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COST OF PRODUCING DECIDUOUS FRUIT TREES IN SELECTED CALIFORNIA NURSERIES

(A Progress Report)

by

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Purpose and Scope of Study.-- The business of producing deciduous fruit trees in California in 1936 was carried on by 116 nurseries with an output for the year amounting to 4.5 million budded trees. These trees consist of various varieties of almonds, apples, apricots, chestnuts, cherries, figs, peaches, nectarines, pears, pecans, plums, prunes, quinces, and walnuts. Numbers of different species budded during 1936 consisted of:

Peaches	1,437,960
Apricots	676,120
Prunes	656,200
Almonds	582,090
Plums	348,230
Pears	246,410
Walnuts	126,900
Cherries	121,610
Apples	120,470
Nectarines	89,100
Figs	62,650
Quinces	7,450
Pecans	2,000
Chestnuts	500

In addition these nurseries, during 1936, produced 7,335,200 seedlings for budding and growing during 1937. 2/

In order to gain a better understanding of some of the economic aspects of their business, representatives of the Deciduous Tree Board of the California Nurserymen's Association called upon the College of Agriculture on June 22, 1936, and asked that a study of the cost of producing deciduous fruit trees be undertaken by the College. 3/ Later, July 18, 1936, an outline of a proposed inquiry into the cost of producing deciduous fruit trees, as planned by the College of Agriculture, was presented to the California Nurserymen's Association at their annual meeting at San Jose, and a rising vote indicated unanimous approval of such a study.

1/ Professor of Farm Management, Agricultural Economist in the Experiment Station and Agricultural Economist on the Giannini Foundation, College of Agriculture, University of California.

2/ Data from Bureau of Nursery Service, State Department of Agriculture, June 23, 1936.

3/ Those present at this conference on behalf of the nursery industry were Messrs. J. E. Bergthold, George C. Roeding, Jr., and J. D. Meriweather of the State Department of Agriculture.

As a result of the interest thus manifested, during the fall months of 1936 a number of nurseries deemed to be typical of a cross-section of the industry were selected 4/ and a field man assigned by the College of Agriculture to the task of collecting the necessary data. Those selected included various parts of the state, various sized businesses, and various methods employed in producing trees. From those selected a total of 15 usable records dealing with seedling trees and 13 dealing with budded trees were obtained. Those nurseries classified by numbers of trees and locations were as follows:

TABLE 1

Size of Business and Location of Nurseries
for Which Cost Data Were Collected

Grouping (by number of trees)	Number of nurseries		
	Northern and central California	Southern California	Total
Seedling trees			
Less than 100,000	3	6	9
100,000 to 200,000	1	0	1
200,000 to 300,000	1	0	1
300,000 to 400,000	0	0	0
400,000 to 500,000	2	0	2
500,000 and over	2	0	2
			15
Budded (second-year) trees			
Less than 50,000	3	2	5
50,000 to 100,000	2	2	4
100,000 to 150,000	0	0	0
150,000 to 200,000	1	0	1
200,000 to 250,000	2	0	2
250,000 and over	1	0	1
			13

The total study included 15 nurseries producing 2,554,000 seedling trees budded, and 13 nurseries producing 2,307,000 dormant bud or second-year trees, of which 1,293,671, or 56.5 per cent, were graded as salable. Counties where these nurseries were located were: Placer, Santa Clara, Contra Costa, San Joaquin, Stanislaus, Merced, Fresno, Tulare, San Bernardino, and Orange.

Method of Determining Costs.-- Each nursery selected for study was visited by a representative of the College and data compiled showing acreage devoted to the growing of deciduous fruit trees; number produced; schedule of operations performed from the time of beginning the preparation of the land to the final disposal of the trees; kind and amount of use of various equipment; kinds and

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4/ The late J. D. Meriwether of the Bureau of Nursery Service, State Department of Agriculture, gave valuable help in making these selections.

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amounts of spraying and dusting materials used in controlling diseases and insect pests; amount of labor performed; rate of work, or output per day, of individual workers and crews; and other data indicative of the input requirements involved in producing these trees. The data were collected for both the first or seedling year and the second or dormant bud year. Some data were collected on so-called "June buds" or trees forced to mature in a single year, but the information was too scattering to justify its inclusion in this report. Following compilation of the basic information, as just outlined, costs for the various operations were determined, including wages; charges for use of work animals, tractors, trucks, farm implements, machines, and other items of equipment utilized in growing the trees; outlays for supplies, including pits, cuttings, seedlings, sprays, dusts, fertilizers, and other materials; and irrigation water. Charges were calculated to cover rent (or use of land), management, office expense, and similar overhead. Finally a determination of selling costs completed the data taking.

Some data could be taken directly or calculated from the various bookkeeping systems in use by the nurseries, but most of the needed data had to be worked up from original sources, including interviews with managers, foremen, and even the workers themselves.

Composite Cost of Producing Deciduous Trees in Nurseries.-- Because of the desire to avoid disclosure of the affairs of individual nurseries, most of the data following are presented as averages. In considering these, the reader should keep in mind that averages for small groups of cases may be misleading. The importance of the average shown depends a good deal on the extent of variation within the group. The data here presented are intended therefore to give some indication of the situation existing on the many nurseries of the state but should not be regarded as necessarily representative of the whole group of nurseries. As indicated at the first of the paper, they were selected with a view to getting as representative a picture as possible in a short time and in view of the fact that many of the nurseries do not have records suited to providing information of the types sought.

A summary of the various items and costs involved in producing deciduous fruit trees on all the nurseries studied and for the total number of trees as indicated above resulted in an average cost the seedling year of 2.5 cents a tree for 2,327,000 trees estimated as produced during the seedling year; an average cost the second year of 3.6 cents a tree for 1,405,919 trees graded as salable; and an average selling cost of 7.1 cents a tree for the 1,504,302 actually sold. This number actually sold includes 1,324,302 trees grown by these nurseries and sold either at retail or wholesale. It also includes 180,000 trees purchased by these nurseries from others for resale. The combined average for all nurseries and all trees is 13.2 cents a tree. The detailed data appear in table 2.

Total Cost of Producing and Marketing Nursery Deciduous Fruit Trees.-- Ten of the nurseries provided complete data from the beginning of preparing for planting until the trees were actually sold and these data thus permit summarizing to show the average cost of producing and selling 1,172,302 trees.

	Total cost	Average cost per tree (based on sales)
Cost of growing seedling trees (first year)	$53,363.40	4.6 cents
Cost of growing budded trees (second year)	48,734.54	4.2 cents
Cost of selling	102,609.22	8.7 cents
Total cost and average cost per tree	$204,707.16	17.5 cents

TABLE 2

Composite Cost of Producing Deciduous Fruit Trees in Selected California Nurseries

Item	Total expenditure
A. Costs first or seedling year (1934)	
Purchase of pits, cuttings and seedlings	$ 7,189.42
Preparation of seedbed	1,116.41
Planting	2,664.21
Harrowing and cultivating	145.40
Hoeing	477.05
Thinning and suckering	3,494.58
Fertilizing	428,45
Spraying and dusting	228.50
Furrowing for irrigation and subsequent cultivation	3,957.88
Irrigating -- labor	2,569.54
Irrigating -- water	3,239.81
Budding	14,448.79
Rent (on 135.5 acres)	3,386.50
Supervision -- foreman	3,486.47
Supervision -- manager	4,170.00
Use of automobiles	1,889.07
Office expense	1,543.80
Insurance	377.44
Taxes	34.90
Miscellaneous (interest on operating capital, depreciation and maintenance of improvements and equipment, etc.)	2,072.18
Total cost (seedling year)	$56,920.40
Number of trees budded	2,327,000
Cost per tree of all produced	2.5 cents
B. Costs second or bud year (1935)	
Stubbing and clearing away brush	$ 2,142.84
Early season soil preparation	1,384.47
Suckering, limbing and rogueing	5,657.09
Fertilizing	270.70
Spraying and dusting	842.03
Furrowing and cultivating	3,112.55
Irrigating -- labor	2,265.30
Irrigating -- water	2,283.98
Digging, pulling, grading, packing and hauling	16,123.11
Rent	3,337.50
Supervision -- foreman	4,141.45
Supervision -- manager	4,194.50

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Table 2 continued.

Item	Total expenditure
B. Costs second or bud year (1935) cont'd.	
Use of automobiles	$1,976.66
Office expense	1,543.82
Insurance	423.96
Taxes	34.90
Miscellaneous	2,231.97
Total cost (second or bud year)	$50,932.67
Number of trees (graded as salable)	1,405,919
Cost per tree (graded as salable)	3.6 cents

C. Selling costs	At wholesale	At retail	Total
Number of trees reported sold	45,250	1,459,052	1,504,302*
Total selling cost	$1,328.20	$106,173.96	$107,502.16
Average selling cost per tree	3 cents	7.3 cents	7.1 cents

* Includes trees purchased for resale.

Loss Percentages.-- Because of a proportion of the trees failing to make satisfactory growth, being misshapen, diseased, or otherwise unsalable, losses occur each growing season and at the time of grading for sale. Further losses are encountered if more trees are grown than can be sold. The data concerning percentage losses, applicable to the years to which the data apply (namely, 1934 for seedling trees and 1935 for budded trees), were found to be as follows:

Number of trees budded (second year)	2,327,000
Number of trees graded as salable	1,405,919
Number discarded	921,081
Per cent discarded	39.6 per cent

Of the 1,405,919 trees graded as salable, no figures of actual sales were obtainable for 130,250 trees. Of the balance data of the percentage of loss traceable to lack of a market showed:

Number of trees graded as salable	1,275,669
Number actually sold	1,112,302
Number not sold	163,367
Per cent not sold	12.8 per cent

Wholesale versus Retail Sales.-- Part C of table 2 indicates the number of trees sold either wholesale or retail for nurseries reporting sales data. In percentages the nurseries represented in this study sold 3 per cent of their output at wholesale, and 97 per cent at retail. Reports on 130,250 trees graded as salable but for which actual selling data could not be obtained indicate that a considerable proportion of these actually sold were disposed of at wholesale. If included, the average selling cost would have been somewhat reduced.

Variations in Costs.-- Costs, as determined individually for each nursery studied, indicated wide differences. The cost of producing seedling trees, for instance, varied with different nurseries from a low of 1.8 to a high of 4 cents a tree; the cost of carrying trees through the bud or second year from a low of 2.6 to a high of 9.8 cents a tree. The cost of selling varied from negligible to 18.3 cents a tree.

These differences are traceable to wide variation in individual cost items. A few of the extremes of cost for selected items are illustrative. These are shown in the following listing. The data are for a unit of 1,000 trees and refer to costs as determined for individual nurseries.

Item	Range in costs per 100 trees
Seedling year	
Preparation of seedbed	
Leveling	0-85.1 cents
Subsoiling	0-41.5 cents
Plowing	0-22.3 cents
Total cost	17.1 cents-$1.33
Planting pits (total)	63.0 cents-$6.72
Hoeing	0-$2.29
Thinning	0-56.1 cents
Fertilizing (total)	0-42.2 cents
Thinning and suckering	0-$1.75
Spraying and dusting (total)	0-53.6 cents

Item	Range in costs per 100 trees
Seedling year (cont'd)	
Furrowing and cultivating	50.0 cents-$3.25
Irrigating (total)	75.2 cents-$5.12
Budding	$4.78-$11.69
Second year (based on number of trees graded as salable)	
Stubbing and cleaning up brush	90.3 cents-$2.90
Early season soil handling	26.4 cents-$4.40
Suckering, limbing, rogueing, and weeding	45.1 cents-$6.59
Spraying and dusting	0-$1.92
Fertilizing	0-$1.01
Furrowing and cultivating	0-$8.83
Digging, pulling, grading, and preparing for shipment	$6.26-$26.47

In addition to the cultural costs the charges for rent, supervision, office expense, and other overhead items showed wide differences. Thus rents per 1,000 trees varied from 57.1 cents to $3.47 for the seedling year, and from 83.3 cents to $5.56 for the second or bud year. Wages of foremen varied from 0 to $5.71 for the seedling (figures per 1,000 of trees budded), management from 0 to $13.33 per 1,000 trees, and office expense from 0 to $9.37. During the second year the cost per 1,000 trees graded as salable involved costs for foremen's wages varying from 0 to $36.40, for management of from 0 to $10.00, and for office expense of from 0 to $13.62.

The resulting variation in costs is partly traceable to differences in operations, partly to differences in costs of materials, and partly to variations in basic rates.

Differences in Operations.-- The following listing illustrates differences in operations:

Operation	Number of nurseries reporting performance (Total of 15 nurseries)
Seedling year	
Leveling	3
Subsoiling	5
Plowing	13 (one nursery reported plowing twice)
Disking	8
Harrowing	7
Clearing land of roots	1
Harrowing after planting	9 (varying from 1 to 3 times)
Hoeing	11 (varying from 1 to 3 times)
Fertilizing	4
Thinning and suckering	2
Spraying	1
Dusting	5
Irrigating	14 (varying from 4 to 18 times)

(Continued on next page)

Table continued.

Operation	Number of nurseries reporting performance (Total of 15 nurseries)
Second year	
Stubbing	9
Plowing	6
Clod mashing	1
Hoeing	9 (varying from 1 to 3 times)
Cultivating	9 (varying from 1 to 11 times)
Spraying	4
Dusting	6
Fertilizing	3
Irrigating	15 (varying from 5 to 15 times)

Differences in Base Rates.-- Rates paid to hired workers and charges for use of work animals illustrate differences in base rates.

The rate per hour paid to workers varied from 25 to 37½ cents an hour. The cost of using work animals (13 of the 15 nurseries owning their own work animals) varied from 72 cents to $2.26 per work day.

Variation in Percentage Losses.-- Average losses, as reported above, varied materially between nurseries. The loss of budded trees finally graded as salable varied from a low of 12.1 per cent to a high of 64.3, in contrast with an average of 39.6 per cent. The percentage of trees graded as salable and not sold varied from a low of 2.6 per cent to a high of 24.4 in contrast with an average of 2.8 per cent.

Effect of Volume of Business upon Costs of Producing Trees.-- Confining an inquiry into the effect of size or volume of business to production costs, ignoring selling expenses since these reflect both retailing and wholesaling, the total and average cost of producing fruit trees during the seedling, or first, year and the bud, or second, year, indicate that no significant differences appear for the seedling year. For the bud year the small nurseries seemed to be at a definite disadvantage, the costs for the small nurseries covered being nearly twice those of the other groups. The costs shown are higher for the three nurseries in the size group 57,590-96,708 trees than for the next smaller and larger groups. While there is some indication of higher costs in this particular size group, this should not be taken as an established fact as the number of nurseries averaged is too small to warrant definite conclusions. Special conditions in one or more of these nurseries may account for the difference shown. There is, however, considerable indication that the very small nurseries have substantially higher costs per tree than the larger ones.

The data are set forth in table 3.

Conclusions and Recommendations.-- As an outcome of this study a few conclusions and recommendations are herewith presented.

1. Based on a study of the cost of producing deciduous fruit trees in 15 California nurseries the average cost of producing 2,327,000 seedling trees averaged 2.5 cents a tree; the cost of producing 1,405,919 graded as salable averaged 3.6 cents a tree; and selling costs, based on 1,504,302 trees, averaged 7.1 cents a tree.

TABLE 3

Cost of Producing Fruit Trees in Nurseries; First and Second Year
Classified by Size of Business

Size of business	Number of nurseries	Number of trees budded	Total cost (dollars)	Average cost per tree (cents)
	First or seedling year			
Number of trees budded:				
7,000- 15,000	2	22,000	800.51	3.6
35,000- 65,000	4	180,000	3,736.16	2.1
90,000-100,000*	2	190,000	4,793.22	2.6
202,000-473,000	4	1,445,000	34,564.58	2.4
	Second or bud year			
Number of trees graded as salable:				
2,500- 5,500	2	8,000	670.39	8.4
18,750- 38,250	4	116,000	4,147.07	3.6
51,590- 96,708	3	280,298	13,398.66	4.8
180,000-356,617	4	1,101,621	33,919.34	3.1

* One nursery omitted from this tabulation on account of exceptionally high and out-of-line costs, namely, 7.1 cents a tree.

2. The total cost, figured on data from 10 nurseries, from which complete data were obtained, indicated an average cost for the seedling year of 4.6 cents, for the bud year 4.2, for selling 8.7 cents, and a total average cost of 17.5 cents a tree.

3. Discards of trees budded and subsequently graded as salable varied by individual nurseries from 12.1 to 64.3 per cent, and averaged 39.6 per cent. Trees graded as salable but not sold varied by individual nurseries from 2.6 to 24.4 per cent and averaged 12.8 per cent.

4. Costs of seedling trees, budded trees, and trees actually sold by individual nurseries varied widely. The differences are accounted for by variations in growing methods; in cost of labor, and work animals and equipment; in overhead charges; and in percentages of losses due to discarding trees or inability to sell all trees produced.

5. Size of business did not significantly affect the cost of producing first-year trees. But production of second-year trees placed the smallest nurseries in a distinctly disadvantageous position. The variation in costs between various sized nurseries was not particularly great when producing first-year trees but was significant when producing second-year trees.

6. The cost of selling trees, particularly at retail, added materially to the final cost of trees actually disposed of. The average cost of 7.1 cents a tree was substantially greater than the cost of growing trees for two years, namely, 6.1 cents. Retailing trees involved selling costs of 7.3 cents in contrast with a cost of 3 cents a tree when sold wholesale.

7. The prevailing lack of records needed to determine costs suggests more attention by nurserymen to installing appropriate systems of cost accounting, provided eventual use is made of the information resulting from such installation. Cost information pertaining to his nursery is particularly useful to the operator who seeks to determine in what way and to what extent changes in his practices, cash outlays, and overhead charges can be brought about.

Acknowledgments.-- Thanks of the author are hereby offered to the nurserymen who gave generously of their time and information and thus made possible a successful outcome of this study. Appreciation is also extended to Mr. W. J. Kelley, whose conscientious work in connection with gathering the necessary data and compiling most of the resulting tabulations constituted the major task of preparing for and presenting this publication.