

# Frozen Strawberry Competition

California's slight interregional advantage could be reduced by small changes in the cost structures in competing regions

Carleton C. Dennis

The following article is the seventh in a series of progress reports on efficiency in the processing and marketing of frozen fruits and vegetables. The studies are being conducted cooperatively with the Agricultural Experiment Stations in Washington, Oregon, and Hawaii and the Agricultural Marketing Service, United States Department of Agriculture.

**The frozen strawberry industry** developed with exceptional rapidity in the years since World War II and is now concentrated in the states of California, Oregon, and Washington. Estimates of production, processing, and shipping costs of a recent study indicate that the West Coast states may be expected to continue as industry leaders.

In the study, it was assumed that retail consumers of frozen strawberries are unable to associate quality of product with particular producing regions. This means there would be no consumer-market price differences with respect to origin of product. Each market would be supplied by the producing region which could produce, process, and transport to the market at the lowest total unit cost. To reduce the problem to manageable proportions, broad production and consumption re-

gions were defined with cost or consumption estimates derived for each. Production and processing costs were developed for 10 major producing regions. Regional cost estimates were based on information gathered in these states.

Consumption estimates, based on estimated population and per capita consumption, were made for each state—except Hawaii and Alaska—and the District of Columbia.

Transportation costs were estimated for shipments from each producing region to each consuming region.

## Farm Production Costs

Farm production costs of representative commercial producers were estimated through group interviews of producers in each region. These estimates were based on the expected yield and the costs of all inputs including land, buildings, machinery expense, labor—including harvesting—and materials.

Regional farm production costs were found to fit roughly into three groups. The lowest cost—per pound—group is

composed of Washington, 9.5¢; Oregon, 9.7¢; and California, 9.6¢. The next group is composed of Michigan, 11.5¢; Tennessee, 11.6¢; Virginia, 12.6¢; New York, 13.8¢ and Arkansas, 16.7¢. The highest costs were found for Louisiana, 23.1¢; and Florida, 25.1¢. The costs of some of these areas are obviously too high to allow serious competition in the frozen strawberry industry although their seasonal production enables them to furnish strawberries for the fresh market.

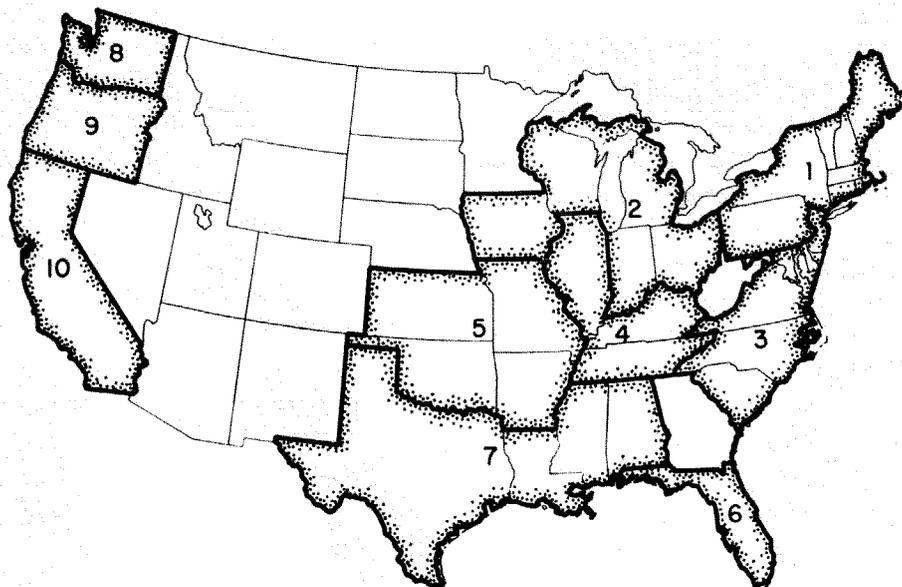
## Processing Costs

Processing-cost differences among regions are comparatively small, but when included with other costs, are often sufficient to shift delivered processed product cost advantage among regions. Important determinants of regional processing costs are wage rates and other factor prices, processing techniques employed, and length of processing season. Wage rates are somewhat higher in the West Coast states—Regions 8, 9, and 10—than in other parts of the country, but the prices for other processing services differ little among regions.

Processing techniques are similar among regions. All regions—other than California—have strawberry freezing seasons of approximately the same

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Ten geographical regions used in the analysis of strawberry production.



### States Included

(Listed in order of production in recent years)

**REGIONS:** 1—New York, Pennsylvania, Connecticut, Massachusetts, Maine. 2—Michigan, Ohio, Indiana, Wisconsin, Iowa. 3—Virginia, North Carolina, South Carolina, Maryland, Delaware, New Jersey. 4—Tennessee, Kentucky, Illinois. 5—Arkansas, Missouri, Oklahoma, Kansas. 6—Florida. 7—Louisiana, Texas, Alabama. 8—Washington. 9—Oregon. 10—California.

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## STRAWBERRIES

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length. Season lengths were estimated at 150 hours for Regions 3-7 and 200 hours for Regions 1, 2, 8, and 9 as compared with 1,000 hours in California. In regions in which strawberry freezing equipment is also used for processing other products, an allocation of equipment fixed costs was made to the different products processed.

Processing costs are lower in large plants, as measured by hourly capacity rate, than in small plants. In this study, it was assumed that all processing would occur in uniformly large plants unless expected regional output would not require large plants. In those cases processing was assumed to occur in smaller plants and unit costs were increased accordingly.

Because of a longer season and in spite of higher labor wage rates, California is able to process strawberries for freezing at a lower cost than any other region. Regions 1 and 2 follow California in processing cost advantage. The processing costs of these regions are slightly lower than the next group—Regions 3-7—because of the slightly longer processing season. Regions 8 and 9 have highest processing costs because of higher wage rates than other regions of similar processing season length.

The cost of frozen strawberries at a freezing plant in each region is composed of the costs of farm production and delivery to the processing plant, processing the berries for freezing, sugar, containers, and freezing. California, followed closely by Washington and Oregon, holds an advantage in total at-plant frozen product cost. Among eastern regions, Regions 2 and 4 have lowest frozen product cost.

Both rail and truck transport are used to move frozen strawberries, and the lowest cost method was assumed to be utilized in each interregional movement. Truck transport was estimated to be most economical at distances of less than 1,200 miles, and rail transport most economical at greater distances. Regions 8, 9, and 10—at a comparatively great distance from eastern consuming areas—have a transportation cost disadvantage of 1.5¢ to more than 2¢ per pound in most of the eastern United States markets.

### Possible Production Pattern

A production pattern—toward which the industry could be expected to move—was estimated with a projected 1970 consumption and 1957-58 costs. Assuming the possibility of greatly increased output without increased cost, California—on the basis of least-total-cost—has a cost advantage for nearly all the frozen straw-

berries in the United States. The total cost of Region 10 strawberries delivered to Regions 1, 3, 5, 6, and 7 was less than the at-plant cost of frozen strawberries produced in those regions. The delivered cost of Region 10 frozen strawberries in Regions 2, 4, 8, and 9 was only slightly greater than their regional at-plant costs. Small transportation charges raise these costs above those of Region 10 so the areas of advantage of these eastern producing regions are limited.

### Cost and Return Variations

A precise solution based on current data is possible, but different data may apply to future periods and projections would be changed. If transportation costs, for instance, increased as little as 10%, Region 2 would have a comparative advantage in production for institutional and manufacturing uses in Michigan and Illinois, which represent about 6% of total United States consumption. At a 50% rate increase, Region 2 would have a comparative advantage in production for all uses in the states of Michigan, Ohio, Indiana, Illinois, and Wisconsin, representing approximately 24% of the total United States frozen strawberry consumption.

A technological change specifically adapted to one or a few regions could result in large production shifts. The introduction of new, long-bearing, heavy-yielding strawberry varieties especially adapted to local growing conditions has been a contributing factor, for example, in the recent rapid increase in California strawberry production. However, such an advantage is precarious. If a similar cost-reducing technology were developed in Region 2, for example, and it became possible to produce 50% more strawberries per year on a given bearing acreage, Region 2 could—assuming a 50% increase in processing season length; constant total nonharvesting costs; and an increase in harvesting costs in proportion to yield—become the most important frozen strawberry producing area of the United States.

Most of the increased production advantage to be gained by other regions would be at the expense of California producers. However, future technological advance is as likely in California as elsewhere—as indicated by the promising trials with the new Solana variety.

Interregional price differentials based on quality characteristics are not in extensive use, but there is considerable interest in the effect they could have on the industry. If, for instance, the strawberries of Regions 8 and 9 were priced just one-fourth cent per pound higher than berries from any other region, Region 8 would obtain a production advantage for about 25% of total United States

consumption, all of which would be at the expense of California.

Although California holds a total unit cost—production, processing, and shipping—advantage, based on present cost structures in nearly all of the United States markets, the advantage is slight and small changes in certain cost components or product pricing could eliminate a large part of that advantage. The differences in total unit costs of production and processing among Regions 8, 9, and 10 are so small that the costs might well be considered equal.

Regions 8, 9, and 10 probably will remain dominant in the frozen strawberry industry, but—contrary to the indications of a least-cost analysis based on present regional costs and returns—it is unlikely that Region 10 will expand to produce nearly all of the United States frozen strawberries.

Relatively minor shifts in regional costs and returns growing out of unpredictable future changes could greatly modify any industry adjustment based on least cost for the United States output of frozen strawberries.

*Carleton C. Dennis was Co-operative Agent of the Agricultural Marketing Service, United States Department of Agriculture and the California Agricultural Experiment Station, University of California, Berkeley, at the time this study was made.*

*This brief report is based on a manuscript for a detailed report, "Interregional Frozen Strawberry Competition." This report will be available without charge from the Giannini Foundation of Agricultural Economics, 207 Giannini Hall, University of California, Berkeley 4.*

## HAY

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difference in favor of rolled hay, the absence of a satisfactory explanation in terms of chemical content raises some doubt as to the validity of any generalization based on this one set of tests. Experience has indicated that feeding results may vary somewhat in different groups of tests, probably because of biological variations.

Additional sheep-feeding trials at Davis with conditioned and unconditioned hay are planned for the fall of 1959.

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