ECONOMIC EFFECT OF INCREASED FROZEN ORANGE CONCENTRATE SALES ON THE ORANGE INDUSTRY OF SOUTHERN CALIFORNIA

by

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TABLE OF CONTENTS

FIGURES

TABLES

ECONOMIC EFFECT OF INCREASED FROZEN ORANGE CONCENTRATE SALES ON THE ORANGE INDUSTRY OF SOUTHERN CALIFORNIA

INTRODUCTION

The marketing of California oranges has a long and varied history. It is the history of cooperative-minded citrus growers working together to overcome the problems of crop surpluses and disorganized marketing. During the first half of this century, the growers have made substantial progress in solving these problems.

In the four-year period following World War II, a new orange product was developed. This product is frozen concentrated orange juice. Consumer acceptance, as judged by sales, has been favorable. There are some economic advantages inherent in this new food item that may bring about lasting changes in the marketing of oranges. Some of these changes are already apparent in the Florida orange industry.

The objectives of this study are to evaluate the sales position of frozen concentrated orange juice and then determine what economic changes may result in the marketing of California oranges.

In order to understand the current position of the California orange industry, it is necessary to study the background of orange marketing in that State. The research background of frozen concentrated orange juice is

presented to acquaint the reader with the underlying causes leading to the development of this new product. Some of the economic advantages of the frozen concentrated juice also are given.

Although the percentage of the California orange crop going into frozen concentrate is still small, there are indications that this percentage may increase in the next few years.

The production increase in citrus products as compared to other fruits in the twenty-year period following 1930 is shown in Figure 1. Citrus products increased 143 per cent in this twenty-year period, while the United States population increase was 21 per cent (1, p.8). Much of the citrus increase occurred prior to 1945. Frozen concentrated orange juice, however, is another form of marketing orange products that may add to the popularity and increased per capita consumption of these vitamin-C containing foods.

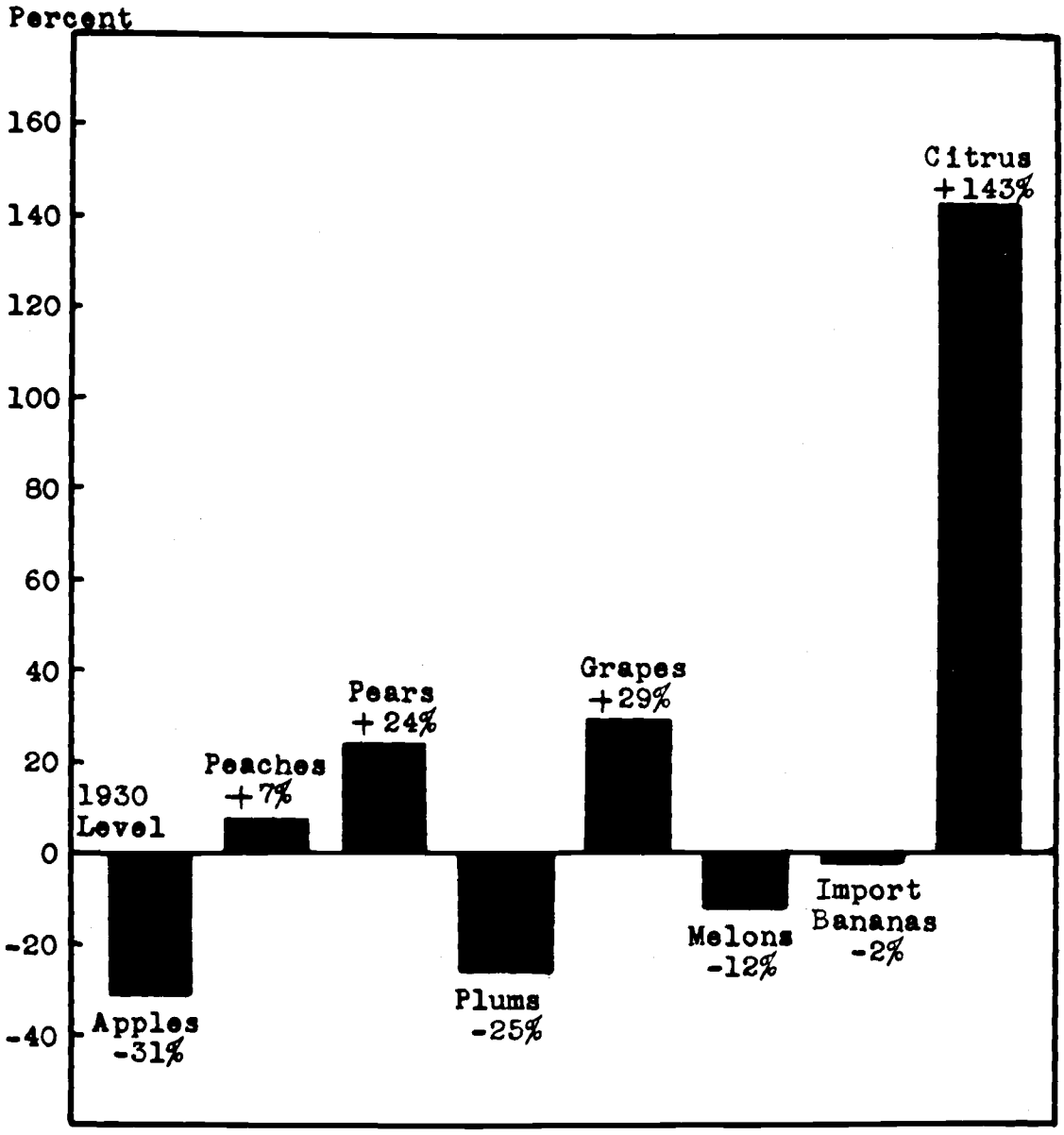

Figure 1: 1950 PRODUCTION LEVEL OF PRINCIPAL FRUIT CROPS OF THE UNITED STATES RELATIVE TO 1930 LEVEL (BASED ON THREE-YEAR AVERAGES TO AVOID SEASONAL FLUCTUATIONS)

EARLY HISTORY OF THE CALIFORNIA ORANGE INDUSTRY

The first recordings of oranges in historical writing are those of a Chinese, Han Yen-chih. He wrote concerning twenty-seven varieties of "oranges" grown around Wen-Chou, China in 1178 (13, p.1).

Sweet Oranges (Citrus sinensis) appear to be unknown in Europe until early in the fifteenth century. So strong was their appeal, however, that only a short time elapsed after their introduction before they were grown in southern Europe wherever soil and climate were suitable.

Just when sweet oranges were introduced into the Americas is unknown, although they were undoubtedly brought over by the Spanish explorers. Orange trees of some sort were recorded in the chronicles of Acosta and Piso (13, p.2) as growing in the West Indies and in Brazil, which indicates their existence in those countries before 1600 and 1648 respectively. Both the sweet and bitter oranges were found growing wild in various sections of Florida by the early settlers.

The Mission Gardens

The introduction of the orange into California accompanied the advent of the Spanish padres in 1769. While their objective was the conversion of the savage

races to Christianity, they did not neglect the material side of life. In establishing the famous California missions--the first at San Diego in 1769 and the last at Sonoma in 1823--all but three of the chain of twenty-one had gardens and orchards (5, p.6) planted by these people of Spanish descent to oranges, figs, grapes and olives. These were the fruits of their native Spanish climate.

To the San Gabriel Mission is accorded the honor of developing the first California orange orchard of any size. This was planted in 1804 and covered six acres. About four hundred seedling trees made up the orchard.

Trees obtained from the mission were soon planted in gardens and courtyards in various districts. The second largest orchard was planted by Don Luis Vignes (13, p.2), who transplanted thirty-five trees from the San Gabriel Mission to his property in Los Angeles.

The first commercial venture was undertaken by William Wolfshill (12, p.17), who secured orange trees from the San Gabriel Mission in 1841 and planted a two-acre orchard on the site of what is now the heart of the Los Angeles business district. This orchard was later increased to seventy acres. In the following years, other commercial orchards came into being in the Los Angeles, San Bernardino and Highlands areas.

Introduction of Budded Varieties

In the eighteen-seventies, several budded varieties of oranges were introduced, the merits of which were the subject of much contention for a number of years after their appearance. Chief among the budded varieties were the Washington Navel, California's winter orange, and the Valencia, the summer orange. It is from the Valencia orange that all of the California frozen concentrate is now produced.

In 1868 the superintendent of gardens of the United States Department of Agriculture (13, p.5) learned through a correspondent then in Bahia, Brazil, of an orange grown in that country reported to be superior to those in the United States. In 1870 twelve small trees were received in good condition. These were planted and propagated by budding on small orange stocks. From this simple beginning has grown the famous California Navel industry of vast proportions.

The Valencia orange, of which production now equals that of the Navel, originated in the Azores. This variety of orange was introduced into California by growers in the eighteen-seventies, who obtained their stock from a London nurseryman, Thomas Rivers (13, p.6).

Early Marketing in California

Production to meet local demands first took place in orchards planted principally for family use. Profitable prices soon led to planting on a commercial scale. Some early shipments were made by steamer from the port near Los Angeles. The first carload of oranges was shipped East by rail in 1877 (5, p.6), a year after the Southern Pacific railroad had been extended to Los Angeles. With the beginning of eastern shipments and the realization that large markets awaited development, the promotion of plantings spread rapidly. By 1885 about a thousand cars were shipped to the East and in the production period 1886-87, twenty-two hundred cars of oranges were shipped.

During the early portion of the period, profits were exceptionally high at times. There was no system of developing markets rapidly enough to take care of such increases in production as were taking place. Complaints soon became common that railway charges were too high and that local buyers and packers as well as eastern dealers exacted unjustifiably wide margins, with the result that consumers restricted their consumption (5, p.8).

At the same time, there were complaints of unsatisfactory treatment of producers by purchasers. Buying during the early period had been done largely on a basis

of the fruit of an entire orchard. The purchaser did the picking. Obviously the purchaser could make the better guess as to the likely yield and certainly knew more than the producer could possibly know of what the market might afford in any given season. Gradually purchasing came to be on the basis of a price per packed box. Producers soon found, however, that they were again the losers when the price fell, because the dealer was in a position to grade heavily. One producer, for example, discovered that half of his oranges were being thrown out as culls. He received permission to take charge of the culls and hired a packer to grade and box them and ship them to another market. Here they actually netted him more than he received for those originally accepted (13, p.9). It was frequently charged that private dealers were districting the state so as to avoid competing with each other. The final blow to the producers was a decision on the part of shippers not to buy fruit outright but to purchase only on consignment, even requiring the grower to underwrite any losses.

COOPERATION AMONG THE GROWERS

Formation of Cooperatives

There were complaints of low prices for oranges as early as the eighteen-seventies. By 1885, when shipments had increased to about a thousand carloads, marketing conditions had become intolerable. At a meeting held in October of that year, the growers formed the Orange Growers Protective Union of Southern California. This organization decided to send representatives east "to sell, regulate and distribute, and do all services required of them by and under such regulation as the executive committee or the board of directors may require" (13, p.10). Two men were actually sent east, where they selected reliable commission men to act as agents for the Union. At the same time the Union selected commission houses to handle its fruit on the San Francisco and the Los Angeles markets.

The organization seems to have been successful the first two years when it claimed to have increased the returns by over a quarter of a million dollars on approximately a thousand carloads of fruit. It also obtained a saving on freight sufficient to pay all expenses of the Union and to return a dividend of twenty-three dollars per car to all members (5, p.9). The organization finally

failed, however, because of persistent opposition of commission men and buyers.

During the first few years of the eighteen-nineties, there were numerous movements to organize cooperative citrus marketing associations. Some of these associations merely contracted with local packers for the handling and sale of fruit. Others contracted with the packers for the handling of fruit but did the selling themselves. One organization, the Claremont California Fruit Growers Association, undertook to do its own packing and selling.

Much confusion existed in the marketing of oranges during the period of 1893 to 1904 when the California Fruit Growers Exchange was officially organized. One example of the difficulty was the practice of making sales on a f. o. b. conditional basis. Under these conditions, if prices were firm when the fruit arrived, the car was accepted and the grower received the agreed price. If, however, the market had weakened, as it frequently did, the buyers could easily find fault with the shipment on inspection and either obtain an allowance from the original price or reject the shipment. This compelled the grower to divert to another market, usually at a loss. In one season these allowances and rebates amounted to nearly one hundred thousand dollars (13, p.33).

When the California Fruit Growers Exchange was first formed, the organization faced many difficulties. There were strong objections from private shippers. Growers did not understand cooperative marketing and either would not support their leaders or else argued over alternate measures. Many associations were managed by men with little commercial experience. As a result there were many errors and cases of inefficiency. Some of these arose from the fact that the packing of fruit under refrigeration for shipment to distant markets was still in an experimental stage. Orange acreage was increasing rapidly and growers blamed the marketing system rather than increased supplies for low returns.

During the following years, however, the California Fruit Growers Exchange gradually overcame these difficulties. The organization produced far-sighted strong leaders who sold the idea of cooperative marketing to the orange growers. The Exchange now markets approximately seventy-five per cent of the California orange production.

A fairly complete knowledge of the orange market at all times was an advantage to the Exchange. Often the weakness of a cooperative movement in adjusting production to demand is the fact that independent producers can reap the benefits without any of the costs of membership. This situation existed in Southern California but the

California Fruit Growers Exchange survived because with their expert knowledge of the markets, they could sell more efficiently than independent producers with unlimited production.

The Exchange System

The exchange system in broad outline (see Figure 2) consists of the local associations, 214 in 1950, with a combined membership of some 15,000 growers; the district exchanges, 25 in the same year (1, p.2); the central exchange; and three subsidiaries. The central exchange owns one of these subsidiaries, the Exchange Orange Products Company, which manufactures canned and concentrated orange juice. The local associations own a subsidiary, the Fruit Growers Supply Company, through which they purchase the various packing house supplies and through which the individual growers obtain the supplies needed in the production of citrus fruits. Another subsidiary is the Exchange Lemon Products Company which is owned by the local associations who desire to have surplus lemons manufactured into by-products.

The local associations usually pick the fruit, grade and pack for shipment, and load it into the cars. The central organization maintains a sales agency through which the selling is done in cooperation with the managers

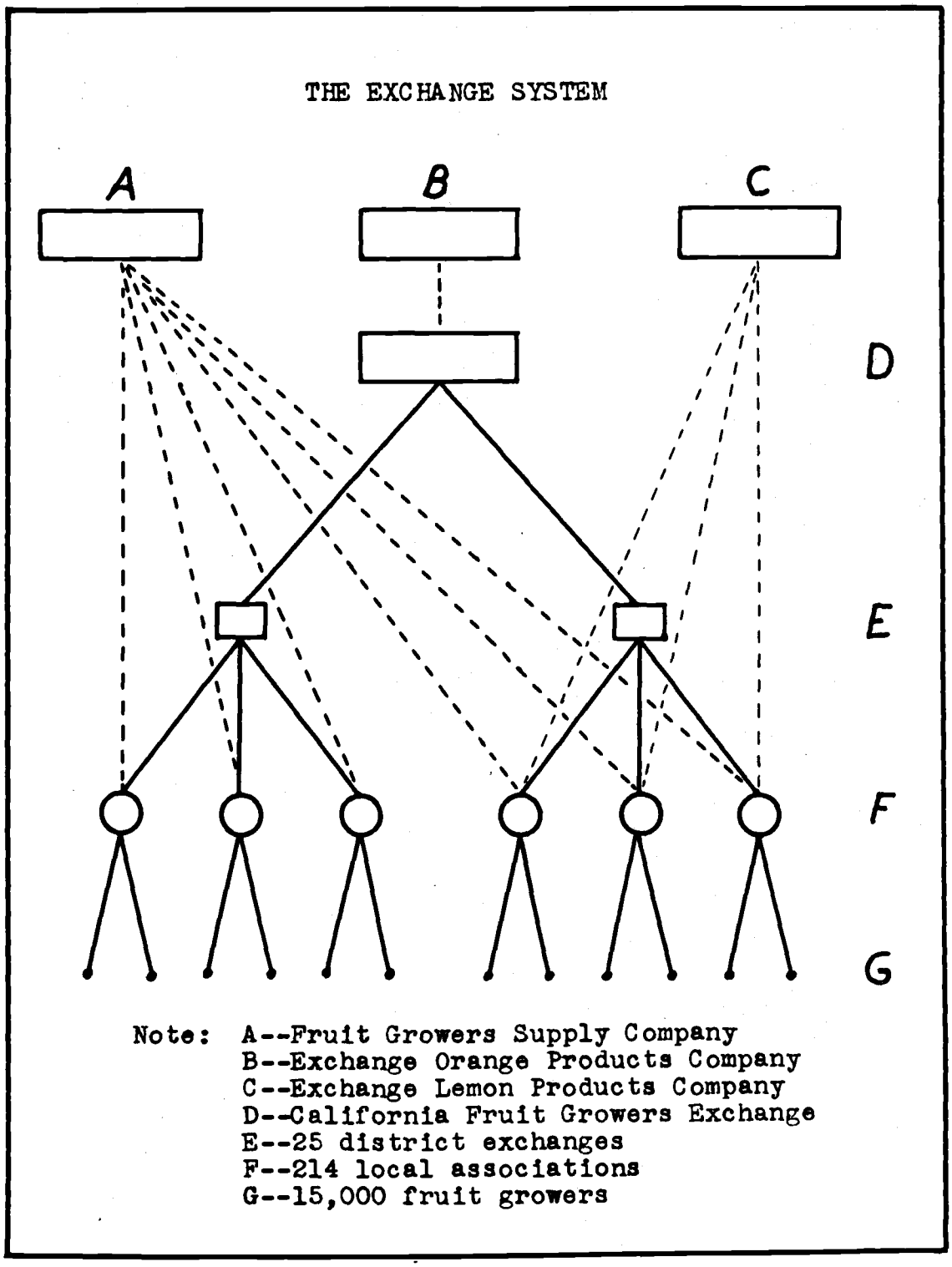

Figure 2: THE EXCHANGE SYSTEM

of the district exchanges.

Two principles are rigidly followed. These are (1) grower control and (2) distribution of benefits to the growers in proportion to the business contributed.

The central exchange has the usual departments to handle various matters of business such as the legal department, traffic, accounting, lemon sales, orange sales, advertising, field department, and statistical department.

Marketing Control

The manager of the orange sales department is at all times in close touch with the managers of the district exchanges and the various sales agents and brokers who represent the California Fruit Growers Exchange in various markets. The Exchange has salaried agents in all of the leading United States and Canadian markets plus a few of the more important foreign markets.

All seasonal and daily market information on supply and demand for oranges is compiled at the central exchange offices in the Sunkist Building in Los Angeles. With this information, two types of regulation over orange sales are exercised. These are (1) limitation of the total volume marketed for the season in years of large crops relative to the buying power of consumers and (2) regulation of the flow of shipments to market during the season even though

the total supply for the season is not excessive.

In seasons of large crops, relative to the buying power of consumers, prices and returns to California growers can be materially increased through limitation of the volume of shipments (20, p.28). An indication of the fluctuation of price with available supply can be seen in Figure 3.

The California Fruit Growers Exchange also files complete information on the exact location of any car of oranges enroute to market. Through the privilege of diversion enroute extended by the railroads, the sales manager can order a car of oranges diverted to adjust the supply at any given market during the market period. This diversion flexibility enables the shipper to obtain the best price available among several markets. If no diversion control were exercised, some markets could be easily glutted with this perishable product with a ruinous drop in the price level.

This orderly marketing, as practiced by the California Fruit Growers Exchange, is also advantageous to the consuming public. A ruinous price drop in the market might mean cheap oranges for a short period. However, this low price would not attract other shipments so the market might suffer temporary shortages. This might result in a cycle of gluts and shortages with corresponding

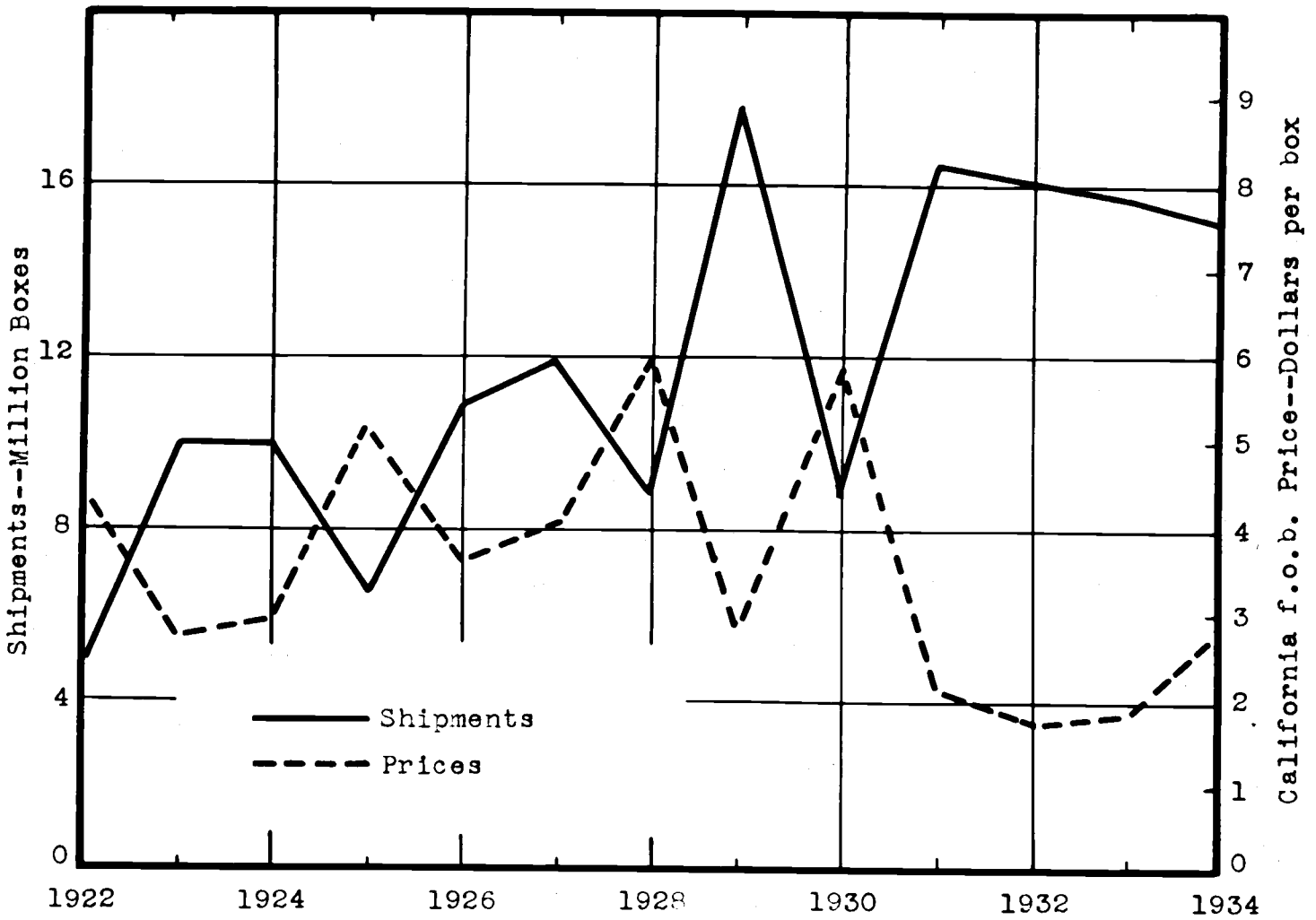

Figure 3: CALIFORNIA SUMMER ORANGES--SHIPMENTS AND SEASONAL AVERAGE f.o.b. PRICES, 1922-1934

low and high prices. The marketing policy of the California Fruit Growers Exchange may have a stabilizing effect on the price as well as the supply.

Grower Services

The Exchange field department is designed for the purpose of bringing about adoption of improved practices in the production, harvesting, and packing of fruit. The work is justified on the grounds that the Exchange must supply consumers with uniform and dependable products.

A pest control service is maintained which saves growers thousands of dollars in connection with the eradication of insects and other pests.

A research laboratory is operated for the investigation of new by-products or of machinery or supplies which promise to be of value.

A growers' service bureau is operated primarily to strengthen membership relations within the California Fruit Growers Exchange. It is engaged in the promotion of new associations when needed and the strengthening of existing locals with reference to organization problems. Complaints and misunderstandings are handled in this department.

The Exchange has carried on an extensive advertising program since the early part of the century. Faced

with overproduction in 1907, the Exchange undertook an experimental advertising campaign in Iowa (13, p.62). That year overall sales of citrus increased 17 per cent in the United States but sales in Iowa increased 50 per cent. This was enough to convince even the most conservative grower that advertising was a practical way to increase orange consumption and thus lessen their overproduction problem.

This advertising featured two brands, "Sunkist" and "Red Ball." "Sunkist" has been used on the highest quality fruit. This name is as well known to the American consumer today as any trade name in use.

BACKGROUND AND DEVELOPMENT OF FROZEN CONCENTRATED ORANGE JUICE

In 1946 very few people had heard of frozen concentrated orange juice. In the following four years, this product became so well known and achieved such demand that it became the leading seller among frozen foods. This frozen concentrate is considered to be one of the most outstanding products developed in the field of processed foods in many years.

A study of the background of this frozen juice indicates that there were six principal factors leading to the development of the new product. These six factors are listed below. Each will then be discussed in some detail.

1. The frozen food stimulus. Many companies were marketing other frozen foods and it was considered desirable to add another popular item to the line.

2. Crop Disposal Factor. A surplus of citrus fruit existed and it was desirable to move this crop profitably.

3. The demand for concentrated citrus juices from soft drink manufacturers. The popularity of soft drinks with fruit juice bases require a large volume of fruit juice concentrates not necessarily of a very high flavor quality.

4. The wartime demand for concentrated citrus juices for European feeding. England was particularly short of vitamin C-containing foods and the United States met the demand by supplying concentrated citrus juices under Lend-Lease agreements.

5. Freeze-drying work on blood plasma. Work on the freeze-drying process led to the thought that delicate food products might be similarly treated. Orange juice was one of the first products considered.

6. The advance of nutritional knowledge. Nutritional knowledge had created a ready demand for a highly palatable source of Vitamin C.

Frozen Food Stimulus

As far back as 1930 the frozen food business was in an early state of development. Even at this time the General Foods Corporation, through its Birds Eye-Snider Division (16, p.242), considered the possibility of adding a frozen unconcentrated orange juice to its line of frozen products. A considerable amount of laboratory work was done on the problem of freezing single-strength orange juice in several types of paper containers. At this time limited public knowledge made it unsafe to consider packing a frozen product in a tin can. Such a product would not be sterile and would spoil if a housewife mistakenly

kept it for even twenty-four hours at room temperature.

As a result of this laboratory work in 1930, General Foods contracted with a California firm to pack an experimental quantity of single-strength orange juice in paper containers. The market testing of this product failed because it was difficult to defrost even though the flavor was fairly good. The delay in waiting for the juice to defrost destroyed the very necessary convenience element of the product.

In 1943 the General Foods Corporation acquired a citrus company--Bireley's of Hollywood, California. This firm had been stimulated by the wartime demand for citrus concentrates into developing what was then considered a good process for making concentrated orange juice. Their product suffered, however, because it was believed that pasteurization was necessary before evaporation, and the concentrate, while acceptable for wartime feeding, was not the type of product that the American housewife would buy. Pasteurization destroyed the normal fresh flavor of this juice. Frozen concentrated orange juice does not have to be pasteurized because of its low temperature in storage.

Another General Foods venture in frozen orange juice came in 1946, when in cooperation with a Florida firm, they participated in a market test of a frozen concentrated product packed in tin cans according to the

method developed in the laboratories of the Florida Citrus Commission. Basically, this new method consisted of evaporating 90 per cent of the juice to 55° Brix and then diluting this concentration with the remaining 10 per cent of fresh, unpasteurized juice. Thus, for the first time, a product evaporated without pasteurization at low temperatures and containing a portion of the highly volatile juice aroma reached the consumer.

The success of this market test was sufficient to encourage the General Foods Corporation to renew activity and the laboratories were soon turning out more samples of frozen concentrated orange juice on an experimental basis. Consumers were soon telling each other of the convenience and good flavor of the market test product.

In 1948, the Mojonnier Bros., an engineering firm in Chicago, developed an evaporator in which the source of heat never exceeds 110° F. and the orange juice boils at a temperature of about 55° F. These low temperature conditions were obtained at no increase in cost and since evaporation at low temperature was theoretically in the right direction, the industry quickly adopted this new type evaporator.

It is noted that the principal driving force in the General Foods development arose from the fact that this company already had a large interest in the frozen food

business and was, therefore, interested in adding promising new articles to its already established line.

One possible reason why frozen concentrated orange juice was so favorably accepted by consumers may have been the fact that this product was placed on the market during a period when the disposable personal income of consumers was at a high level.

If this product has been introduced in a period comparable to the early 1930's, it might have been considered merely another unnecessary luxury. Consumers are normally cautious about buying new products. In the period following World War II, consumers, having ample purchasing power, were willing to try promising new items.

Crop Disposal Factor

For many years there has been a great fear of overproduction in the citrus industry. The California Fruit Growers Exchange cannot sell all the oranges that they would like to market at a price which is satisfactory to them. For many years a portion of the crop has been eliminated from market channels. It has been important that alternate uses be found for this crop surplus. Government laboratories and industrial firms have been stimulated to action by this condition.

It also has been important that the citrus growers

have an outlet for their lower grade fruit, and this has been a strong stimulus in establishing the canned citrus juice industry. The advantage of processing orange juice of any kind is that fruit of off size or with skin blemishes can be used. This type of raw product has juice of an equal quality with that of the better grades going into fresh markets.

Stimulus from the Soft Drink Industry

The part of the soft drink industry in developing frozen concentrated orange juice consisted largely in supplying background experience. Without the experience of producing concentrate as a base for soft drinks, many manufacturers would not have been able to go promptly into vacuum concentration of juice. The soft drink industry was willing to accept concentrates which were inferior in flavor by present standards. They were able to do this because they added citric acid, sugar, and a fairly large quantity of the peel oil, which quite effectively masked the pasteurized taste. The soft drink industry has learned better methods since World War II and is now benefiting from the superior concentrates now being produced.

Freeze-Drying of Blood Plasma

The evaporation at below freezing temperatures of

blood plasma is one of the research stories of World War II. It was natural that when the war was over, many persons operating in this field looked for larger volume commercial uses for the so-called "Freeze-Drying Process." Orange juice was one of the attractive possibilities. The group working in this field made their share of mistakes. Their basic mistake was the idea of carrying the orange juice powder by freeze-drying all the way to dryness. The powder was to be sold in consumer packages through the grocery stores.

There were several handicaps to carrying out this idea. In the first place, the process was very costly. This factor alone might not have been an unsurmountable obstacle, because, theoretically, it was possible to reduce the cost of the process. There also was an important psychological disadvantage to the product. The housewife was inclined to be a little skeptical. It was quite difficult to convince her that a yellow powder added to water would produce real orange juice with full nutritional qualities.

Several firms spent large amounts of money in research on the powder, but only one of them switched from the powder to the frozen concentrate and became successful in the field. This firm was the National Research Corporation in Boston, which formed a subsidiary to

manufacture orange juice powder by the freeze-drying method. This plant when built was very expensive and had a high potential capacity. Unfortunately, many manufacturing difficulties were experienced.

In the experience of the General Foods Corporation, no matter how careful they were in producing orange juice powder on a laboratory basis by the freeze-drying process, they were never able to return quality in the finished product unless they kept it hermetically sealed in an atmosphere of inert gas at 0° F. In that way their best powders held up fairly well for as long as six months.

The experience of the National Research Corporation is a good example of why industrial research may be profitable to some industries. In spite of making what might be described as a commercial failure in putting their money initially on the powdered product, the National Research Corporation was able to turn this failure to advantage because in developing their process, they had also developed high capacity, low-temperature evaporators of unique design. Consequently, when market tests on the frozen concentrated product turned out successfully, they were able to start production in their evaporators on a large scale and get into the market quickly. Initially this firm marketed its product through Snow Crop Marketers. The following year the relationship between the two

companies was dissolved and Snow Crop, being convinced at this time of the merits of the new product, started out to develop production facilities of its own. Vacuum Foods, the subsidiary of the National Research Corporation, in turn set out to develop their own sales organization. This firm which markets its product under the trade name of "Minute Maid" is now one of the three important organizations in the manufacture and distribution of frozen concentrated orange juice.

The Advance of Nutritional Knowledge

Very few food industries owe more to advances in nutritional knowledge than the citrus industry. Nutritional information has not only stimulated the sales of processed citrus products, but the consumption of fresh fruit as well. It might be said that one reason for the popularity of citrus products is their recognition as an excellent source of vitamin C.

The other products competing with frozen orange concentrate are primarily fresh fruit and canned juice. Frozen concentrate has a convenience advantage over fresh fruit because the juice is ready as soon as the concentrate is mixed with water. The cost of frozen concentrate compares favorably with both fresh and canned juice. Eventually, it is believed that sales promotion costs will be

reduced and economies in freight and container costs will come into full play.

When compared with frozen single-strength juice there is a convenience factor in frozen concentrate as well as superiority in flavor. The flavor in a 4-to-1 concentrate seems to stand up in zero temperatures better than does the flavor of frozen single-strength juice. There is an economic advantage of concentrate over single-strength also, inasmuch as with modern evaporating equipment it is cheaper to evaporate water than to store and pay freight on it. There is also a reduction of approximately 50 per cent in the container costs (22, p.16).

When compared with canned juice the frozen concentrate enjoys no advantage in convenience. There is very little advantage in nutritional qualities, but there is a definite advantage in flavor. All experience indicates that any time orange juice is heat processed, irreparable damage is done to the flavor.

Frozen concentrate is almost as convenient as the canned product. It has a substantial advantage in flavor and also one other minor advantage. When purchased it is cold and must be kept cold while it is in the kitchen. The result is that when the concentrate is mixed with three parts of tap water, it is about the right temperature for drinking. This is a minor advantage but it may

contribute to the popularity of the concentrate.

The consistency in flavor of fresh juice and frozen concentrate is described in a Consumers Research report (10, p.8).

> "As critical consumers are well aware, early oranges do not compare in flavor or general desirability with those marketed at the height of the season. It is obvious, therefore, that the frozen juice packed at a time when oranges are at their best will be more palatable than juice packed when oranges are not at their prime."

These seem to be the factors that made frozen concentrate such a success in the grocery field. This product illustrates the importance of balance between the items of price, convenience, flavor, and nutrition.

Unsolved Problems

There are still some problems in frozen concentrated orange juice which remain to be solved. There is still some misunderstanding among housewives regarding keeping qualities of frozen canned goods. Can companies and the canning industry have thoroughly sold the customer on the idea that she can keep products in a tin container on the shelf under all kitchen conditions. As a result, quite often someone buys a few cans of this frozen product and places them on the kitchen shelf. Since the product is not sterile, microorganisms in the juice produce gas at

room temperature. The resulting pressure may cause the can to explode.

The big problem in the production of a superior frozen concentrated orange juice is the retention of top aroma and avoidance of peel oil in the product. The retention of top juice aroma is a difficult problem. One of the reasons that a concentrate keeps better than single-strength juice is that it contains originally only 10 per cent of the typical flowery aroma of fresh juice. The straight juice contains all of the aroma and when this changes chemically, it is somewhat objectionable. The change goes on progressively, even at zero temperatures, but it goes on so slowly that for the first six months of storage it is difficult to detect any change.

The problem of quality control in the industry is important. The General Foods Corporation has found it necessary to develop skilled taste panels by selecting from a large group, persons who are the most discriminating in their ability to detect differences in the flavor of citrus juices. In selecting this panel it has been necessary to guard against getting persons who are regular consumers of canned orange juice. These persons have developed a tolerance, if not a preference for juice containing a large amount of peel oil. Experience indicates, however, that consumers generally do not desire more than

a minimum of peel oil.

In the concentration process, 90 per cent of the juice goes through the evaporator and this results in a thorough cleanup of peel oil. It is necessary to watch the other 10 per cent of unevaporated juice to see that it contains a minimum of peel oil since once this oil gets into the juice, it is impossible to remove later without damaging the flavor.

PRODUCTION RECORD OF FROZEN CONCENTRATE

Beginning of Commercial Production

The production record of frozen concentrated orange juice after the war can be matched by few other similar industries. This production has become a major outlet for the nation's orange crop (Table 1).

In the period 1946-50 the citrus industry was in the midst of a significant change because of the development of the frozen concentrate. Growers, investors, and marketing agencies throughout the various channels of trade were re-evaluating their positions. Concentrators and many growers were optimistic and enthusiastic about this new product. Other agricultural producers were concerned over the possible loss of at least a part of their markets as the new product sought a share of the consumer's food dollar. In a few short years frozen concentrated orange juice became an important new factor in the citrus industry.

Commercial manufacture of frozen concentrated orange juice began in Florida in the 1945-46 season. During the first twelve months, production of the 4-to-1 concentrate was 226,000 gallons (Table 1). This comprised only one-fifth of 1 per cent of the United States orange crop in that season (19, p.17).

Yearly Increases

After 1946 production of the new product increased rapidly. Production was more than doubled in the next season, quadrupled in 1947-48 and then in 1948-49 jumped to five times the previous year's level. Production during that season amounted to slightly over 12 million gallons, not including small quantities of concentrated, blended orange and grapefruit juice. This production absorbed ten million boxes of oranges or about 11 per cent of the total crop. Canning took about 29 per cent of the 1948-49 orange crop and fresh use accounted for nearly 60 per cent. The frozen concentrate outlet is estimated to have taken about 22 per cent of the 1949-50 orange crop.

Table 1. Production of Frozen Concentrated Orange Juice In Florida and California 1945-50 *

(In Thousands of Gallons)

Season	Florida	California	Total
1945-46	226	0	226
1946-47	559	0	559
1947-48	1,936	437	2,373
1948-49	10,233	1,963	12,196
1949-50	21,577	2,500 1/	24,077 2/

* U. S. Dept. of Agriculture, Bureau of Agricultural Economics

1/ Industry estimate 2/ Preliminary

The citrus season in Florida extends from September through July. Frozen concentrated orange juice in that State is packed from December through June. California packs frozen concentrated juice only during the Valencia season which extends from April through October.

In the 1948-49 season frozen concentrate took about 14 per cent of the Florida oranges, canning about 32 per cent, and fresh use about 54 per cent. With the 1949-50 orange season in Florida nearly completed in mid-June, frozen concentrate utilized about 31 per cent of that State's oranges, canning about 29 per cent, and fresh use about 40 per cent. (19, p.18).

Season	Frozen Concentrate	Canned	Fresh
1948-49	14%	32%	54%
1949-50	31%	29%	40%

Since the product is four times the strength of fresh orange juice, the 12 million gallons produced in 1948-49 was equal to about 48 million gallons of single-strength juice or about 14 million cases of 24 No. 2 cans. In the same season, the pack of canned orange juice amounted to 19 million cases of 24 No. 2 cans and that of blended orange and grapefruit juice, 11 million cases. In addition, the equivalent of about 150,000 cases of frozen single-strength orange juice was produced in California (15, p.10).

Production of the concentrate was confined to Florida exclusively during the first two seasons and that State still produces the bulk of the product marketed. In 1948-49, for example, Florida produced more than 10 million gallons and California produced almost 2 million gallons. The frozen orange concentrate manufactured during the 1947-48 season and the two seasons following was packed mainly in 6-ounce cans for sale by retail stores.

California, having historically marketed most of its fruit in fresh form, was rather slow in adopting the new frozen concentrate process. Commercial production in California began in the summer of 1948 with 437,000 gallons the first season. Since its introduction, production has rapidly expanded in California.

Manufacture of frozen concentrated orange juice in Florida in the 1949-50 season was more than double the 1948-49 output. Through June 17, 1950, over 21 million gallons were produced in that State (11, p.7). Production in California in 1949-50, drawing from the Valencia crop, was 25 per cent over the preceding year's output.

During the 1945-46 and 1946-47 seasons when the possibilities for the new product were being explored, the frozen concentrate was distributed mainly through the hotel, restaurant, and soda-fountain trades. The consumer response to the new product was so favorable that in

1947-48, considerable quantities were distributed through retail stores to household consumers. The product rapidly gained a following even though supplies of fresh oranges and canned orange juice were large and were moving slowly to consumers at prices sharply lower than during wartime.

Consumption per person (19, p.19) during the 1948-49 season was nearly three pounds, single-strength basis (Figure 4). In the same season, consumption of canned single-strength orange juice was about four pounds per person. The consumption of all citrus juices combined was about 10⅓ pounds (juice equivalents) per person in that same year. The increase in consumption of frozen orange concentrate over the previous season about offset the decrease in canned citrus juice.

Frozen concentrated orange juice has been sold in retail stores at prices competitive with both fresh oranges and canned orange juice. In 1950, popular brands of the 6-ounce can sold at retail at prices ranging from 22 to 30 cents. This means that the concentrate diluted to single-strength cost the consumers a little over one cent per ounce. In other words, a glass of four ounces served for breakfast costs four to five cents. This cost is approximately the same as that of other fruit juices (15, p.11).

With the growth in output and popularity of the

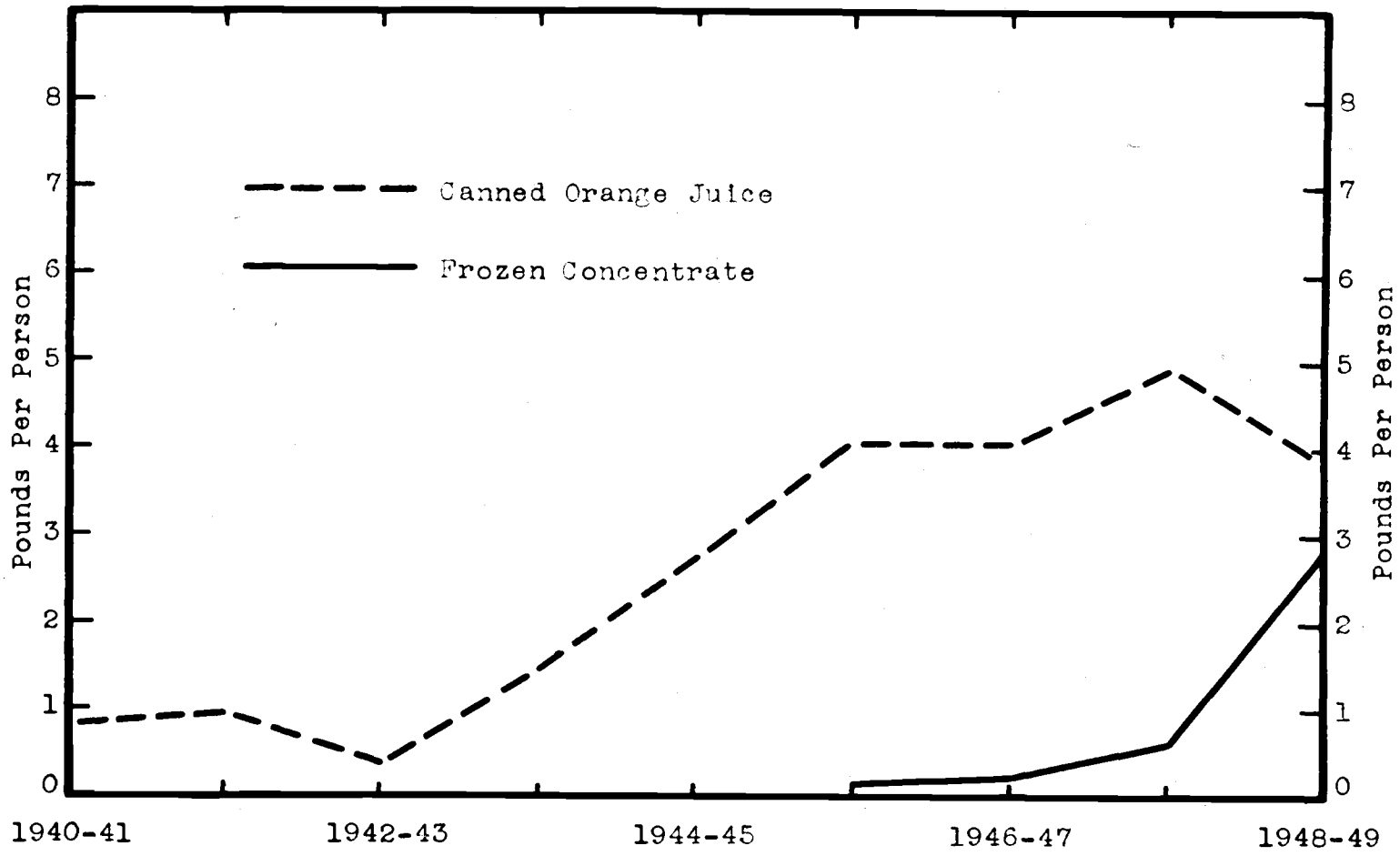

Figure 4: ORANGE JUICE CONSUMPTION PER PERSON (SINGLE-STRENGTH BASIS)

frozen citrus concentrate, distribution of the product has become more widespread. A nation-wide survey conducted in 1949 by Industrial Surveys Co., Inc., for the United States Department of Agriculture revealed that frozen concentrated orange juice was being handled by a rapidly increasing percentage of retail stores (19, p.13). Of the stores surveyed, about 17 per cent carried the product in April, 24 per cent in August, and 31 per cent in November 1949. In contrast, 84 per cent of the stores carried canned orange juice in November 1949. This survey showed that the frozen orange concentrate was least available in stores doing a relatively small volume of business, in stores located in small cities and towns, and in stores in the South. But even among such stores, the percentage carrying the frozen orange concentrate doubled during 1949.

More than twice as many household consumers purchased frozen concentrated orange juice in April 1950 than in April 1949. According to the survey of a national sample of household consumers conducted by Industrial Surveys Co., Inc. The proportion (14 per cent) of families who bought the product in April 1950 was the highest recorded up to that time (19, p.19). The percentage of families purchasing frozen orange concentrate exceeded 19 per cent (1, p.6) in October of 1950 (Figure 5).

The rapid growth of the frozen orange concentrate

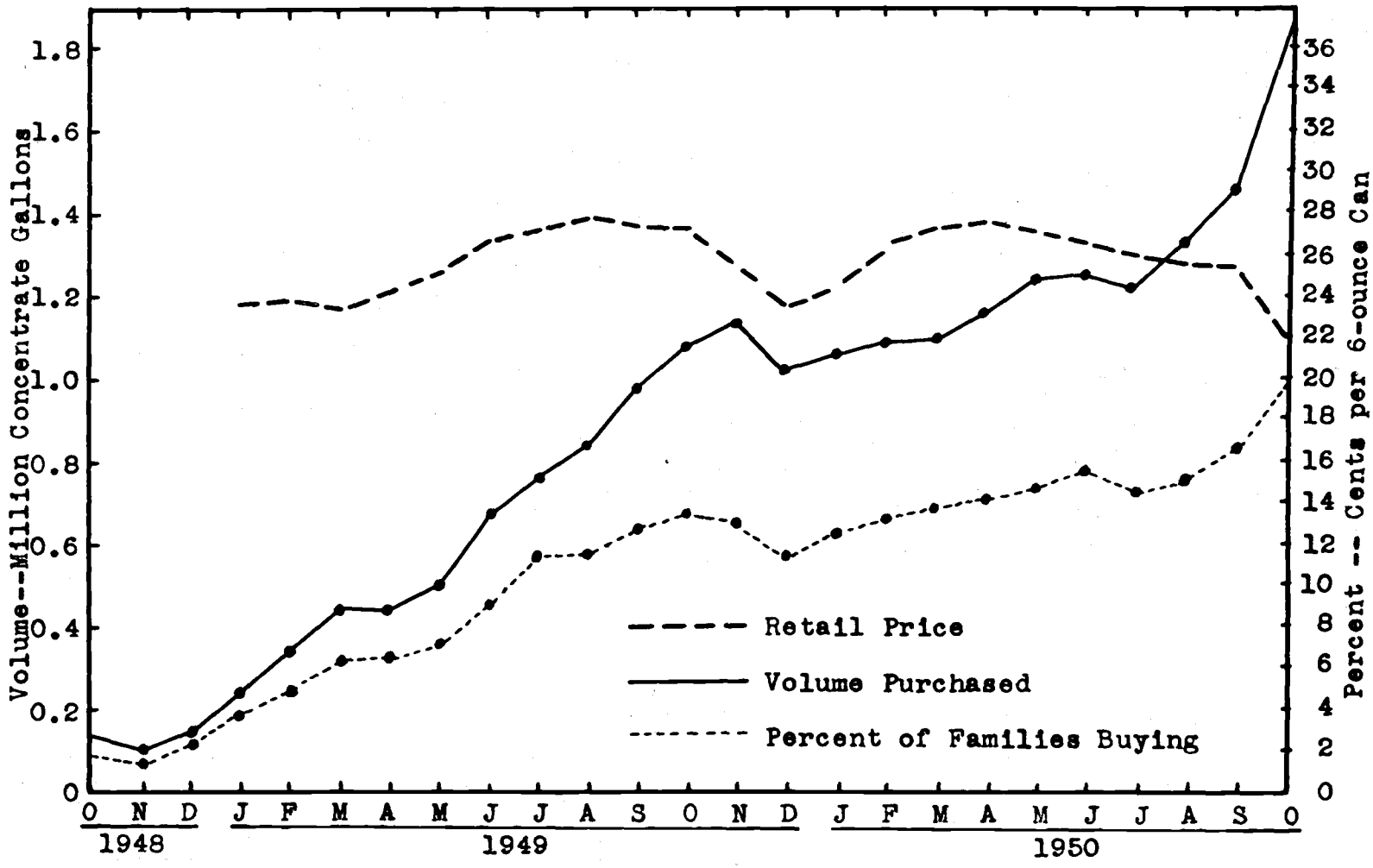

Figure 5: UNITED STATES FROZEN ORANGE CONCENTRATE--VOLUME PURCHASED, PERCENT OF FAMILIES BUYING, AND RETAIL PRICE PER CAN

industry is the result largely of the favorable reception accorded the new product by consumers. The ease and quickness with which the new juice can be prepared for consumption and its fresh-like flavor, together with its reasonable price, rapidly won it a place on the breakfast menu. On the production end, the cost of tin cans was less than one-half the cost of packing an equivalent amount of single-strength juice in 18-ounce cans. Less storage space was required and the smaller volume could be transported at a considerable saving. Expansion in production, distribution, and hence consumption has grown with the construction of new concentrating plants, installation of frozen food cabinets in retail stores, and more and better refrigerators in homes.

With increased plant capacity, production in Florida reached a peak weekly output of more than 1.3 million gallons of frozen orange concentrate in the 1949-50 season. Additional plants were built in California in 1950 to process the Valencia crop. The first plant in Texas will be ready to begin processing in the 1950-51 season.

SALES TREND AND CONSUMER ACCEPTANCE

Availability

When a new product is to be introduced to household consumers, the scope and area of distribution is an important consideration. The distributors of frozen concentrated orange juice decided to introduce it area by area as they did not have a sufficient quantity to supply the entire country. It was sold first in the thickly populated Northeast and next in the North Central States. Later it was sold in other parts of the country as additional supplies became available.

Upon the basis of a nationwide sample of stores (11, p.10), it is estimated that about two out of five retail grocery stores had frozen concentrated orange juice available in August, 1950, compared with only one out of four in August 1949. In August 1950, availability of frozen concentrated orange juice was most frequent in stores in the North Central and Pacific regions, in store units of the three largest chains, and in store units doing an annual volume of business exceeding $500,000. Frozen concentrates were also more widely distributed in medium and large cities than in cities of less than 10,000 population.

Regional Consumption Pattern

Consumer acceptance of frozen concentrated orange juice has been favorable when judged in terms of sales. Since its introduction, household purchases of this product have increased nearly every month. In 1949 purchases advanced from 227,000 gallons in January to 1,024,000 gallons in December. Household consumers bought 1,865,000 gallons in October 1950 (7, p.134).

Up to the end of 1950, purchases of frozen concentrated orange juice were larger in some areas than others. In the second quarter of 1950, 56 per cent of all household purchases were made in the northeastern part of the United States. The next highest region, the North Central States, accounted for only 24 per cent. These regions are characterized by a largely urban population and, combined, they contain about 58 per cent of the United States population (7, p.136). When household purchases are viewed again on per capita basis, the regional pattern is again very definite. Per capita household consumption in the Northeast was 2½ times as high as in the Central States--the next highest region during the second quarter of 1950. During this period, the regional distribution of household purchases per 1,000 capita were: Northeast, 52 gallons; North Central States, 21 gallons; Pacific States, 17

gallons; Mountain and Southeast, 15 gallons; and Southern States, 9 gallons (11, p.10). High family-purchase rates are associated with availability in the retail outlets and the presence of refrigerators in the homes. When these areas of relatively low consumption gain increased handling facilities and greater sales promotion, they may approach per capita purchases comparable to that already achieved in many large cities. The one exception may be the southern part of the United States where incomes are normally lower than in other sections.

Family Buying Practices

Household purchases of frozen concentrated orange juice are related to various family characteristics (11, p.11). Families living in large cities--over 500,000 population--purchase more frozen concentrated orange juice than those living in smaller communities or on farms. About half of the large city families use it at least occasionally compared with about one-third in the smaller cities and one out of twelve among farm families.

Household purchases of frozen concentrated orange juice are also related to family income. Among high-income families, the proportion purchasing this product is greater than the proportion among low-income families. In this respect purchases of frozen concentrated orange juice

differ from purchases of canned juices which are not so closely related to family income.

Family composition affects the purchasing of the concentrated juice. A larger proportion of the families with children purchase it than those without children. The proportion is highest among families with children under six years of age (7, p.138).

These family characteristics give an indication of some of the factors that affect the consumption of frozen concentrated orange juice. Consideration of these and the regional distribution of purchases may indicate the potential market expansion through directed sales promotion.

Retail Cost Comparison of Canned Orange Juice and Frozen Concentrate

The Bureau of Labor Statistics collected monthly retail prices of frozen concentrated orange juice and single-strength canned juice in six large cities of the United States from September 1949 through June 1950 (14, p.13). Average prices computed from this data measure changes in unit costs to consumers (Table 2). These averages are not necessarily average prices for the United States.

A 6-ounce can of frozen concentrated juice will make 24 ounces of single-strength orange juice. The same

quantity of single-strength juice that is contained in a No. 2 can, which contains 18 ounces, can be made from three-fourths of a can of frozen concentrated juice. The cost of this frozen juice would be three-fourths of the cost of a 6-ounce can.

Table 2. Retail Prices of Canned Single-strength Orange Juice and of an Equivalent Quantity of Single-strength Juice Made from Frozen Concentrated Orange Juice,* 6-city Average,[1] September 1949-June 1950

Year and Month	No. 2 can of single-strength orange juice	Frozen concentrated orange juice: Equivalent of No. 2 can of single-strength juice	Frozen concentrated orange juice: 6-ounce can
	Cents	Cents	Cents
1949			
Sep	22.2	21.6	28.8
Oct	22.3	21.6	28.8
Nov	21.7	20.4	27.2
Dec	18.6	18.3	24.4
1950			
Jan	19.5	19.4	25.9
Feb	20.0	21.7	28.9
Mar	19.4	22.7	30.3
Apr	19.3	22.1	29.4
May	19.1	21.2	28.3
Jun	19.0	21.0	28.0

* U. S. Dept. of Agriculture, Bureau of Agricultural Economics

[1] Prices are simple averages of Bureau of Labor Statistics prices in six cities--Boston, Chicago, Cleveland, New York, Pittsburgh, and St. Louis.

In the first half of the ten-month period for which

prices in these six cities are available, the cost of canned single-strength juice in No. 2 cans averaged higher than the cost of an equal quantity of single-strength juice made from frozen concentrated juice. In the second half of this period the reverse was true.

Retail Cost Comparison of Fresh Orange Juice and Frozen Concentrate

According to a Consumers Research survey (9, p.12) using Florida and California oranges available in New Jersey at the end of January 1950, the cost per serving of fresh juice ranged from five cents to twelve cents for a four-ounce serving. Small Florida pineapple oranges selling at 29 cents a dozen provided the five-cent serving. The twelve-cent serving reflected the cost of juice from California Navel oranges.

Compared with these prices, frozen concentrated orange juice could be obtained in that area at a cost of a little over four cents a serving. This price was based on an average cost of 25 cents per 6-ounce can of frozen concentrate.

In the period January 1949 through September 1950, the average price paid by householders in the United States for frozen concentrated orange juice varied between 23.7 and 28.0 cents per 6-ounce can (Figure 5). In

October 1950 there was a sharp drop in prices. Householders paid an average of 22.1 cents per 6-ounce can during that month. This decline in prices may indicate that for the first time processors had a larger supply on hand than they believed they could dispose of before the new season began. In October 1950 there was a 27 per cent increase in household consumption accompanied by a 13 per cent decrease in price. This elasticity of demand for the new product was an indication of the effectiveness of a drop in price as a method of increasing sales.

Changes in Consumption

Monthly changes in purchases of fresh oranges, canned orange juice, and frozen concentrated orange juice are compared in Figure 6. Data for the processed products have been converted to fresh-orange equivalents (1, p.6) on the basis of nine oranges equalling 24 ounces of canned juice or one 6-ounce can of frozen concentrated juice. A comparison of purchases in August 1950 with those in August 1949 (Figure 7) shows that household purchases of oranges and orange juice for the month were about 6.4 million (11, p.11) dozen greater in 1950. This increase consists of a gain of about 7.8 million equivalent dozens in the form of frozen concentrated orange juice. This increase was partially offset by small reductions in

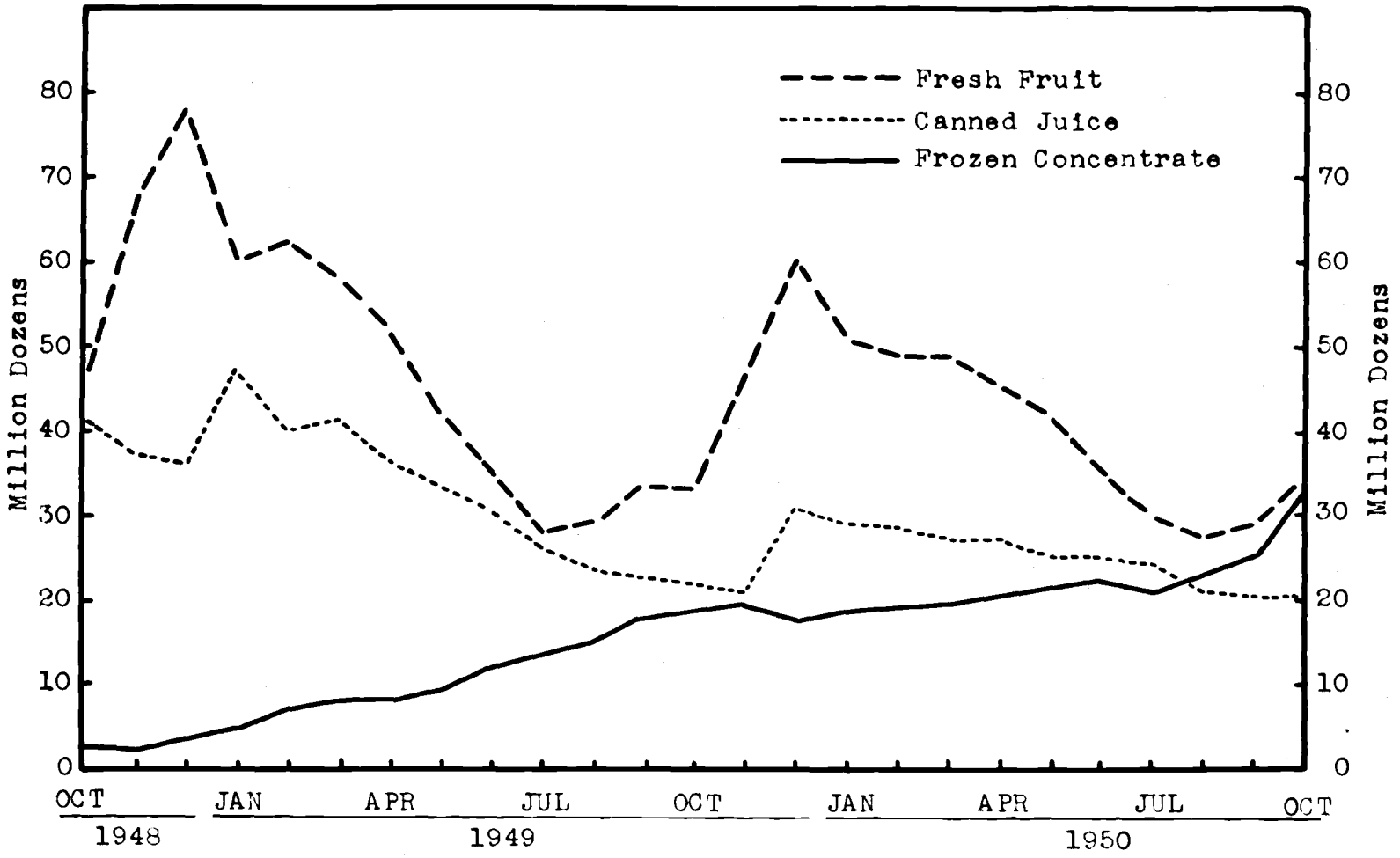

Figure 6: UNITED STATES VOLUME PURCHASES OF ORANGES
FRESH FRUIT, CANNED JUICE, FROZEN CONCENTRATE
--IN DOZENS OF FRESH ORANGES

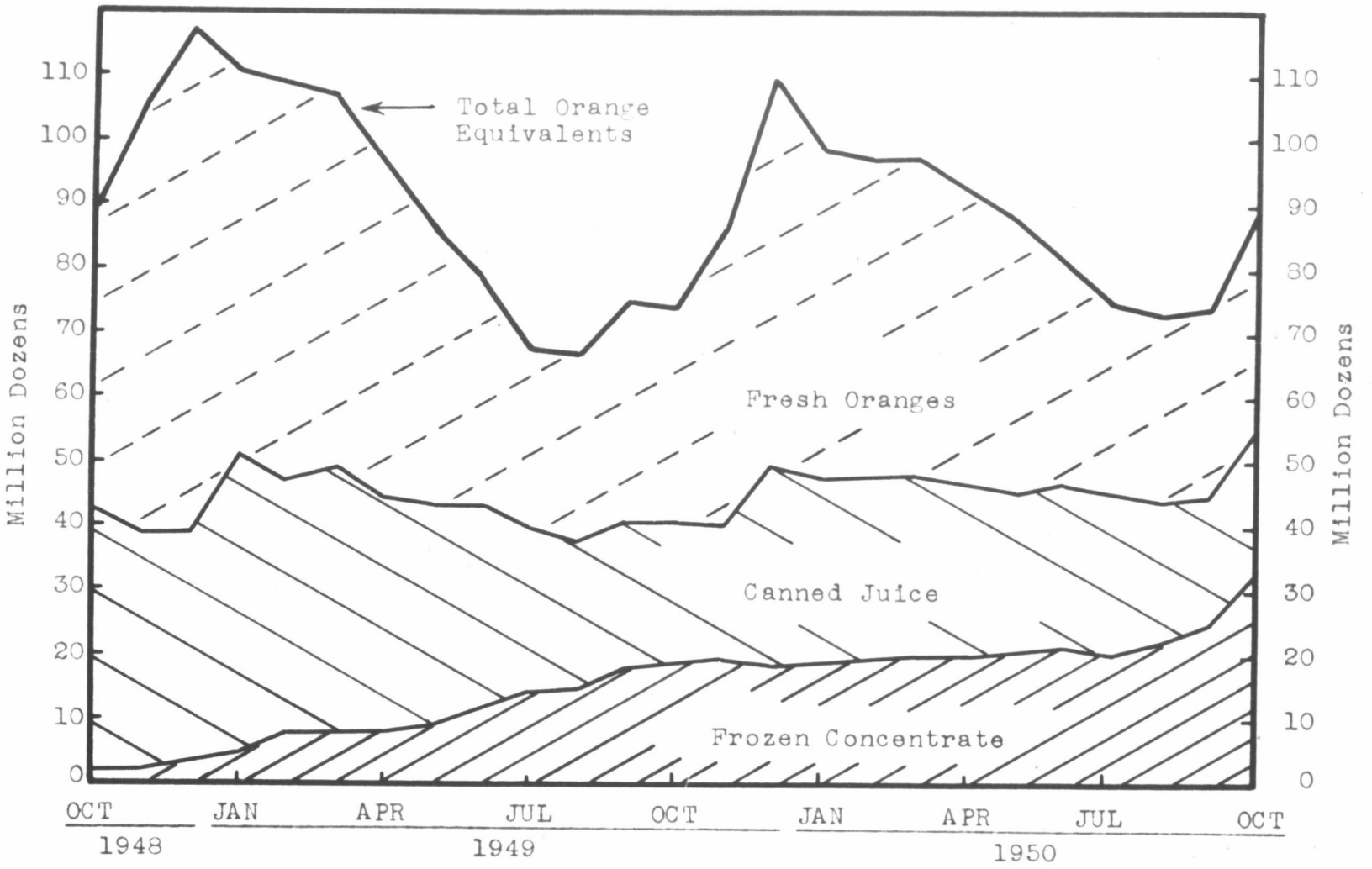

Figure 7: PURCHASES OF ORANGE PRODUCTS BY CONSUMERS IN THE UNITED STATES

purchases of canned single-strength juice and fresh oranges. This change indicates that frozen concentrated orange juice may become an effective factor in lessening the usual summer decline in purchases of all orange products.

It is estimated that during October 1950, household consumers in the United States bought nearly 39 per cent of their oranges in fresh form, 23 per cent in canned single-strength juice, and 38 per cent in frozen concentrated juice. In October 1949, total purchases (11, p.1) were distributed as follows: fresh oranges, 50 per cent; canned single-strength juice, 25 per cent; and frozen concentrated juice, 25 per cent (Figure 6).

Types of Containers

The first breakdown of the pack by size of container was made at the end of the 1947-48 season. In that season about 68 per cent of the output was in small-sized cans, mainly 6-ounce (6, p.26). The percentage of the pack in that size can rose to 80 per cent in the 1948-49 season. Estimates for the 1949-50 season indicate that there was no percentage change from the previous year. Containers ranging from above six ounces through 32 ounces accounted for 20 per cent of the 1947-48 pack, 15 per cent of the 1948-49 and about 12 per cent of the 1949-50 pack.

Almost all of the 6-ounce pack reaches the consumer in lithographed tins. Only one or two companies in the 1949-50 season used bright cans to which paper labels were later applied.

Vitamin C Retention

Control laboratory data compiled by technicians at the Vacuum Foods Corporation plant at Plymouth, Florida, suggest that the nutritional value of orange juice reconstituted from frozen concentrated juice is slightly higher than that of fresh juice (17, p.110).

Their reason for the higher ascorbic acid[1] content was that the final product when reconstituted was still more concentrated than the fresh juice. Accordingly, the soluble solids and ascorbic acid were higher in the reconstituted product (Figure 8).

The data cover a production period of seven months during the 1947-48 season. This represents frequent daily determinations of the ascorbic acid content of fresh juice and the reconstituted concentrate. The ascorbic acid determinations, which totaled 1,432, were made during the processing of approximately one million boxes of fruit. The mean of these determinations was calculated as a daily

[1] Vitamin C and ascorbic acid are synonymous terms for the same chemical substance.

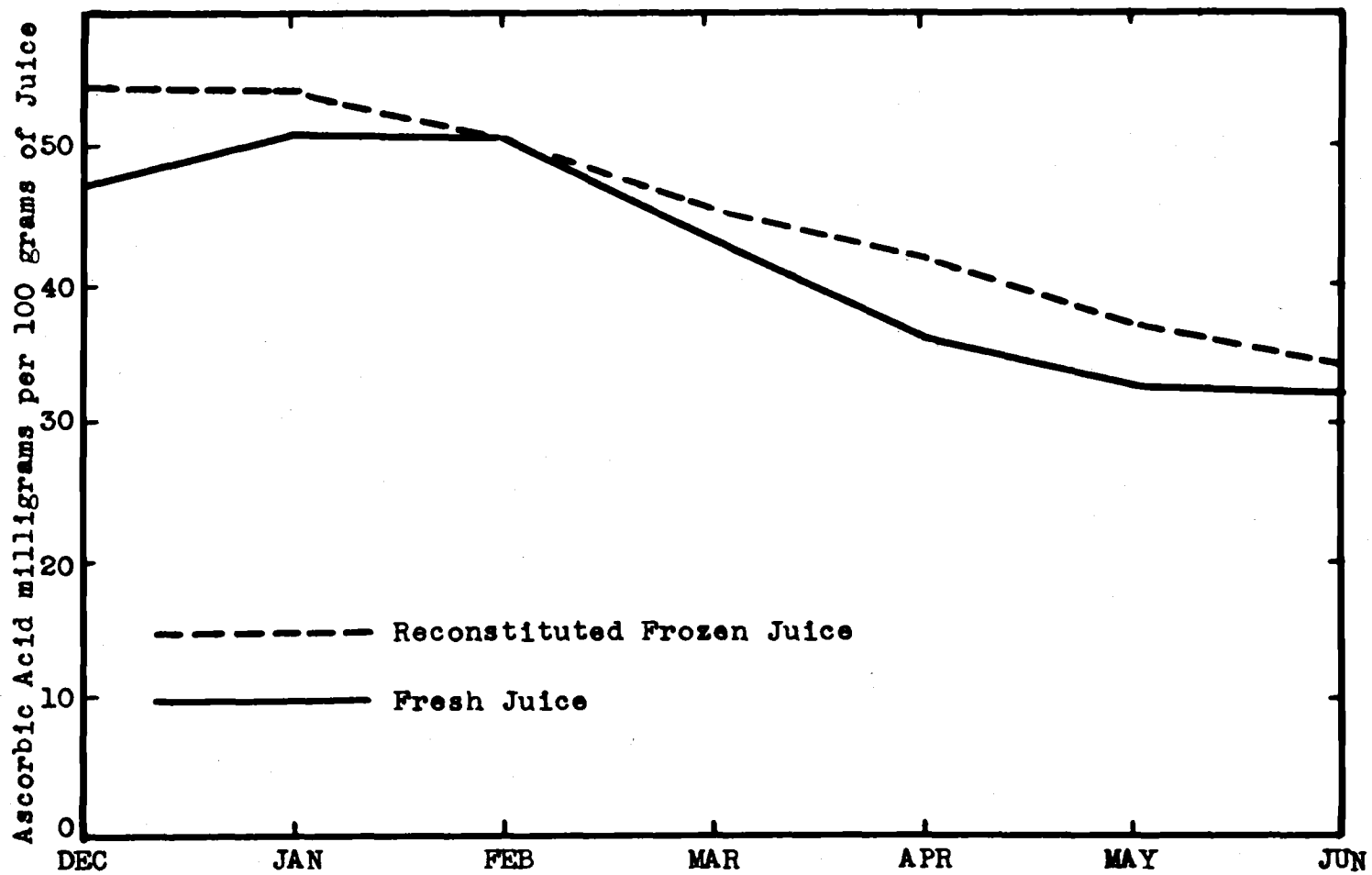

Figure 8: VITAMIN C CONTENT VARIATIONS IN ORANGE PRODUCTS

average, which was in turn averaged for each month of operation.

The magnitude of the difference between the mean ascorbic acid content of fresh juice and reconstituted concentrate fluctuated considerably from month to month. This fluctuation reflects the variation in soluble solids content caused by varietal and rootstock differences.

In January 1950, a Consumers Union publication (8, p.17) reported on tests for vitamin C content of fresh orange juice and frozen concentrated juice. These tests indicated that the reconstituted frozen concentrate contained an average of 40 milligrams of ascorbic acid per 100 grams of juice as compared with 45 milligrams per 100 grams of fresh orange juice.

It is apparent that these two separate experiments do not agree as to final results. However, it is quite possible that in the experiment at the Vacuum Foods Corporation plant, the company was producing a slightly more concentrated product than the average for the entire industry. If this supposition is valid, then the experiment reported by the Consumers Union publication is more likely correct for the industry as a whole.

Both experiments indicate that the vitamin C content of reconstituted frozen concentrated juice varies only a small degree from fresh juice. This information is

of significance to users--particularly hospitals, dieticians, and parents who depend on this product as a principal source of vitamin C for infants and children.

COMPARATIVE MARKETING CHARGES

Processing and Freight Cost Comparison

Detailed costs of marketing California oranges in various forms are not available at the date of this writing. A specific comparison of Florida marketing costs is indicated by studies made by the Department of Agricultural Economics at the University of Florida in 1950 (23, p.109).

Table 3. Cost of Marketing Florida Oranges Based on a 90-lb. Box Yielding 5 Gallons of Juice

	Fresh Fruit (one box)	Canned Juice (13.7 46-oz.)	Frozen Concentrate (25.9 6-oz. cans)
Processing or Packing	$ .83	$ 1.30	$ 1.04
Freight to New York	1.10	.49	.19

The detailed costs as shown in Table 3 cannot be applied as such to the marketing of California oranges. Labor and material costs in California would not be the same. Freight charges on western railroads for a comparable distance would be based on a different schedule.

The same weight and bulk relationship would, however, apply to California production. On this basis, it is believed that the same general cost relationship would

result if detailed marketing costs of California oranges were determined.

A statement by one of the officials of the California Fruit Growers Exchange indicates the change taking place in the type of freight shipments.

> "The change in utilization of oranges greatly affects other segments in our economy as well as the industry itself. It has been vitally important to the railroads, for example, that fruit be handled in their fresh or natural state. The equivalent of ten carloads of fresh oranges can now be moved in one car of frozen orange concentrate." (32, p.230)

Methods of Transportation

In marketing frozen concentrated orange juice, it is important that a satisfactory temperature be maintained as the product moves through the channels of trade. The industry believes that it would be best if the concentrate which is frozen at zero or below in the plant, could be kept at that temperature until it is prepared for serving. In actual practice, the temperature of the product is allowed to change several times before reaching the consumer. Keeping the temperature within reasonable limits is an important consideration in the transportation, warehousing and retail display of this product.

Although many shippers do not consider it an entirely satisfactory method, frozen foods have been shipped in ordinary end-bunker ice-refrigerated cars since

the frozen food industry began in 1930. Some railroads have been experimenting with mechanical refrigeration, but the number of these cars in operation is very small. There are indications that the number of mechanically refrigerated railroad cars will increase as technological improvements are developed.

There are many conflicting views on the relative merits of rail and truck transportation. In 1947 and 1948, the frozen orange concentrate industry depended more on rail than truck transportation. But in the 1949-50 season, approximately half of the Florida production was moved by truck (11, p.9). On the basis of the service now available, many shippers use motortruck transportation. The industry believes that storage temperatures above zero are harmful to the quality of frozen concentrated orange juice. Properly equipped trucks are able to maintain the desired low temperatures. On distances of a thousand miles or less, motortrucks take less time than rail transportation. The trucks offer direct delivery to more than one point. The cost of shipping by motortruck is generally higher than shipping by rail.

A motortruck can carry only a little more than half the load of a railway car, but many shippers believe that this is an advantage. A problem facing small distributors of frozen juices is the large investment in inventories

that is necessary when buying full carload lots. With no way to hedge against changes in price, the small distributor would rather buy in less-than-carload quantities even though he may have adequate storage facilities for larger volumes. Rail stops for partial unloading are not satisfactory because of the higher rate for less-than-carload shipments. There is also the necessity of rebracing the load and re-icing after each stop. This delay results in fluctuating temperatures.

Of the factors favoring the use of trucks for hauling frozen concentrated orange juice, maintaining the temperature seems to be the most important. Improvements in rail transportation, though slow in coming, may eliminate the temperature advantage now enjoyed by motortruck carriers.

Conservation of Metals

Concentrators of frozen orange juice are not seriously concerned about obtaining cans during the present emergency. The use of 6-ounce frozen concentrate cans, when compared to cans used for single-strength canned juice, conserves essential metals. The No. 3 can of single-strength orange juice contains 46 ounces or two ounces less than two reconstituted cans of frozen concentrate. However, the No. 3 can uses a little over three

times the amount of tin and steel of one 6-ounce can (22, p.26). Also, the No. 2 can, holding 18 ounces, does not contain as much juice as a 6-ounce can which yields 24 ounces, but it uses twice as much steel and tin.

If steel and tin supplies become very short, specifications can be changed to produce an inside-enameled can for concentrates. This would reduce the amount of tin needed.

Another obvious advantage of concentrates is that shipping space and weight can be saved during an emergency.

THE CALIFORNIA ORANGE CONCENTRATE INDUSTRY

Location of Concentrating Plants

Frozen concentrated orange juice production began in California in 1947 (Table 4). The two plants operating that year were Bireley's Division of General Foods Corporation at Hollywood and Pure Fruit Juices, Incorporated at La Habra. In the following year two more concentrating plants began production. These plants were Cal-Grove Products Company at Covina and Hart's Citrus Products Company at Brea.

In 1949, production was started at Real Gold Citrus Products, Anaheim. In 1950, the industry was further increased by Exchange Orange Products at Ontario, Golden Citrus Juices at Fullerton, and Paramount Citrus Association at San Fernando. The map location of these plants is shown in Figure 9.

Raw Products

There were approximately 237,000 bearing acres of orange groves in California in 1950 (2, p.2). Of this acreage, 24 per cent is in Orange County, 22 per cent in Los Angeles County, 17 per cent in Tulare County, 16 per cent in San Bernardino County, 9 per cent in Ventura County, 6 per cent in Riverside County, 3 per cent in

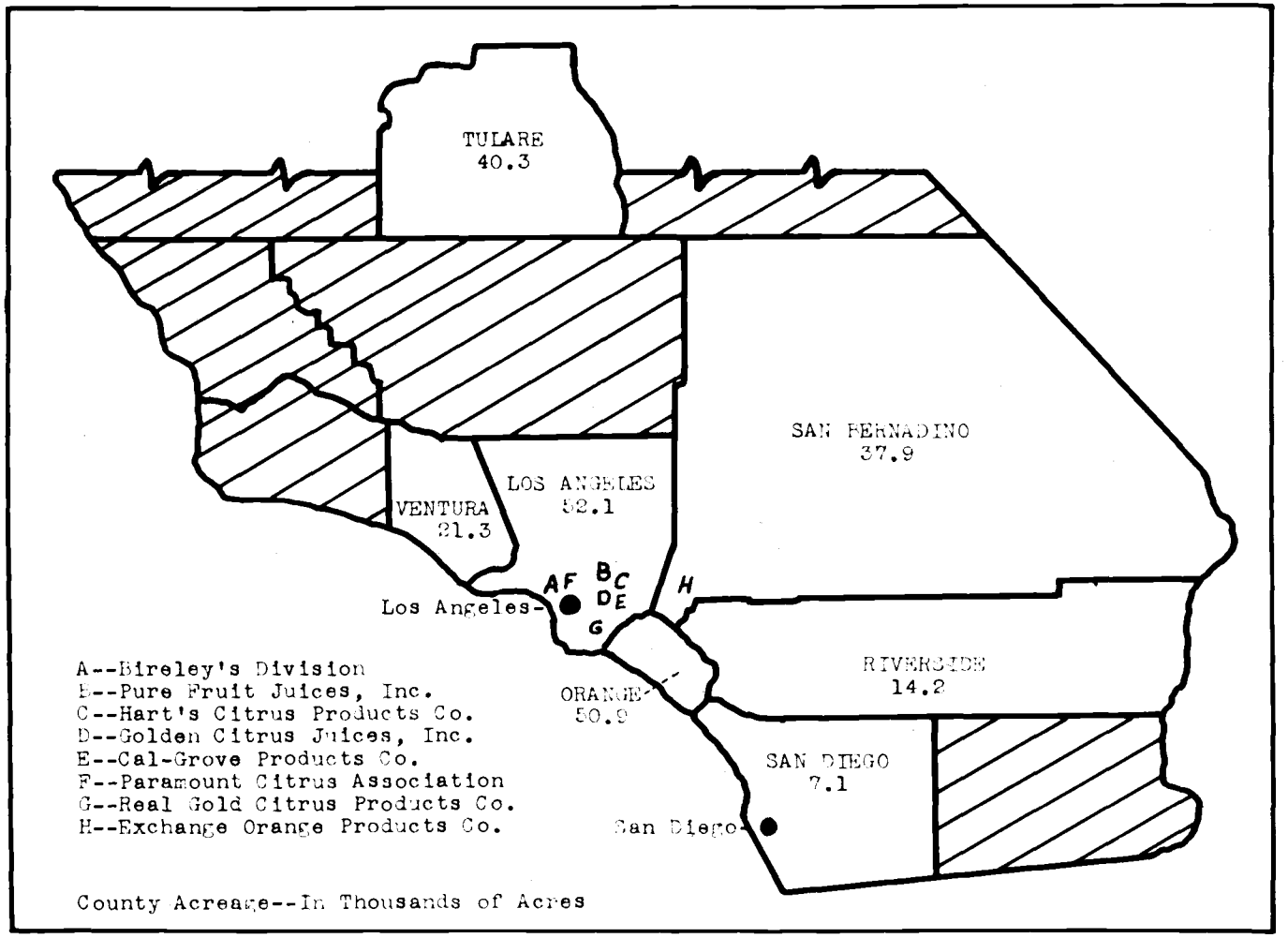

Figure 9: MAP OF SOUTHERN CALIFORNIA SHOWING PROCESSING PLANT LOCATIONS AND ORANGE ACREAGE BY COUNTIES

Table 4. Frozen Orange Concentrate Packers of California*

	Bireley's Division	Exchange Orange Prods.	Golden Citrus Juices, Inc.	Hart's Citrus Products Co.
Plant Location:	Hollywood	Ontario	Fullerton	Brea
Parent Firm:	General Foods Corporation	California Fruit Growers Exchange	American Fruit Growers	----
Date of First Commercial Concentrate Pack:	1947	1950	1950	1948
Source of Raw Product:	CFGE, others	CFGE	American Fruit Growers	Various
Pack Sold Under Own Label:	100%	-0-	60%	40%
Pack Sold Under Buyers' Label:	-0-	100%	40%	60%
Own Brand:	"Birds Eye"	----	"Blue Goose"	"Flowing Gold" "Hart's"
Buyers' Labels:	----	"Minute Maid" "Birds Eye"	"Snow Crop" "Flav-R-Pac"	"PictSweet" "Flav-R-Pac"
Capacity per Hour, Gallons 42° Brix:	450	600	250	200

(Continued on the following page)

Table 4. Frozen Orange Concentrate Packers of California (Continued)

	Pure Fruit Juices, Inc.	Real Gold Citrus Prods.	Paramount Citrus Assn.	Cal-Grove Products Co.
Plant Location:	La Habra	Anaheim	San Fernando	Covina
Parent Firm:	----	Mutual Orange Distributors	----	Damerel-Allison Co.
Date of First Commercial Concentrate Pack:	1947	1949	1950	1948
Source of Raw Product:	CFGE, MOD, AFG, Indep. Growers	MOD	Own Orchards	Various
Pack Sold Under Own Label:	30%	90%	100%	30%
Pack Sold Under Buyers' Label:	70%	10%	-0-	70%
Own Brand:	"Cold Gold"	"Real Gold"	"Cal-Fame"	"Cal-Grove"
Buyers' Labels:	"Cedergreen" "Locker-Pak"	----	----	"Minute Maid" "PictSweet"
Capacity per Hour, Gallons 42° Brix:	125	550	200	300

* Western Canner and Packer, October 1950

San Diego County, and the balance of 3 per cent in other areas. All of the counties named, except Tulare, lie south of the Tehachapi range of hills.

The citrus farmers, like other agricultural producers, have many production problems. One of these is the weather. Growers must be on the alert to protect their crops from freezing temperatures during the months of October through March. The smudge pot has been the main defense used in the past. The nightly frost warning service, provided by some California radio stations, informs the farmers when smudge pots are needed. More modern methods of producing and disseminating heat are being developed and tested.

Insects and diseases are some of the other serious difficulties faced by the citrus grower. The long, warm California summers provide suitable incubation periods for a wide variety of pests. Some of the insects and diseases damage only the fruit, while others are injurious to the trees. The growers combat these insects and diseases with different types of insecticides and fungicides. The annual cost of these products is measured in millions of dollars (6, p.23).

Cultivation, weed control, irrigation, and the labor supply needed in harvesting of the crops, are additional matters of concern to the citrus farmer. The

frozen concentrate packers give attention to these problems because a good crop is essential to their operations. The plant field men work closely with the producers in meeting and overcoming these problems.

An additional factor important to the Southern California frozen concentrate business is that of control of the citrus acreage. In some areas of the nation, and with some crops, a packer may have the option of dealing with any of hundreds of individual growers, all operating independently. Southern California citrus marketing, however, is concentrated in the hands of relatively few major concerns.

The California Fruit Growers Exchange controls approximately 75 per cent of the entire orange acreage of the State. Mutual Orange Distributors, a second cooperative, controls 10 per cent of the acreage. American Fruit Growers is the third largest factor. Of the total 237,000 acres, only 30,000 acres are operated by independent growers (6, p.23).

The first consideration of any California frozen concentrate packer is to obtain a reliable supply of raw product. All but three of the packers now in the business have that assurance through the ownership of groves.

Preliminary Processing

The season on Valencia oranges usually starts in the latter part of April and extends through October. Oranges for frozen concentrate are transported to the processing plants by truck and trailer or by rail cars. The fruit is inspected on arrival at the plant to eliminate poor quality raw product. After inspection, the oranges are carried by belt conveyors to temporary storage bins. Samples from each load are taken to the plant laboratory to be analyzed for quality factors.

Schedules for blending are arranged if the orange variations make this practice desirable. California oranges have a higher acid content than Florida oranges. This higher acid content is caused by environmental factors in the growing of the fruit. If the plants receive some fruit of high-acid content, this must be blended with fruit of low-acid content. The criteria of good orange juice is the proper ratio of acid to sugar content. United States Department of Agriculture standards for grade A frozen concentrated orange juice specify that no sugar shall be added. For this reason the sugar-acid ratio of grade A orange juice can be adjusted only by the blending of the natural raw product.

The oranges are discharged from the storage bins on

to conveyor systems which carry them through washers. In the washers, the oranges are immersed in detergent solutions and then scrubbed with mechanical brushes (Figure 10). After washing, the fruit is rinsed by overhead sprays of water. Next the product is inspected on conveyor belts and given an additional washing in water containing a small quantity of chlorine. Later they are size-graded for efficient extraction of the juice.

Several types of juice extractors are used in the California industry. Some plants use mechanical reamers in which the fruit is first halved and then the halves are pressed against spinning burrs (Figure 11 and 12). Another type of machine inserts a tube into the orange and then squeezes the orange so that the juice discharges through the tubing. A third type of extractor halves the fruit, flattens it and cuts away the pulp. The pulp is then pressed to release the juice.

Stainless steel tubes receive the juice which is divided into two flows--one representing about 90 per cent of the volume and the other the balance. The larger quantity is strained through a fine-screen finisher, producing a relatively clear liquid. The smaller flow of juice goes through a unit with a coarser screen, thus retaining a portion of the pulp and juice sacs.

The clear juice is pumped into tanks from which it

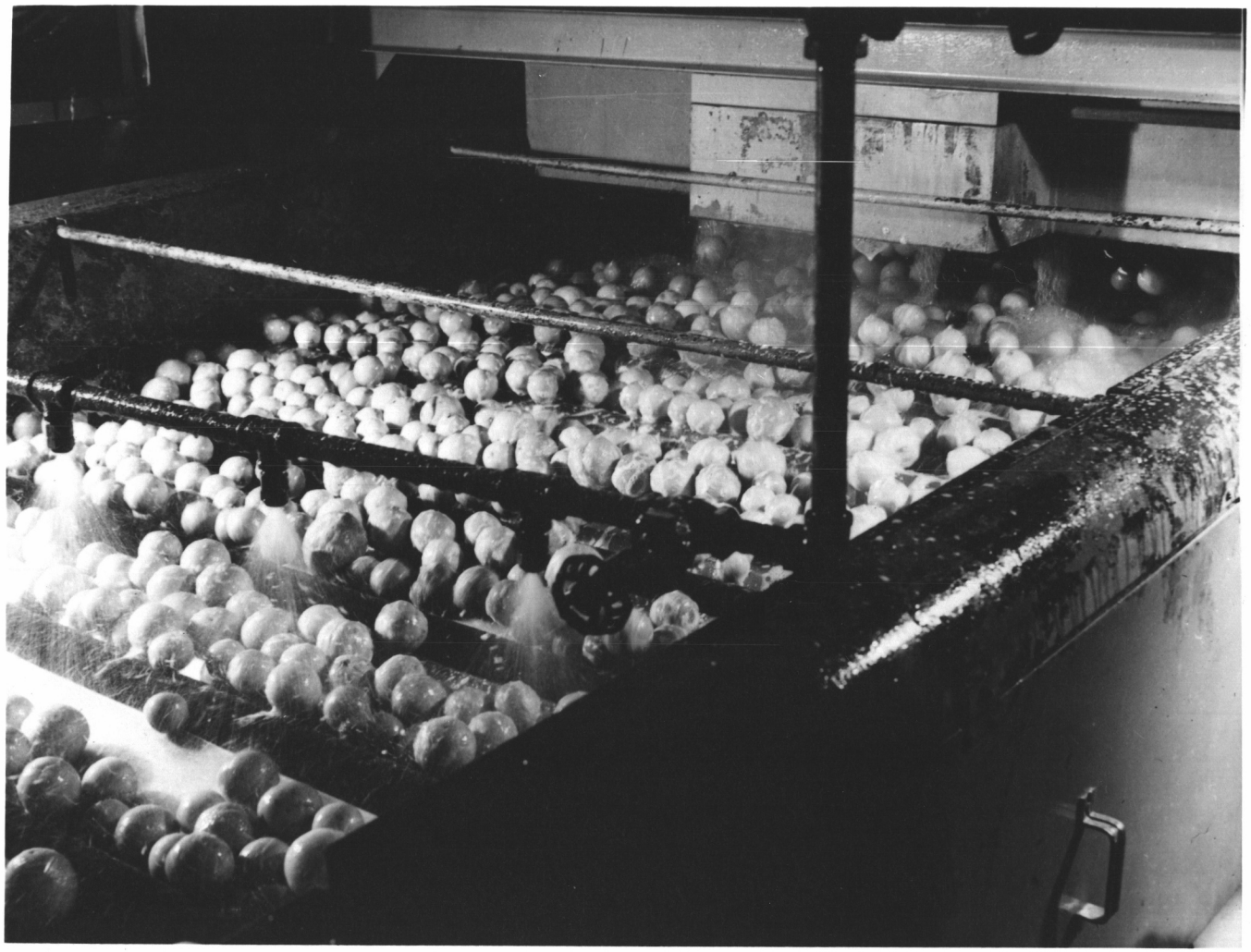

Figure 10: ORANGES BEING WASHED AND RINSED (Courtesy Bireley's)

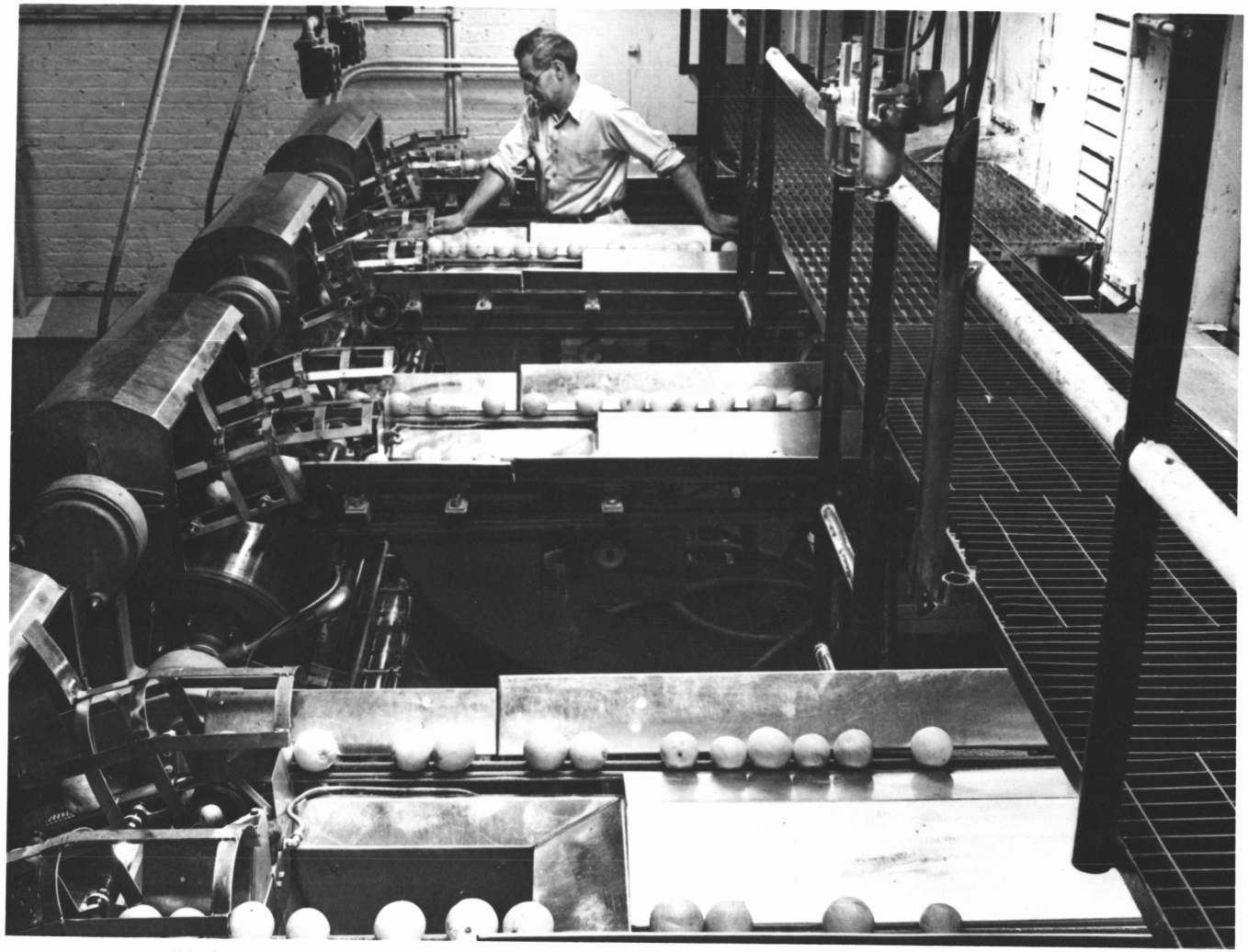

Figure 11: CITROMAT JUICE EXTRACTORS (Courtesy Bireley's)

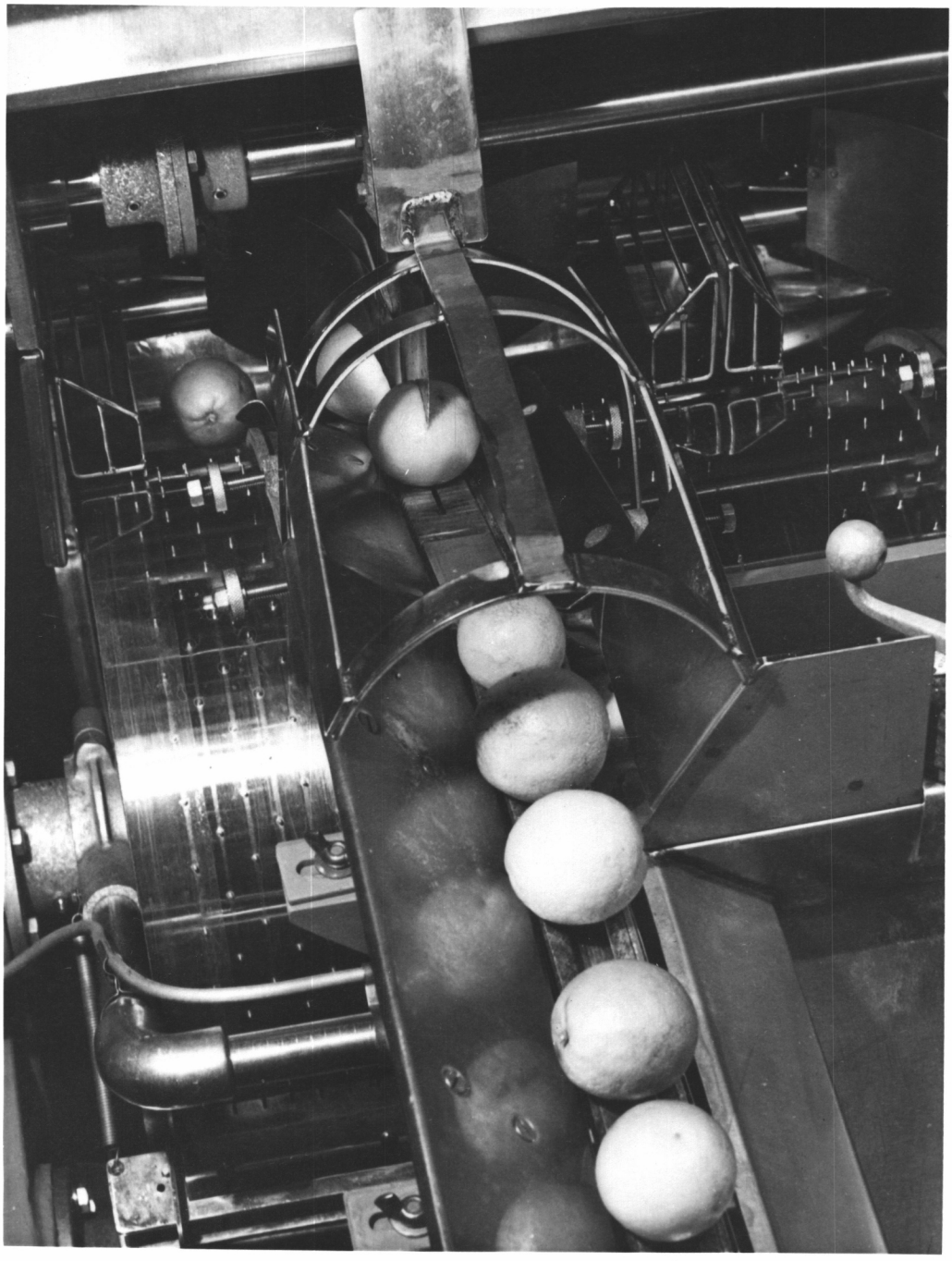

Figure 12: CLOSEUP VIEW OF CITROMAT JUICE EXTRACTOR
(Courtesy Bireley's)

is supplied to the evaporator in a constant flow. The pulpy juice, with seeds and large pulp removed goes through cooling equipment which reduces the temperature to about 34° F. It is then stored in a refrigerated holding tank.

Concentrating and Freezing

There are two major types of evaporating equipment used in the California frozen concentrate operations. These units are the Mojonnier evaporator and the Howard evaporator.

In the Mojonnier evaporator (Figure 13) the clear juice is subjected to a vacuum of about 29 inches of mercury. The juice is concentrated from about 13° Brix to 55° Brix. This concentrating process is accomplished at a temperature not exceeding 60° F.

The Howard system is designed to achieve the same basic result. However, the concentrating is done in three stages instead of one as in the Mojonnier evaporator.

Regardless of the evaporation method used, the concentrated juice is discharged into blending or standardizing tanks. These are usually cold-wall units which chill the product. At the same time it is mixed with the pulpy unprocessed juice until the standard 42° Brix is reached. The standardized juice is then pumped to mechanical

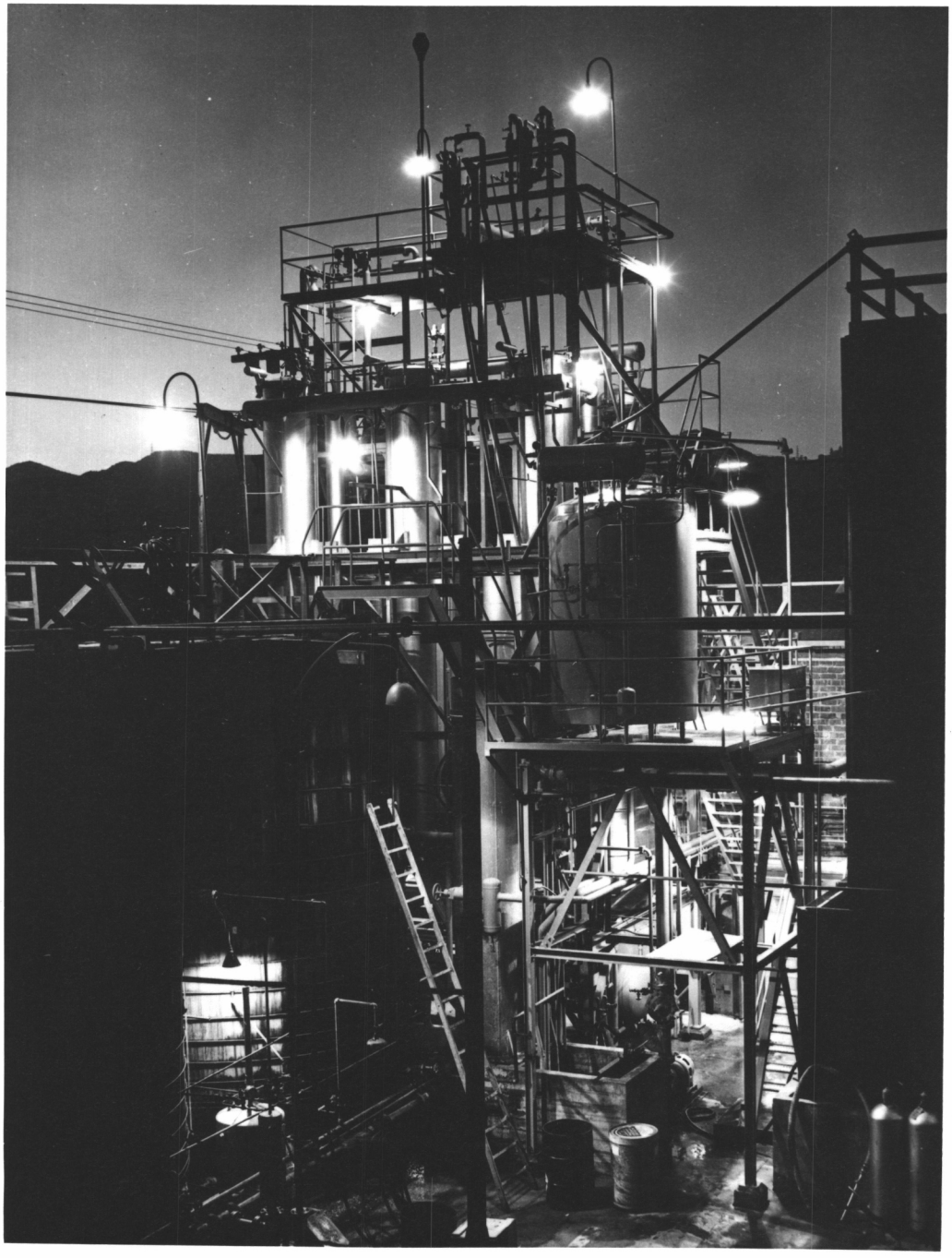

Figure 13: NIGHT VIEW OF MOJONNIER LOW-TEMPERATURE EVAPORATOR
(Courtesy Bireley's)

filling and double-seaming equipment (Figure 14).

The final processing operation is hard-freezing. Various types of air-blast tunnels are used for this purpose. Temperatures down to -30° F. are maintained in these units (Figure 15). The temperature of the concentrate can be reduced to 0° F. in less than two hours. At a temperature of 0° F. the concentrate can be safely stored or transported to market.

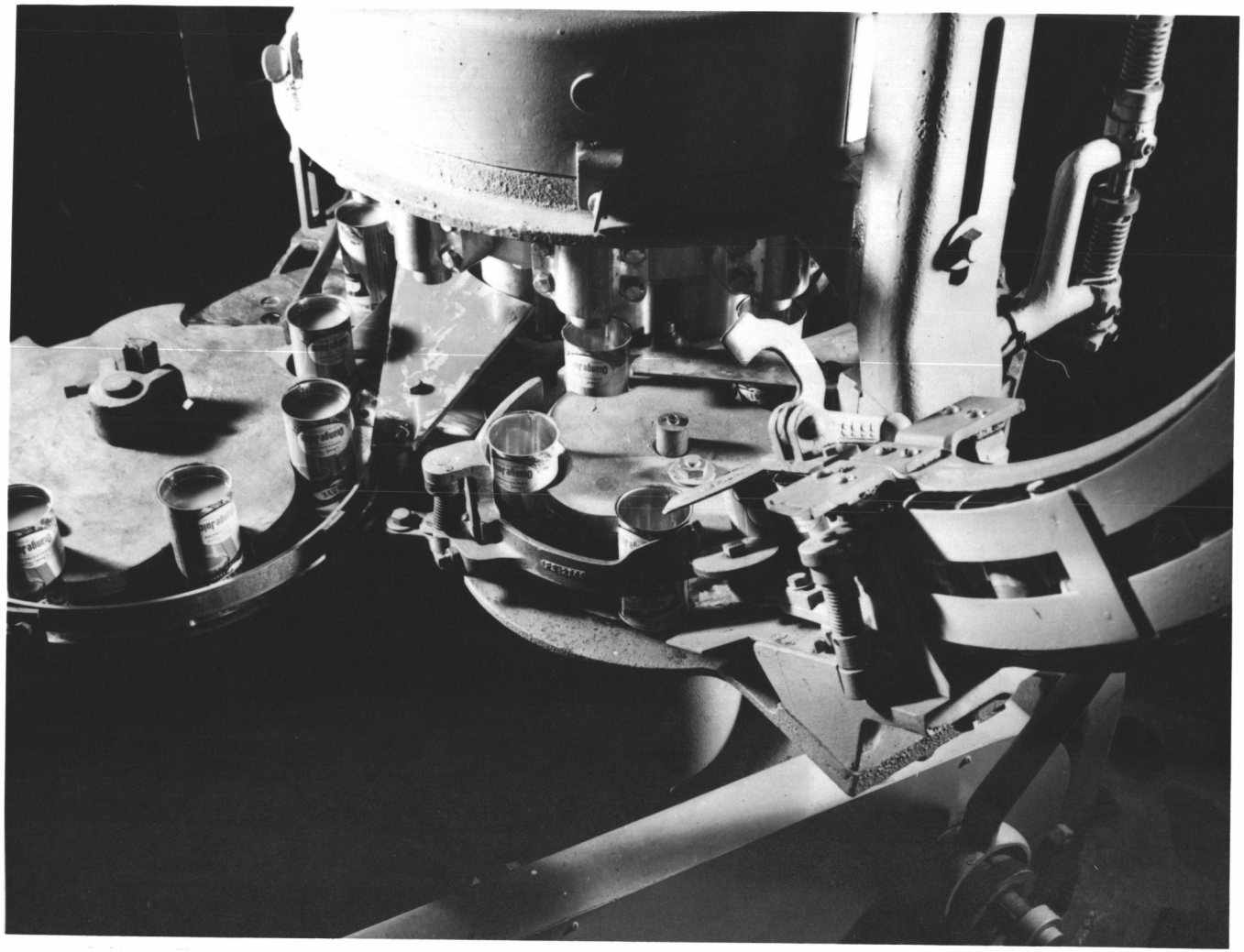

Figure 14: FILLING MACHINE FOR 6-OUNCE CANS (Courtesy Bireley's)

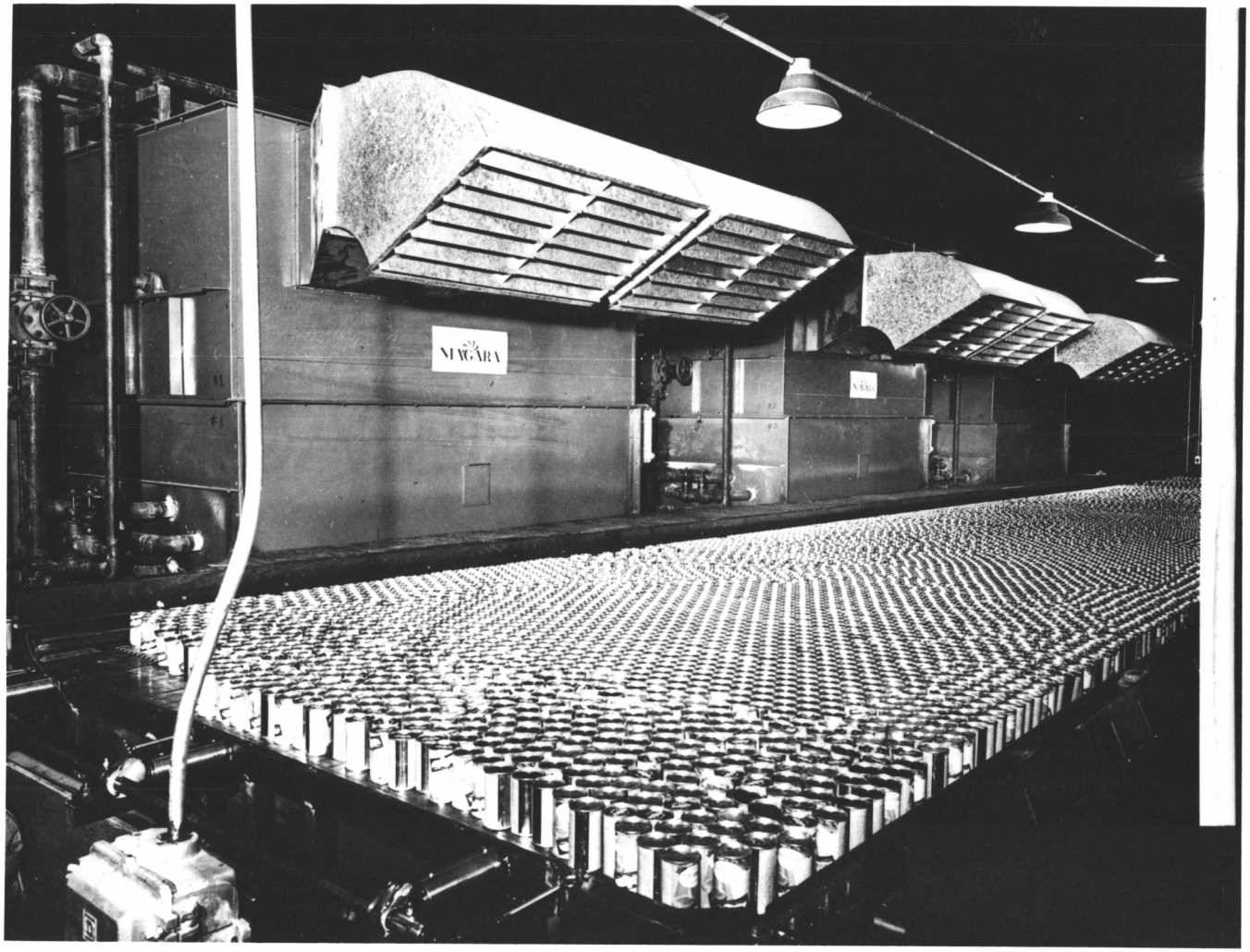

Figure 15: VIEW INSIDE OF FREEZING TUNNEL. 12,000 CANS ARE SUBJECTED TO A BLAST OF -30° F. AIR SIMULTANEOUSLY. (Courtesy Bireley's)

CURRENT STATUS OF THE CALIFORNIA ORANGE INDUSTRY

The California Fruit Growers Exchange has traditionally marketed its orange crop in fresh form. While other food brokers were advertising their products in multi-colored cans and packages, the California Fruit Growers Exchange maintained the position that the best sales package for oranges is the protective skin of the fruit itself. The familiar "Sunkist" label has been used by that organization since 1908. Since that time the Exchange has established a record of consistent quality for their fresh fruit products. The Exchange has spent $55,000,000 (3, p.91) in advertising since 1908 to make "Sunkist" a household word for fresh citrus fruit.

California canned orange juice has been normally produced from lower grade fruit. This lower grade fruit generally contained good quality juice, but the fruit was of odd sizes or had skin blemishes. The citrus growers had become accustomed to thinking of processed orange juice as a by-product and a secondary market for the orange crop of the State. California has always produced a high percentage of good quality oranges, so it was in the interest of good marketing to place major emphasis on the sale of fresh fruit.

As frozen concentrated orange juice became a nationally known product with favorable consumer acceptance

the California Fruit Growers Exchange installed the necessary evaporating and freezing equipment in the processing plant of their subsidiary, the Exchange Orange Products Company at Ontario. The capacity of the Exchange Orange Products plant was the largest of any concentrating plant in California in 1950 (Table 4). This plant began frozen concentrate production in 1950. Sales contracts were made with the Birds Eye-Snider Division of General Foods Corporation and the Vacuum Foods Corporation. Half of the frozen concentrate production of Exchange Orange Products Company was marketed by General Foods Corporation under the trade name of "Birds Eye." The other half of this production was marketed by Vacuum Foods Corporation under their "Minute Maid" label.

In September 1950, after one season of this type of marketing, officials of the Exchange recognized that frozen concentrated orange juice was becoming an important factor in the marketing of the nation's orange crop. Arrangements were made to market the 1950-51 production of frozen concentrate at the Ontario plant through direct channels of the Exchange.

To market this production directly, the Exchange needed a well-known trade-mark to place on the product. The "Sunkist" trade-mark was not available to the Exchange for any type of product except fresh citrus fruit. In

the early history of the "Sunkist" trade-mark, the California Packing Corporation, a separate organization, had obtained the right to use that name on canned products. In September 1950, the California Fruit Growers Exchange bought the exclusive rights to that trade-mark for $1,250,000 (27, p.91).

When canned fruit juices had become popular in the 1930's, the Exchange began packing these and other by-products. However, they were in no hurry to put a "Sunkist" label on these products. They felt that inferiority in the processed products would damage the value of the trade-mark on fresh fruit.

The purchase of this trade-mark in 1950 for use on frozen concentrated juices indicates that the California Fruit Growers Exchange, the largest factor in marketing of California oranges, now considered frozen concentrate as one of the potential primary markets for the orange crop of that State.

Increasing Plant Facilities

An indication of the confidence that the California orange industry has in their new product is the continued expansion in concentrating facilities. Three of the plants shown in Table 4 were constructed in 1950. It is likely that these three plants did not reach full capacity

in their first season.

On July 23, 1950, the complete concentrating facilities of the Damarel-Allison Company at Covina were purchased by one subsidiary of the California Fruit Growers Exchange.

In November 1950, the Exchange Lemon Products Company, a subsidiary of California Fruit Growers Exchange, began construction of a new $300,000 concentrating plant at Corona. This plant will be designed to concentrate both orange and lemon juice. The general manager of that company indicated that it was necessary to build this plant to cope with the expansion of the frozen concentrate market for both oranges and lemons.

This rapid movement of the California Fruit Growers Exchange into the concentrating industry suggests that this organization anticipates an increase in frozen concentrate sales. Part of this increase may result from the use of the "Sunkist" trade-mark on this new product.

Other California companies are following this expansion trend. The Real Gold Citrus Products plant at Anaheim was closed for three months following December 15, 1950, to enable the company to modernize its plant and expand facilities.

In January 1951, a new low-temperature concentrator was installed at Hart Fruit Products Company at Brea.

This new concentrator was designed especially for the Hart plant at a cost of more than $100,000. This increase in capacity will enable the plant to process 400 tons of fruit daily during the summer of 1951.

At the same time, this company added new laboratory equipment to enable their technicians to carefully analyze the product and thus insure the maintenance of high quality standards.

Effect of Frozen Concentrate Production on the Valencia Market

At the end of the 1949-50 season, total Valencia orange production in Southern California had not been affected by the increase in frozen concentrate produced.

Table 5. Production and Utilization of California Valencia Orange Crops, 1947-48 to 1949-50* (Thousand Boxes)

Crop Season	Production	Utilization of Sales			
		Fresh	Frozen Concentrate 1/	Other Processed 1/	Total Processed
1947-48	26,369	19,497	361	6,511	6,872
1948-49	24,584	14,367	1,622	8,595	10,217
1949-50	26,245	15,000	2,066	9,179	11,245

* U. S. Dept. of Agriculture, Bureau of Agricultural Economics

1/ Computed on the basis of one box equal to 1.21 gallons of frozen concentrate, 1949-50 Florida average.

The Valencia crop remained relatively stable during the three-year period that California has produced frozen concentrate (Table 5). The 1948-49 crop was small because of a severe freeze during that season.

The percentage of the Valencia crop going into frozen concentrate increased from 361,000 boxes to 2,066,000 boxes in that three-year period. This is an increase from 1.4 per cent to 7.9 per cent of the Valencia crop. As indicated, frozen concentrate did not represent a very large percentage of the 1949-50 Valencia crop in California, but the nominal increase of this three-year period is comparable to the first three seasons of the frozen concentrate production in Florida. It took about three years for Florida plants to become established and thus reach large scale production (Figure 16).

With increased plant facilities, together with the confidence shown by the California Fruit Growers Exchange, it is expected that frozen concentrate production in California may increase substantially during the 1950-51 season. This may generally follow the production pattern of the Florida industry in its fourth and fifth season. Bureau of Agricultural Economics statistics (14, p.10) point out that the market for frozen concentrate can still be greatly expanded through directed sales promotion. The use of the "Sunkist" trade-mark on frozen concentrate may

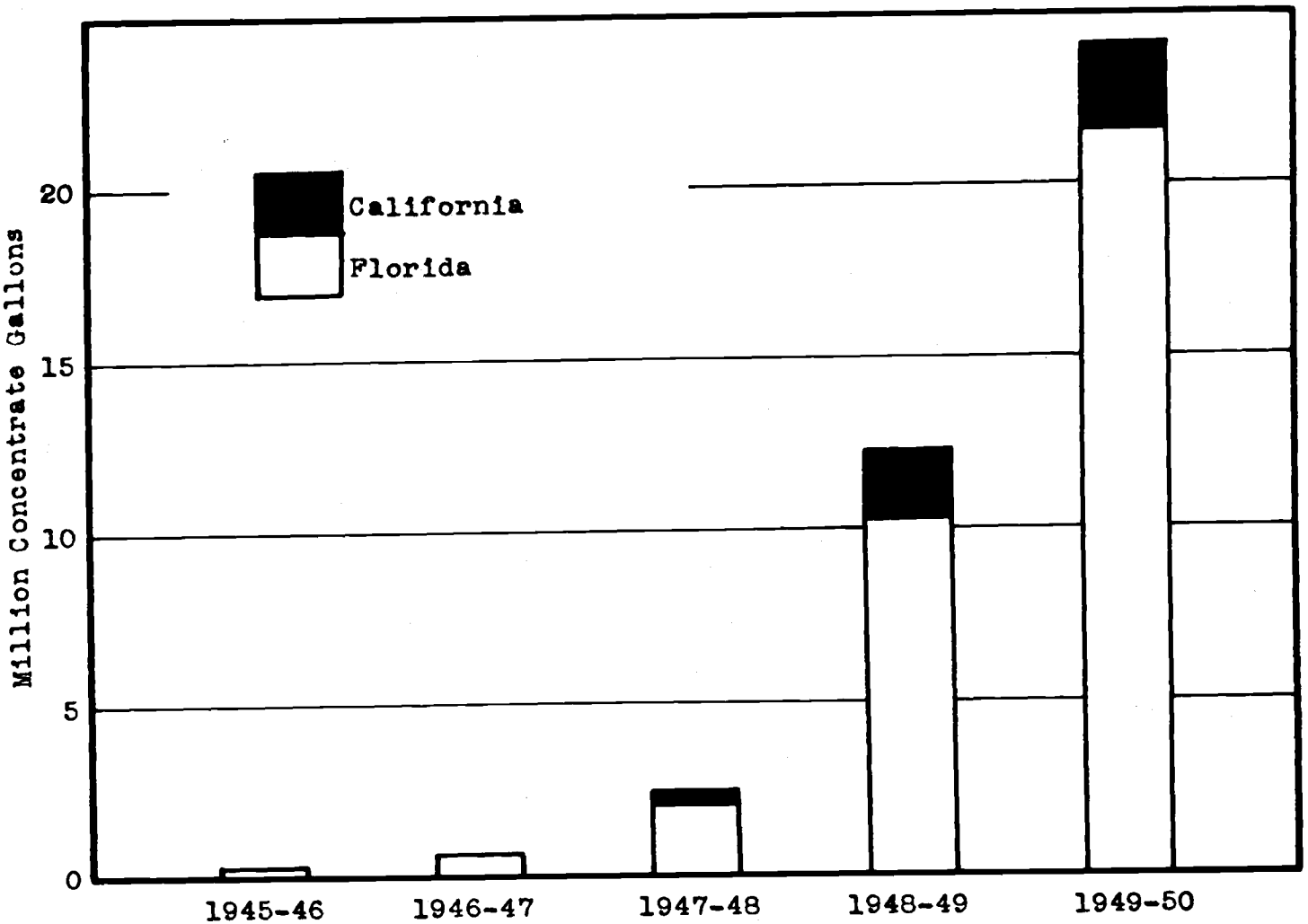

Figure 16: PRODUCTION OF FROZEN CONCENTRATED ORANGE JUICE IN FLORIDA AND CALIFORNIA 1945-50

further this expected market expansion.

Some members of the California orange industry (6, p.31) feel that the frozen concentrate has already helped stabilize the California Valencia market. They indicate that the demand for this new product has aided in maintaining the Valencia price at approximately $40 per ton or $1.50 per box. It has provided a new outlet for California orange groves already in bearing and may allow increased plantings if the fresh market is not adversely affected.

Orange groves in Florida have increased in value since the start of frozen concentrate production in that State. Average grove land prices in Florida have increased from approximately $500 per acre to about $2000 per acre (22, p.37). That type of rise in grove land values has not been evidenced in California. However, if California frozen concentrate production expands substantially, grove land values in that State may also be expected to increase.

CONCLUSIONS

The production and sales records of frozen concentrated orange juice indicate that this food product has been readily accepted by the consumer.

It is likely that production of this frozen juice in California, as well as in Florida, will continue to expand in the next few years. The orange market is well organized by the California Fruit Growers Exchange and by other marketing agencies such as General Foods Corporation, Vacuum Foods Corporation and Snow Crop Marketers. These companies have reliable trade names and good marketing channels through which they can promote additional sales.

The national consumption of frozen orange concentrate shows a steady gain each month. As long as the disposable personal income of American consumers remains well above the prewar level, housewives will have money to spend for such items as frozen concentrate. There are indications that retail outlets and transportation facilities are increasing. There are also some prospects of additional sales to the beverage dispensing trade and to the institutional purchasers. These factors indicate that the market for frozen orange concentrate will continue to increase for a few more years. However, there is some

possibility that production may expand more rapidly than sales promotion. If this happens, surpluses may develop.

Most new industries have high costs during the first few years of production. Therefore, the processing costs of frozen orange concentrate may show some reduction as the industry becomes more stabilized. The canned orange juice industry is now well established. Most of the cost reductions previously possible in that industry have already been made. Unless there are technological improvements, it is not likely that the processing costs of canned orange juice will decrease.

The savings associated with the handling of orange juice in frozen concentrated form may give that part of the industry a cost advantage over the single-strength orange juice enterprise.

It is possible that people may consume more orange juice as a result of this new product. Consumers have discovered that frozen orange concentrate is a reasonably priced food item with high nutritional value which has the advantages of convenience and flavor.

There are indications that at the present general price level, frozen orange concentrate sells well at any price up to 29 cents per 6-ounce can retail, but sales slow down at 30 cents or above. The average housewife seems to have decided the maximum amount that she will pay

for this product.

California has a well developed fresh orange market. The quality of oranges grown there is well adapted to that trade. Therefore, frozen orange concentrate may replace only those fresh oranges which are purchased for juice preparation. There are some economic and convenience advantages of frozen concentrate as compared to fresh oranges when these products are purchased for juice purposes.

The question of whether or not total orange consumption will increase as a result of this new product is not yet definite. Many growers in Florida are setting out new orchards in anticipation of increased orange sales. However, California growers are more cautious. It is probable that canned orange juice and fresh orange sales will decrease slightly while frozen concentrate sales increase at a steady rate. This trend may continue until the market for frozen concentrate becomes stabilized.

Monthly sales of orange products are being stabilized by the sale of frozen orange concentrate. It is reasonable to assume that total annual orange sales will increase because the new product has lessened the usual summer decline in orange consumption.

The development of frozen orange concentrate has

increased grower returns in Florida and stabilized the prices of Valencia oranges in California at a reasonable level. It has provided a new outlet for surplus oranges and fruit of off sizes or with minor skin blemishes.

Oranges for the concentrate market can be transported from the farm to the plant in large bulk trucks. This provides a saving in labor and boxing materials over fresh oranges. Fresh oranges must be packed in field boxes on the farm and then transported to the packing sheds.

There are indications that the dehydrated orange pulp left over after processing is equal to rolled barley in feed value and makes a palatable feed for cattle. Many farmers in the areas of orange production make use of this feed. Orange pulp that the housewife throws away after making her own orange juice is often a complete loss.

California orange growers, as represented by their principal marketing agency, the California Fruit Growers Exchange, feel that the development of frozen orange concentrate will help provide another satisfactory market for their crop. This will lessen their surplus problem and stabilize the sale of Valencia oranges.

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