

Maintaining the Competitive Edge

in

California's Canned Fruit Industry

UC Agricultural Issues Center
Study Group

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September, 1992

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Preface

This report, one in a series published by the UC Agricultural Issues Center, points to the multi-dimensional nature of the challenges confronting peach, pear, and apricot growers and canners in California. It clarifies the issues and opportunities shaping the future for the state's fruit canning industry.

The UC Agricultural Issues Center launched its Competitive Edge series to provide a forum for evaluating the competitiveness of California agriculture. Each report will focus on the current trends and longer-run outlook for a California commodity or group of similar commodities.

This report was prepared by a cross-disciplinary study group of eleven experts, knowledgeable about the industry. Its purpose is to help canned fruit leaders make better informed decisions. It is our hope that we have achieved our goal.

Kirby Moulton, Study Group Chair

Harold O. Carter, Director, UC Agricultural Issues Center

Acknowledgements

This report is the product of a collaborative effort. In carrying out the project the study group relied on the knowledge and insights of a number of organizations and individuals. We gratefully acknowledge their assistance.

Barbara Watts of Apricot Producers of California, Tom Krugman of California Cling Peach Advisory Board, and Tom Elliott of Canned Fruit Promotion Service provided valuable information.

We extend special thanks to Henry Schacht, Gene Stokes and Tom Elliott for their careful review of this report.

Kirby Moulton deserves special recognition for his leadership of the study group and for drafting most of the report. Julie Spezia served as Agricultural Issues Center's coordinator, writer and editor. Ray Coppock and Carole Nuckton (now with Oregon State University) assisted Julie Spezia in editing the report. Sandy Fisher and Joyce Perz prepared this report for publication. A special thanks to Joyce Perz for the cover design.

Harold O. Carter
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EXECUTIVE SUMMARY

Competitive strategies to be considered by the California canned fruit industry include (a) lowering costs, (b) differentiating the U.S. product and (c) expanding demand.

Lower costs will be needed if U.S. processors are to compete head-on with efficient low cost producers in the canned fruit "commodity" market. They can be achieved through improved technologies that increase orchard yields. Improved cultural practices or new varieties could increase the conversion rate from raw product to finished product leading to lower fruit costs per case of output. New varieties that extend the packing season would lower unit overhead costs. Improved technologies in the plant could increase fruit recovery, reduce the cost of other inputs, or permit more efficient management practices. Continued technological innovation is essential to keep ahead of competition in a world where current technologies are rapidly spread to others.

Product differentiation requires the development of unique product specifications, packaging or services. It allows the U.S. product to be set apart from that of its competitors because of its better fit to market demands. This is really a demand enhancing strategy. It is needed along with other more traditional strategies like packaging and promotion so that the expected increases in world canned fruit supplies (primarily peaches) can be absorbed without significant price changes. A critical consideration is that the potential gains from promotion must be weighed against their costs. The North American market appears to be a promising promotion target because of its size and potential economic growth. The European market, on the other hand, will be principally served by added production from Greece. The Pacific Rim will remain a competitive market for products from California, Europe, Australia and South Africa.

Demand expansion strategies for California canned fruit processors and growers include additional promotion, improving quality products, tailoring products to changing consumer preferences, innovative packaging, differentiating products to earn premium prices, and identifying and serving "niche" markets that increase processor returns. This report takes care to separate the effects of price changes from other factors that affect the level of consumer demand. Price changes tend to alter the quantity purchased, but do not change the fundamental character of market

demand. The other factors, such as product improvement, promotion, consumer income, and the strategies of competitors, tend to shift market demand so that consumers are willing to buy more (or less) at each price level. These factors are important for the industry to analyze and respond appropriately.

Introduction

Before 1845 the only fruit trees growing in California were those planted by the Spanish padres around the eighteenth-century missions. Immediately after the War with Mexico and consequent occupation of California by the United States, several small orchards were set out near Monterey. A dozen others were planted by settlers in the Santa Clara Valley near San Jose and in the Sacramento Valley near Sacramento.

California's commercial canning industry stems from the primitive salmon cannery established by William Hume at the foot of K Street in Sacramento in 1852. This was followed by others, but as the salmon population waned from the sludge of gold mining, attention was turned to canned fruit. Pioneers in the industry such as Francis Cutting sold Mason jars filled with jams and jellies from shops in San Francisco in the early 1850s.

Canning technology evolved in the 1860s and, coupled with demand from New England sailors and Civil War soldiers, brought almost immediate prosperity to the canning industry on the Eastern seaboard. During this same period, California and Oregon developed their orchards so rapidly that only the rapid expansion of the canning industry saved the Pacific Coast states from disastrous overproduction.

By the 1880s, California fruit and vegetable processing had become a business of impressive proportions. Favorable soil and climate, the development of mechanical peach pitters, and lye peeling contributed to California's dominance as clingstone peach producer and canner.

Over the years the canned fruit industry has developed and changed. As a mature industry it still must adapt to change in the marketplace. The canned fruit industry continues to be an important enterprise

in California. The value of processed canned fruit (peaches, pears, apricots, and cocktail) is estimated at \$600 million.

While growers tend to specialize, processors are likely to process and market a variety of fruits and vegetables. For our study, we selected three commodities—peaches, pears and apricots—because these products have similar production procedures and problems, share processing firms, and face similar challenges in the marketplace. We identify the similarities and differences among those three commodities. Since both peaches and pears are used in fruit cocktail, we also look at that product.

In preparing this report, we adopted a long-term outlook, rather than focusing on immediate problems. We discuss the most important issues which include changes in consumer preferences and market trends, environmental constraints and regulations, and costs of production and processing. We pose the question: What strategies are needed if the California canned fruit industry is to maintain or improve its competitive edge?

Structure of the Canned Fruit Industry

California's canning industry has undergone significant change over the last 50 years. Consolidation of many small canneries to achieve economies of scale has led to larger and more efficient firms. Higher costs for wages, cans and sugar in the 1970s drove up the price of canned fruit, further weakening a sales already eroded by competitive products and changing consumer lifestyles.

At the farm level, improved cultural practices and varieties have enabled fruit growers to produce supplies of peaches, pears, and apricots for processing from fewer acres. For instance, California pear acreage decreased by 43 percent from 1970 to 1989, from 35,000 down to 20,000 acres. Yet the average production per acre increased by an equivalent percentage from 8.68 tons in 1970-79 to 12.41 tons in 1980-89. So average pear production in California remained the same at about 309,000 tons.

The canned fruit industry is complex, with a number of actors and entities affecting its competitiveness. Following the flow of the fruit (Figure 1), we see the bulk of the raw product being used by canneries, while minor amounts are diverted to fresh sales, freezing, and drying.

Normally, canneries contract with growers at the time of planting to ensure a stable supply of fruit. The contracts are usually for three years and are renewable for the life of the orchard. These contracts help control the raw product flow to the cannery, extending the season from the earliest to the latest maturing fruit. The controls, however, are not perfect; there are still times of scarcity and surplus of fruit.

Pear, apricot, and to a limited extent peach, growers also have the option of selling to the fresh market. This can be an important alternative depending on market conditions.

The process season for fruit begins in July and finishes in October, with some pears held in cold storage for later processing.

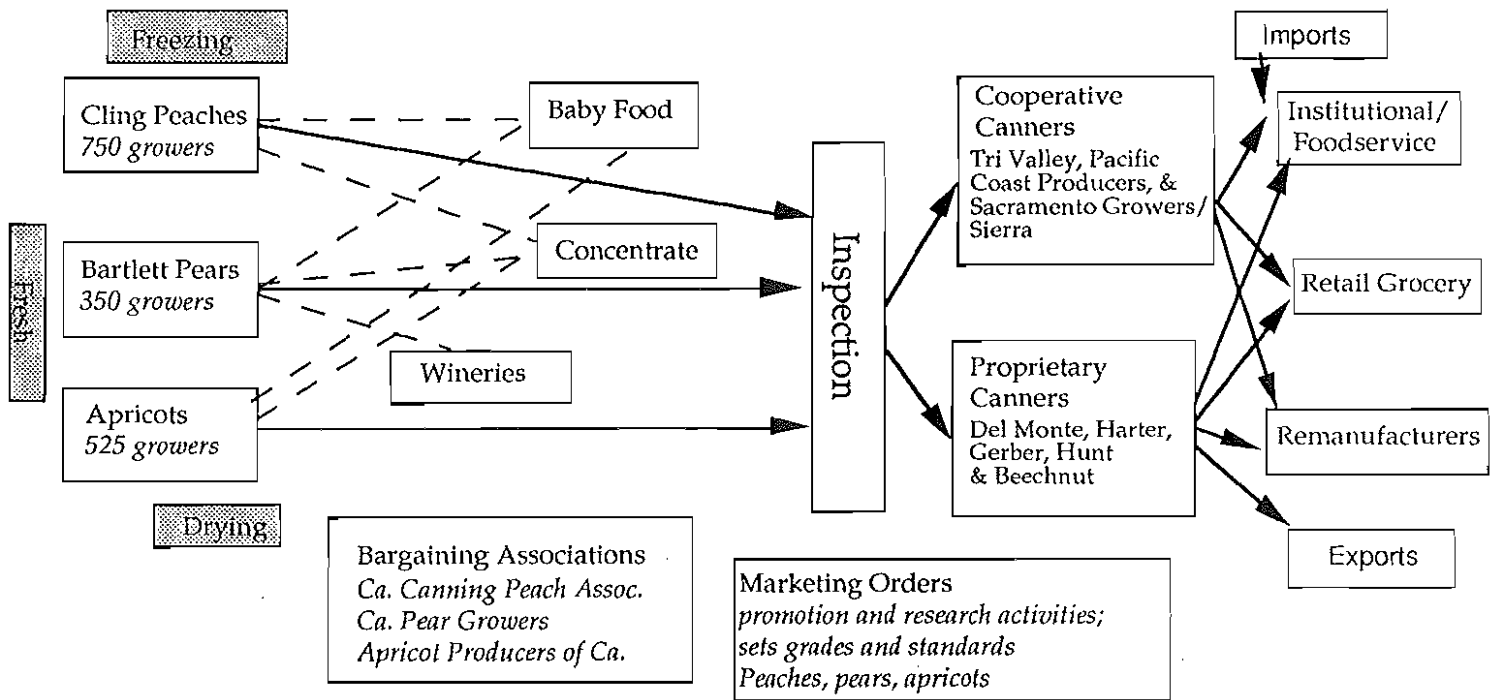


Figure 1. Structure of Canned Fruit Industry

Fruit is picked at its maximum size and maturity, with great care to avoid bruising. Several pickings are made to achieve uniform quality.

Each truckload of fruit leaving the orchard is randomly sampled by a neutral third party as a way of establishing the quality of fruit destined for processing. All commodities are inspected differently. For example, pears are inspected for shape, defects, and insect damage. Pressure tests are also conducted. It is considered a "clean ticket" if the sample has less than 5 percent damaged fruit; any more than 5 percent and the processor docks the amount paid to the grower for that shipment. Whereas cling peaches do not have similar tolerances; all defects are scored with emphasis placed on maturity. The State Shipping Point Inspection Service inspects pears, the Dry Fruit Association Inspection Service inspects apricots, and the Cling Peach Inspection Program inspects peaches.

The fruit is moved rapidly through the processing plant in order to preserve flavor, color, consistency and nutrition for the consumer. Once the pits and skin are removed, the fruit is rinsed, graded and sized. Then it is conveyed to the various production lines for processing into several products. The fruit is, at numerous check points during processing, inspected.

The fruit is put into cans and then moved through machines which add syrup or natural juice from concentrate. The filled cans are exhausted of air by means of either live steam heating (5-8

minutes at 212° F), or mechanical vacuumizing with vacuum syrupers. Finally, the sealed cans are sterilized in big rotary cookers for 25-40 minutes at 212 ° F, or shorter times of 12-20 minutes at 220-225 ° F in pressure cooker models. Immediately, the canned fruit is cooled and ready for labeling and packing into shipping cases.

Cases of canned fruit are marketed to consumers through retail outlets either as a branded or a private label (e.g. retailer brand) product. The most popular consumer sizes are the buffet (8 oz.), the No. 303 (16 oz.) and the No. 2 ½ (1 lb. 13 oz.). The foodservice industry mainly uses No. 10 cans (6 lbs. 12 oz.). The foodservice industry and institutional purchases make up 35 percent of the total canned fruit sales. The export market is less significant. California canned fruit processors currently export less than 5 percent of their product. The industry faces varying degrees of competition in domestic and export markets from foreign produced canned fruit.

Peaches

Peaches are classified as either clingstone or freestone. The difference, as the name implies, depends on whether the pit clings to the flesh of the peach or comes free with ease. Nearly all of the peaches raised for canning in the United States are grown in California and, of these, 95 percent are clingstone varieties.

The cling peach, with tight, protective skins and a pit that adheres to the flesh with great strength, traditionally has been the premier peach for canning. With an average annual pack of cling peaches at around 18 million standard cases (24 No. 2 ½ can per case), peaches are the most important fruit canned in the state. A small percentage of clingstone peaches are diverted for freezing but are rarely sold on the fresh market; whereas freestone peaches can be sold fresh, frozen or canned. Ninety-five percent of cling peaches are canned, either as peach halves, slices, baby food or in mixed fruit packs such as fruit cocktail.

Some 750 growers operate 30,000 acres of cling peach orchards in California's Central Valley. Harvesting runs from early July through mid-September, with four cling peach maturity classifications: extra early, early, late and extra late. Harvest usually starts in lower San Joaquin Valley (Kingsburg to Exeter) in early July. Extra late varieties complete the harvest in early to mid September in the Yuba-Sutter and Modesto areas.

Once harvest begins, canneries operate 24 hours a day to process the fruit before it spoils. Peaches can be stored for about two weeks in cold storage. Cold storage is essential during a hot

Processing fruit is tested for pesticide residue to protect consumer health and safety. The Department of Pesticide Regulation, Pesticide Enforcement Branch under the California Environmental Protection Agency (CAL-EPA) is charged with monitoring residues before processing. Formerly, under the California Department of Food and Agriculture, this department oversaw four different programs: Preharvest Monitoring Program, Marketplace Surveillance (for fresh produce), Priority Pesticide Program (focusing on materials of special concern), and Produce Destined for Processing Program. The reorganization under the newly created CAL-EPA coincided with the state budget crisis and the preharvest and processing programs were discontinued July 1, 1991. They had not been renewed as of May, 1992.

After fruit is processed it may be inspected according to federal food manufacturing standards. (CDFA's Processed Food Monitoring Program is inactive.) The Food and Drug Administration may inspect plants with canned product destined for interstate shipment. They determine their caseload according to the likelihood of food-borne disease or illness.

spell when the fruit matures quickly in the orchard, so the cannery may suddenly have a two week supply of fruit to process in one week.

"Grade pack" refers to those pears canned as pear halves or pear slices, and is used to distinguish those products from processed pears used in cocktail or mixed fruit.

Pears

Bartlett (Williams) variety pears account for at least 95 percent of California's pear production. Unlike clingstone peaches, Bartletts can be marketed for the fresh or processed markets. Today, 70 percent or more of California Bartlett pears are canned as pear halves or in fruit cocktail, about 15 percent are sold as fresh fruit, nearly 15 percent are used in winemaking, and a few are dried. Recently the cannery utilization of pears in California has declined by 17 percent, while the tonnage of pears marketed fresh has increased by 14 percent. An estimated 2.1 million standard cases of grade pears were packed in 1990-91.

California pears are grown almost entirely in the northern part of the state. During normal years, the Sacramento River district begins the harvest season in July. The Mendocino district pears begin maturing in the first week of August, and the Lake district pears are ready to harvest in mid-August. Pears are generally placed in cold storage for one month or more before processing. This encourages more uniform ripening, and lengthens the processing season.

Unlike peaches and apricots, pears do have domestic competition from the Pacific Northwest which, in 1991, packed 8 million standard cases. A small amount of Sacramento district pears are shipped to Washington to begin that region's processing season. Although Pacific Northwest canners have a different set of standards (preferring a pear with a longer, fatter neck) cannery pear tonnage shipped to the Northwest could increase unless grade pear processing increases in California. The canneries in Oregon and Washington have lower overhead and labor costs. However, they currently do not pack fruit cocktail because cling peaches are not grown in those states.

Apricots

About 55 percent of the tonnage generated by the 16,500 acres of apricots in California is canned. The remaining apricots go to the fresh market, to freezers or to fruit driers. The average annual pack for apricots is 4.4 million standard cases.

The dominant apricot variety for processing is the Patterson, although Tiltens are used as well. The harvest season for

Pattersons begins around mid-June in Contra Costa County. The apricot processing season runs from mid-June to mid-July. Apricots can be held in cold storage for only about one week.

Fruit Cocktail

Fruit cocktail is made up of peaches (30-50%), pears (25-45%), grapes (6-20%), pineapple (6-16%) and maraschino cherries (2-6%). Only 20 percent of the peach pack goes into cocktail, so cocktail is not as important a product to peach growers as canned halves or slices. However, California pear growers sell 80 percent of their processing crop for cocktail.

Canneries start packing fruit mixtures including fruit cocktail in late July when grapes from lower San Joaquin are mature. However, the packing season can be extended by using diced fruit canned earlier in the season. The extended season and the ability to use oversized fruit in cocktail processing increases plant efficiency and helps lower per case costs of finished product. The 11 million standard cases of fruit cocktail packed each year give California canners a unique market. The product also helps efficiency because it utilizes oversized fruit and extends the processing season.

Role of Bargaining Associations

Bargaining associations are formed by producers seeking, through group action, to improve their ability to bargain with processors. Since the early 1950s ownership of food manufacturing assets has concentrated in fewer hands. For example, in 1952 there were 42 canners of cling peaches in California, many of them family owned and situated near the orchards of the growers who sold their crops to them. Today there are 10 canners processing cling peaches. Similarly, the number of firms processing apricots has declined from 50 in 1960 to four in 1991. Only one processor accounted for virtually all of the grade pack pear processing in California and only four accounted for the cocktail processing.

As negotiators of contracts with processors, bargaining associations work to give producers more equitable market power. Additionally, they encourage market stability in the industry by diverting surpluses, such as the sale of non-standard peaches to Mexican processors for use in their domestic market.

The California Canning Peach Association (CCPA) is a cling peach grower cooperative that provides bargaining and marketing programs and services. CCPA represents 87 percent of all the non-cooperative membership tonnage; adding tonnage of the cooperative processors (TVG, PCP), CCPA accounts for 64 percent.

The California Pear Growers (CPG) is a bargaining cooperative that negotiates with canners and other buyers to obtain the best price it can get for growers. It is also active in legislative advocacy, primarily at the federal level, but increasingly at the state level as well. Membership is voluntary, and the organization is funded through cannery service charges. CPG represents 80 percent of the California Bartlett pear growers.

The Apricot Producers of California (APC) is a cooperative association providing information and services to its grower-members. Bargaining for a fair price is the association's major function. Both growers and processors (through service fees) provide financial support for APC. The association negotiates the price for 80 percent of canning apricots.

Competitive Issues Challenging Bargaining Associations

The issues that will challenge the effectiveness of bargaining associations in the future include:

- (1) Bargaining associations must be able to strategically plan for change. For example, bioengineered varieties with special characteristics such as resistance to disease or chemicals may segment the market by "franchising" or contracting growout to a limited number of growers, thus eroding the percentage of product the association represents.
- (2) Finding new outlets for surplus product will continue to be a challenge for bargaining associations. For example, the California Cling Peach Association will endeavor to market 100 percent of its member production through long-term contracts, development of markets, and expansion of juice and concentrate markets.

Processors—Cooperative and Proprietary

Both cooperative and proprietary canners sort and can fruit by grade. The product is stored in cans and is labeled with brand names or private labels which are usually store brands.

The biggest player in the state's canned fruit industry is Tri Valley Growers. Forty percent of the processing fruit tonnage in the state is processed by this grower-owned cooperative. Tri Valley purchases a portion of its needs on the open market (15 percent), with the remainder supplied by members. Tri Valley sells most of its canned fruit under retailer-owned labels such as Lady Lee or Townhouse. The largest part of the remainder is sold under its own brands, S&W and Libby, with a small portion marketed as Tri Valley. The cooperative sells domestically to retail, government, institutional, and restaurant markets and is also a major exporter.

Del Monte is another major player in California's canned fruit industry, processing peaches, pears, apricots and cocktail. It accounts for 35 percent of the state's processing fruit tonnage, much of which is purchased on a term contract basis. The firm contracts with growers to supply product for from four to ten years with the price negotiated annually. Historically, Del Monte was a major exporter but over time has supplied a growing share of its overseas markets from foreign subsidiaries. These subsidiaries were recently sold (spun off) when Del Monte was bought out by a management group. Ninety percent of the firm's product is marketed under its brand label, with small amounts sold under private label as conditions dictate.

There are four medium size processors in California. Pacific Coast Producers, a processing cooperative, cans 11 percent of the tonnage. Six to 7 percent of its product is purchased on the open market with the rest sourced from members. It markets peaches, pears, apricots and cocktail only through private label sales. Sacramento Growers is a raw product cooperative with a processor agreement with Sierra Quality Cannery (also known as Sacramento Growers Cooperative/Sierra). It has one facility in Sacramento and cans 6-7 percent of the tonnage. It processes only peaches and cocktail which are entirely sold as private label. Harter is a proprietary canner processing 4 percent of the tonnage in the state. Its one plant in Yuba City cans peaches exclusively and sells under private label. Sun Garden processes about 20 percent of California's processed apricots.

There are also numerous processors who handle smaller tonnages of California product. Two baby food companies, Gerber and Beechnut, purchase peaches, pears and apricots. Hunt-Wesson has a co-pack arrangement with Sierra for peaches and cocktail under its brand name. Hunt purchases the peaches from the California Cling Peach Association and then contracts with Sierra for the processing. J.R. Wood Inc. exclusively freezes cling peaches and purchases 2 percent of the cling peach tonnage.

Marketing Orders

A marketing order is a governmental legal arrangement enabling agricultural producers and processors to band together to conduct certain marketing activities that cannot be accomplished individually. Advertising, sales promotion, quality control and research may be included in a marketing order's activities. The Department of Food and Agriculture monitors state marketing orders. The programs are all funded by assessments on growers and processors.

The California Cling Peach Advisory Board's advertising and promotion activities are entirely generic, supporting all California cling peach products and fruit cocktail without differentiating between branded and private label. Consumer activities of the Board focus mainly on education, research, acreage statistics and public relations. Export promotion activity is carried on in cooperation with the Foreign Agricultural Service of the U. S. Department of Agriculture.

Since 1967, the processed pear marketing order has been managed by the California Tree Fruit Agreement, a conglomerate of federal marketing orders. In recent years, research activities in the pear industry have been funded exclusively by Pear Zone (a state marketing order for processed pears). Pacific Coast Canned Pear Service (PCCPS) is the promotional arm of Pear Zone and Oregon and Washington pear associations. It is involved in export promotion of canned pears from California, Washington and Oregon, with each state contributing funds in proportion to its tonnage. In the past, PCCPS has concentrated on the food service and institutional market segments, but lately it has moved into more direct consumer marketing.

A new cooperative effort, the Canned Fruit Promotion Service, will supplant the activities of the Pear Zone and PCCPS in regard to peach, pear and cocktail promotion in domestic markets as of July 1, 1991.

The Cling Peach Advisory Board promotes cocktail sales in conjunction with its mixed fruit committee (a combination of California pear and peach growers). It also has been involved in new product development, such as finding new types of fruit mixes that appeal to consumers.

The California Apricot Advisory Board serves the state marketing order for both fresh and processed apricots promoting the sale of California apricots and apricot products. The Board's program is financed by assessments on growers producing or selling 15 tons or more of apricots in a single season. The marketing program includes canned apricots (both retail and food service), dried apricots (both retail and ingredient manufacture), fresh apricots, frozen apricots, apricot nectar, apricot concentrate (puree).

Competitive Issues Challenging Marketing Orders

The issues that will challenge the effectiveness of marketing orders include:

- (1) How to survive in an environment of rising costs, tight budgets, and reduced political support. This is difficult because the benefits of services such as research and promotion are not easily measured, while their costs are all too evident. Improvement in efficiency and effectiveness will require cooperation among all elements of California's fruit growing and processing industry.
- (2) Orders must continue to create dynamic programs that not only increase sales opportunities for processor members, but also limit the potential for foreign product substitution in domestic and export markets. With market share being as much a function of supply as demand, the availability of a crop of sufficient size is of paramount importance. While supply management is now out of the purview of marketing orders, maintaining quality and uniformity of raw and finished product is important to success in all markets.

Consumer Demand for Canned Fruit

When making investment decisions, canning fruit growers, canning industry management, and investors must continually project and evaluate probable changes in quantities of various canned products that can be sold at a given price, or vice versa. The quantity levels are affected by U.S. population growth, prices of competing products, changing U.S. consumer preferences, foreign market conditions, and innovations or developments in product characteristics. These factors are often difficult to separate.

There has been a dramatic downward trend in consumption of canned fruits since the 1970s, which appears to have leveled off in the late 1980s (see Table 1 on page 17). A number of factors may have contributed to the decline in sales.

- Health concerns, particularly about the amount of sugar intake, may explain why some consumers purchased "lite" products sweetened with cyclamates in the 1960s. When a regulatory change stopped the use of this artificial sweetener, this market segment was lost for over a decade.
- Loss of European export markets created dislocation in the industry. Canneries were geared for size 2 ½ cans, preferred by Europeans but too large for the preferences of most American families.
- The increasing availability of alternative food forms means increased competition. Improved distribution of fresh fruit leads to competition between fresh and canned fruit on a year round basis in many markets.

Various market survey data indicate that consumer preferences for canned fruit vary with socio-economic characteristics such as age, race, income, and household size. As the mix of these characteristics in the total population changes, so does the average per capita consumption associated with given prices.

Ban on Cyclamates Rocked Canned Fruit Industry

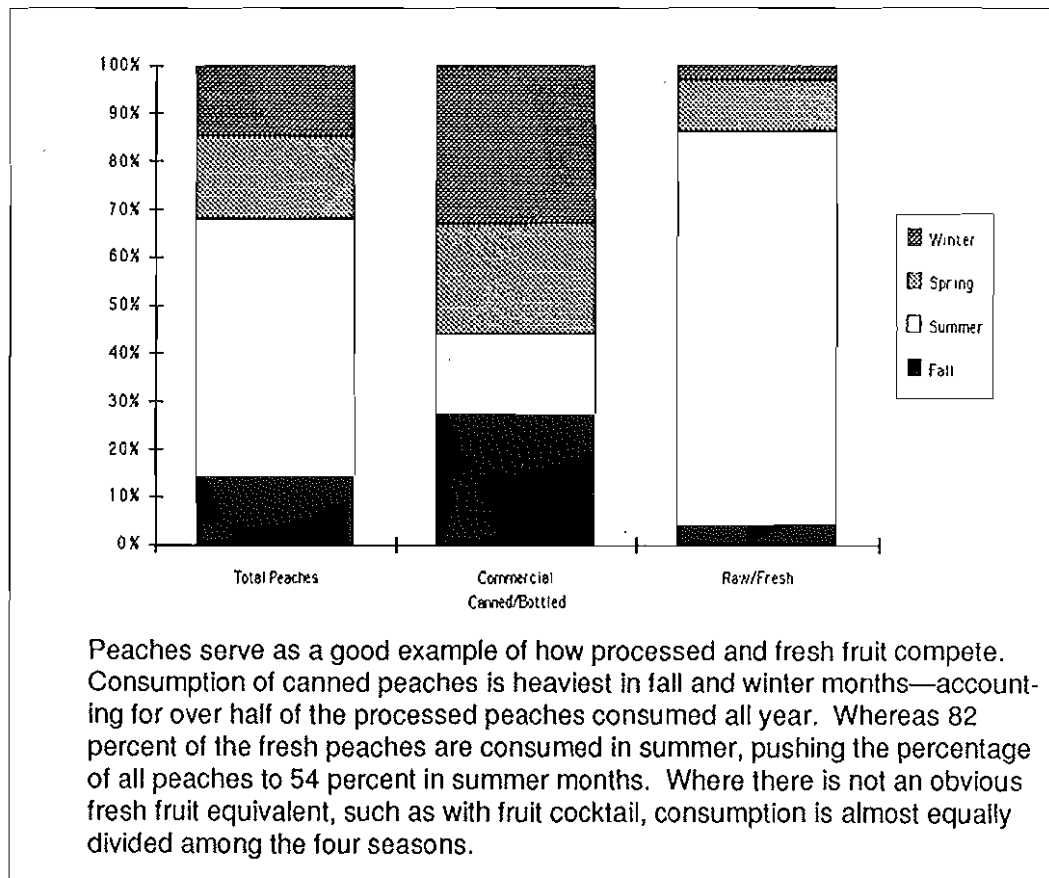
In October 1969, the Secretary of Health, Education and Welfare ordered cyclamates removed from the list of substances generally recognized as safe for use in foods. Production of foods and beverages containing cyclamates, an artificial sweetener widely-used at the time, was stopped immediately and products already on the market were recalled.

The canned fruit industry, which packs a year's supply of product at one time, was at the close of the late summer fruit harvest. Cyclamates were used in canned fruits marketed as a low-calorie alternative. California Cannery and Growers was left with 5 million cases (of a total pack of 24 million cases) packed under its Diet-De-light brand.

Market Reserve Corporation of America Information Services conducted a menu census based on 2,000 households across the nation in 1989. The findings suggest that the greatest per capita use of canned fruit were among the 0-5 and the +55 age groups. Dieters eat more canned fruit than non-dieters. With the exception of pears, purchase of canned fruit is skewed towards lower income groups—perhaps because of its price advantage over fresh fruit and the fact that its largest consumer group, seniors, often lives on fixed incomes.

The growing diversity of population within the United States presents both challenges and opportunities to the canned fruit industry. The fastest growing ethnic groups are Asians and Hispanics, yet relatively little is known about their food preferences. By 2000, over 30 million foreign-born Americans will assert their consumer preferences at the supermarket (compared to 10.5 million in 1970, 15 million in 1980, and 22 million in 1990). By 2000, one of three children will be Hispanic, Asian, black or American Indian. The population is becoming both older and younger. The youngest baby boomer is now 27 and births remain at the baby boom level of 4 million a year for the third consecutive year.

Although consumer purchase behavior is continually being monitored, it is difficult to separate the respective effects of nutri-



tion, health and convenience. It is also difficult to measure change in consumer preferences. The following is a general discussion of some of the trends most likely to impact canned fruit sales.

Raised awareness about health and nutrition continue to influence food purchases. The most recent Dietary Guidelines for Americans released by the USDA suggest maintaining a healthy weight, choosing a diet low in fat and cholesterol, and eating moderate amounts of a variety of foods. Caloric content of foods is also of concern. Consumers want to avoid sugar yet satisfy their longing for sweet-tasting food. The development of packed-in-its-own-juice canned fruit is a response to this consumer preference. In recent years loss in sales of fruit in heavy syrup has been made up by sales of fruit in its own juice.

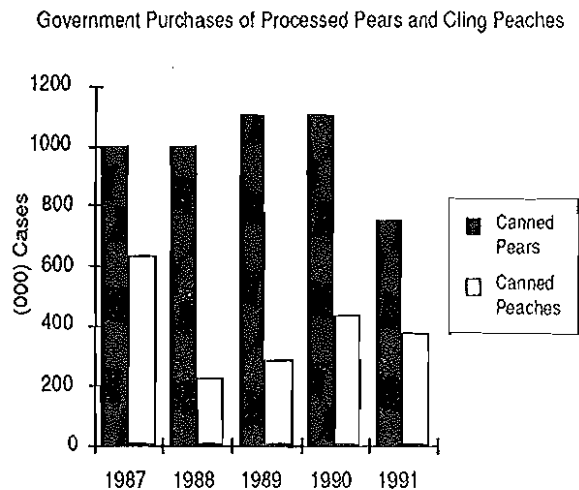
The demand for convenience is already being felt in the marketplace. While most canned fruit is still purchased in the form of the traditional can, the fastest growing segment of the canned fruit industry is the snack pack. Meanwhile, people are eating at home less; in 1989, Americans spent 38 percent of total food dollars away from home. However, the restaurant market has not been fully exploited by the canned fruit industry. Many menus offer neither fresh nor canned fruit.

When Americans do eat at home, the demand for convenience is still prevalent, hence the popularity of microwave-prepared foods. Eighty percent of American households own a microwave. Meanwhile, the fastest growing niche in the freezer section is children's meals. As the composition of American households changes and the proportion of single heads of households increases, the demand for nutritious, simple-to-prepare products will rise.

Institutional sales of canned fruit are significant to the industry. Government purchases of canned peaches and pears are important; these purchases help to remove excess supply. Canned fruit is used in the school lunch program, a venue that may expand as year-round school becomes more commonplace. Military purchases are not likely to increase, but purchases by correctional institutions probably will. In 1990 there were 700,000 prisoners in state and federal prison and another 300,000 in local and county jails. With a growing prison population, we can expect the current one billion prison meals served a day to increase.

While the canning industry has no control

The U.S.D.A. purchases canned peaches, pears, apricots, fruit cocktail and mixed fruit for various programs including the Emergency Food Assistance, the School Lunch Program, and the Needy Family and Other Related Feeding Programs. The level of purchases varies from year to year.



over the factors affecting consumer income, competitive product prices, and most demographic factors influencing consumer preferences, it can, through well conceived marketing strategies, influence demand levels. This includes directing advertising, merchandising, and promotion programs to appropriate groups and searching for ways to vary product characteristics and packaging to meet the changing preferences. Efforts of this sort may have helped in the apparent recent stabilizing of per capita demand, but a continuing effort seems required if further declines in demand level are to be avoided.

Demand for individual canned fruits is interdependent. The economic reports reviewed for this study did not measure the impact of competition between peaches, pears, apricots and fruit cocktail. However, the apricot industry recognizes that the prices of peaches and pears have had a profound negative impact on the demand for apricots. Apricot prices have remained consistently below those for peaches and pears and the decline in apricot volume actually preceded the downturn for all canned fruits that began in 1973-74.

Projecting Demand Levels in U.S. Markets

The ability to project future demand levels is critical to making current decisions about investments and operations. This ability is often frustrated by the complex economic, social and political relationships that affect industry profits. The following paragraphs report the results of several studies and their implications for future demand levels. These studies differentiate between changes in product purchases caused by altered prices and those caused by other factors (demand shifters) that change the amount purchased at every price level. Price policy is dependent on knowing the effects of price changes and product, promotion, and research strategies are dependent on knowing the effect of the other variables.

Table 1 shows that U.S. per capita consumption of the major canned fruits produced in California declined from the early 1970s to the mid 1980s, but remained relatively stable from 1985 to 1989. (It is impossible to compute per capita consumption values after 1989 because of discontinued reporting of pack and stock data).

If the *per capita* quantity that can be sold at a given price remains constant, we would expect the level of *total* demand (total quantity sold at a given price) to increase about 1 percent per year due to population growth. U.S. population has been increasing at approximately 1 percent per year and seems likely to continue to do so in the near future. On the other hand, if the per capita de-

Table 1. U.S. Consumption Per Thousand People
of Canned Peaches, Pears, Fruit Cocktail and Apricots, 1970-1989

Year	Consumption Per Thousand*				Four Commodity Total	U.S. July 1 Population (millions)
	Peaches	Pears	Fruit Cocktail	Apricots		
1970-74	102.7	44.1	54.2	17.1	218.1	209.9
1975-79	95.8	45.3	51.0	12.1	204.2	220.2
1980-84	74.9	38.7	39.7	8.3	161.6	232.1
1985-89	70.3	36.3	43.0	6.3	155.7	243.9
1985	69.4	32.4	39.8	8.5	150.1	239.3
1986	69.6	36.9	44.6	4.8	155.9	241.5
1987	70.3	36.2	40.2	6.0	152.7	243.9
1988	71.6	38.0	42.4	5.9	157.9	246.2
1989	70.9	38.2	47.8	6.2	162.1	248.8

*Market-year quantities in equivalent cases of 24 No. 2-1/2 cans;
Includes imports, excludes exports.
Source: computed from data in French and King; Wann; and
French, Eryilmaz and Blackman.

Table 2. Deflated F.O.B. Processor Prices
of Canned Peaches, Pears, Fruit Cocktail and Apricots, 1970-1989

Year	Deflated F.O.B. Price*				PCE Deflator 1988=1.0**
	Peaches	Pears	Fruit Cocktail	Apricots	
1970-74	17.54	22.68	21.54	20.62	.39
1975-79	18.12	21.64	21.88	22.45	.56
1980-84	18.90	20.95	22.56	24.72	.80
1985-89	19.31	20.17	21.79	24.01	.96
1985	19.83	22.16	22.67	22.87	.90
1986	19.71	21.26	22.93	25.05	.92
1987	19.22	19.56	21.98	24.74	.96
1988	19.35	18.87	21.10	24.15	1.00
1989	18.46	18.99	20.29	23.22	1.04

* Price (\$) per case of 24 No. 2-1/2 cans deflated by the Personal Consumption Expenditure deflator, 1988=1.0.

** Middle year value for five year periods.

Source: computed from data in French and King; Wann; and French, Eryilmaz

mand continues to decline due to changing consumer preferences, total demand may increase at a lesser rate, remain constant, or decline. Hence, it is of some importance to determine the causes of shifts in canned fruit sales. To do so we need to separate the changes in canned fruit sales due to price fluctuations from those due to the longer term shifts in consumer preferences.

Despite level or slightly declining "real" prices between 1980-84 and 1985-89, per capita consumption continued to drop for canned peaches, pears and apricots but grew for fruit cocktail. Assuming price flexibilities (the effect of quantity changes on prices) and elasticities (the effect of price changes on quantity) remained within the estimated range noted in the box on this page, the data in Table 2 suggest that there were (a) downward shifts in levels of per capita demand for canned peaches, pears and apricots, and (b) an increase in the level of demand for fruit cocktail. In other words, the changes in shipments were not due *only* to changes in prices.

While we have only a few observations from which to judge, it is of further interest to examine the data with respect to possible

Four Studies of Demand for Processed Fruit

Estimates of demand are provided in four recent econometric studies: French and King on canned peaches and fruit cocktail; Wann and Northwest Economic Associates (NEA), both on canned Bartlett pears and fruit cocktail; and French, Eryilmaz and Blackman (FEB) on canned apricots. These studies used historical records of prices and product movement, as well as factors affecting the level of demand such as consumer income, to estimate how quantities marketed have affected prices (or vice versa) and how demand levels have changed over time.

The four studies vary in the ways the demand models are specified and estimated. All encountered problems in accounting for difficult-to-measure effects of consumer preference changes due to changes in demographics and life styles. Changes in the mix of product characteristics (package types, styles, quality) and somewhat crude price data added to the measurement problems. It is not surprising, therefore, that estimates of price-quantity relationships varied among the studies, even for the same commodity such as fruit cocktail.

In order to compare commodity demands without reference to units of measurement, relationships between prices and quantities are commonly expressed in percentage terms. The percentage change in price associated

with a 1 percent change in quantity is called a *price flexibility*. For example, a price flexibility of -0.5 indicates that, with all other variables constant, a 1 percent increase in per capita quantity marketed is associated with a 0.5 percent decrease in price. When quantity is the predicted variable, the percentage relationship is called a *price elasticity* of demand. The elasticity is approximately the inverse of the price flexibility.

The empirical studies which expressed demand functions with price as the dependent variable (Wann, NEA, FEB) obtained price flexibility estimates ranging between -0.34 and -0.67, with -0.5 as the most representative number. A study by French and King, which expressed quantity as the dependent variable in the f.o.b. demand functions facing processors of canned peaches and fruit cocktail, obtained price elasticity estimates of -0.70 and -0.74. These numbers predict that with all other factors constant, a 1 percent increase in price would decrease the U.S. per capita movement of canned peaches by 0.7 percent and fruit cocktail by 0.74 percent. This suggests price flexibilities somewhat greater than one. The differences in results among these studies indicate that about the best that can be said as a generalization is that the price flexibility for canned fruit is probably between -0.5 and -1.4, or the elasticity of demand is between -0.7 and -2.

shifts within the more recent 1985-89 period. This time, per capita consumption of canned peaches, pears and fruit cocktail increased while that for canned apricots declined and then rose some, but did not regain its 1985 level. Again, the relevant question for industry management is: How much of this change was due to declining prices and how much was due to other factors?

Using the range of economic measurements cited in the commodity studies, it appears that the increase in canned peach consumption was lower than might be expected given the price decrease. Therefore, it appears that per capita demand was still declining but probably at a slower rate than previously. Perhaps some of the product changes or promotional efforts were paying off for the industry. For fruit cocktail, the consumption increase was about what might be expected due to price decreases and, therefore, there may have been no significant change in the level of per capita demand. Apparently the previously noted growth in demand declined. The evidence concerning canned pear demand is inconclusive and we are unable to determine if the growth in consumption is due only to lower prices. For apricots, the decline in consumption is greater than that expected from price increases alone and, therefore, it appears that consumer demand is still declining. If industry fails to increase demand through product development, promotion, or similar demand-enhancing strategies or if other factors do not foster increased demand, then industry must cut back on supply to match market needs at a profitable level.

If the per capita demand trends suggested by the 1985-89 data continue in the near future, we would expect *total* consumption of fruit cocktail (at a given price) to continue to increase with U.S. population growth at about 1 percent per year. The total demand for canned pears might also increase, but that trend is less clear. The downward movement in per capita demand for canned peaches and apricots seems likely to be about offset by the growth in population, thus keeping aggregate consumption near 1985-89 levels.

These economic results indicate that factors affecting canned fruit consumption including consumer preferences, product characteristics and market development must change in a new direction if the industry is to grow. Changes might result from industry initiatives in research, product development and promotion and from external forces beyond the industry's influence. The challenge facing industry managers is how to identify appropriate new strategies that will create the needed changes.

The Technical Aspects of Demand Projections

In support of the conclusions concerning demand changes between 1980-84 and 1985-89, note that the per capita consumption (disappearance) of canned peaches decreased by 6.1 percent while the deflated average price increased by 2.2 percent. With no change in demand level and a price flexibility of -0.5, we would expect a quantity reduction of 6.1 percent to be associated with a 3 percent increase in average price, rather than 2.2 percent. Hence, we conclude the per capita demand for canned peaches shifted downward. That conclusion is further strengthened if the price flexibility is assumed to be larger—i.e., more consistent with the French-King elasticity estimate of -0.7. The evidence supporting a downshift in demand level for pears and apricots is even more clear since in both cases average per capita consumption declined even though the average deflated price decreased.

For fruit cocktail, the average per capita consumption increased by 8.3 percent between the two periods. With no change in the level of demand and a price flexibility of -0.5, we would expect average deflated price to have decreased by 4.1 percent. Since the observed average price decreased by only 3.4 percent, we conclude that the level of demand increased. This conclusion is even more strongly supported if we assume the higher price flexibility levels consistent with the French-King elasticity estimate of -0.74 for fruit cocktail.

Considering the period 1985-89, note first that over that period the average annual change in the deflated price of canned peaches was -1.61 percent. With a price elasticity of -0.7 we would expect average per capita consumption to have increased by 1.13 percent (1.61×0.7). However, the observed average percentage increase was only 0.54, suggesting a further decline in the level of per capita demand, although perhaps at a lower rate than in previous period.

For fruit cocktail, the average annual change in per capita disappearance was a positive 5.1 percent. With a price flexibility of -0.5 we would expect an average change in price of -2.51 percent. Since the observed price change was -2.71 percent, we conclude that there was no significant change in the level of per capita demand.

For canned pears, the average 1985-86 to 1988-89 annual percentage changes in per capita consumption and deflated price were 3.71 and -3.74 respectively. With a price flexibility of -0.5 we would expect the price to decrease by 1.9 percent compared to the observed value of 3.74 percent, suggesting a decrease in per capita

demand. However, if the price flexibility were 1.0, a value still within the range of price flexibility estimates, -1.0 expected decrease would be the same as the observed decrease. Hence, the evidence of demand change for canned pears is inconclusive.

For apricots, the average annual percentage changes in per capita consumption and prices were -3.78 and 0.52 respectively. With a price flexibility of -0.5 we would expect the deflated price to have increased by 1.89 percent (a bit less with a lower flexibility and more with a higher flexibility). In any case, the expected price increase exceeds the observed increase of 0.52 percent, suggesting some further decline in per capita demand.

Global Competition in Canned Fruit

The United States dominates the global production of canned peaches, pears and mixed fruits (Table 3). In 1990, its output far exceeded that of any other country. Its canned peach production was 50 percent larger than that of Greece, and its canned pears and fruit cocktail production was three times that of Italy. However, its dominance in canned peaches has eroded as Greek production doubled and U.S. production dropped 39 percent between 1978 and 1988. The U.S. position in canned apricots is less imposing, ranking second to Greece but above that of other world producers.

The level of U.S. canned fruit imports varies by year. In 1989-90, they accounted for the following shares of total supply: peaches—10.3 percent; apricots—1.6 percent; canned fruit mixtures—1.4 percent; and pears—negligible. Principal import sources are Greece, other European Community countries, and Chile.

Table 3. Production of canned peaches, pears, apricots and fruit mix, 1990.

Country	Peaches	Pears	Mixed ^a	Apricots
	— 1,000 metric tons, net weight—			
United States ^b	353	209	272	32
Greece	252	c	27	46
Italy	80	37	80	c
Spain	65	10	c	12
France	34	24	25	c
Japan	21	c	4	c
South Africa	62	25	40	15
Argentina	41	c	6	c
Australia	37	47	24	8
Chile	26	c	2	c

^a Includes fruit cocktail and mixed fruit

^b Estimated by author based on industry interviews.

c indicates a negligible quantity

Source: USDA, FAS, *Horticultural Products Review*, May, 1991

The United States is no longer a significant exporter of canned fruit. However, historically the U.S. has exported large volumes of canned fruit (Table 4). Now because of the U.S. producers' large domestic market and their high production costs relative to many foreign producers, the United States ranks lowest of all major producing countries in the percentage of domestic product exported.

Greece is by far the largest exporter of canned peaches and canned apricots, accounting for almost 60 percent of the global total, excluding minor producers (Table 5). Italy is the leader in canned fruit mixes, including fruit cocktail, although export shares are more evenly divided among producers. Australia is the principal exporter of canned pears, followed closely by South Africa. This has not always been the case.

Major factors affecting global competition in the 1990s

The major factors shaping the competitive future of California's canned fruit industry in world markets include revised public policies, changes in production and processing costs, larger and more aggressive processors, and improved orchards.

Policy Changes

Recent policy changes affecting global competition include:

Implementation of the Canned Fruit Agreement between the European Community and the United States. This resulted in lower subsidies to EC canners and higher net raw product costs.

Table 4. U.S. Exports of Canned Peaches, 1978/79 to 1985/86 and 1990/91

	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86	1990/91
	Equivalent 24 - 2 1/2 cases								
North America	994,180	1,002,887	1,318,456	955,403	572,993	275,641	241,566	165,032	122,970
European Community	692,793	668,900	542,588	159,663	319,489	45,911	7,437	11,966	79,578
Other W. Europe	319,560	288,159	190,218	132,819	83,700	26,906	26,953	51,04	9,670
Middle East	43,530	39,176	48,538	44,415	45,735	64,235	27,866	21,676	20,941
Asia	1,043,243	817,570	649,790	562,155	618,138	312,474	197,509	393,738	616,302
Other	98,353	184,602	128,939	99,542	114,648	8,875	15,098	1,398	9,420
World Total	3,192,244	3,007,723	2,878,723	1,954,371	1,762,325	778,769	560,010	691,135	913,544
Value in Dollars ('000)	\$37,965	\$43,011	\$44,030	\$30,494	\$26,760	\$12,979	\$10,472	\$11,708	\$17,311

Source: Bureau of Census, Department of Commerce; Foreign Agricultural Service, U.S.D.A.; Cling Peach Advisory Board.

Table 5. Exports of canned peaches, pears, apricots and fruit mix, 1990.

Country	Peaches	Pears	Mixed ^a	Apricot
	— 1,000 metric tons, net weight—			
United States ^b	18	3	28	c
Greece	232	c	25	44
Italy	45	30	56	c
Spain	9	5	c	15 ^d
France	3	1	c	c
Japan	c	c	c	c
South Africa	55	25	39	15
Argentina	10	c	2	c
Australia	19	33	14	3
Chile	13	c	1	c

^a Includes fruit cocktail and mixed fruit

^b Estimated by author based on results June 1990 - March 1991.

^c indicates a negligible quantity

^d export level exceeded production because of high beginning stocks

Source: USDA, FAS, *Horticultural Products Review*, May and June,

Raw product costs for peaches increased from \$128 per ton in 1988 to \$183 in 1989 in Greece. Similar results were evident in the per ton cost of pears for processing in Italy. This raised finished costs by about \$1.24 per case and reduced the cost difference between Greece and California.

The dissolution of the canned fruit marketing board in Australia ended the practice of single desk selling that allowed non-competitive domestic prices to subsidize competitive export prices.

Boycotts of South African products in their traditional markets have led to the development of new markets in the Pacific Rim, replacing markets lost in Europe, and a focus on bulk packs where country of origin may not be as important. Economic sanctions against South Africa were relaxed if not eliminated in 1991. This could well lead to an expansion of South African exports of canned peaches, pears and apricots (especially concentrate) to North America and provide a stimulus for expanded production in South Africa.

The 1991 application of Argentina to obtain GSP treatment for processed pears would result, if successful, in the duty free entry of processed pears from all countries already receiving GSP benefits. This would stimulate added investment in processing in Argentina where pear processing has been principally to produce pear concentrate.

Subsidies In the European Community

Subsidies affect competition in the canned fruit industry by distorting prices. European Community (EC) subsidies are designed to support prices, encourage investment and modernize production. They are high relative to promotional aids, interest rate incentives, and other indirect subsidies paid by other countries.

The Community's processing subsidy recognizes that its grower production costs are higher than those in the outside world. Consequently, growers need high prices and processors need subsidies if they are to remain competitive with non-EC processors. The subsidy and minimum grower price system is operated through a complicated system of contracts. Prices are set by the Commission (the Community's administrative body) only in the processed sector; elsewhere they are set by the Council (the Community's policy body).

Currently subsidies are paid for production within quotas established by the EC for each of the producing countries. Limits on processor subsidies are set so that the net (after subsidy) price paid by processors for peaches or pears would be no less than the trade weighted average of farm gate prices paid in main, non-EC producing countries. A complex set of rules governs the calculation of these subsidies. The precedent for this arrangement was established in the Canned Fruit Agreement between the EC and the United States covering processed peaches and pears.

The EC establishes minimum grower prices in terms of European Currency Units (ECU) which are converted to Greek, Italian or Spanish currencies (for examples) using the politically determined "green rate" of exchange. Manipulations of the green rate may result in different price signals to processors and growers than implied by changes in the ECU value of the subsidy. For example, the minimum grower price for processing peaches was unchanged in ECUs between 1988 and 1989, but when converted to Greek drachmas, it increased by 21 percent and encouraged growers to produce for processing. The subsidy is paid for raw products that meet minimum standards, hence there is little grower incentive to favor quality over quantity unless processors are willing to pay a price premium.

Growers may also sell "surplus" fruit into the EC withdrawal scheme when fresh market prices fall below a specified level. The withdrawal system is used principally for fresh market fruits (and vegetables) and is designed to assure a "reasonable" price for fruit sold on the open market. But it is also used for peaches and pears that would otherwise be used in processing. This is straightforward for pears which shift between fresh market and processed use depending on price differentials. Cling peaches, however, are almost exclusively used for processing. Nevertheless, they are eligible for the EC withdrawal program. About 26 percent, or 77,000 U.S. tons, of the clingstone harvest in Greece in 1988-89 was sent to withdrawal. This diversion jumped to 204,000 U.S. tons in 1989-90, 46 percent of total clingstone production.

The withdrawal program is a significant factor in reducing grower risks. The anticipation of Greece's entry into the Common Market, the profitable levels of the minimum grower price and the risk reducing character of the withdrawal price stimulated an expansion of cling peach production and a doubling of canned peach output between 1978-80 and 1988-90.

The European Community also provides assistance in the modernization of its agricultural sector through capital grants and/or low cost loans. In general, it doesn't finance expansion in capacity. As of 1990, the last grant for peaches and pears was in 1988 and it was for modernization. Projects designed to encourage the planting of better varieties of peaches and pears, such as the orchard restructuring project in Greece, are eligible for aid.

National governments have continued to devise agricultural development plans and finance them, where possible, through the EC subsidy system; and, where not possible, to encourage investment through government loans at less-than-market interest rates. These governments have also tended to support cooperatives through grants and loans that assure their long-term survival. Proprietary firms object to the special financing for cooperatives because it changes the competitive relationships between cooperative and private firms. Interview results suggest that cooperative fruit canners tend to be higher cost operators than private firms despite the coops' preferential treatment.

In Chile, the government was instrumental in facilitating the expansion of fresh fruit production and exporting. Government interest in diversifying into the processing sector could lead to investment incentives for development of that sector over the next decade.

Changes in production and processing costs

The United States is a high-cost producer of canned peaches and pears relative to most global competitors. This situation results in part because European processors are highly subsidized and because U.S. salaries and benefits are higher than those in most competing countries. The results are evident in the example of peaches presented in Table 6. U.S. raw product costs to processors were the highest of the major producing countries in 1988, and its finished cost was second only to Italy which is not an important source of peach exports.

Greek, Italian and Spanish processors were subsidized by the European Community so that their net raw product costs were below those in many other countries. These subsidies contributed to a low finished cost in Greece, but were offset by operating inefficiencies in Italy and Spain. South Africa's finished costs reflect a very favorable exchange rate, low labor rates and efficient processing. Chile's costs are low for much the same reason, although processing costs are higher than in South Africa. These cost estimates are derived from varying accounting systems and may not be strictly comparable, but they provide a general idea of actual cost differences.

Costs for processing pears follow a similar pattern but are generally lower, on a per case basis, than those for peaches because of lower pear prices and greater processing efficiencies. In Australia, California and South Africa, the difference as reported by processors is about \$1 per standard case. Economic sanctions were well on their way to removal after South Africa's plebiscite in 1992. Although data from Spain appear to show processed pear costs to be \$3 below peach costs, their packaging and syrup specifications are different from those in the United States. Adjustment for these differing specifications results in only a \$1 difference in standard costs. Data relating to apricot production and processing costs were not collected.

Wages differ significantly among the various producing countries. In 1988-89, they were lowest in Chile and South Africa, and highest in Italy, Australia and the United States (Table 7). Low wages do not always indicate that production and processing costs are lower, since inefficiency can offset wage advantages. For example, peach and pear production costs in Greece and Spain

must be subsidized to make them competitive on world markets even though wage rates are low relative to the United States. Labor is a small component of processing costs (less than 10 percent of total costs in Greece) and cannot confer great cost advantages at the processing level. However, in countries like South Africa and Chile, low labor costs are combined with efficient production and processing practices to produce canned fruit at low costs.

Labor cost differences have the most impact where technologies are similar between competing countries. South Africa illustrates this point because it combines a favorable exchange rate with modern cultural and processing technologies and low hourly wages. The result is a low grower price, \$137 per ton in 1988, a high case pack-out per ton of peaches, and the lowest finished goods cost of any major processing country. Argentina provides a counter example because low labor costs there are partly offset by small sized and relatively less efficient processing plants.

Table 6. Estimated Costs for Producing One Standard Case of Canned Peaches, 1988

Producing Country	Grower Price ^a \$/U.S. ton	Peach Cost ^b \$/case	Other Cost ^c \$/case	Total Cost \$/case
Greece	128	2.88	8.62	11.50
South Africa	137	3.08	6.92	10.00
Italy	152	3.42	12.08	15.50
Argentina	154	3.47	9.03	12.50
Spain	159	3.58	9.92	13.50
Chile	173	3.89	7.61	11.50
Australia	199	4.48	9.02	13.50
U.S.A.	213	4.79	9.70	14.50

a In the case of EC countries this is the difference between the price paid to the grower and the subsidy received by the processors. For other countries it is the average market determined grower price as paid by processors. In 1989, the EC established grower prices and processor subsidies per metric ton were:

Greece	\$303	\$120
Italy	325	128
Spain	322	114

b Grower price per ton divided by 44.44, the estimated number of cases per ton of peaches. This conversion rate has not been adjusted to reflect differences between countries and between years.

c The difference between finished costs, which were estimated by persons interviewed, and the per case equivalent of the grower price.

Source: USDA- Foreign Agricultural Service, Horticultural Products Review, 1988; personal interviews, 1989; and Moulton, Kirby "Status of the Canned Fruit Agreement with the EC", Department of Agricultural and Resource Economics, University of California, Berkeley, July, 1989.

Larger processors

Many countries are following the pattern of the United States toward fewer and larger processors. However, none of the foreign processors has achieved the scale of California's major operators. Larger firms tend to be more sophisticated in their production and marketing, reaching out to foreign sources for supplies and seeking foreign markets for shipments. For example, both Del Monte and Tri Valley have purchased canned peaches from South America and a South African processor has invested in a Greek processing plant to augment export supplies. Such firms also have the capability to increase consumer demand through their promotion and product development strategies and may influence their sales through pricing practices.

Improved and expanded orchards

Growers in most producing countries are improving their peach orchards. Average yields in California increased from 13 ton per acre in 1967-69 to 18 tons in 1987-89. Current levels are higher than in most other countries and indicate what might be done as others improve varieties and irrigation and cultural practices. Greece, ranking second in peach production and first in peach exports, has an active program to improve its orchards and lengthen the processing season. Peach orchards in Spain are shifting to more productive sites. Chile is examining ways to improve its orchards and expand production.

Table 7. Estimated Hourly Labor Costs, Including Benefits, for Unskilled Workers in Processing Plants, 1988-1989

Country	\$US per hour
South Africa	1.02
Greece	3.60
Italy	11.00
Spain	4.78
Chile	0.70
Argentina	0.94
Australia	8.50
California	11.33

Source: Interviews conducted in each country (except South Africa) during January - April 1989. Where interview estimates differed, a choice was made based on judgement of the interviewer. The results are indicative of general cost differences between countries. California figure is for Teamster wage for sorting labor plus 34.6% benefits; data provided by California processor.

The pear situation is more complicated by the dual use of the principal processing varieties. Australia, South Africa and Italy have ample supplies of pears that can be sold to the fresh market or to processors. Argentina has directed its attention almost entirely to the fresh market, and processes relatively few pears except into concentrate. In each of these countries, however, there is the potential for improved yields that will reduce raw product costs to processors.

The research was conducted by the University of California and supported by the California Cling Peach Advisory Board, the California Tree Fruit Agreement (for the pear industry), and the U.S. Department of Agriculture.

Projecting Change in the Nineties

During the course of Moulton's research in 1989 and 1990 on global competition in the canned fruit industry, data were collected, and interviews conducted in 15 countries. Most interviewed were pessimistic about the long run outlook for canned fruit. Exceptions were in Greece and Chile (and to some extent in Argentina) where low cost producers anticipated gaining market share in peaches from higher cost producers such as the United States, Australia and Italy. Processors in Spain believed that investment opportunities were more promising in value-added products, mandarin oranges, and other specialty products. Some consolidation of processors is expected in Spain which may alter long-term strategies for peaches and pears. It is apparent that Spanish producers believe fresh market pears to be a better profit opportunity than canned pears. The overall tenor of the global interviews was that canned deciduous fruits were not very profitable items.

Pessimism about the future for canned peaches is contrary to trends between 1980 and 1989. During that period, average annual consumption world-wide increased by 2.7 million cases (6.4 percent) from approximately 43 million cases to 45.5 million cases (USDA, Federal Agricultural Service). Consumption in the United States dropped, as noted earlier, but in other countries it increased more rapidly than the world average, opening up new marketing opportunities. Other countries were able to increase shipments because of added production and certain price advantages (subsidies or low production costs). U.S. production declined from approximately 22 million cases to 16 million, exports dropped sharply and imports rose. The loss in U.S. production was more than offset by a gain of 10.5 million cases in other countries. A disturbing factor, and one that contributed to the pessimism noted above, was the build up of non-U.S. canned peach inventories during 1987-1989 that accounted for 1.4 million cases. The concern of California processors, of course, was over the loss of world market share to non-U.S. processors during the decade of the 1980s.

Growers in California sensed a change in conditions after 1985 as per capita consumption appeared to stabilize and "real" prices for canned peaches remained higher than in previous years (Table 2). They responded by planting more acreage that will add to California's cling peach supplies over the next five years. Growers in Greece and other countries increased production because of actual or subsidy-induced cost advantages and because consumption appeared to be increasing in many countries. The prospects of increased grower prices under the E C's Common Agricultural Policy also was a factor in expanded production in Greece and Spain.

The future course of pear production for processing is more problematic because of a closer link between fresh and processed use. Processing could be significantly expanded from present levels by relatively modest diversions from fresh market utilization.

Australian processors are reportedly investing in expanded pear production in the belief that they can displace South Africa as a leading supplier to Canada. They are also counting on increased sales of pears packed in juice. High production and processing costs may limit this expansion and orchards will need some renewal to meet industry quality requirements. The costs for raw product and labor are high relative to several competitors, although the plants are modern and efficient. One industry executive claimed that it cost about \$13.00 to produce a standard case of pears and \$14.00 to produce canned peaches in 1989. At that time, Australian processors could land pears in New York for about \$20 per standard case and still make a good profit. Changed economic conditions in 1991 brought the Australian industry into serious financial difficulty as high costs and low prices squeezed the major processors. This may have derailed plans for expanded processing.

Interviews in Chile, Argentina, Greece and Italy uncovered little interest in expanded orchards or facilities for canned pear production. Argentine processors have maintained a strong interest in the production and export of pear concentrate.

The forces shaping competition in the nineties will result in expanded peach production, narrower quality differences between producing countries, lower prices unless demand is stimulated, a changed pattern of U.S. imports, and a new set of buyer preferences.

Expanded Production

The world production of peaches for processing is likely to be 110,000 U.S. tons higher in 1995 than it was in 1989, a growth of about 10 percent. This would add 5 million cases or so to current

world pack levels. Although the projection is highly speculative, about 50,000 additional tons are anticipated in Greece due to its orchard improvement program and 60,000 tons in California due to expanded acreage. Projections for Greece are confusing since the government projects an expansion even though large volumes of cling peaches are removed from the market through the EC fresh market price support program. Should such diversions cease, canned output could increase without added orchards. The industry in South Africa has expressed a need for about 15,000 tons more but new planting rates through 1988 were inadequate to support that need.

Spain's Ministry of Agriculture projected no growth in peaches for processing between 1984 and 1992. However, peaches used for jams, purees and juice were expected to increase by 70,000 tons and some of this could be shifted to canning if economic conditions dictate. There is little evidence that production levels in Australia, Italy, or Argentina are likely to change significantly.

Projections for pears are much less certain. Plantings are more likely to respond to changes in fresh market prospects since most processing countries have doubts about the canned pear market. Subsidies in the European Community will make it profitable to maintain pear orchards in production longer than market forces would otherwise dictate. Consequently there is a continuing potential for expansion of canned pear production by diversion from fresh market use without a corresponding investment in new orchards.

Processors in the European Community do not receive subsidies for canned apricots. Consequently, grower planting and processor investment is more finely tuned to anticipated market needs.

Better Quality

Orchard improvement programs and better processing methods are likely to result in improved peach quality in Greece, Chile and Argentina. Greece's production currently yields about 50 percent "choice" quality. U.S. buyers in Chile and Argentina are controlling or monitoring quality in processing plants and contributing to improved product quality in both those countries. It is expected that South Africa, Spain, Australia and the United States will maintain their current quality levels. The implication is that California canned peaches will not be able to earn quality premiums against foreign competition as easily as in the past.

The situation in pears is different. Processing in all countries is predominantly of the Bartlett (or Williams) variety. Therefore,

improved quality is more likely to come from better cultural and handling practices than from varietal changes. Processing technology is similar in the major producing areas. Consequently, product quality, grade for grade, is likely to remain about as it is.

Lower Prices

Grower prices for cling peaches in California, after being corrected for inflation, fell 21 percent between 1974 and 1990, a period in which production and acreage dropped also. Yield increased by one-third and offset the price drop so that the remaining growers found that their average revenue per acre (expressed in real dollars) rose from \$2,721 to \$2,879.

During this same period, real f.o.b. prices per standard case of peaches declined about 8 percent. The net result is that, in real terms, the average cost of peaches used in each standard case declined \$1.03 (21 percent), the f.o.b. price dropped \$1.35 (8.2 percent), and the processor's margin (the difference between the f.o.b. and raw product prices) decreased 32¢ (2.7 percent). This suggests that price weaknesses in the finished goods market were mostly passed back to growers and were offset through increased yields. The trade benefitted because lower raw product prices and slightly lower processor margins were able to sustain lower f.o.b. prices. The implications of this for analyzing changes in demand are discussed in a previous section.

Grower prices for pears declined in real terms also. Between 1955-60 and 1984-88, they dropped from the equivalent of about \$2 per standard case to \$1.29 (expressed in constant 1967 dollars). The f.o.b. prices (in constant dollars) declined from \$7.96 to \$5.97 per standard case, or 24 percent. Consequently, average processor margins narrowed from approximately \$5.96 to \$4.68. Clearly, some growers and processors could not survive this change and were forced out of the industry. Those that remain have high yields, efficient management, and improved technology.

This past relationship between production and prices is important because it supports the likelihood that peach and pear prices will decline further in the presence of increased California production and expanded supplies from Greece and other countries. The amount prices will change depends on what happens to demand. If demand increases in major markets (due, for example, to population growth) then price drops could be minimal.

Changes in U.S. Imports

Increases in world peach supplies will put pressure on the U.S. market as Greece, Chile and South Africa (if boycotts are eased) seek to sell their added production. U.S. import prices will probably decline leading to increased imports and lower domestic prices.

Prices were deflated by the GNP deflator. Peach cost per case was based on 44.44 cases per ton, with no allowance for changes in processor efficiency over the period. The reduced processor margin may have been absorbed through improved efficiency. Data on pears were provided by the California Pear Growers Association. See California Canning Peach Association, "Cling Peach Almanac, 1991" for production and price data.

The analysis by French and King, cited earlier in this report, estimated that the price elasticity of demand for canned peaches at the f.o.b. level was -0.7 over the period studied. The demand for imported canned peaches may be more price elastic because about three quarters of imports are in number 10 cans or larger, destined for the institutional trade. Purchases by that trade tend to be by specification and brand has little importance. Consequently price is likely to be more important in the purchase decision than it is for retail packs. Analysis of data between 1970 and 1988, using four equations to model domestic and import demand and supply, produced an estimate that the price elasticity of demand for imported canned peaches was -4.1. This same elasticity may apply to U.S. products in the same market since they are probably interchangeable with foreign supplies. The model estimated that the price elasticity of demand for domestic canned peaches sold to all domestic markets was -0.62, quite close to the French and King results based on an earlier period.

Analysis of canned pear import data yielded a similar result, although it is difficult to interpret because of the volatile pattern of imports over the period. Moulton and Liu estimated a 2 equation system for import demand and supply and calculated that the price elasticity of demand for imports is likely to be between -3.0 and -3.9. The system did not generate an estimate of the elasticity of demand for domestic canned pears. The study by Wann, cited earlier, estimated a price flexibility of demand for all canned pears of -0.5 which implies a price elasticity of -2.0. Thus, it appears that the demand for domestic and imported canned pears is relatively price elastic but the data do not permit a conclusion that it is greater for imports than for domestic canned pears.

Changes in Tariffs and Subsidies

Negotiations under the General Agreement on Tariffs and Trade (GATT) could result in a lowering of the U.S. tariff on imported canned fruit. Subsidies would also be subject to reduction under such an agreement. Lacking an adequate trade model that incorporates the effects of changes in tariffs and subsidies, we turn again to the price elasticity estimates from studies of U.S. canned fruit demand and supply.

If EC subsidies and U.S. tariffs on canned peaches were reduced in equal proportions, then reduced EC subsidies would raise processor costs sufficiently to offset the lower prices gained through tariff reduction. Duty paid prices for EC canned peaches in the United States would remain about the same as long as the same percentage cut was applied to tariffs and all relevant subsidies. The principal concern of the U.S. industry is that not all

subsidies would be reduced or that national programs would offset negotiated reductions in EC subsidies. Imports from non-subsidized suppliers such as Chile, Argentina or South Africa would not be subject to policy-induced cost increases and would benefit fully from the U.S. tariff cut. If such supplier have adequate capacity, they could replace much of the Greek product in the U.S. market.

A similar situation exists for canned pears for which the EC subsidy and the U.S. tariff are reasonably close in value. If the processor subsidy and the U.S. tariff were both completely removed, the duty-paid price for imported pears from the EC would be less than 3 percent higher than they were before the cuts. Imports from low cost non-subsidized suppliers would not be subject to policy induced cost increases and would benefit fully from the U.S. tariff cut. If such suppliers have the capacity, they would replace EC suppliers to the U.S. market.

The situation for canned apricots would be different because EC processors are not subsidized. They would, however, benefit from U.S. tariff cuts, especially if they had a cost advantage relative to U.S. processors.

U.S. processors of canned fruit believe that the North American Free Trade Agreement (incorporating the already agreed free trade agreement with Canada) will benefit the canned fruit industry. Such an agreement could improve the competitive standing of canned fruit in the Canadian market relative to EC, Australian and other suppliers—as long as Canada does not grant similar preferential treatment to Australia or other suppliers. Mexico is perceived as a potentially good market for canned fruit because there is little domestic competition and there appear to be reasonable opportunities for growth.

Production Issues Affecting Future Costs and Competitiveness

Fruit production in California is dynamic as growers react to expected market prices, their costs of production and changing land values and uses. Growers are particularly sensitive to the market when they make their planting decisions. Once the trees are in, they must depend on their ability to control product quality and costs. This ability is a management tool and directly related to competitiveness. The decline in cling peach bearing acreage from 41,000 acres in 1980 to 26,000 acres in 1990 is evidence of producers' ability (and need) to respond to economic conditions caused by reduced demand and increased yields. Similar declines occurred in pear and apricot acreage as growers sought to reduce costs and increase productivity.

Productivity per acre has increased for fruit crops due to improved varieties and cultural practices. However, we cannot assume that this upward trend in tons per acre will continue forever. More pesticide regulation is likely; labor costs are increasing; and competition for land is more intense. Thus, the fruit producer's efforts to maintain or increase competitiveness will depend on efficient management.

Changes in varieties

Changes in fruit varieties used for processing come slowly. It takes several years of testing a new variety under orchard conditions to determine its sizing, quality, defects, productiveness and its processing merits and problems. Plantings require a major investment by growers and do not usually bear fruit for three or four years. If a poor performing variety is chosen the industry suffers quality and financial problems. Historically, the process of variety change has taken 20 years from the time of first orchard testing until full industry usage. Examples of this long testing period are the Patterson apricot (1963-1985) and the Dr. Davis cling peach (1968-1986).

Variety development, selection and testing for processing quality are conducted by private breeders, the USDA or the University of California. Often promising varieties are found as chance

seedlings in commercial orchards by growers. In the past, much of the development of new varieties was supported by private breeders and cannery representatives. Today the potential sales from a new variety are insufficient to attract the involvement of many private individuals.

The University of California with support from industry funds is developing varieties of cling peaches and in a more limited way of apricots. Research is aiming for cling peach varieties that are extra early and early season, with good size, yield, firmness, flavor and no pit problems. Earlier maturity can spread the season forward, helping utilize plant capacity.

The Bartlett pear is the only variety used for processing anywhere in the world. U.S. and other processors have used the Bartlett exclusively for nearly a century; yet there are no processing pear variety development programs anywhere in the world. An even greater need is for a rootstock development program that can create a dwarfing or semi-dwarfing rootstock to reduce tree size as an aid in harvesting. Harvesting existing trees often requires a 14 foot ladder, a practice that may become prohibitively expensive. As other fruit crops develop tree training and pruning programs and/or dwarfed rootstocks, the pear industry may need to replace tall trees in order to compete with other fruit crops for labor.

Apricot varieties are undergoing continuous change. The Patterson variety, developed by private breeder Fred Anderson, is currently replacing the Tilton which, in turn, replaced the Blenheim for processing in the 1960s. Although the Patterson is a new and well accepted processing variety, it could be replaced as breeders seek even better physical and economic characteristics in a processing fruit.

Change in Cultural Practices

The development of smaller-sized, more closely planted orchard trees is a trend that will continue in fruit production. Dwarfing rootstocks help restrict tree size and make high density orchards easier to manage. For instance, with dwarfing rootstocks the apple industry has changed from orchards of giant trees (30 feet high planted about 70 per acre) to medium height orchards that can be partially or completely picked from the ground, with 300 to 500 trees per acre. Currently, dwarfing rootstocks are not available for peaches, pears or apricots, but their development could reduce labor costs 50 percent.

Without dwarfing rootstocks, tree height can be partially controlled by severely bending limbs when trees are young and/or

tree limb bending of closely planted trees, with or without trellises, is double that of standard vase-trained orchards, but earlier and higher fruit production can easily pay these training costs. Some cling peach growers have started cordon training trees (more like grape vines) that commonly yield twice as much in the early years (two to five years) as standard-trained trees. Extra planning and tree training are needed to make this system work.

It takes seven years after pear trees are planted to produce a crop and 15 years to hit peak production. This means that when Bartlett pear trees are removed growers currently cannot afford to replant with Bartletts. Statistics bear out that there have been no new plantings of standard Bartletts in California, except interplants, in the last ten years. Some pear growers are also trying new training methods to gain early production and smaller sized trees.

Processing fruit growers in the coming years certainly will try new tree training methods to create earlier yielding, higher density, lower height orchards that can result in less labor demanding harvest. If progress continues in this direction, the use of ladders in orchards might be eliminated which would greatly reduce insurance and labor costs in the future.

Mechanization and Labor

Cling peach orchards are usually picked twice because the fruit does not ripen uniformly. Generally the first pick is by hand and then the second can be strip-picked mechanically. Undersized fruit can be sorted out and utilized as concentrate or for baby food.

Mechanical harvest of cling peaches is possible and was used on 8 percent of the crop in 1990 and 1991. Apricots can be mechanically harvested as well. However, the quality of machine-harvested fruit is not as good as hand-harvested and requires a change in handling. Also, machine-harvested fruit must be processed sooner than hand-harvested fruit. These constraints on mechanical harvesting of canned fruit crops limit its usage—thus labor will continue to be needed for hand harvesting fruit for processing. Costs of harvesting machines are four or five times higher in the 1990s than in the 1960s when they were first developed. These costs have further limited the use of machines for harvesting.

Pear orchards are also generally picked twice, with the large fruit harvested early in the season. The medium and small fruit then has a chance to gain in size and maturity for the second pick. However, pears cannot be mechanically harvested because bruised pears develop dry spots in storage.

A continual supply of laborers is essential to the processing

A continual supply of laborers is essential to the processing fruit industries. There is heavy demand for seasonal labor for pruning all crops in the winter, for thinning peaches and apricots in May and June and for harvesting all crops during the summer. For much of the year, labor for all production practices is handled by foreign labor.

There was considerable concern over potential farm labor shortages when the Immigration Reform and Control Act (IRCA) was passed in 1986. In a recent paper, Philip Martin and J. Edward Taylor concluded that the Special Agricultural Worker program under IRCA may have actually stimulated immigration of Mexican workers. Furthermore, Martin and Taylor do not anticipate farm labor shortages as a result of a North American Free Trade Agreement.

Water Costs and Availability

Processing-fruit crops are grown on land that has some of the most available, lowest cost water in California. However, water costs are likely to increase as demand for water grows and as power for pumping increases in cost. Groundwater availability in fruit areas of Stanislaus, Sutter, Yuba, Mendocino, Lake and Sacramento counties has been adequate even under drought conditions when irrigation districts limited surface water to growers. Overall, the droughts of 1977-78 and 1990-91 caused some tree stress in these fruit areas, but much less than in other California agricultural areas. A problem concerning growers is that the quality of groundwater is not good in all the areas when district canal water is cut back during droughts. If groundwater used to replace scarce surface supplies is saline, it can have detrimental effects on fruit orchards in the long term.

Pesticides and Other Chemicals

Barring dramatic changes in pesticide laws, processing-fruit crops will have most of the needed pesticides and biologicals to control pests, diseases and weeds if trends of the 1988 to 1991 period continue for a decade. Very few new chemicals will be developed and released, but existing ones can control most problems. However, new regulations on pesticide usage can be expected as special tolerances for certain pesticides are imposed to deal with specific problems. Also, the high cost of reregistering old chemicals such as NAA for control of preharvest drop of pears may be a problem. Manufacturers may be deterred from reregistrations since costs may not be fully recovered through sales. Consequently, some growers may be left without an adequate substitute and will face losses in productivity.

Research and commercial experience in using biological

agents to control pests will help growers replace some effective chemicals that may be banned. However, control of pests in fruit crops solely by biological methods will probably not be achieved within the next decade, if at all. Control will most likely be through some combination of biologicals and chemicals at a higher but acceptable cost. Good progress has been made in biological pest control in the last five years for pests such as Oriental fruit moth in peaches and codling moth in pears. Mating disruption with pheromones has been an effective method of biological control in several situations. However, it is not very effective where pest populations are high or where orchards are mixed and pests move from orchards of one fruit or nut species to another. Biological control measures are being actively researched by universities and other public institutions with the support of fruit industries, but progress is slow because of the complicated nature of pest control and the need for nearly complete elimination of pests on or in processed fruit.

Nitrogen fertilizer usage could be restricted in the future to prevent nitrate groundwater contamination in California. This would add another restriction to fruit growing but should not limit production. Less nitrogen fertilizer could improve fruit quality without lowering production significantly.

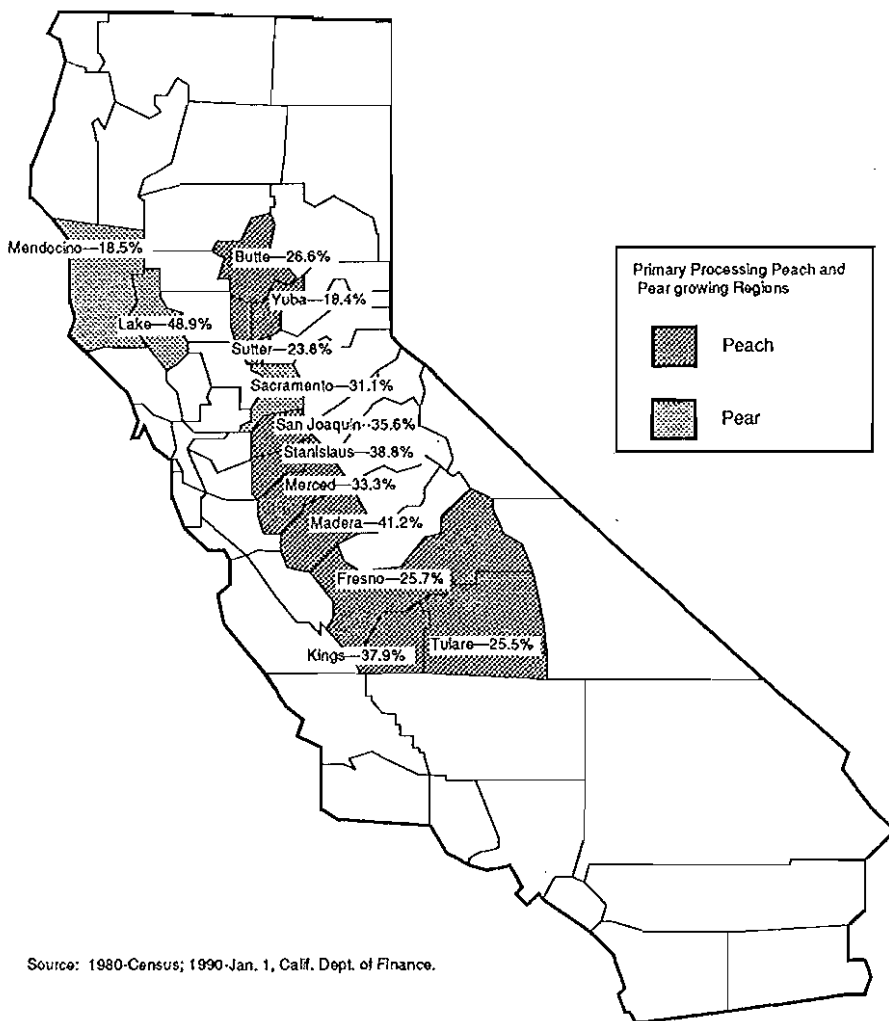
Land availability and use

Growers in California have long known the pressures of urban development. When the computer industry sped the urbanization of the Santa Clara Valley, growers moved to the Central Valley where there was plenty of prime land to plant orchards. So far, land has not been a limiting factor for the processing fruit industry. Because of increased productivity due to new varieties, better cultivation practices and increased acreage, there has been a continuous supply of fruit for processing. However, the Central Valley is now experiencing tremendous growth pressures; land availability may become an issue in the near future.

In fact, every county in the major cling peach growing regions is experiencing urban growth pressures (see Figure 7). For example, Stanislaus County is ranked number one for both cling peach and apricot production; it also has one of the fastest growing populations in the state. The pressure to convert agricultural land and resources will further intensify as the Central Valley's population is expected to grow from 4.5 million inhabitants to 7.5 million by 2005.

In the short term, peach orchards bulldozed for urban development will be replanted on land formerly planted with lower-value agricultural crops. Over time, however, expanding cities

Figure 7. Growth in County Population in Primary Processing Peach and Pear Growing Regions
% Change 1980-90



Source: 1980-Census; 1990-Jan. 1, Calif. Dept. of Finance.

may compete more directly for land, thus inflating the land values until they are too costly for even high-value agricultural crops.

In Lake and Mendocino counties, important pear growing regions, competition for land comes mainly from higher-value crops such as wine grapes. Farmers frequently replace pear trees with wine vineyards as orchards age and become less productive.

The pear-growing region along the Sacramento Delta is pressured by the proposed establishment of a national wildlife refuge (see box on page 43). This conflict typifies the competing environmental values that we may see more of in the future.

When urban areas spread into agricultural production regions those who continue to farm in the city's shadow may conflict with their new urban neighbors. Conventional agricultural practices which result in dust, flies, noise and odors are often the cause of complaint by urban neighbors, which may end in legal disputes. When combined with vandalism and pilferage, urban development can have an adverse effect on local agriculture. Abandoned orchards waiting to be converted to urban use are a particular problem for fruit growers; they can be a major sources of disease or insect pests.

Local governments are responsible for the majority of land use and development decisions affecting agriculture. The principle that necessarily must guide planning and protection efforts in farming areas is one that views agriculture as an economic activity dependent on a network of local busi-

Less than a year ago, the U.S. Fish and Wildlife Service proposed the creation of the Stone Lakes National Wildlife Refuge in the delta region south of Sacramento. The agency's plan outlined a wildlife and waterfowl refuge that could encompass up to 74,000 acres of the region's land, much of it now cornfields, pear orchards, vineyards, row crop operations and pastures.

From the agency's perspective, this is a precious region for wildlife and wetlands. Situated along the Sacramento River, it lies near the Pacific Flyway (the region's major waterfowl migration corridor) and—a hundred years ago—included extensive wetlands.

In the early part of this century these wetlands were considered nothing more than useless swamp. New settlers drained the wetlands for agricultural use and developed the rich delta land into an area of significant agricultural importance. As a result, from the farmer's perspective a new refuge could mean the destruction of years of work—the possible increase of mosquitoes and other pests, the uprooting of carefully tended trees and vines, and at worst, the suspension of farmers' ability to continue farming land that their fathers and grandfathers worked.

Instead of drawing battle plans when the refuge was announced, local farmers saw an opportunity to take an affirmative approach to protect the region. In the months since, they have explored ways to maintain the long-term viability of agriculture while enhancing environmental resources.

The farmers' chief action has been to form the North Delta Conservancy (NDC), a private, nonprofit land trust to save valuable farmland as well as wildlife and waterfowl habitat. At the request of local residents, the American Farmland Trust assisted with the organization of the NDC and has been working to help launch its programs. Through the NDC, local residents hope to join forces with other private and public agencies working in the area to create a private refuge protecting the region's unique natural resources.

—from *American Farmland*, Fall 1991.

rated into the planning process. Commercial agricultural operations, such as processing fruit orchards, are working environments that must be part of a larger economic network to survive. This larger network is, at the regional level, an agricultural infrastructure that includes warehousing, canning and distribution facilities as well as farm services such as equipment dealers, and repair shops. Both the land resource and the economic infrastructure are necessary to sustain agriculture.

Planning tools are available to local governments to assist them in addressing these land-related issues, such as an agriculture element in the general plan, a right-to-farm ordinance, and/or a buffer zone. Some farmer organizations are exploring purchase of development rights and mitigation programs to preserve the agricultural base in the county. Private organizations are also active in organizing agricultural land trusts.

California's increasing population puts the state's natural resources at greater risk and increases the public's awareness of environmental concerns. With the ascendance of

environmental values on California's political agenda, agriculture's use of natural resources is more closely scrutinized. There are differing values regarding the use of natural resources; for processing-fruit growers these differences manifest themselves in areas of water quality, the allocation of water resources, and the preservation of wildlife habitat.

The challenge for the fruit grower is to find ways of stewarding the resources while maintaining an economically viable operation.

The Last Frontier

Urbanization of Santa Clara County in the 1950s and 1960s forced fruit growers to move to other parts of northern California. Growers of apricots moved to the westside of the San Joaquin Valley; prune growers moved to the Sacramento Valley; pear growers moved to Mendocino and Lake counties.

Processing plants in San Jose area closed in the 1980s as new plants were built in the Central Valley (mainly Modesto) as a result of the movement of the fruit industry out of Santa Clara County.

There are no more valleys in California for growers to move to when the Central Valley urbanizes. We must learn to live within the last frontier.

Processing Issues Affecting Future Costs and Competitiveness

As in the past, sales will be stimulated by product development involving fruit type (including mixed fruits and cocktail), covering juice or syrup, and container type. Covering syrups have evolved from sucrose to corn sweeteners to fruit juices. Packing in concentrated juice of the same fruit is growing in popularity, enhancing flavor and "naturalness." In recent years canned apricots and freestone peaches have not significantly affected pear and cling peach sales, but competition has been felt from canned pineapple and applesauce. Responsive strategies centering on innovative mixed products incorporating exotic or popular competing fruits could help offset this competition.

Packaging and Distribution Technologies

Packaging is a key factor that will influence the market and profitability of canned fruit products. The challenges are convenience, cost and environmental concerns. Single-serving containers have introduced a new generation of products to a new generation of consumers with nontraditional eating habits. Plastic containers offer marketing appeal but the plastics which offer the greatest product shelf life are difficult to recycle and decompose slowly in landfills. Traditional cans are recyclable but portend long-term problems with respect to the cost of tin, steel and aluminum. Plastic-ring six pack carriers for beverage cans and stackable shrink-wrap multi-can packs minimize casing costs and shoplifting and help eliminate environmentally objectionable pallets; however they increase plastic waste and may cause environmental issues of their own. The future will require a range of package sizes including individual serving containers, institutional-sized bag-in-box containers, tanks and transportable totes for remanufacturing products. The future will also see thinner wall metal cans and more paper-based composites (e.g., paper, plastic and metal foil laminates) competing with traditional and modernized glass and metal packages.

Processing Alternatives

Heat sterilization will remain the primary preservation technique. Challenges will be to achieve higher quality more effi-

ciently. Strategies will include greater automation, lower labor costs, and better efficiencies in energy and water use. Technological advances are needed in raw fruit harvesting and handling, sorting and utilization of defective fruit, container filling and heat transfer technologies. A special need exists for fruit weight control in filling operations. Defect sorting by automatic, non-invasive methodologies such as magnetic resonance imaging could reduce sorting labor costs.

Progress has been made toward accommodating new packaging materials and shapes in retorting operations. Microwave, radio frequency and direct electrical resistance heating of bulk fruit products are at the experimental stage of development. The most successful recent technology is aseptic processing which packs sterilized, cold product into presterilized containers (of any sort) in an aseptic environment. Because the heating step is rapid, very high quality finished products are achieved. This technology has revolutionized the business of juice drinks in composite containers, and there is no reason that pumpable concentrates, purees and diced products could not be similarly processed now. There is room for improvement in pumps, heat exchangers, residence time controllers and fillers for aseptic processing of larger fruit pieces.

A number of other heat sterilization processes have been proposed over the years. These are technically achievable with today's technology. Flame sterilization, microwaving or other high-temperature, short-time, in-container processing can produce particulate fruit products with quality comparable to aseptic processing. Sterilized fruit packs without any covering juice or syrup have been produced in a pilot plant and could be adopted with little further development.

Canners may need to diversify product lines and processing methods to maintain profitability in changing markets. Goals would be to better utilize fruit for a variety of value-added products. Developing products or markets for undersized, overripe and defective fruit is an example. Superior frozen or subcooled fruit products can be developed by taking advantage of research understanding of the glass transition point; rapid cooling to a viscous solid state that prevents ice crystal formation can result in less drip loss and better texture upon thawing. Development of antioxidative, edible protective coatings may open up salad bar and institutional outlets for fresh fruit. Juices, concentrates, and pickled or dried products could expand markets for excess or defective cannery fruit.

Concepts for New Products

The following product concepts illustrate various combinations of quality, packaging and processing ideas discussed above.

- Nectars, juice drink cocktails and "crush" drinks in individual aseptically-processed laminated paper juice packs
- Vacuum-canned diced fruit, in single serving cans without cover liquid
- Pre-sliced fresh fruit with an edible coating, refrigerated for delicatessen, institution and restaurant trade
- Lightly pasteurized acidified fruit, bag-in-box, for institutions with refrigeration capability
- Cooked diced fruits for baked goods, gallon size bag-in-box
- Aseptic stabilized diced fruit for ice cream mixes, yogurt or cottage cheese in large containers such as bag-in-box or returnable totes
- Single serving ice cream fruit toppings in aseptic pouch

Holding Fruit before Final Processing

Because of the short fruit harvest season and high labor costs it would be advantageous to hold fruit several days or even weeks before processing. The goals would be to minimize overtime labor costs for weekends and holidays, even out surges in fruit harvest, and extend the processing season. Controlled atmosphere storage is successful with fruits that store well like pears and apples; for example, pears can be stored, ripened and canned acceptably up to six months after harvest. No similar success has been achieved with stone fruit. Research at the molecular or genetic level may be necessary to develop such storage.

In the meantime, it would be helpful to be able to hold peeled fruit for several days in partially processed form. Proposed holding procedures are acidification, mild heat treatment, chilled antioxidant solutions, deaeration and near-frozen storage. Research on oxidation and other deteriorative biochemical mechanisms might suggest alternative short term preservation methods. Probably several methods applied simultaneously will prove most effective.

Fruit holding methods would extend the processing season by a few days which, again, would take full advantage of cannery labor and equipment. At the front end of the season, early varieties may provide sooner startup, but extending past Labor Day causes problems with pests and availability of harvest labor.

Strategies for the 1990s

The outlook for California's canned fruit industry is for expanded world production, improved quality, and reduced trade barriers. Unless product demand is stimulated, competition will become more intense in domestic and foreign markets and prices will decline. Given the relatively price-inelastic nature of consumer demand for processed fruits, price drops will result in revenue losses to sellers. This outlook could be improved if California's industry is successful in changing its cost and product structure relative to that of its competitors, and it could be changed by stimulating an increase in consumer demand for canned fruit. The purpose here is to summarize and expand what has been said in previous sections, so that responsive strategies can be easily compared.

Growers and processors in the industry share a common purpose in improving California's competitiveness and, therefore, they share a joint responsibility in developing effective strategies for the nineties. Likewise, the various marketing orders, bargaining associations and service bureaus have roles to play in identifying and developing appropriate strategies.

Projections of future canned fruit supply are tenuous. They are based on information concerning planted areas in several different countries and on assumptions that removals will not be significant and that past utilization patterns will be followed. Projections also take into account the opinions about the future provided by persons in industry and government. They are reasonable given the situation and industry "feel for the future" that existed in 1989-1991. Changes in eastern Europe could result in more product coming onto western markets; policy changes in the EC could result in reduced output; and low prices could accelerate orchard removals. Given these uncertainties, it is probably wise to develop California strategies based on the assumption of stronger rather than weaker competitive pressures.

The price effect of increased supplies is discussed in the section, *Consumer Demand for Canned Fruit*. For example, if the world supply of canned peaches expands by 5 million cases, as

suggested in the discussion of global competition, and if this were reflected on the U.S. market, then real (inflation corrected) prices would drop by approximately 5 to 15 percent, depending on demand characteristics. This would be in addition to whatever other changes were caused by different market factors. However, similar price responses might be expected from changes in the supply of canned pears, fruit cocktail and apricots.

A separate issue facing the canning pear industry is the loss of a major part of the grade pack pear business to canneries in Washington. This appears to be a natural outcome of lower production costs in that state and the existence there of ample processing capacity. Only one major processor of grade pack pears remains in California. However, the only strategy in response to this situation is likely to be a private one.

Promising strategies for lowering production costs are in hastening the development of dwarf root stock and the development of low-cordon or trellis-training techniques. These would lower the height of trees and decrease labor costs, particularly for harvest. Added research expenditures will be needed to accelerate the appearance of dwarf root stocks in peaches, pears and apricots.

The successful introduction of new varieties of extra early and early cling peaches should extend the production and processing season and allow lower unit costs, particularly at the processing level where idle capacity is especially expensive. This is likely to be a long term strategy, given the slow process of breeding new varieties. It could provide the industry an important competitive edge if the new varieties were site specific to California.

Continuing research will be needed on ways to meet new environmental and safety requirements. California leads its competitors in responsive cultural and processing practices and may gain an economic advantage as they come under similar regulations. This strategy is cost-containing rather than cost-reducing.

Growers will need alternative market outlets for raw product if production grows more rapidly than demand. This suggests a continuing strategy of market research to identify markets in other geographic areas or in other product forms. Fundamental to such a strategy is an up-to-date understanding of market conditions and outlook. However, the industry suspended publication of pack, stock and shipment reports in 1990, making understanding market conditions more difficult.

Significant reductions in processing costs appear unlikely. However, each technology, as it is developed, will make some contribution to lower costs and improved quality. Related to the development of early or late season varieties that lengthen the processing season is the strategy to increase research attention to longer holding periods for raw product. This would lower costs by reducing expensive night shift and weekend processing.

Longer term attention should be given to the aseptic processing of larger fruit segments, although this is unlikely to change market conditions much for the 1990s.

Research strategies need to be developed concerning new packaging without non-degradable plastic, and profitable uses for under-sized, over-ripe and defective fruit such as nectar, concentrates, and pickled and dried fruit. New product development is important in gaining competitive advantage. Seven new product concepts were suggested in this report, ranging from aseptically-processed nectars to single serving fruit toppings in aseptic pouches.

We stress research strategies because they underlie almost all of the business decisions undertaken by members of the industry. Research has proven to be an important competitive tool in other sectors. It was the basis of the enormously successful product development strategies of California's almond industry. It was the basis for the "rush of technology" that allowed the frozen strawberry industry to stave off the threat of competition from Mexico more than 20 years ago. It was the basis for the effective political action programs by the processing tomato and frozen vegetable industries.

Research in and of itself will do no good unless its results are implemented in management decisions. Thus, there is the need for continuing product differentiation, market development, segmentation and promotion. The industry will also need to maintain its public affairs initiative to assure that it is treated equitably in public policy decisions. To the extent that these activities are based on the research strategies suggested here, we believe that California's canned fruit industry will be well poised to meet the intensely competitive conditions anticipated in the 1990s.

For Further Reading

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Study Group Members

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Moulton, a Cooperative Extension economist in the Department of Agricultural and Resource Economics at Berkeley, specializes in the analysis of competition and related policy. He has authored reports on competition in the wine, processed tomato, frozen vegetable, and fresh and processed fruit industries and on EC and GATT policy.

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The Norene Ranch has continually evolved its cultural methods with over 50 years experience as cling peach producers. Donald Norene manages the Ranch's peach production and serves on Sutter County's planning commission. He has a B.S. in Agricultural Science and Management from UC Davis.

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As President of the California Pear Growers, Peltier is responsible for negotiations with food processors to establish raw product pricing. She develops and implements a strategic plan for marketing fruit and represents grower interests in government relations activities on trade, labor, marketing and agricultural chemical issues. Peltier received her B.S. in Agricultural Communications from California State University, Fresno.

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