FROZEN PASSION FRUIT JUICE

AN APPRAISAL OF THE MAINLAND MARKET POTENTIAL

FRANK S. SCOTT, JR.

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ACKNOWLEDGMENTS

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FROZEN PASSION FRUIT JUICE

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Frank S. Scott, Jr. 1/

INTRODUCTION

This publication summarizes the results of a test of the mainland market potential for frozen Hawaiian passion fruit juice. It is an initial investigation of consumer acceptance of the product in 6-ounce cans.

The recent development of a process for quick freezing has made it possible to convert the perishable fruit into a marketable product. As a result of market acceptance of the juice in frozen form, coupled with high yields, commercial production of the product has been greatly stimulated. Acreage in vineyards increased from almost no commercial production in 1953 to 392 acres in October, 1955. Many farmers are interested in the product, and more and larger plantings are contemplated. It appears that commercial production of passion fruit may offer a promising new industry to Hawaii. The passion fruit vine is well adapted to Hawaii's climate and grows well on rough lava land not well suited to the major crops of sugar cane and pineapple.

With a yield of 10 tons per acre and a current price of 50 cents per pound, farmers are grossing $1,100 per acre. Some vineyards are yielding as high as 23 tons per acre. The major production costs of trellising and labor can be reduced appreciably through improved production methods. Disease and insects do not, at present, place serious limitations on the crop in Hawaii.

Thus, production possibilities appear favorable. But the size and success of the industry is equally dependent upon the market potential. The product is marketed as a frozen juice concentrate, for blending with other juices, for flavoring sherbets, and for use in passion fruit chiffon pie. It is also heat processed, both as a

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concentrate and with water added, ready for use as a canned fruit beverage. However, since present methods of heat processing destroy much of the natural flavor and aroma, quick freezing is the only completely satisfactory form in which the product is marketed. At least until a more satisfactory method of heat processing is developed, the frozen juice is expected to constitute the major outlet for the fruit.

This phase of the consumer acceptance study is devoted entirely to determining the probable market for the frozen juice concentrate distributed in 6-ounce cans. Another publication, Factors in Merchandising Frozen Passion Fruit Juice, is expected to be released soon.

Further attention will be given to other passion fruit products in succeeding studies.

PROCEDURE

This market test for frozen passion fruit juice was based on (1) a city-wide survey made in Redlands, California, completed early in September, 1955, and on (2) records of store movement of the product in Redlands and Riverside, California (see appendix A). An effort was made to choose a city having a rather typical cross-section of population with a well-defined trade area and of a size for which enough juice was available for an early test. Since the product is expected to be distributed in California prior to being available to other mainland areas, it seemed desirable to choose a test city which was, within limits, representative of both California and the nation. No city, of course, is entirely representative of other areas of the nation. Redlands, however, satisfied the above requirements reasonably well and seemed a good choice from which generalizations could be made.

Juice for the initial test was produced, processed, and labeled by the Hawaii Agricultural Experiment Station's Food Processing Laboratory. During May, 1955, the juice was introduced at a retail price of 21 cents per 6-ounce can in the 4 large stores in Redlands (3 of which are units of chains), in 2 of 3 medium-size independent stores, and in 11 of the 15 small stores with juice facilities. In introducing the product, Friday and Saturday demonstrations were held at four of the five large
stores and in one medium-size store. Individual stores advertised the product in the local daily newspaper along with their weekly specials. There was also some advertising by handbill and radio. The small stores did not advertise the product and, therefore, depended on customer knowledge of the product through advertisements by the large stores. In order to obtain more reliable data on repeat sales as contrasted with initial sales, the product was not promoted further during the 3-month period preceding the city-wide survey.

In most of the cooperating stores weekly records were kept of sales of passion fruit juice, prices of other frozen juices, and volume of sales of other frozen juices.

On August 17, the juice was introduced in a large supermarket in Riverside, California, at 25 cents per 6-ounce can for the purpose of determining the effect of a higher price on volume of sales. Promotion procedure was similar to that in Redlands.

Late in August, 3 months after the product had been made available in most of the local markets, a city-wide survey was initiated in which every other household in Redlands was contacted. Two articles explaining the purpose of the survey appeared in the local newspaper during the survey period.

In November the product was offered for one week at a special price of 19 cents per can, or 2 cans for 37 cents, and further advertised both by individual stores and by a general advertisement emphasizing use of the juice as a breakfast drink. The product will continue to be offered for sale both in Redlands and at the large test market in Riverside in order to obtain further data on seasonality of sales.

SALES POTENTIAL

Indications of potential purchases of frozen passion fruit juice by mainland consumers were determined by three methods (table 1).

In method A, actual sales of passion fruit juice in Redlands were directly expanded to determine probable sales at the national level (see Appendix B). In method B, per capita sales of passion fruit juice in Redlands were related to
national per capita sales of frozen orange juice concentrate and expanded in proportion to national sales of frozen orange juice concentrate. In method C, sales of passion fruit juice in Redlands were related to national per capita sales of frozen lemonade base and expanded in proportion to national sales of that product. Basic calculations are shown in the appendix to this report.

Table 1. Estimated Potential Sales of Frozen Passion Fruit Juice in the United States as Based on Test Sales in Redlands, California.

<table>
<thead>
<tr>
<th>Method</th>
<th>Annual sales in Redlands</th>
<th>Annual sales in U. S.</th>
<th>No. of acres required at 10 tons of fruit per acre</th>
<th>Retail value at 21 cents per 6-ounce can or $5.04 per case</th>
<th>Gross income to Island economy at 15 cents per 6-ounce can or $3.60 per case</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>392.1 cases</td>
<td>2,940,750</td>
<td>5,559</td>
<td>14,821,380</td>
<td>10,586,700</td>
</tr>
<tr>
<td>B</td>
<td>392.1 cases</td>
<td>2,843,210</td>
<td>5,374</td>
<td>14,329,778</td>
<td>10,235,556</td>
</tr>
<tr>
<td>C</td>
<td>392.1 cases</td>
<td>2,552,603</td>
<td>4,825</td>
<td>12,865,119</td>
<td>9,189,371</td>
</tr>
</tbody>
</table>

a/ Calculations shown in appendix B.

As determined by expansion of the Redlands sample.

As indicated in table 1, the three different methods gave similar results in estimating potential national sales of frozen passion fruit juice on the basis of the Redlands test. The potential ranged from $9.2 million, when based on the relationship to lemonade sales, to $10.6 million, when based on a direct expansion of Redlands sales to obtain the national sales potential.

These expansions indicate that if frozen passion fruit juice were generally available in mainland markets, consumers in the United States would buy about $14,000,000 worth of passion fruit juice per year at a price of 21 cents per 6-ounce can and under the assumptions discussed later in this report. This would yield an annual gross income of approximately $10,000,000 to Hawaii's economy and require somewhat in excess of 5,000 acres of passion fruit at a yield of 20,000 pounds per acre. These estimates are considered conservative. But it should be kept in mind that the expansion of data from a single area to determine the market potential for
a larger area is subject to numerous limitations. Although the results of a study of this type are necessarily dependent upon a number of assumptions, they may be used with caution as a guide until further information on market acceptance is available. Some of the necessary assumptions in generalizing from the Redlands test are indicated below. It was assumed that consumers in the United States as a whole would like passion fruit juice about as well as the people in Redlands and that the per capita consumption would be the same. Among other reasons Redlands was selected because it was thought that buying habits there would be reasonably typical of those for the nation. No city is entirely representative of other segments of the population, but Redlands, as previously indicated, was considered a good choice in the size range for which enough juice was available for an early test.

**ECONOMIC CONDITIONS**

The general level of business conditions existing during 1955 was used in estimating the market potential for the juice in this report. Considering factors which can be measured only after the juice is sold on the Mainland in rather substantial volume, the initial study was orientated primarily toward determining how much juice, if available, could be sold in the immediate future. The survey indicated a close relationship between income of consumers and amount of juice purchased in Redlands. Only 6 percent of the people in the group with annual incomes of under $3,000 had purchased frozen passion fruit juice during the 3 months preceding the survey. But for the middle income group of $3,000 to $5,999, the percentage was 14 percent, and for the high income group of $6,000 and over it was 24 percent. Hence volume of sales of passion fruit juice, other conditions being the same, would be expected to be highly dependent upon consumer purchasing power. With a general business recession, consumers would be expected to sharply curtail consumption of passion fruit juice. However, it cannot be expected that people with higher incomes who have bought the juice, will react the same way with a decreased income as those who had a lower income in the first place. A certain percentage of people who buy a product during a period of prosperity will continue to buy it under less favorable conditions if a strong liking has been attained for the product.
SEASONALITY OF SALES

Since the test up to the time of this report had only been in operation for the 6-month period from May to November, it was necessary to estimate sales during the other 6 months in order to obtain data on annual consumption. Frozen orange juice concentrate, which is used to a large extent as a breakfast drink, sells almost in equal volume during all seasons of the year but in slightly greater quantities during the winter season. Frozen lemonade base, considered primarily a hot weather refreshment, sells in very large volume during the summer months, but suffers a sharp drop in sales during the winter months. As yet there is no definite indication as to which of these seasonal patterns frozen passion fruit juice will follow. Although it will probably be used primarily as a warm weather refreshment, 20 percent of the consumers who bought it during the test period in Redlands indicated that they had used it at least once as a breakfast drink. Early fall sales have declined considerably in comparison to summer sales, but not as rapidly as has been the case for lemonade. There is some indication, therefore, that sales would not decline as much during the winter as is true for lemonade—nor would they be maintained during the winter as in the case of frozen orange juice concentrate. In order to arrive at conservative estimates of gross annual sales of frozen passion fruit juice prior to a conclusive determination of the seasonal pattern, the estimate of winter sales of passion fruit juice have been reduced proportionately to the pattern for frozen lemonade base. A further release on the seasonality of sales will be made shortly after completion of a full year's record of sales in Redlands.

PROMOTION

In expanding the Redlands data, it was also necessary to assume that promotion and merchandising of the juice in other parts of the country would be equivalent to that in Redlands. Except for store demonstrations, promotion, in the opinion of the trade, was kept at a rather conservative level up until the time of the city-wide survey. At the time of the survey, 46 percent of the households contacted indicated awareness of the juice. There is no indication as to what effect a very intensive promotional campaign would have on sales. Such a campaign was purposely avoided in
this study in order to avoid the danger of overestimating the market. It appears relatively certain that substantial sums of money would need to be expended to bring consumer knowledge of the product up to the level attained in Redlands. Still further promotion might boost sales considerably beyond the potential indicated in this report. A more intensive study of promotion is now underway and the results will be released within a few months. In arriving at a per capita consumption figure for Redlands, it was assumed on the basis of relationships between awareness of the juice and purchases that one-half of the remaining 54 percent of the population would have bought the juice at the same per capita rate as the other 46 percent who know about it if they too had been informed.

EXTENT OF REPEAT SALES

The usefulness of data on volume of sales during a test period for a new product is highly dependent upon the extent of repeat sales. The mere fact that large numbers of people buy the product and try it out after tasting it at a demonstration or finding out about it through other means is no assurance that the product will "go over." Many of these people will not like the product well enough to buy it again or cannot afford repeat purchases. Only those consumers who come back for repeat purchases constitute an effective demand for the product.

Frequency of Purchases

Fifty-three percent of the people who had bought frozen passion fruit juice made only one purchase during the 3 months preceding the city-wide survey. These consumers apparently did not like the juice well enough to go back for more or could not afford further purchases. The percentages of the population making various numbers of repeat purchases are shown in table 2.

The buying pattern during the week prior to the survey further emphasized the fact that a large percentage of the consumers who had tried the juice had not become steady customers. Sixty-four percent of those who had bought one or more cans during the previous 3 months bought no juice during the previous week. Yet in answer to the question "If passion fruit juice continues to be readily available on
the market, do you think you will continue to buy it for your family," 74 percent of
the Redlands consumers indicated "yes" and 5 percent indicated that they might buy
it. Hence there appears to be an inconsistency between these two sources of informa-
tion. The record of purchases would indicate that the majority of the consumers
were either dissatisfied with the juice after trying it once or twice or else could
not afford to continue buying it. But the other source of information indicates
that most of the people who had bought it would continue to buy it. On the basis of
the gap between the two answers, it appears that there is considerable opportunity
for promotion. The majority of the people who had bought the juice once did not
continue to buy the juice during the survey period, yet the majority indicated that
they would continue to buy if the juice continues to be made available. This may
indicate that further promotion would be effective in increasing sales.

Table 2. Percentages of Redlands Consumers Making Specified Numbers of Purchases
of Frozen Passion Fruit Juice. 3/

<table>
<thead>
<tr>
<th>Purchases during 3 months preceding the survey</th>
<th>Purchases during week preceding the survey by those who bought juice during the preceding 3 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of times</td>
<td>Percent of consumers</td>
</tr>
<tr>
<td>-----------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>0</td>
<td>--</td>
</tr>
<tr>
<td>1</td>
<td>53</td>
</tr>
<tr>
<td>2</td>
<td>24</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>6 or more</td>
<td>7</td>
</tr>
</tbody>
</table>

3/ Percentage of those who bought the juice.

In order to reduce the bias from new sales, the first 3 weeks of sales records,
which coincided with the promotion period, were excluded from sales data used in
determining the market potential. This did not completely eliminate the bias. It
is believed, however, that other factors tending to retard sales during the test
period, such as lack of familiarity with the product, would more than offset the effects of purchases by consumers who would not make repeat purchases.

Number of Cans Bought

Table 3 shows the percentages of the consumers buying specified numbers of cans of the juice during the 3-month period prior to the survey. The majority of the purchases were small, with 43 percent of the people having bought only one can.

Table 3. Percentages of Redlands Consumers Buying Specified Numbers of Cans of Frozen Passion Fruit Juice.

<table>
<thead>
<tr>
<th>Number of cans</th>
<th>Percent of consumers</th>
<th>Number of cans</th>
<th>Percent of consumers</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>--</td>
<td>0</td>
<td>64</td>
</tr>
<tr>
<td>1</td>
<td>43</td>
<td>1</td>
<td>22</td>
</tr>
<tr>
<td>2</td>
<td>23</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>5-8</td>
<td>9</td>
<td>5 or more</td>
<td>1</td>
</tr>
<tr>
<td>9 or more</td>
<td>8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a/ Percentage of those who bought the juice.

Sixty-four percent of the people who had bought at least one can of passion fruit juice during the previous 3 months didn't buy any during the previous week. Thus only 36 percent of the people who had bought the juice at some time during the test period were still buying one or more cans per week at the time of the survey.

Volume of Sales in Relation to Other Frozen Juices

Figure 1 and table 4 show the volume of sales of passion fruit juice in relation to other frozen juices in three different types of Redlands stores. In these three stores, the volume of sales of passion fruit juice was far less than that of orange juice and lemonade, which are considered large volume juices. But it is highly encouraging that sales of passion fruit juice exceeded those of frozen grapefruit, tangerine, and pineapple juices and amounted to 59 percent of sales of frozen grape juice and 48 percent of those of limeade.
Figure 1. Average Number of Cases of Frozen Passion Fruit Juice and Other Specified Frozen Juices Sold Per Week in Three Redlands Markets, May 23 to November 7, 1955.

Table 4. Average Number of Cases of Frozen Passion Fruit Juice and Other Specified Frozen Juices Sold Per Week, May 23 to November 7, 1955, Three Redlands Markets.

<table>
<thead>
<tr>
<th></th>
<th>Orange juice</th>
<th>Lemon-ade</th>
<th>Lime-ade</th>
<th>Grape juice</th>
<th>Passion fruit juice</th>
<th>Pineapple juice</th>
<th>Grapefruit juice</th>
<th>Tangerine juice</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>27.6</td>
<td>11.0</td>
<td>0.6</td>
<td>3.2</td>
<td>1.4</td>
<td>1.0</td>
<td>0.4</td>
<td>0.04</td>
</tr>
<tr>
<td>B</td>
<td>29.6</td>
<td>9.5</td>
<td>6.8</td>
<td>2.9</td>
<td>2.0</td>
<td>0.8</td>
<td>1.1</td>
<td>0.9</td>
</tr>
<tr>
<td>C</td>
<td>12.6</td>
<td>3.2</td>
<td>0.7</td>
<td>0.5</td>
<td>0.5</td>
<td>0.2</td>
<td>0.01</td>
<td>0.3</td>
</tr>
<tr>
<td>Total</td>
<td>69.8</td>
<td>23.7</td>
<td>8.1</td>
<td>6.6</td>
<td>3.9</td>
<td>2.0</td>
<td>1.5</td>
<td>1.2</td>
</tr>
</tbody>
</table>
The volume of passion fruit juice sales in relation to sales of the better known frozen juices would normally be expected to increase as consumers become more familiar with the new product.

Changes in prices of other frozen juices in relation to frozen passion fruit juice would be expected to have a bearing on sales of passion fruit juice. With an increase in prices of competitive juices, and with no change in the price of passion fruit juice, more people would be expected to buy passion fruit juice and vice versa.

**EFFECT OF LABEL**

No commercial firms were processing frozen passion fruit juice in 6-ounce cans at the time the University was ready to introduce the product for the test. It was necessary, therefore, for the University to process and label the juice.

The simple paper label used in the test, although contrasting with the labels of all other frozen juices, would be expected to receive less response from consumers than the attractive lithographed picture labels now being used by the commercial processors of frozen passion fruit juice in Hawaii. A study is being initiated in Redlands in December, 1955, for testing the effects of label on sales. It is planned that the juice from three commercial processors will be offered in certain Redlands stores along with University labeled juice and weekly records kept of comparative sales.

**SENSITIVITY TO PRICE**

It should be kept clearly in mind that the market for the product, as calculated above, is based on a retail price of 21 cents per can. This was slightly higher than prices of most frozen juices in Redlands at the time of the test, but still considered within a competitive range. A higher retail price would decrease the amount of juice which could be sold and a lower price would be expected to bring about an expansion in sales. The major purpose of the test was to determine the volume of passion fruit juice which would sell at a price reasonably competitive with the prices of other frozen juices. It was not to determine how a small quantity would sell at a high price. A certain amount of most products can be sold at prices out
of range with those of competing products. But if an important industry is to
develop from a new product, that product must be able to compete pricewise with
similar products. If people like the product and will buy it at competitive prices,
but not at prices out of line with the prices of other juices, processors will know
that as volume is increased and prices reduced, volume of sales can, at the same time,
be increased. If, on the other hand, the product were offered for sale in the test
city exclusively at a higher than competitive price and failed to receive favorable
consumer response, it would not be known whether the unfavorable response was due to
price or to taste or to some other factor. With no sales there could be no determi-
nation of consumer response.

In order to test the response of consumers to a higher price, the juice was
offered at 25 cents per 6-ounce can at a large supermarket in a suburban shopping
center in Riverside, California, located 13 miles from Redlands. This store,
although larger, is comparable as a trading center to the major stores in Redlands.
The juice was promoted in a similar manner as in Redlands. In the Riverside store,
sales of frozen passion fruit juice per 100 cases of all frozen juices were only
8.3 percent as great as for three major stores in Redlands during the 3-month period
from August to November. On the basis of this limited evidence it is apparent that
consumers are highly sensitive to price in buying frozen passion fruit juice. Where-
as sales expanded to the national level at 21 cents per 6-ounce can would be expected
to provide an outlet which would yield an income to the Islands of $10,000,000 and
require in excess of 5,000 acres in vineyards, sales at 25 cents, although yielding
a greater return per unit, would provide an estimated gross income to the Islands of
only $833,000 and require only 462 acres in vineyards.

Even at 21 cents per can, the frozen passion fruit juice was selling at a price
somewhat higher than the prices of other frozen juices (table 5). Yet in the survey,
62 percent of the consumers who bought any of the juice indicated that the price of
passion fruit juice was reasonable, and 22 percent said that price was not a factor
in buying the juice. Only 16 percent specifically indicated that the price was too
high. But a large percentage of those who paid little attention to price were not repeat purchasers. With continuous buying, price, as indicated in records of store sales, had an important bearing on amount purchased.

Table 5. Prices of Frozen Fruit Juice Concentrates, Per 6-ounce Can, Redlands, May to November, 1955.*

<table>
<thead>
<tr>
<th>Frozen juice concentrate</th>
<th>Price per 6-ounce can</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Large stores</td>
</tr>
<tr>
<td>Passion fruit</td>
<td>21 cents</td>
</tr>
<tr>
<td>Orange</td>
<td>16-19 cents</td>
</tr>
<tr>
<td>Lemonade</td>
<td>12-15 cents</td>
</tr>
<tr>
<td>Limeade</td>
<td>10-15 cents</td>
</tr>
<tr>
<td>Grapefruit</td>
<td>12-17 cents</td>
</tr>
<tr>
<td>Tangerine</td>
<td>18-19 cents</td>
</tr>
<tr>
<td>Grape</td>
<td>19-21 cents</td>
</tr>
<tr>
<td>Pineapple</td>
<td>15-17 cents</td>
</tr>
</tbody>
</table>

* These prices are in line with prices of frozen juices in most areas of Southern California.

At a retail price of 19 cents, which would be more nearly competitive with other frozen juices, it is reasonable to assume that a considerably larger volume of passion fruit juice could be sold than at the test price of 21 cents. And, insofar as the capacity of the national market to absorb the juice is concerned, gross income to the Islands at 19 cents retail would be far in excess of the $10,000,000 figure which was based on a price of 21 cents. But along with the prices at which various quantities of the juice can be sold, production costs must also be taken into consideration. The Riverside test indicates that the juice from the 400 acres now in production could be sold at 25 cents per can. But to sell the juice from 5,000 acres, the price must be reduced to about 21 cents and to sell even more, other conditions being the same, the price must be reduced further.

As volume of production is increased, the retail price will probably need to be reduced, but at the same time per unit costs of both farmers and processors should decline, thus making it possible to make as much profit with lower prices and lower
costs as before at higher prices and higher costs. As is true of other enterprises where competition exists, new farmers and processors will be expected to continue to enter the business until the point is reached where a substantial percentage of the firms are making a reasonable profit in line with the profit which could have been received if the capital had been invested in other enterprises. When this point is reached some firms will be making above average profits because of low costs and high yields. Other firms will be making below average profits and may in some instances be forced out of business because of major price declines or other reverses. While some firms will be going out of business, others will enter. It is of importance to keep in mind that the capacity of consumers to buy the juice depends not only on the desire for the product but on the level of consumer income. The Redlands survey was made during a period of prosperity. If the nation goes into a recession, consumers would be expected to pay a lower price for the same quantity or take a smaller quantity at the same price.

At any rate, as the passion fruit industry expands, the price to farmers and other costs to the processors will be expected to decline until profits are in line with those of other enterprises. As processing volume expands, it is reasonable to assume that processors can make greater net profits on smaller per unit margins.

COMPETITION FROM OTHER AREAS

As a substantial market is developed for passion fruit juice it is reasonable to assume that producers will eventually be faced with competition from other areas. Although passion fruit is grown commercially in other tropical and sub-tropical areas, the probable seriousness of such competition has not yet been evaluated. It is believed, however, that development of the mainland market for the Hawaiian product will put Hawaii in a stronger position when and if other producing areas compete for the mainland market.

SUMMARY AND CONCLUSIONS

This study, based on estimates which are considered conservative, indicates that with proper promotion and availability of the product, at least $14,000,000 worth of
frozen passion fruit juice could be retailed annually in the United States at 21 cents per 6-ounce can and with economic conditions existing in 1955. Assuming that Hawaii will supply the bulk of the frozen juice, this would yield a gross income to Hawaii's economy of about $10,000,000 and require an estimated 5,000 acres in vineyards. This does not include potential sales of frozen juice for other uses, such as blends for other juices and for flavoring of sherbets. Nor does it include prospective sales of heat-processed juice. Heat processing, although not completely satisfactory at the present time, is being improved and may eventually make an important addition to sales of passion fruit products. Hence, although frozen juice is expected to be the major outlet for the fruit, other products processed from it would be expected to increase the market potential for passion fruit to a figure somewhat above $14,000,000.

As people become more aware of the product and as population increases, the aggregate market demand should increase and would be expected to be considerably greater 10 years from now than exists today. On the other hand, competition from other producing areas may prove to be a threat as the market is further developed. Increases in production and market promotion should go hand in hand. By the time, for example, that we have 3,000 acres in production, we should have created a market outlet for at least that much. Both the creation of market demand through promotion and the expansion in acreage sufficient to meet the full market demand would be expected to take place gradually. Processors will serve a very important function in equalizing supply and demand.

Both costs of production and prices will be expected to decline as the volume of production is increased. A small amount can be sold at a high price, but as the volume of production continues to increase, sales will have to be made to consumers with lower incomes or not quite as strong a desire for the product, and these people will take the product only at lower prices. This does not mean that profits will drop proportionately to the price. Processors, in particular, will have considerably lower costs when they are in a position to utilize their plants to full capacity.
rather than a few hours a week. Farm production costs will also be expected to 
decrease up to a certain point as production increases both per farm and per acre. 
The important thing now is that we have indications that there is a substantial 
potential demand for the product and that it would be reasonably safe, in light of 
today's purchasing power, to expand production to 5,000 acres if the product can be 
retailed for 21 cents or even more if it can be sold at a lower price.
APPENDIX A

SAMPLING PROCEDURE

Store Sales

The product was on sale during the test period in the following stores:

<table>
<thead>
<tr>
<th>Store Type</th>
<th>No. of stores in Redlands with frozen juice facilities</th>
<th>No. of stores used in sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>National chain</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Regional chain</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Large independent</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Medium size independent</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Small independent</td>
<td>15</td>
<td>11</td>
</tr>
</tbody>
</table>

It was estimated that the stores included in the sample handled 90 percent of the volume of frozen juice sales in Redlands. The sample was expanded according to estimated total sales for the city.

City-wide Survey

In the city-wide survey an attempt was made to contact every other household in each block. In instances where no one was at home, one repeat visit was made. With no response after the repeat visit, the preceding household or, as a final resort, the succeeding household was chosen. In instances of no response from either the selected household or the alternates, a nonrespondent resulted. In all, 2,432 records were obtained, representing approximately 46 percent of the households within the Redlands city limits. Out of the 2,432 records, 1,122 of the respondents or 46.1 percent were aware that frozen passion fruit juice was being sold in Redlands. A total of 319 or 13.1 percent of the households interviewed had bought the juice. The number who had bought the juice during the 3 months preceding the survey amounted to 28.4 percent of those who knew it was being offered for sale.
APPENDIX B

CALCULATIONS FOR ESTIMATING THE MAINLAND MARKET POTENTIAL OF FROZEN HAWAIIAN PASSION FRUIT JUICE

Method A: Direct Expansion of Redlands Sales

Average weekly sales of passion fruit juice in Redlands, May 23 to November 21, 1955. (Expanded to account for stores with frozen food facilities but which did not handle the juice), 24 6-ounce cans per case .......................................................... 7.30 cases

Expansion for including one-half of the 54 percent of the consumers who were not aware that the product was being sold in Redlands .................................................................................. 4.28 cases

Adjusted weekly sales June-November ........................................................................ 11.58 cases

Weekly sales December-May (Adjusted to U.S. seasonal pattern of frozen lemonade base, October, 1954 to September, 1955) ................................................................. 3.50 cases

Average weekly sales, annual basis ............................................................................. 7.54 cases

Annual sales of passion fruit juice, Redlands ............................................................... 392.1 cases

Annual sales of passion fruit juice, United States

\[
\frac{165,000,000 \text{ (U.S. population)}}{22,000 \text{ (Redlands population)}} = 7,500
\]

\[
7,500 \times 392.1 = 2,940,750 \text{ cases}
\]

Retail value of potential national sales of passion fruit juice @ $5.04 per case .................. $14,821,380

Gross revenue to Hawaii, $3.60 per case ..................................................................... $10,586,700

No. of acres required (at 529 cases per acre) ............................................................... 5,559 acres

Method B: Expansion of Redlands Sales of Frozen Passion Fruit Juice on Basis of Relationship to National Per Capita Consumption and Sales of Frozen Orange Juice Concentrate

Annual sales of passion fruit juice, Redlands (As determined for Method A) ....................... 392.1 cases

Per capita sales of passion fruit juice, Redlands ........................................................... 17.8 cases per 1,000 capita

Per capita sales of frozen orange juice concentrate, October, 1954-September, 1955 ......... 367.6 cases per 1,000 capita

Percent Redlands per capita sales of passion fruit juice was of U.S. per capita sales of frozen orange juice concentrate .......................................................... 4.84%
Method B (continued)

Gross national sales of frozen orange juice concentrate,
October, 1954-September, 1955 $58,744,000 cases

Potential U. S. sales of passion fruit juice
(4.84 percent of $58,744,000) 2,843,210 cases

Retail value of potential national sales of passion
fruit juice @ $5.04 per case $14,329,778

Gross revenue to Hawaii @ $3.60 per case $10,235,556

No. of acres required (at 529 cases per acre) 5,375 acres

Method C: Expansion of Redlands Sales of Frozen Passion Fruit Juice on Basis of
Relationship to National Per Capita Consumption and Sales of Frozen Lemonade Base

Annual sales of passion fruit juice, Redlands
(As determined for Method A) 392.1 cases

Per capita sales of passion fruit juice, Redlands 17.8 cases
per 1,000 capita

Per capita sales of frozen lemonade base,
October, 1954-September, 1955 58 cases
per 1,000 capita

Percent Redlands per capita sales of frozen passion fruit
juice was of U. S. per capita sales of frozen lemonade base 30.7%

Gross national sales of frozen lemonade base,
October, 1954-September, 1955 8,314,667 cases

Potential U. S. sales of frozen passion fruit juice
(30.7 percent of 8,314,667) 2,552,603 cases

Retail value of potential national sales of passion
fruit juice @ $5.04 per case $12,865,119

Gross revenue of passion fruit juice to Hawaii @ $3.60 per case $9,189,371

Number of acres required (at 529 cases per acre) 4,825 acres

2/ Basic data on national sales of frozen orange juice concentrate and frozen
lemonade base taken from Consumer Purchases of Selected Fruits and Juices, USDA
Agricultural Marketing Service, Washington 25, D. C. Data for September, 1955,
estimated by the writer.