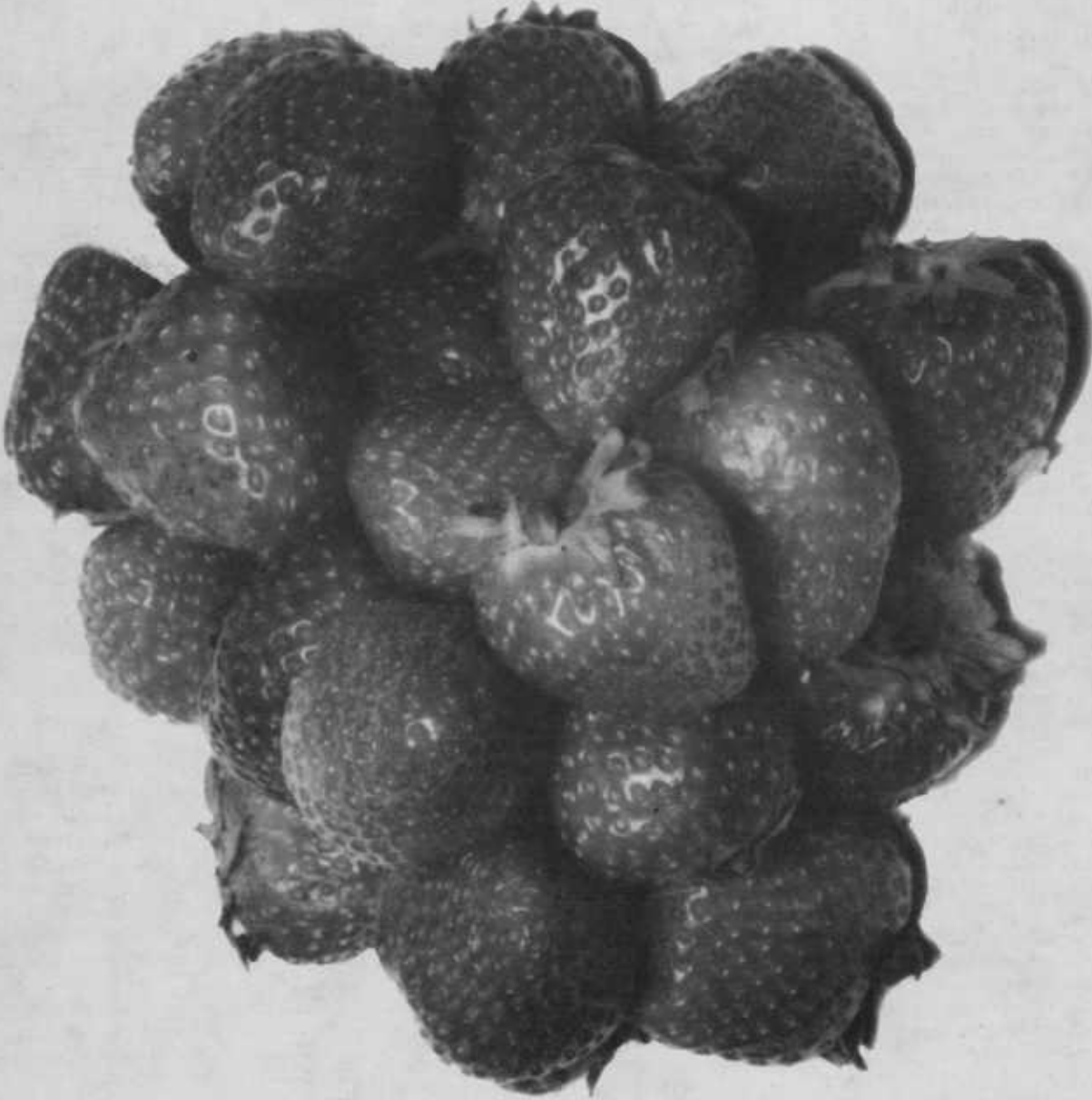


Strawberry Production, Returns, and Costs in Oregon and Washington



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OREGON STATE UNIVERSITY EXTENSION SERVICE

Summary and Conclusions

Despite declining Oregon and Washington strawberry acreage and production through most of the 33-year period, 1950-1982, the value of production to growers mostly increased during that period. Value of production increased again in 1983 to a record \$38.5 million. Helping to offset acreage declines in Oregon was a steady yield increase per acre.

In the 1950's, the yield averaged just over 4,000 lb an acre. By the early 1980's, that figure had increased to about 9,400 lb annually. In 1983, Oregon's yield was a record 11,500 lb an acre.

Contributing to increasing value of production over the period were generally rising prices in the two states. After declining slightly in the late 1950's and early 1960's, grower prices for strawberries generally followed an upward trend that accelerated in the last decade of the period. A large percentage of the crop was processed during the 1950-1982 period.

We gathered cost of production information for both Oregon and Washington and updated it to 1982 price levels. We estimated the break-even prices needed to cover all costs (including establishment amortization) to be 35¢ a pound for Oregon and 41¢ a pound for Washington. We assumed that a sizable portion of the Washington crop had been harvested for the fresh market and thus at a higher harvesting cost.

To offset possible harvest labor shortages, mechanical strawberry harvesters have been developed for processing berries. In study results, net savings from using a mechanical harvester (over hand harvesting) were shown to be as high as \$585 an acre. The only drawback was the lack of a strawberry variety that would satisfactorily withstand the rigors of machine harvest. Provided that a suitable variety is developed, the mechanical harvester could be a viable harvesting alternative in the future compared to hand harvesting.

Table 1.—U.S. strawberry acreage harvested, yield, production, and processed percentage, by growing area, 1981

| Growing area | Acreage harvested (acres) | Yield (lb/acre) | Production (× 1,000 lb) | Processed production (percent) |
|--------------|---------------------------|-----------------|-------------------------|--------------------------------|
| California | 10,900 | 49,500 | 539,550 | 27 |
| Oregon | 5,500 | 9,300 | 51,150 | 91 |
| Florida | 3,200 | 21,000 | 67,200 | ^a |
| Washington | 2,800 | 6,000 | 16,800 | 80 |
| Michigan | 2,700 | 6,500 | 17,550 | 30 |
| U. S. Total | 36,600 | 20,200 | 739,320 | 28 |

^a Negligible amount processed.

Source: OSU Extension Economic Information Office.

Introduction

The value of Oregon and Washington strawberry production has been growing rapidly in the past few years. In contrast, strawberry acreage and total production have declined steadily since the 1960's. In 1982, the value at farm level of strawberries produced in the two states was over \$33.5 million. In 1983 it reached a record \$38.5 million.

Our strawberries are considered a high quality berry, but because of the relatively short harvest season, the majority of harvested berries go to processed markets (table 1). In 1981, over 90% of Oregon's crop went to processing while about 80% of Washington's crop was processed.

California is a major strawberry producer, with more acreage in 1981 than Oregon and Washington combined. Only 27% of California's strawberry crop was processed in 1981. Virtually all of Florida's crop is shipped fresh.

Oregon and Washington strawberries are grown predominantly west of the Cascade Mountain Range. The Willamette Valley is the major production area in Oregon. Strawberry production in Washington is in the inland area bordered by the Cascades on the east.

Most commercial strawberry producers have a diversified farm; approximately 10 to 15 acres are used for strawberry production. Raspberries, blackberries, tree fruits, and/or vegetables are other crops that are typically grown.

Purpose of the study and procedures

For a number of years, public policymakers in Oregon and Washington have tried to deal with a wide range of rural community development concerns such as maintaining adequate agricultural productivity, improving environmental quality, and understanding the role of the agricultural economy in the two states.

The study reported here is part of a broad project to enhance such understanding. It deals with a single commodity sector of agriculture—horticultural production. The strawberry crop information assembled in this report together with that gathered by other researchers on other important crop and livestock sectors should provide a valuable agricultural data base to help policymakers establish sound recommendations on important rural development questions.

The specific focus of this research was to determine the trends of the strawberry crop, a segment of horticultural production that continues to be important to many growers, processors, and consumers—even nationally.

Specific objectives of this study were to:

1. Assemble and analyze data on acres, production, and value of Oregon and Washington strawberries.
2. Assemble and analyze strawberry cost of production data.
3. Assemble and analyze data on mechanical vs. hand harvest of strawberries in the two states.

Strawberries are the only berry crop discussed in this report. An earlier report was done on the "other" berry crops.* We collected all available data on acreage production, value, and costs from various sources. We summarized these data for Oregon, Washington, and two states combined. The assembled data cover a 33-year period, 1950-1982. The information included acreage harvested, annual production, and value of production.

We updated the estimated production cost budgets for Oregon to 1982 values by using indexes, including variable and ownership costs. The base yields we assumed for these budgets were those considered typical of well-managed commercial farms. Be cautious when you use these budgets—they are based on cost studies for specific areas.

Berry crop use

Processed strawberries are used for juice stock, puree, individual quick freeze, and frozen sliced strawberries. They are also used in ice cream, jams and jellies, juices, flavorings, dessert toppings, and yogurt.

In 1982, approximately 67 million pounds of the strawberries produced in the two states were processed (table 2). That amounted to about 87% of all strawberry production. There was a general downward trend in both total production and the amount of production going to the processed market, starting in the early 1970's.

Processed production gradually increased during the 1950's and early 1960's. In 1964, a record 136.5 million pounds was produced. By the early 1970's, processed production was declining. In the last few years of the period, only about 86% of the crop was being processed each year.

Total production followed a pattern similar to processed production. In the 1950's and early 1960's, total production increased slightly. Total production reached a record level in 1964, when 141 million pounds of strawberries were produced. A record 97% of the crop was processed in that year. In the early 1970's, total

Table 2.—Oregon and Washington strawberry production, processed and total, percent processed, 1950-82

| Year | Processed production (× 1,000 lb) | Total production (× 1,000 lb) | Percent processed |
|------|--------------------------------------|----------------------------------|-------------------|
| 1950 | 60,246 | 66,452 | 91 |
| 1951 | 46,750 | 52,830 | 88 |
| 1952 | 82,073 | 89,346 | 92 |
| 1953 | 98,330 | 105,915 | 93 |
| 1954 | 94,602 | 102,733 | 92 |
| 1955 | 115,300 | 122,745 | 94 |
| 1956 | 76,500 | 80,353 | 95 |
| 1957 | 124,300 | 134,000 | 93 |
| 1958 | 102,600 | 109,140 | 94 |
| 1959 | 126,900 | 135,120 | 94 |
| 1960 | 112,200 | 117,300 | 96 |
| 1961 | 108,200 | 114,500 | 94 |
| 1962 | 125,400 | 132,800 | 94 |
| 1963 | 106,200 | 111,200 | 96 |
| 1964 | 136,500 | 141,000 | 97 |
| 1965 | 84,500 | 88,000 | 96 |
| 1966 | 126,900 | 134,900 | 94 |
| 1967 | 120,400 | 126,940 | 95 |
| 1968 | 102,800 | 109,000 | 94 |
| 1969 | 89,400 | 95,700 | 93 |
| 1970 | 95,100 | 101,400 | 94 |
| 1971 | 102,900 | 109,700 | 94 |
| 1972 | 72,400 | 79,200 | 91 |
| 1973 | 64,500 | 70,400 | 92 |
| 1974 | 57,800 | 64,200 | 90 |
| 1975 | 58,600 | 64,900 | 90 |
| 1976 | 63,700 | 72,900 | 87 |
| 1977 | 48,100 | 55,100 | 87 |
| 1978 | 44,400 | 51,500 | 86 |
| 1979 | 52,100 | 59,000 | 88 |
| 1980 | 54,800 | 63,700 | 86 |
| 1981 | 57,900 | 68,000 | 85 |
| 1982 | 66,900 | 76,600 | 87 |

Sources: OSU Extension Economic Information office; U. S. Department of Agriculture, *Agricultural Statistics*, selected years; Washington Department of Agriculture, *Berry Crops*, selected years.

production began to decline. In the early 1980's, the level of production was steady.

The percent of total production going to processed markets increased very slightly in the 1950's and early 1960's. In the early 1970's, the percentage of the production that was processed started to decline slightly. In the early 1980's, the percentage of the crop being processed was steady.

Acreage, production, and value trends

Acreage trends

Acreage devoted to strawberries generally declined between 1950 and 1982. Acreage harvested in Oregon reached its highest point in 1957, when 18,500 acres were harvested (table 3). The most rapid rate of decline occurred in the late 1960's and early 1970's. Oregon experienced the largest rate of decline during that period.

Table 3.—Strawberry acreage harvested in Oregon and Washington, 1950-82

| Year | Oregon (acres) | Washington (acres) | Total (acres) |
|------|-------------------|-----------------------|------------------|
| 1950 | 14,000 | 7,200 | 21,200 |
| 1951 | 14,500 | 8,000 | 22,500 |
| 1952 | 15,300 | 8,300 | 23,600 |
| 1953 | 15,500 | 8,500 | 24,000 |
| 1954 | 15,200 | 8,500 | 23,700 |
| 1955 | 17,500 | 8,500 | 26,000 |
| 1956 | 16,800 | 3,500 | 20,300 |
| 1957 | 18,300 | 8,000 | 26,300 |
| 1958 | 15,600 | 7,500 | 23,100 |
| 1959 | 15,600 | 7,000 | 22,600 |
| 1960 | 14,500 | 6,900 | 21,400 |
| 1961 | 13,000 | 6,800 | 19,800 |
| 1962 | 14,000 | 7,300 | 21,300 |
| 1963 | 14,000 | 7,100 | 21,100 |
| 1964 | 13,900 | 6,200 | 20,100 |
| 1965 | 11,500 | 4,700 | 16,200 |
| 1966 | 12,500 | 5,600 | 18,100 |
| 1967 | 13,200 | 5,600 | 18,800 |
| 1968 | 12,000 | 5,300 | 17,300 |
| 1969 | 12,000 | 4,500 | 16,500 |
| 1970 | 11,000 | 4,100 | 15,100 |
| 1971 | 10,000 | 4,100 | 14,100 |
| 1972 | 8,200 | 3,800 | 12,000 |
| 1973 | 7,400 | 3,600 | 11,000 |
| 1974 | 6,700 | 3,600 | 10,300 |
| 1975 | 5,800 | 3,400 | 9,200 |
| 1976 | 5,200 | 3,000 | 8,200 |
| 1977 | 5,300 | 3,300 | 8,600 |
| 1978 | 5,000 | 3,300 | 8,300 |
| 1979 | 5,200 | 3,100 | 8,300 |
| 1980 | 5,200 | 2,900 | 8,100 |
| 1981 | 5,500 | 2,800 | 8,300 |
| 1982 | 5,800 | 3,000 | 8,800 |

Source: OSU Extension Economic Information Office.

*Burt, L. A., M. E. Wirth, and L. S. Burt, *Production, Value and Cost Trends of Selected Pacific Northwest Berry Crops*, Washington State University, College of Agriculture Research center, Bulletin 0899 (Pullman, 1981).

Table 4.—*Strawberry yield per acre in Oregon and Washington, 1950-82*

| Year | Oregon yield (lb/acre) | Washington yield (lb/acre) | Total yield (lb/acre) |
|------|------------------------|----------------------------|-----------------------|
| 1950 | 3,070 | 3,260 | 3,134 |
| 1951 | 2,220 | 2,580 | 2,348 |
| 1952 | 3,610 | 4,110 | 3,786 |
| 1953 | 4,020 | 5,130 | 4,413 |
| 1954 | 3,890 | 5,130 | 4,335 |
| 1955 | 4,770 | 4,620 | 4,721 |
| 1956 | 4,210 | 2,750 | 3,958 |
| 1957 | 5,000 | 5,300 | 5,091 |
| 1958 | 4,400 | 5,400 | 4,725 |
| 1959 | 5,700 | 6,600 | 5,979 |
| 1960 | 5,000 | 6,500 | 5,484 |
| 1961 | 5,200 | 6,900 | 5,784 |
| 1962 | 6,100 | 6,500 | 6,237 |
| 1963 | 5,000 | 5,900 | 5,303 |
| 1964 | 7,200 | 6,600 | 7,015 |
| 1965 | 5,200 | 6,000 | 5,432 |
| 1966 | 7,700 | 6,400 | 7,298 |
| 1967 | 6,900 | 6,400 | 6,751 |
| 1968 | 5,900 | 7,200 | 6,298 |
| 1969 | 5,800 | 5,800 | 5,800 |
| 1970 | 6,500 | 7,300 | 6,717 |
| 1971 | 8,300 | 6,500 | 7,777 |
| 1972 | 6,700 | 6,390 | 6,602 |
| 1973 | 6,600 | 6,000 | 6,404 |
| 1974 | 6,200 | 6,300 | 6,235 |
| 1975 | 7,200 | 6,790 | 7,048 |
| 1976 | 9,190 | 7,700 | 8,645 |
| 1977 | 6,600 | 6,090 | 6,404 |
| 1978 | 6,800 | 5,300 | 6,204 |
| 1979 | 8,200 | 5,300 | 7,117 |
| 1980 | 8,900 | 6,000 | 7,862 |
| 1981 | 9,300 | 6,000 | 8,187 |
| 1982 | 10,000 | 6,200 | 8,705 |

Source: OSU Extension Economic Information Office.

(about 6% annually). Washington declined at a rate of about 5% annually.

The rates of decline diminished in the late 1970's and early 1980's. Oregon's growers harvested 6,900 acres in 1983, the largest number in 10 years. Washington harvested 3,100 acres in 1983, the highest in 4 years.

Although acres harvested declined, yields per acre increased over this period (table 4).

Oregon experienced the most rapid increase; since 1975, the yield per acre has increased at an average annual rate of more than 4%.

In 1982, Oregon reached a record high per acre yield for the period, 10,000 lb. Another record was set in 1983 when Oregon experienced a yield of 11,500 lb an acre.

Washington experienced a rapid increase in yield per acre during the 1950's and early 1960's. This increase was at a rate of about 4% annually. In the late 1960's and early 1970's, the yield per acre in Washington began to decline slightly.

The decline was slightly higher in the late 1970's and early 1980's. Washington's yield, despite the downward trend, had a record of 7,700 lb an acre in 1976.

In the two states combined, the yield per acre was increasing over this period because of Oregon's influence. In the 1950's and early 1960's, the average yield per acre increased at an average rate of about 4% annually. In the early 1970's, the average rate of increase slowed, primarily because of a slight decline in Washington's yield.

Late in the period, the average growth rate increased somewhat. In 1982, the two states reached the highest average yield per acre during the 33-year period, about 8,700 lb an acre.

Production trends

Production of strawberries was variable during the 1950-1982 period. Total production in Oregon increased from 1950 to 1964 at an average annual rate of about 2% (table 5). In 1964, over 100 million pounds of strawberries were produced—the most ever produced in Oregon during the period.

Starting in 1965 to about the mid-1970's, the growth rate declined; total production dropped at an average rate of about 4% a year. In the latter part of the period, production was steady. Because of the higher acreage yield, Oregon's production in 1983 was 79.4 million lb, the highest in 16 years.

As the amount of total production in Oregon increased or decreased, so did the amount of production that went to processed markets. This percentage remained fairly constant from 1950 to the early 1970's. Following that time, the percentage production that was processed

Table 5.—*Oregon strawberry production, processed and total, percent processed, 1950-82*

| Year | Processed production (× 1,000 lb) | Total production (× 1,000 lb) | Percent processed |
|------|-----------------------------------|-------------------------------|-------------------|
| 1950 | 41,086 | 42,980 | 95 |
| 1951 | 30,570 | 32,190 | 95 |
| 1952 | 53,073 | 55,233 | 96 |
| 1953 | 60,330 | 62,310 | 97 |
| 1954 | 56,202 | 59,128 | 95 |
| 1955 | 80,700 | 83,475 | 97 |
| 1956 | 68,000 | 70,728 | 96 |
| 1957 | 86,300 | 91,600 | 94 |
| 1958 | 66,600 | 68,640 | 97 |
| 1959 | 85,100 | 88,920 | 96 |
| 1960 | 70,400 | 72,500 | 97 |
| 1961 | 63,500 | 67,600 | 94 |
| 1962 | 80,800 | 85,400 | 95 |
| 1963 | 66,100 | 69,300 | 95 |
| 1964 | 96,600 | 100,100 | 97 |
| 1965 | 56,700 | 59,800 | 95 |
| 1966 | 93,000 | 96,300 | 97 |
| 1967 | 88,100 | 91,100 | 97 |
| 1968 | 68,200 | 70,800 | 96 |
| 1969 | 66,900 | 69,600 | 96 |
| 1970 | 68,400 | 71,500 | 96 |
| 1971 | 79,500 | 83,000 | 96 |
| 1972 | 51,400 | 54,900 | 94 |
| 1973 | 45,800 | 48,800 | 94 |
| 1974 | 37,600 | 41,500 | 91 |
| 1975 | 39,000 | 41,800 | 91 |
| 1976 | 41,600 | 47,800 | 87 |
| 1977 | 31,200 | 35,000 | 89 |
| 1978 | 30,400 | 34,000 | 89 |
| 1979 | 38,700 | 42,600 | 91 |
| 1980 | 42,000 | 46,300 | 91 |
| 1981 | 46,700 | 51,150 | 91 |
| 1982 | 53,500 | 58,000 | 92 |

Source: OSU Extension Economics Information Office; U.S. Department of Agriculture, *Agricultural Statistics*, selected years.

began to decrease slightly. In the last few years of the period, the average rate of decline slowed, and the percentage that was processed remained fairly constant (about 91%).

Total production of strawberries in Washington declined more in terms of percentage than Oregon did during the time

Table 6.—*Washington strawberry production, processed and total, percent processed, 1950-82*

| Year | Processed production (× 1,000 lb) | Total production (× 1,000 lb) | Percent processed |
|------|-----------------------------------|-------------------------------|-------------------|
| 1950 | 19,210 | 23,472 | 82 |
| 1951 | 16,180 | 20,640 | 78 |
| 1952 | 29,000 | 34,113 | 85 |
| 1953 | 38,000 | 43,605 | 87 |
| 1954 | 38,400 | 43,605 | 88 |
| 1955 | 34,600 | 39,270 | 88 |
| 1956 | 8,500 | 9,625 | 88 |
| 1957 | 38,000 | 42,400 | 90 |
| 1958 | 36,000 | 40,500 | 89 |
| 1959 | 41,800 | 46,200 | 90 |
| 1960 | 41,800 | 44,800 | 93 |
| 1961 | 44,700 | 46,900 | 95 |
| 1962 | 44,600 | 47,400 | 94 |
| 1963 | 40,100 | 41,900 | 96 |
| 1964 | 39,900 | 40,900 | 98 |
| 1965 | 27,800 | 28,200 | 99 |
| 1966 | 33,900 | 38,600 | 88 |
| 1967 | 32,300 | 35,840 | 90 |
| 1968 | 34,600 | 38,200 | 91 |
| 1969 | 22,500 | 26,100 | 86 |
| 1970 | 26,700 | 29,900 | 89 |
| 1971 | 23,400 | 26,700 | 88 |
| 1972 | 21,000 | 24,300 | 86 |
| 1973 | 18,700 | 21,600 | 87 |
| 1974 | 20,200 | 22,700 | 89 |
| 1975 | 20,600 | 23,100 | 89 |
| 1976 | 22,100 | 25,100 | 88 |
| 1977 | 16,900 | 20,100 | 84 |
| 1978 | 14,000 | 17,500 | 80 |
| 1979 | 13,400 | 16,400 | 82 |
| 1980 | 12,800 | 17,400 | 74 |
| 1981 | 11,200 | 16,800 | 67 |
| 1982 | 13,400 | 18,600 | 72 |

Source: OSU Extension Economics Information Office; U. S. Department of Agriculture, *Agricultural Statistics*, selected years; Washington Department of Agriculture, *Berry Crops*, selected years.

period (table 6). Production in Washington increased slightly from 1950 to the mid-1960's. In 1962, Washington had its best year—it produced more than 47 million pounds of strawberries.

Starting in 1965, Washington experienced a general decline in production (the average annual rate of decline was about

5% from 1965 to about 1975). In the late 1970's and early 1980's, the average rate of decline increased slightly to about 6% annually. Washington production in 1979 was only 16.4 million lb—a record low for this period. By 1983, that figure had increased slightly to 19.2 million lb, the most in 6 years.

In Washington, as the amount of total production decreased, the amount of production that went to processed markets decreased even more. The amount of processed production increased somewhat in the late 1950's and early 1960's.

In 1965 to the early 1970's, the average annual portion of the crop processed began to decrease slightly. In the ending years of the period, the percent of the crop processed was decreasing at an even greater average annual negative rate (about 3%).

Value trends

The price level for strawberries differs according to the market in which they are sold. Strawberries sold in the fresh market generally received a higher price during the period than those sold for processing.

The fresh price for Oregon strawberries gradually increased (table 7). From the early 1950's to the late 1960's, the Oregon fresh price for strawberries increased only slightly.

The lowest price year was 1957—only 12.7¢ a lb. From the late 1960's to the early 1970's, the average annual growth rate was about 4%. In the last years of the period, the average annual growth rate was about 6%. The highest price for fresh strawberries in Oregon in the 33-year period was 1982 (54.0¢ a lb).

The price for Oregon strawberries for the processed market increased to a greater degree than fresh strawberry prices. In the 1950's to early 1960's, the processed price decreased slightly. The lowest year for processed prices was 1957 (only 8.1¢ a lb). In the late 1960's to early 1970's, the price of strawberries for the processed market increased at an average annual rate of about 5%.

In the last decade of the period, the average rate of increase was about 7% annually. The highest amount paid for processed strawberries during the 33-year period was in 1982 (43.0¢ a lb).

Table 7.—*Oregon strawberry prices, fresh and processed, 1950-82*

| Year | Fresh price (¢/lb) | Processed price (¢/lb) | Weighted average price (¢/lb) |
|------|--------------------|------------------------|-------------------------------|
| 1950 | 28.1 | 22.1 | 22.4 |
| 1951 | 18.1 | 17.1 | 17.2 |
| 1952 | 16.7 | 15.3 | 15.4 |
| 1953 | 19.4 | 15.9 | 16.0 |
| 1954 | 21.7 | 14.7 | 15.1 |
| 1955 | 20.0 | 15.6 | 15.8 |
| 1956 | 18.2 | 15.4 | 15.5 |
| 1957 | 12.7 | 8.1 | 8.4 |
| 1958 | 25.1 | 12.0 | 12.4 |
| 1959 | 26.2 | 13.0 | 13.6 |
| 1960 | 17.6 | 14.1 | 14.2 |
| 1961 | 15.1 | 12.1 | 12.3 |
| 1962 | 15.2 | 12.9 | 13.0 |
| 1963 | 24.0 | 12.1 | 12.7 |
| 1964 | 24.7 | 13.9 | 14.3 |
| 1965 | 29.3 | 15.3 | 16.0 |
| 1966 | 23.0 | 17.3 | 17.5 |
| 1967 | 17.0 | 14.1 | 14.2 |
| 1968 | 23.2 | 16.5 | 16.8 |
| 1969 | 23.0 | 17.0 | 17.2 |
| 1970 | 24.0 | 15.6 | 16.0 |
| 1971 | 23.1 | 14.7 | 15.1 |
| 1972 | 28.8 | 17.2 | 17.9 |
| 1973 | 32.1 | 23.4 | 23.9 |
| 1974 | 36.1 | 24.5 | 25.6 |
| 1975 | 32.9 | 22.0 | 23.0 |
| 1976 | 35.2 | 27.5 | 28.5 |
| 1977 | 36.0 | 27.6 | 28.5 |
| 1978 | 33.0 | 26.3 | 27.0 |
| 1979 | 41.0 | 33.0 | 33.7 |
| 1980 | 45.0 | 31.9 | 33.1 |
| 1981 | 45.8 | 34.4 | 35.4 |
| 1982 | 54.0 | 43.0 | 44.0 |

Source: OSU Extension Economic Information Office; U. S. Department of Agriculture, *Agricultural Statistics*, selected years.

Because a large percentage of the crop is processed, the average price for all Oregon strawberries followed the same general pattern as the processed price. The overall average grower price for 1983 in Oregon declined somewhat to 39.0¢ a lb.

Table 8.—*Washington strawberry prices, fresh and processed, 1950-82*

| Year | Fresh price (¢/lb) | Processed price (¢/lb) | Weighted average price (¢/lb) |
|------|--------------------|------------------------|-------------------------------|
| 1950 | 24.7 | 23.7 | 23.9 |
| 1951 | 21.4 | 17.1 | 18.0 |
| 1952 | 20.6 | 15.2 | 16.0 |
| 1953 | 21.1 | 15.9 | 16.6 |
| 1954 | 19.2 | 15.6 | 16.0 |
| 1955 | 20.3 | 16.2 | 16.7 |
| 1956 | 20.4 | 15.8 | 16.3 |
| 1957 | 13.0 | 8.0 | 8.5 |
| 1958 | 16.0 | 12.0 | 12.4 |
| 1959 | 18.5 | 13.7 | 14.2 |
| 1960 | 21.7 | 14.4 | 14.9 |
| 1961 | 16.5 | 12.1 | 12.3 |
| 1962 | 22.8 | 13.1 | 13.7 |
| 1963 | 18.5 | 12.0 | 12.3 |
| 1964 | 21.6 | 14.3 | 14.5 |
| 1965 | 26.0 | 18.7 | 18.8 |
| 1966 | 26.0 | 16.6 | 17.7 |
| 1967 | 26.1 | 15.0 | 16.1 |
| 1968 | 24.3 | 16.9 | 17.6 |
| 1969 | 26.0 | 17.1 | 18.3 |
| 1970 | 26.2 | 15.8 | 16.9 |
| 1971 | 24.4 | 14.6 | 15.8 |
| 1972 | 23.5 | 18.0 | 18.8 |
| 1973 | 27.0 | 23.7 | 24.1 |
| 1974 | 29.3 | 25.2 | 25.7 |
| 1975 | 25.8 | 21.0 | 21.5 |
| 1976 | 30.4 | 27.3 | 27.7 |
| 1977 | 31.1 | 27.4 | 28.0 |
| 1978 | 31.2 | 24.0 | 25.4 |
| 1979 | 38.0 | 34.0 | 34.7 |
| 1980 | 45.0 | 31.0 | 34.7 |
| 1981 | 47.0 | 34.0 | 38.3 |
| 1982 | 47.0 | 42.0 | 43.0 |

Source: OSU Extension Economic Information Office; Washington Department of Agriculture, *Berry Crops*, selected years.

The fresh price for Washington strawberries also generally increased over the 33-year period (table 8). The fresh price had a slightly decreasing trend from the 1950's to about the mid-1960's. The lowest price received for Washington strawberries was in 1957 (13.0¢ a lb). From the late 1960's to early 1970's, the fresh market price increased at an average annual rate of about 2%.

During the final decade of the period, the average annual rate of growth in the fresh price was about 7%. The highest price for Washington fresh strawberries during this period was earned in both 1981 and 1982; the grower price was 47.0¢ a lb.

The processed price for Washington strawberries followed a pattern similar to the Oregon processed price. In the 1950's and early 1960's, the process market price followed a slight downward trend. The lowest price received for Washington processed strawberries was also in 1957; the grower price was 8.0¢ a lb.

In the late 1960's and early 1970's, the processed price began to increase gradually (the average annual rate of growth was about 4%). In the last decade of the period, the average rate of growth increased to 6% annually. The highest prices received in the processed market for the period occurred in 1982; the grower price was 42.0¢ a lb. The 1983 price also declined to about 39.0¢ a lb.

In Washington, the average price received for all strawberries declined in the 1950's and early 1960's, and then began to increase. In the 1950's and early 1960's, the average price was steady. In the late 1960's to early 1970's, the average price began to increase at an average rate of about 4% annually. In the latter years of the period, the average price for Washington strawberries increased at an average annual rate of about 7%.

The value of strawberry production in Oregon, Washington, and the two states combined generally increased throughout the 1950-1982 period (table 9). During the 1950's, the value of Oregon's strawberry production averaged \$9.5 million. During the late 1960's, the value of Oregon's crop actually declined on an average annual basis.

By the late 1970's and early 1980's, Oregon's value of production was increasing rapidly, including an 8% average annual growth rate in the last few years of the period.

The production value of Washington strawberries was also increasing at about the same average rates as Oregon, but at considerably lower dollar levels. In the 1950's, Washington's value of production averaged \$5.2 million a year. By the early 1980's, the value had only increased to an average \$6.8 million.

Table 9.—*Value of strawberry production in Oregon and Washington, 1950-82*

| Year | Oregon (× \$1,000) | Washington (× \$1,000) | Total (× \$1,000) |
|------|--------------------|------------------------|-------------------|
| 1950 | 9,615 | 5,606 | 15,221 |
| 1951 | 5,521 | 3,721 | 9,242 |
| 1952 | 8,481 | 5,461 | 13,942 |
| 1953 | 10,356 | 7,224 | 17,580 |
| 1954 | 8,897 | 6,991 | 15,888 |
| 1955 | 13,144 | 6,554 | 19,698 |
| 1956 | 10,968 | 1,571 | 12,539 |
| 1957 | 7,650 | 3,612 | 11,262 |
| 1958 | 8,609 | 5,040 | 13,649 |
| 1959 | 12,064 | 6,493 | 18,557 |
| 1960 | 10,448 | 6,685 | 17,133 |
| 1961 | 8,641 | 5,775 | 14,416 |
| 1962 | 11,445 | 6,487 | 17,932 |
| 1963 | 8,766 | 5,178 | 13,944 |
| 1964 | 14,292 | 5,911 | 20,203 |
| 1965 | 9,583 | 5,303 | 14,886 |
| 1966 | 16,848 | 6,128 | 22,976 |
| 1967 | 12,932 | 5,765 | 18,697 |
| 1968 | 11,803 | 6,716 | 18,519 |
| 1969 | 12,063 | 4,782 | 16,845 |
| 1970 | 11,372 | 5,057 | 16,429 |
| 1971 | 12,512 | 4,222 | 16,734 |
| 1972 | 9,791 | 4,556 | 14,347 |
| 1973 | 11,680 | 5,215 | 16,895 |
| 1974 | 10,620 | 5,823 | 16,443 |
| 1975 | 9,610 | 4,992 | 14,602 |
| 1976 | 13,622 | 6,945 | 20,567 |
| 1977 | 9,979 | 5,626 | 15,605 |
| 1978 | 9,183 | 4,452 | 13,635 |
| 1979 | 14,370 | 5,696 | 20,066 |
| 1980 | 15,333 | 6,038 | 21,371 |
| 1981 | 18,126 | 6,439 | 24,565 |
| 1982 | 25,435 | 8,072 | 33,507 |

Source: OSU Economic Information Office; Washington Department of Agriculture; U. S. Department of Agriculture, *Agricultural Statistics*, selected years.

The highest value of production in the two states as a whole was reached in 1982, when growers received over \$33.5 million (growers in the early 1980's averaged \$26.5 million a year). In contrast, growers received only an average \$14.8 million a year for the crops produced in the 1950's.

Production costs and returns

We estimated production cost budgets for both Oregon and Washington (tables 10 and 11). The two studies were done at different times and under dissimilar cultural conditions. The base yield used for both Oregon and Washington was 5 tons an acre.

We estimated production costs per acre for strawberries in Oregon to be \$3,171 (assuming 20 acres of strawberries on a 200-acre farm). We estimated Washington production costs to be \$4,106 an acre (assuming a 10-acre strawberry operation).

Preharvest costs in Washington were higher, primarily because of heavier use of chemicals. Harvest costs were also higher in Washington because part of the crop was assumed to be harvested for fresh market. This necessitated higher labor and container charges.

Postharvest and overhead charges were higher in Washington because of greater tractor and machinery expenses. We estimated break-even prices to be 32¢ a pound for Oregon and 41¢ for Washington.

Every 3 years, a strawberry field is plowed under and the field replanted. Total establishment costs for Oregon were \$1,537 an acre (table 12). Washington establishment costs were \$2,337 an acre (table 13). Establishment costs were higher in Washington because of greater expenses for chemicals, machinery operations, and labor.

For both budgets, establishment costs were amortized over 3 years at 13% interest. We prorated the establishment costs included in the Oregon production cost budget (table 10) at \$651 an acre. We estimated the amortized establishment cost in Washington to be \$982 an acre (table 11).

Future alternative—mechanical harvesters

In the past few years, a recessionary economy brought plentiful harvest labor. But when the economy starts an uptrend, such as in 1983, labor for harvesting drops off. To offset periods of low labor availability, a mechanical strawberry harvester was developed and tested.

There are drawbacks. One is that no variety of strawberry has been developed that will satisfactorily withstand harvest by machine. There are several qualities that this strawberry needs, so that it can be harvested by machine.

The berries must be firm, resistant to disease, and have high yield capabilities. Plants also need an upright fruiting habit to minimize damage. Most of the fruit should mature at the same time so that a higher percentage of the crop is picked.

Another drawback is the acceptability of the strawberries to processors. Some processors do not have the capability of handling the extra bulk (leaves and stems) associated with mechanical harvesting.

Processors may place a price discount on machine-harvested strawberries. This discount would also take into account bruised or damaged strawberries. Machine harvest enthusiasts hope that if a new variety of strawberry is developed, such discounts would not be necessary.

When comparing the cost of hand-harvesting strawberries to machine-harvesting them, we can see different cost relationships. Total usable product (tons/acre) in recent studies was estimated to be higher for hand-harvested strawberries than for machine-harvested strawberries: 3.66 tons/acre for hand-harvested berries compared to 2.71 tons/acre for machine-harvested.

However, harvest costs were considerably lower for machine-harvested strawberries than for hand-harvested ones. Total harvest cost plus extra processing costs were only \$196 an acre for machine-harvested strawberries.

The results of these studies comparing harvest methods are highly dependent on the relative yields between a hand-harvested and machine-harvested berry. For a hand-harvest yield (3 pickings) more than twice the yield of machine-harvest (1 picking), the advantage of hand-harvest was estimated to be \$210 an acre. In another study, the savings per acre ranged from \$523 in favor of mechanical-harvest to \$187 in favor of hand-harvest.

The differences resulted from variation in yields and efficiency. Using a composite format compiled from several of the studies, 1982 costs and yields, and the 1982 estimated prices for fresh and processed strawberries in Oregon, we estimated that there would have been \$545 net savings per acre in favor of machine-harvest in 1982 (table 14).

For hand-harvested strawberries, total harvest costs were \$1,764 an acre. Product value for hand-harvested strawberries, after deducting those costs, was \$2,166 an acre. In contrast, the product value for machine-harvested strawberries, net of harvest costs, was \$2,711.

Mechanical harvesting may be a viable alternative for future use if the present varietal drawbacks can be overcome. Since a high percentage of Oregon and Washington strawberry production goes to processed markets, mechanically picked strawberries could be feasible.

Mechanization would reduce the labor uncertainty routinely experienced by growers. With new varieties developed for mechanical harvest, higher per-acre yield levels might be reached than those observed in the cited studies.

Table 10.—Production costs for strawberries in Washington county, Oregon, July 1982^a

| Cost items | Inputs per acre | | | | | Total cost \$ |
|--|-----------------|-------------|-----------------|----------|-------------|------------------|
| | Labor | | Machinery \$ | Other | | |
| | Hours | Value \$ | | Item | Value \$ | |
| <i>Preharvest cultural operations</i> | | | | | | |
| Cultivate (3 ×) | 3.0 | 29.00 | 14.00 | | | 43.00 |
| Hoeing | 8.0 | 48.00 | | | | 48.00 |
| Insecticide & fungicide spray or dust (3 ×) | 1.0 | 10.00 | 10.00 | mtl. | 52.00 | 72.00 |
| Irrigation (2 ×, 2'' ea.) | 2.0 | 12.00 | 23.00 | elec. | 4.00 | 39.00 |
| <i>Harvest costs</i> | | | | | | |
| Picking & supervision labor | (17¢/lb) | 1,700.00 | | | | 1,700.00 |
| Hauling | | 69.00 | 58.00 | | | 127.00 |
| Bookkeeping, recruiting, etc. | | 95.00 | | supplies | 10.00 | 105.00 |
| <i>Postharvesting operations^b</i> | | | | | | |
| Irrigation (2 ×, 2'' ea.) | 2.0 | 12.00 | 23.00 | elec. | 4.00 | 39.00 |
| Clip tops | .33 | 3.00 | 5.00 | | | 8.00 |
| Weevil control (banded) | .2 | 2.00 | 2.00 | mtl. | 23.00 | 27.00 |
| Cultivate & runner control (2 ×) | 2.0 | 19.00 | 11.00 | | | 30.00 |
| Subsoil | .50 | 5.00 | 8.00 | | | 13.00 |
| Herbicide | .20 | 2.00 | 2.00 | mtl. | 8.00 | 12.00 |
| Side dress fertilizer ^c | | | | fert. | 61.00 | 61.00 |
| <i>Other charges</i> | | | | | | |
| Land charges | | | | | 150.00 | 150.00 |
| Operating capital interest @ 1.4% | | | | | 24.00 | 24.00 |
| General overhead | | | | | 22.00 | 22.00 |
| Total cash costs | | 1,772.00 | 62.00 | | 358.00 | 2,192.00 |
| Total noncash costs | | 234.00 | 94.00 | | 0 | 328.00 |
| Total annual production costs | | 2,006.00 | 156.00 | | 358.00 | 2,520.00 |
| Amortized establishment costs | | | | | | 651.00 |
| Net cost/producing year | | | | | | 3,171.00 |
| Cost/lb @ 6-ton yield | 29.5¢ | | | | | |
| Cost/lb @ 5-ton yield | 31.7¢ | | | | | |
| Cost/lb @ 4-ton yield | 35.1¢ | | | | | |
| Cost/lb @ 3-ton yield | 40.7¢ | | | | | |

^aBased on (1) 20 acres on a 200-acre farm; (2) 3 bearing years, 5-ton/acre average; (3) operator's labor @ \$9.50/hour; (4) hired labor @ \$6.00/hour; (5) 3 tractors: 90-100 hp @ \$17.00/hour, 50 hp @ \$9.00/hour, 25 hp @ \$4.00/hr. Rates for operator's and hired labor were updated from a *Washington County Strawberries Enterprise Sheet*, OSU Economic

Information Office, February 1979 (includes Social Security, Workman's Compensation, and other labor expenses).

^bPostharvest costs not incurred in third year.

^cGenerally done but not required in all cases.

Table 11.—*Strawberry production costs—full production for direct processing and marketing western Washington 10-acre enterprise—1982 (assuming a 5-ton yield per acre)*

| Costs | Unit | Price/unit \$ | Quantity | Total cost \$ |
|--------------------------------|------|------------------|----------|------------------|
| <i>Preharvest</i> | | | | |
| Tenoran | lb | 7.60 | 2.00 | 15.20 |
| Guthion | lb | 6.00 | .50 | 3.00 |
| Metasystox R | gal | 34.00 | 1.50 | 51.00 |
| Ronilan 50 WP | lb | 25.00 | 1.00 | 25.00 |
| Furadan | gal | 51.50 | 1.50 | 77.25 |
| 10-20-30 | tons | 0.118 | 400.00 | 47.40 |
| Devrinol 50 WP | lb | 8.30 | 4.00 | 33.20 |
| Machinery repair | acre | 2.33 | 1.00 | 2.33 |
| Tractor repair | acre | 2.68 | 1.00 | 2.68 |
| Irrigation repair | acre | 35.04 | 1.00 | 35.04 |
| Irrigation fuel | acre | 8.24 | 1.00 | 8.24 |
| Labor (tractor & machinery) | hour | 4.50 | 12.91 | 58.09 |
| Labor (irrigation) | hour | 4.00 | 8.00 | 32.00 |
| Interest on operating capital | \$1 | 0.12 | 188.85 | 22.66 |
| Overhead | \$1 | 0.05 | 2,522.40 | 126.12 |
| <i>Harvest</i> | | | | |
| Harvest preparation | hour | 4.50 | 4.00 | 18.00 |
| Hand labor | flat | 1.50 | 400.00 | 600.00 |
| Hand labor | flat | 2.00 | 375.00 | 750.00 |
| Supervisory labor | hour | 10.00 | 36.00 | 360.00 |
| Cleanup labor | hour | 4.50 | 2.00 | 9.00 |
| Flats | flat | .50 | 400.00 | 200.00 |
| Machinery repair | acre | 6.93 | 1.00 | 6.93 |
| Machinery fuel | acre | 30.00 | 1.00 | 30.00 |
| Machinery lube | acre | 4.50 | 1.00 | 4.50 |
| Labor (tractor & machinery) | hour | 4.50 | 7.20 | 32.40 |
| <i>Fixed</i> | | | | |
| Machinery depreciation | acre | 73.43 | 1.00 | 73.43 |
| Machinery interest | acre | 61.43 | 1.00 | 61.43 |
| Machinery insurance | acre | 3.07 | 1.00 | 3.07 |
| Tractor depreciation | acre | 33.01 | 1.00 | 33.01 |
| Tractor interest | acre | 39.61 | 1.00 | 39.61 |
| Tractor insurance | acre | 1.98 | 1.00 | 1.98 |
| Irrigation depreciation | acre | 43.84 | 1.00 | 43.84 |
| Irrigation interest | acre | 65.76 | 1.00 | 65.76 |
| Management charge ^a | | 2,550.04 | .05 | 127.50 |
| Prorated establishment cost | acre | 2,336.93 | .42 | 981.51 |
| Land rent | acre | 125.00 | 1.00 | 125.00 |
| Total preharvest costs | | \$ 539.22 | | |
| Total harvest costs | | 2,015.81 | | |
| Total fixed costs | | 1,556.14 | | |
| Total production costs | | 4,106.18 | | |

^aManagement charge is 5% of variable cost.

Compiled from 1982 *Strawberry Enterprise Budget for Western*

Washington, Washington State University, Cooperative Extension Service, Bulletin 1077 (Pullman, 1982).

Table 12.—*Establishment costs for strawberries in Washington county, Oregon, July 1982^a*

| Cost items | Inputs per acre | | | | | Total Cost \$ |
|--|-----------------|--------|-----------|--------|-------------|------------------|
| | Labor | | Machinery | Other | | |
| | Hours | Value | | Item | Value \$ | |
| <i>Cultural operations</i> | | | | | | |
| Subsoil | .5 | 5.00 | 8.00 | | | 13.00 |
| Plow | .4 | 4.00 | 8.00 | | | 12.00 |
| Disc & harrow (3 ×) | .75 | 7.00 | 15.00 | | | 22.00 |
| Field cultivator | .5 | 5.00 | 9.00 | | | 14.00 |
| Fumigation ^b | .5 | 5.00 | 7.00 | mtl. | 182.00 | 194.00 |
| Cultimulcher (2 ×) | .33 | 3.00 | 7.00 | | | 10.00 |
| Fertilize (broadcast) | .17 | 1.00 | 1.00 | fert. | 16.00 | 18.00 |
| Preplant insecticide | .2 | 2.00 | 2.00 | mtl. | 56.00 | 60.00 |
| Lime (2 tons) ^b | | | | custom | 58.00 | 58.00 |
| Plant trimming | 3.0 | 18.00 | | | | 18.00 |
| Planting, 11,000 plants/acre; 5 people (5 acres in 8 hours) | 8.0 | 53.00 | 16.00 | plants | 439.00 | 508.00 |
| Roll plants | .2 | 1.00 | 3.00 | | | 4.00 |
| Fertilizer ^c | | | | fert. | 51.00 | 51.00 |
| Herbicide | .2 | 2.00 | 2.00 | mtl. | 59.00 | 63.00 |
| Irrigation (3 ×, 6" total) | 3.0 | 18.00 | 68.00 | elec. | 7.00 | 93.00 |
| Cultivate (3 ×) | 3.0 | 29.00 | 14.00 | | | 43.00 |
| Herbicide (fall) | .2 | 2.00 | 2.00 | mtl. | 26.00 | 30.00 |
| Hand weeding (crew) | 8.0 | 48.00 | | | | 48.00 |
| Pest control | .2 | 2.00 | 2.00 | mtl. | 18.00 | 22.00 |
| <i>Other charges</i> | | | | | | |
| Land charge (cash rent basis) | | | | | 150.00 | 150.00 |
| Operating capital interest (@ 14%) | | | | | 53.00 | 53.00 |
| General overhead | | | | | 53.00 | 53.00 |
| Total cash costs | | 91.00 | 65.60 | | 1,168.00 | 1,324.60 |
| Total noncash costs | | 114.00 | 98.40 | | 0 | 212.40 |
| Total establishment costs | | 205.00 | 164.00 | | 1,168.00 | 1,537.00 |
| Amortized for 3 years at 13% | | | | | | 651.00 |

^aBased on (1) 20 acres on a 200-acre farm; (2) 3 bearing years; (3) operator's labor @ \$9.50/hour; (4) hired labor @ \$6.00/hour; (5) 3 tractors: 90-100 hp @ \$17.00/hour, 50 hp @ \$9.00/hour, 25 hp @ \$4.00/hour. Rates for operator's and hired labor were updated from *Washington County Strawberries Enterprise Sheet*, OSU Economic

Information Office, February 1979 (includes Social Security, Workman's Compensation, and other labor expenses).

^bGenerally done but not required in all cases.

^cApplied during another operation and includes soil insecticide.

Table 13.—*Establishment costs, establishment year, western Washington data, 10-acre enterprise, 1982 (assuming a 5-ton yield/acre)*

| Costs | Unit | Price/unit \$ | Quantity | Total cost \$ |
|--------------------------------|------|------------------|----------|------------------|
| <i>Variable</i> | | | | |
| Soil test | acre | 4.50 | 1.00 | 4.50 |
| Nematode test | acre | 2.50 | 1.00 | 2.50 |
| Roundup | gal | 83.00 | .75 | 62.25 |
| Cust. plow | acre | 25.00 | 1.00 | 25.00 |
| Dolomite | tons | 97.50 | 1.00 | 97.50 |
| Cust. lime | acre | 3.50 | 1.00 | 3.50 |
| Cust. fumigate | acre | 30.00 | 1.00 | 30.00 |
| Terrocid 54/45 | gal | 27.00 | 11.00 | 297.00 |
| 10-20-20 | lb | 0.118 | 500.00 | 59.25 |
| Strawberry plants | head | 4.00 | 110.00 | 440.00 |
| 10-15-15 | lb | 0.113 | 600.00 | 68.10 |
| Strawberry plants (replant) | head | 4.10 | 5.50 | 22.55 |
| Hand weed | hour | 4.50 | 6.00 | 27.00 |
| Metasystox R | gal | 30.80 | 1.50 | 46.20 |
| Devrinol 50 WP | lb | 8.30 | 4.00 | 33.20 |
| Tenoran 50 WP | lb | 7.60 | 2.00 | 15.20 |
| Overhead | \$1 | 0.05 | 1,615.96 | 80.80 |
| Plant labor | hour | 4.50 | 8.00 | 36.00 |
| Replant labor | hour | 4.50 | 1.50 | 6.75 |
| 10-20-20 | lb | 0.118 | 400.00 | 47.40 |
| Machinery repair | acre | 5.87 | 1.00 | 5.87 |
| Tractor repair | acre | 5.43 | 1.00 | 5.43 |
| Irrigation repair | acre | 35.04 | 1.00 | 35.04 |
| Irrigation fuel | acre | 8.24 | 1.00 | 8.24 |
| Labor (tractor & machinery) | hour | 4.50 | 26.16 | 117.74 |
| Labor (irrigation) | hour | 4.00 | 8.00 | 32.00 |
| Interest on operating capital | \$1 | 0.12 | 737.94 | 88.55 |
| <i>Fixed</i> | | | | |
| Machinery depreciation | acre | 90.64 | 1.00 | 90.64 |
| Machinery interest | acre | 74.34 | 1.00 | 74.34 |
| Machinery insurance | acre | 3.72 | 1.00 | 3.72 |
| Tractor depreciation | acre | 66.90 | 1.00 | 66.90 |
| Tractor interest | acre | 80.28 | 1.00 | 80.28 |
| Tractor insurance | acre | 4.01 | 1.00 | 4.01 |
| Irrigation depreciation | acre | 43.84 | 1.00 | 43.84 |
| Irrigation interest | acre | 65.76 | 1.00 | 65.76 |
| Management charge ^a | | 1,697.57 | 0.05 | 84.88 |
| Land rent | acre | 125.00 | 1.00 | 125.00 |
| Total variable cost | | \$1,697.57 | | |
| Total fixed cost | | 639.36 | | |
| Total establishment costs | | 2,336.93 | | |

^aManagement charge is 5% of variable cost.

Compiled from 1982 *Strawberry Enterprise Budget for Western*

Washington, Washington State University, Cooperative Extension Service, Bulletin 1077 (Pullman, 1982).

Table 14.—Comparison between mechanical harvest and hand-picking harvest costs

| Calculation steps | 1982 Estimate | Your estimate |
|---|-------------------|---------------|
| Usable product under mechanization^a | | |
| Average total yield (ton/acre) | 5.00 | _____ |
| Berries recovered by the harvester (ton/acre) (5.0 × .76) | 3.80 | _____ |
| Less culls (3.80 × .11) | (0.42) | _____ |
| Total usable product (tons/acre) | 3.38 | _____ |
| Revenue (\$/acre) for machine harvest | | |
| Total revenue 3.38 tons × 43.0¢/lb ^b | \$2,907.00 | _____ |
| Harvest costs (\$/acre) with mechanization | | |
| Direct labor costs ^c (4 hours @ \$9.50) + (4 hours @ 12.00) | 86.00 | _____ |
| Repair costs (4 hours @ \$10.00/hour) | 40.00 | _____ |
| Depreciation (4 hours @ \$9.06/hour) | 36.00 | _____ |
| Tax & housing (4 hours @ .68/hour) | 2.70 | _____ |
| Insurance (4 hours @ .07/hour) | .30 | _____ |
| Interest (4 hours @ 3.49) | 14.00 | _____ |
| Fuel (4 hours @ 1.79/hour) | 7.20 | _____ |
| Processing cost (\$/acre) ^d | 9.80 | _____ |
| Total harvest and extra processing costs | \$ 196.00 | _____ |
| Product value net of harvest costs | \$2,711.00 | _____ |
| Usable product under hand-picking | | |
| Average total yield (tons/acre) | 5.00 | _____ |
| Berries actually picked (5 tons @ .95) | 4.75 | _____ |
| Less culls (4.75 @ .037) | (0.18) | _____ |
| Total usable product (tons/acre) | 4.57 | _____ |
| Revenue (\$/acre) for hand-picked harvest | | |
| Total revenue (4.57 tons @ 43.0¢/lb) | \$3,930.00 | _____ |
| Harvest costs (\$/acre) for hand-picked strawberries^e | | |
| Total harvest costs (19.3¢/lb × 9,140 lb) | 1,764.00 | _____ |
| Product value net of harvest costs | \$2,166.00 | _____ |
| Net savings as a result of using the harvester (\$2,711 – 2,166) | 545.00 | _____ |

^aUsing the SKH&S harvester sponsored by the Stayton Canning Cooperative.

^b1982 Oregon processed price (table 7).

^cThe direct labor cost was estimated using wage rates of \$9.50/hour for the machine operator and \$6.00/hour for two assistants. It takes 4 hours to harvest 1 acre.

^dThis includes wage rates and fringe benefits of employees.

^eThe estimated harvest cost for hand-picking was about 19¢/lb, including costs of recruiting, labor, transportation and supervision, hauling and handling of berries, and bookkeeping.

Compiled from:

Hussen, Ahmed M., William G. Brown, Dean E. Booster, Francis J. Lawrence, Lloyd W. Martin, and George Varseveld, *Estimated Costs and Returns from Mechanical Strawberry Harvest in Oregon: A Progress Report*, Oregon State University Agricultural Experiment Station Special Report 556 (Corvallis, 1979).

Kim, Chong S., William G. Brown, and R. Ronald Langmo, "Economic Feasibility to Oregon Growers of Mechanically Harvested Strawberries," in *Strawberry Mechanization*, Oregon State University Agricultural Experiment Station Bulletin 645 (Corvallis, 1980).

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