5. The index numbers used are those issued periodically by the USDA, Agricultural Marketing Service, (formerly BAE). Index numbers listed in the table above for the year 1947 and 1953 have a 1910-14 base. The ratios shown in the last column are based in 1947 = 100.

The 1953 Rates Used to Revise Costs

The data for producers using horses for farm power in the original sample are eliminated from the data used to compute the 1953 costs. County agents and producers interviewed prior to the start of this study agreed that use of horses for power in the present farming system is negligible. A statistical analysis[6] of the data from farms utilizing tractor power only and farms using horses for power in any manner indicates the data do not differ sufficiently to be from different populations. Therefore, data from those producers who utilized horsepower to produce the 1947 crop are eliminated to get a more realistic base from which to estimate 1953 production costs. This reduces the number of farms from 99 to 53.

With the exception of the preceding assumption that tractors are now the source of farm power, the farming

6. The t-test is used to make the statistical comparison between the average total cost per pound resulting from the two methods of power. The t-value resulting from the comparison is 1.58, which is less than the critical value of 1.67 at the five percent level of significance. This indicates that the two samples are from the same population and that either sample can be used to represent the population. Therefore, the data for producers using tractor power are used to compute the estimated costs.

practices are assumed to be the same for 1953 as for 1947. This assumption was checked with county agents and producers, who stated that they knew of no one who had made any appreciable changes in his production methods. They also stated that labor rates made the changes which are explained in the paragraph which follows.

The total labor cost is composed of the total wages paid to temporary, permanent, supervisory, and picking employees. Temporary employees are those hired for a rush period when the permanent employees and the employers cannot complete all the work by themselves. Permanent employees are those working throughout the entire year and those working for a producer during the growing and harvesting season of a particular year. Supervisory employees are those planning and directing the work of one or more subordinate employees. Pickers are those hired to harvest the crop at maturity. The wage rates used to compute the labor costs for each of the preceding classes of employees is given for 1947 and 1953 in the summary on the following page.

Employee	1947	1953
Temporary	$0.80 per hr.	$0.90 per hr.
Permanent	0.90 " "	1.00 " "
Supervisory	1.00 " "	1.00-1.25 per hr.[7]
Picking	0.0498 per lb. (5, p. 21)	0.05 per lb.

The land values quoted in the original survey are used again in this analysis. Justification for the use of the original values is based on the report "Farm Real Estate Market" (9), which gave the index of land values for March 1947 as 101 and for March 1953 as 101. The same interest on the investment in the planting for 1947 is used in the 1953 study since the land values and the rate of interest are the same for both years.

Tractor expenses for each operation are derived by multiplying the average cost to operate the tractor for one hour and the number of hours used for that operation. The sum of the costs for each operation represents the total annual cost attributed to the production of

7. The duties of a supervisor are performed for almost all producers by the permanent employees who are acquainted with the procedures commonly followed on a particular farm and also with the desires of the employer. Therefore, wages for the supervisory position are figured at the rate of $1.00 per hour unless the survey sheet indicates that the producer hired someone especially to perform those duties for the harvest season only. In the latter case, the wages are computed at the rate of $1.25 per hour.

strawberries. The total annual expense includes: (1) annual depreciation[8] based on a 10-year life expectancy permitted by the county tax assessors; (2) interest computed at the rate of five percent per annum on the average investment;[9] (3) upkeep labor at the rate of \$1.00 per hour; (4) tax exempt fuel at \$0.19½ per gallon; (5) labor for repairs as quoted by local implement companies at a rate 50 percent higher than the 1947 cost; (6) depreciation for tractor tires at the rate of \$27.00 per year based on a life expectancy of seven years; (7) and for those who had insurance, an increase of one-third over the 1947 figure.

Expenses for depreciation of buildings and machinery (excluding the tractor) are revised by multiplying the 1947 cost and the ratio (116.3) between the parity indices (US) for July 1947 and July 1953.[10] These costs are revised with index numbers because (1) any values assigned to the buildings without a re-evaluation would be

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8. The annual depreciation equals one-tenth of the price of the 1953 model that is comparable to the 1947 model as listed in the original survey.

9. The average investment equals the tractor's value at the beginning of the year plus the tractor's value at the end of the year divided by two.

10. See Table 1, page 12 of this thesis.

meaningless and likely to be less accurate than the data corrected with index numbers; (2) and the size and the models of the machinery are not given in the data.

The costs of services and materials are computed by multiplying the 1953 price for each particular item by the number of input units. The 1953 and the 1947 costs given below are quoted by local merchants and do not represent prices paid by producers who bought through cooperatives.

	1947	1953	Units
Seed:			
Oats	$0.035	$0.03	pound
Vetch	0.08	0.06	pound
Rye	0.037	0.07	pound
Fertilizer	4.00	4.75	cwt.
Lime	10.00	12.00	ton
Dust:			
DDT	9.00	10.70	cwt.
Rotonone	15.00	14.00	cwt.
Apple bait	8.00	8.00	cwt.
Strawberry plants	18.00	20.00	per 1,000

Irrigation power rates for those who were connected to the main line prior to 1950 have remained the same as those quoted in 1947. Local power officials[11] state that lower rates are now in effect, but the cost to re-wire and install additional meters to qualify for the new

11. Information quoted by Pacific Power and Light Company, Corvallis, Oregon.

rates is too high to justify the change. In their opinion, the 1947 rates are still in effect and should be used to compute the irrigation costs for this study.

Statements for the tax rates for two[12] of the seven counties in the sample area indicate a reduction of 0.1 mill which amounts to $1.00 for $10,000 taxable property. Since any difference would be averaged over the total yield, this amount does not appear to be significant and will not be considered in revising the taxes. However, depreciation for the taxable items is revised by using the ratio (116.3)[13] between the US Parity indices for 1947 and 1953, thus implying that the values of the taxable items increased in the same proportion. Therefore, the 1953 taxes are revised by multiplying the 1947 tax figure by the same ratio.

The cost to establish the stand is computed the same way as the cost to produce the crop with one exception. Interest on the investment to establish the stand is figured at five percent for the 39 months that the

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12. Benton and Clackamas counties.

13. See Table 1, p.12.

plants occupy the land.[14] Because the plants do not bear any strawberries the year in which they are planted, the total cost to establish the stand is recovered by depreciating the total cost incurred the first non-productive year over the three productive seasons. Thus, the total cost to establish the stand is divided by three and this amount is included in the total cost for each of the three productive seasons as "stand depreciation".

14. Interest is computed for 39 months to remain consistent with the computation in the original study (Station Bulletin No. 469, Kuhlman, G.W. and D.C. Mumford, Agricultural Experiment Station, Oregon State College, Oct. 1949, p.28.). Oregon producers normally let the stand occupy the land for three production years, each ending about June 30th. This would indicate that the interest is computed from Apr. 1st of the year the stand is established until June 30th of the third productive year.

CHAPTER V

REVIEW OF THE REVISED COSTS

Cost to Establish the Stand

Since strawberry plants do not bear during the year in which they are planted, the cost to establish the stand remains to be recovered in the three productive years. The revised 1953 cost data for 33 farms are used to compute the average costs itemized in Table 2 on the following page. In the original study 68 farms were used to estimate the cost of establishing a stand. The number was reduced to 33 since 35 of the 68 used horsepower.

As shown in the table, the major portion of the cost to establish the stand is attributed to the plants and the planting labor. In the Willamette Valley, "the individual hill system is the one most commonly used in non-irrigated plantings" (13, p.15). This system constitutes the largest portion of the plantings in the sample. The recommended number of plants to use in establishing an acre of strawberries is "from 6,000 to 10,000 plants per acre" (13, p.16), but the average number of plants used in this study is 5,575 plants per acre. Based on the quoted price of $20.00 per thousand for 1953, the annual cost of plants is $37.15 per acre which represents 29.1

Table 2. Average annual stand depreciation per acre for 1953.

Item[15]	Cost per acre (dollars)		Percent of total	
Preparation for planting:				
Staking	0.30		0.2	
Plowing	1.60		1.2	
Harrowing	0.90		0.7	
Disking	2.10		1.6	
Cover crop	1.10		0.9	
Fertilizing	7.40		5.8	
Manuring	0.80		0.6	
Group total		14.20		11.0
Planting:				
Plants	37.15		29.1	
Labor	6.50		5.1	
Group total		43.65		34.2
Crop maintenance:				
Other cultivating	7.35		5.8	
Hoeing	26.75		20.9	
Dusting	0.35		0.3	
Baiting	2.10		1.6	
Irrigating	0.20		0.2	
Group total		36.75		28.8
Other expenses:				
Transportation	2.90		2.3	
Buildings, etc.[16]	4.90		3.8	
Miscellaneous[17]	5.70		4.5	
Group total		13.50		10.6
Interest and taxes:				
Taxes	1.55		1.2	
Interest on land investment	3.85		3.0	
Interest on working capital	1.55		1.2	
Interest at 5% for 39 months on total investment above[18]	12.75		10.0	
Group total		19.70		15.4
Total		127.80		100.0

15. Necessary supplies and labor are included for each operation.

16. Includes insurance, fuel, lights, and water.

17. Includes liability insurance, meal tickets, and office expenses.

18. See footnote no. 14 on p.19.

percent of the total stand depreciation. The cost of labor and equipment needed to plant the crop is $6.50 per acre which brings the total cost of planting to $43.65 per acre. This cost represents 34.2 percent of the total cost to establish the stand. The annual cost for the plants ranges from $26.60 to $80.70 per acre and depends upon the planting system utilized by the producer.

Expenses incurred for crop maintenance amount to $36.75 per acre or 28.8 percent of the annual cost. The hoeing cost included in this group amounts to $26.75 per acre and represents 20.9 percent of the total. This cost is the second largest of all costs and ranges from $1.05 to $72.00 per acre which is the largest range of any of the costs. The remaining cost items within the group amount to $10.00 per acre or 7.9 percent of the total. Of the remaining costs, other cultivating costs amount to $7.35 per acre which is 5.8 percent of the total cost.

The remaining costs representing more than five percent of the total are fertilizing and interest on the amount invested in all phases of establishing the crop. Fertilizing costs alone amount to $7.40 per acre. However, manure and cover crops plowed under as green manure are also part of the fertilizing program. When the cost of these operations are included, the total fertilizing expense amounts to $9.30 per acre or 7.3 percent of the total. A few farmers did not use any fertilizer, cover crop or manure to establish the stand and have no costs for these operations. The highest cost for those farmers who had these expenses is $33.70 per acre. Interest on the investment to establish the stand is computed at the rate of five percent for all producers. The interest averages $12.75 per acre and represents 10.0 percent of the total. The range of this cost is from $7.70 to $21.85 per acre. The remaining costs[19] considered as a group amount to $25.35 per acre and represent 19.7 percent of the total. The individual cost items within this group constitute less than five percent of the total.

The average total cost to establish one acre amounts to $127.80 per year for each of the three productive years. The range of these costs is from $83.35 to $231.00 per acre. Since the cost to establish the stand is based on economic conditions in the production area, the average total cost is assumed to be a representative figure for the producers. This cost is included in the

19. The expense items included in this group are: staking, plowing, harrowing, disking, transportation, buildings, miscellaneous items, taxes, and the interest for the land and the working capital.

production costs under the expense item, "stand depreciation".

Cost to Produce the 1953 Crop

The 1947 input data for 53 producers are used to compute the 1953 production costs. For these costs, the producers obtained a yield of 2,699,843 pounds from 748 acres for an average yield of 3,609 pounds per acre. Based on this yield and 1953 prices for inputs, the revised average total cost of production is $590.30 per acre of 16.4 cents per pound.

Table 3. Revised costs of producing strawberries, 1953.[20]

Costs	Revised 1953 costs Per acre	Per pound (cents)	Per cent of total
Preharvest:			
Crop maintenance	$174.55	4.8	29.6
Stand depreciation	127.80	3.5	21.6
Indirect operational*	49.80	1.4	8.4
Interest and taxes	19.95	0.6	3.4
Group total	372.10	10.3	63.0
Harvest:			
Picking	180.45	5.0	30.6
Other than picking	37.75	1.1	6.4
Group total	218.20	6.1	37.0
Total	$590.30	16.4	100.0

*Includes building and miscellaneous expenses.

20. These costs are given in detail in Table 1 of the Appendix.

Preharvest costs amount to $372.10 per acre. This is 10.3 cents per pound, which represents 63.0 percent of the total. Crop maintenance and stand depreciation are the major items in this group. These two costs average $174.55 and $127.80 per acre or 4.8 and 3.5 cents per pound respectively. Their combined totals amount to more than half of all costs. The indirect operational costs and the interest and taxes account for the remainder of the preharvest costs. These costs average $49.80 and $19.95 per acre or 1.4 and 0.6 cents per pound respectively and represent 8.4 and 3.4 percent of the total.

Harvest costs account for the remaining 37.0 percent of the costs and amount to $218.20 per acre or 6.1 cents per pound. Picking cost amounting to $180.45 per acre or 5.0 cents per pound is the largest cost in this group and accounts for 30.6 percent of the total. Costs other-than-picking average $37.75 per acre or 1.1 cents per pound and represent 6.4 percent of all costs.

Cost data classified according to the yield reveal a marked increase in the average total cost as the yield decreases. As shown in Table 4 on the following page, costs increase from 12.3 to 28.9 cents as the yield decreases from 6,197 to 1,572 pounds per acre. This increase is due largely to the preharvest costs which increase from 6.4 to 22.8 cents. Harvest costs increase only from 5.9 to 6.1 cents as the yield decreases from the high to the low.

Table 4. Effect of yield on revised production costs, 1953.

Yield per acre Range	Average (pounds)	No. of farms	Average costs per pound Preharvest (cents)	Harvest (cents)	Total (cents)
5,000 and over	6,197	10	6.4	5.9	12.3
2,500 to 5,000	3,656	30	10.1	6.1	16.2
0 to 2,500	1,572	13	22.8	6.1	28.9
1,000 to 10,000 (All farms)	3,609	53	10.3	6.1	16.4

The reason the average preharvest costs increase as yield decreases is that preharvest costs largely are fixed at the beginning of the harvest season. Because these costs are largely fixed at this phase of production, total preharvest costs will not vary as the yield varies. As a result, higher yields have more pounds over which to average total preharvest costs than lower yields and, therefore, average preharvest costs vary inversely with yield. For example, preharvest costs amounting to $300.00 per acre average twenty cents per pound for 1,500-pound yields and five cents per pound for 6,000-pound yields.

Harvest costs tend to remain relatively constant on a per-pound basis for all yields. This is because picking costs, which are paid on a piece rate, constitute over 80 percent of the total harvest cost. Other-than-picking costs, the remaining harvest expense, are incurred only while the crop is being harvested. Because these two costs are incurred directly on the basis of the yield, the harvest costs tend to remain about the same for all yield groups.

Although the data in Table 4 show costs declining as the yield increases, the producer should not conclude that the average unit cost can be reduced just by increasing the yield. Some producers cannot reduce the unit cost by increasing the yield because the additional cost of getting a higher yield may increase rather than decrease the average cost per pound. For example, a producer obtaining a yield of 1,572 pounds at a cost of $454.30 per acre has costs averaging 28.9 cents per pound. If production costs increase to $600.00 per acre while increasing the yield to 2,000 pounds, the average costs increase to 30.0 cents per pound. In this case, the producer is incurring lower costs with the lower yield and is defeating his purpose in trying to decrease costs by increasing the yield.

CHAPTER VI

A COMPARISON OF THE RESULTS OBTAINED BY THE TWO METHODS OF REVISING THE COSTS

Production costs have been revised by using the index number method. This method, as explained previously, consists of computing a ratio between the indices for a group of homogeneous commodities existing at the time the survey was conducted and the time the cost information is desired. The weighted average costs for the original survey are summarized in four major categories and these averages are multiplied by the appropriate index ratio for the cost. The total of the four costs is the revised total average cost. In this case, 1947 production costs for 53 producers whose data are used to compute the costs in objective number one are used to compute a weighted average. The 1947 and the 1953 indices are used to make the revision.

Production costs are computed in the first objective of this thesis by multiplying the number of input units as given in the 1947 data by the 1953 price per unit. Thus, the revised costs are intended to represent the costs actually incurred by the producers if the commodity or service had been purchased in 1953 instead of 1947.

Therefore, the costs revised by using the 1953 prices are called the actual costs.

A comparison of the revised average total costs in Table 5 below disclosed a net difference of 0.1 cents per pound between the results of the two methods. Based on the average yield of 3,609 pounds per acre for the study, only $3.60 difference exists between the average total costs per acre. The difference ranges from $1.00 for the lowest yield of 1,000 pounds to $10.00 for the highest yield of 10,000 pounds per acre. Because the average total costs are nearly identical, no significant difference appears to exist between the results of the two methods.

Table 5. A comparison of 1947 and revised 1953 costs of producing strawberries.

Costs	1947 costs (cents)	1953 index numbers[21]	Revised 1953 costs: Index (cents)	Revised 1953 costs: Actual (cents)
Preharvest:				
Materials & supplies	5.7	116.3	6.7	6.9
Labor	3.3	113.0	3.7	3.4
Harvest:				
Picking	5.0	--	5.0	5.0
Other than picking	1.0	113.0[22]	1.1	1.1
Average total costs[23]	15.0	--	16.5	16.4

21. 1947 = 100

22 and 23 on following page

The difference between the average total costs revised by the two methods is due to the combined differences between the cost items. Preharvest labor costs revised by index numbers are 0.3 cents higher than costs revised by the actual rates. This difference is almost eliminated in the total by the 0.2 cents difference between the preharvest cost for materials and supplies revised by the actual rates and the costs revised by index numbers. The net result is an insignificant difference of 0.1 cents between the two average total costs.

It should not be concluded that the two methods of revising basic cost data are equally accurate even though no significant difference has been found in this study. Comparisons have been made for only one crop and one crop year. It is possible that the two methods might show entirely different results for other crops and for other years.

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22. The "Composite wage index, Oregon" is used to make the revision even though some building and machinery expenses are included in the average because the amount contributed by them is only 0.08 cents per pound.

23. Based on an average yield of 3,609 pounds.

CHAPTER VII

AN EVALUATION OF THE TWO METHODS OF REVISING COST DATA

The method of revising cost data as developed in the first objective has two advantages over the index number method. One of these advantages is that the revised costs are based on the actual prices for the inputs used to produce strawberries. This is in contrast to costs revised with indices based on the average price changes for a group of commodities. For example, the parity index used includes price changes for the commodities used to produce livestock, wheat, corn, cotton, and many other crops. The result is that costs revised with index numbers are affected by price changes for combines, corn huskers, cotton gins, and many other products not associated directly with strawberry production.

Another advantage of revising cost data with the method developed in the first objective results from using wages and prices which prevail in the production area, the Willamette Valley. Costs revised in this manner are based specifically on economic conditions in the production area. The wage index and parity indices, however, are based on state and national economic conditions. Thus, the assumption is implied that national changes in prices paid by producers and wage changes in the entire state of Oregon are the same as the change in prices and wages in the Willamette Valley strawberry industry. This appears to be an unlikely situation.

Computing costs with the actual prices and the original input data, however, has an inherent disadvantage which limits its use. Computations necessary to make the revisions are too time consuming for the method to be usable. About 25 different computations must be made to revise the cost data for each producer. After the producers' costs are computed, about 20 additional computations are necessary to determine the average cost for the sample. By contrast, costs revised with index numbers require only six computations.

The advantages of revising cost data with the actual price for the units input can be retained while eliminating the disadvantages. This can be done by using index numbers based on prices paid for the factors of production in the production area. For example, the costs in the original study are computed by input units by the prices paid for the inputs and averaging the costs over the yield. These costs, which are summarized under four items,[24] are based on cultural practices used to produce strawberries only. If the assumption is made that production methods have not changed, then indices based on the specific prices of the inputs can be used to revise the original cost data. This method can be used not only to revise strawberry production costs but also to revise the cost data for other crops produced in the area.

24. These cost items are: (1) preharvest materials and supplies, (2) preharvest labor, (3) harvest picking and (4) harvest costs other than picking.

CHAPTER VIII

SUMMARY AND CONCLUSIONS

The increased competition in the strawberry industry has caused Oregon producers to become concerned about their future competitive position. Since continued production in the long run depends upon receiving a profitable return, attention is directed to the factors determining a profitable return, namely, market price and production costs. Because the market price tends to remain the same for all producers in a particular area, the individual producer is left with the alternative of reducing costs if possible. The Oregon Agricultural Experiment Station has followed the practice of bringing up to date previous cost studies by an index number method. The accuracy of costs revised in this manner has been questioned. Therefore, it is the purpose of this thesis to compute the estimated 1953 costs by using 1947 physical input data and 1953 prices for those inputs. In addition, the results obtained by the index number method and by the method of using the actual prices are compared and an evaluation is made of the method of revising the cost data.

The total cost to establish the stand and to produce the crop is the sum of all costs resulting directly or indirectly from the production of strawberries. The average is computed by dividing the total cost by the total product of these costs. The cost to establish the stand is accrued during the first non-bearing year and includes costs incurred in preparation to planting the crop. The average total cost to establish the stand is divided equally over three production years and included in the production expenses as stand depreciation. The average total cost of production is based on one pound for a particular year and includes preharvest and harvest costs. Preharvest costs are those costs whose total amount is incurred largely before the harvest season. Harvest costs are those whose total is incurred largely during the harvest season.

The cost to establish the stand was given as $108.83 per acre annually in Experiment Station Bulletin No. 469. (5, p.27). This represents the weighted average cost for 68 growers and was used as the cost of stand depreciation for 99 producers whose data are used to compute production costs. The average cost of production was 15.07 cents per pound (5, p.21) and consisted of preharvest costs amounting to 8.87 cents and harvest costs amounting to 6.20 cents per pound. Four other cost studies have been completed prior to 1947 but the change in cultural practices and the fact that none of the original data are available now makes these studies irrelevant to the present study.

Costs are revised in this thesis by two methods, namely, with index numbers and by using 1953 prices for the 1947 input units. The index method consists of summarizing the costs under four items and multiplying the average amount in each item by the ratio between the 1953 and the 1947 indices. These costs and the index numbers are given on pages 11 and 12 of this thesis.

The other method consists of multiplying the units of input given in the 1947 survey by the 1953 prices for those inputs. The total costs for the 53 producers in the sample are averaged over the total yield. The average costs for the items of expense are given in Table 1 of the Appendix.

The average cost to establish the stand amounts to $127.80 per acre annually. The cost of plants and the labor to plant them accounts for 34.2 percent of the total. This cost and crop maintenance costs, which account for another 28.8 percent, are the two major cost items. The remaining 37.0 percent of the costs consists of interest and taxes (15.4 percent), preparation for planting (11.0 percent), and other expenses (10.6 percent). The cost to establish the stand is included in the production costs as the stand depreciation.

Based on an average yield of 3,609 pounds per acre, the revised 1953 production costs are $590.30 per acre or 16.4 cents per pound. These averages are based on 1947 input data collected from 53 producers who obtained 2,699,843 pounds of strawberries from 748 acres.

Preharvest costs averaging $372.10 per acre or 10.3 cents per pound represent 63.0 percent of all costs. Crop maintenance and stand depreciation costs average $174.55 and $127.80 per acre or 4.8 and 3.5 cents per pound, respectively. These two costs account for 51.2 percent of the total cost of production.

Harvest costs of $218.20 per acre or 6.1 cents per pound account for the 37.0 percent of the costs. Picking costs averaging $108.45 per acre or 5.0 cents per pound account for 36.0 percent of the total. Harvest costs other than picking amount to $37.75 per acre or 1.1 cents per pound and represent 6.4 percent of all costs.

When the data are classified according to the yield, the average cost to produce a pound increases as the yield decreases. For example, costs increase from 12.3 to 28.9 cents per pound as the yield decreases from 6,197 to 1,572 pounds per acre. Preharvest costs which increase from 6.4 to 22.8 cents per pound account for most of the increase. Harvest costs increase from 5.9 to 6.1 cents per pound as the yield decreases. This is due to the fact that preharvest costs are largely fixed at the start of the harvest season. Because their total amount is largely fixed before the harvest, each pound of a small yield must include more of the total cost than larger yields. Harvest costs remain relatively constant for all yields because picking costs paid on the pound basis constitute over 80 percent of all harvest costs.

Although average costs per pound decrease as the yield increases, the conclusion should not be made that all a producer needs to do to lower costs is to increase yields. This may not be possible because the costs may increase more in proportion to the original amount than the yield increases. In this case, the producers are defeating their purpose in trying to decrease costs by increasing the yield. However, under the conditions prevailing for the producers in this sample, the higher yields tend to be accompanied by lower costs.

A comparison of the costs revised with index numbers and costs revised with actual prices for the inputs discloses a difference of 0.1 cents per pound. Based on the yields in this survey, the differences range from $1.00 to $10.00 per acre as the yields range from 1,000 to 10,000 pounds per acre. This small difference does not appear to be a significant amount. However, the conclusion should not be made that the results of both methods are equally accurate. Different results may be found to exist for other crops and for other years. Revising costs with the actual prices for the inputs has two advantages over the index number method. One of these advantages is that the revised costs are based on the actual prices paid for the inputs used to produce only strawberries. Another advantage results from using input prices prevailing in the production area. These characteristics are in contrast to features incorporated in the index numbers based on the price changes for many commodities over a large area.

Computing costs by using the actual prices for the inputs has an inherent disadvantage which limits its use. This disadvantage results from the computations, which are too time consuming to be practical on a large scale. About 25 different computations are necessary to revise the producers' costs and about 20 more are necessary to determine the average costs for the sample. The index number method requires only six computations to make the revision.

By combining the principles of the two methods, the disadvantages can be eliminated while retaining the advantages. If the assumption is made that production methods have not changed, then indices based on the actual prices for the inputs in the production area can be used to revise the costs.

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APPENDIX 1

Table 1. Estimated 1953 costs to produce Oregon strawberries.

Items	Amount Per acre (Dollars)		Amount Per lb. (cents)	Percent of total	
Preharvest costs:					
Crop maintenance					
Topping	0.70			0.1	
Cultivating	16.25			2.8	
Hoeing	86.90			14.7	
Fertilizing	31.60			5.3	
Dusting	6.80			1.2	
Baiting	9.50			1.6	
Irrigating	1.85			0.3	
Transportation	17.10			2.9	
Prep. for & clean-up after harvest	3.85			0.7	
Group total		174.55	4.8		29.6
Stand depreciation		127.80	3.5		21.6
Indirect operating					
Buildings[25]	20.85			3.5	
Miscellaneous[26]	28.95			4.9	
Group total		49.80	1.4		8.4
Interest and taxes					
Taxes	3.80			0.6	
Interest on land	10.35			1.8	
Interest on working capital	5.80			1.0	
Group total		19.95	0.6		3.4
Total preharvest costs		372.10	10.3		63.0
Harvest costs:					
Picking	180.45		5.0	30.6	
Other than picking	37.75		1.1	6.4	
Total harvest costs		218.20	6.1		37.0
Total costs		590.30	16.4		100.0

25. Includes insurance, power and lights, fuel, etc.

26. Includes cost to assemble laborers, liability insurance tickets, etc.