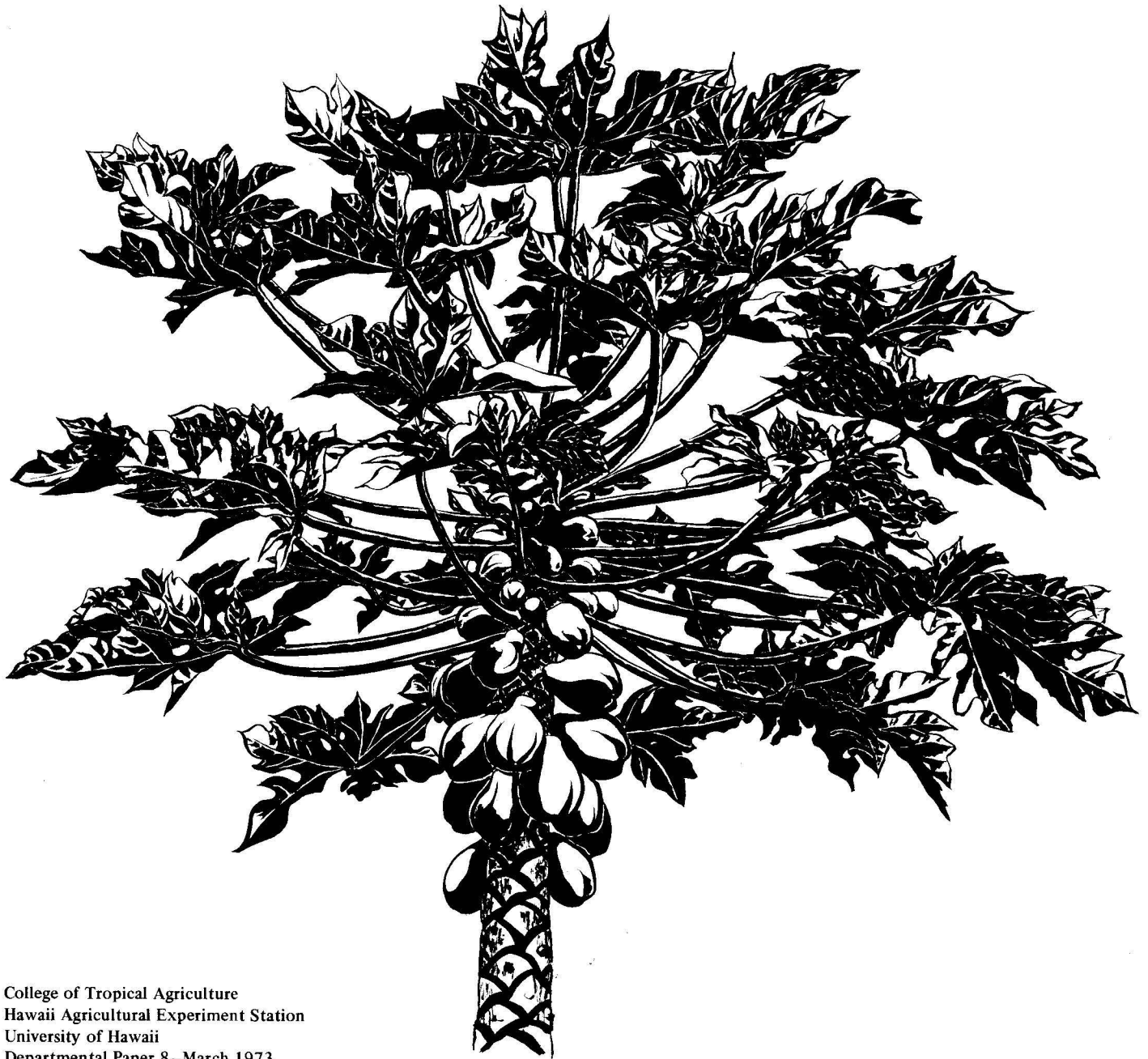


**PAPAYA MARKETING ON OAHU:
Retail Markup Analysis and
Consumer Behavior Study**

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PAPAYA MARKETING ON OAHU: RETAIL MARKUP ANALYSIS
AND CONSUMER BEHAVIOR STUDY

Heinz Spielmann and Robert A. Souza

Introduction

Two areas of research in papaya marketing on Oahu which have never before received the attention they deserve are presented in this report.

The Papaya Administrative Committee, which administers the federal papaya marketing order in Hawaii, requested information on the present retail markup structure for papayas in Oahu food stores. The Committee also expressed an interest in the development of a consumer profile, describing consumer quality preferences and consumption habits.

The concern with retail markups evolved over time. Producers throughout the industry noted with concern that the retail markups on papaya tended to grow beyond what was believed to be a fair return to the retail outlet. When the markup approached and in some instances reached past the 40 percent level, producers felt that more information was needed to determine the cause of this markup and to find ways by which this margin could be reduced. The first part of this report deals with this problem and attempts to show some of the causes related to the size of the markup. It also suggests means through which retail markups can be held to a somewhat lower level.

The Committee desired to direct production into channels that would meet the needs of consumers. Since this can be done only if as much as possible is known about the consumer and his requirements, we have developed an overall picture which will enable delivery of a more readily accepted and satisfying product.

We inquired into the demographic characteristics (ethnic origin, age, size of family, and income grouping, etc.) of papaya consumers. By means of a questionnaire, we also obtained data on consumer preferences (size of fruit, preferred maturity, quality ranking, etc.) and on preferred product usage.

The results of our study should bring about a more orderly marketing of Hawaii produced papayas on Oahu. Various production and distribution deficiencies can be eliminated and thereby contribute to the possible reduction of the present retail markup. By fitting production more closely to the qualitative and quantitative requirements of the consumer, an improved product flow and greater consumer satisfaction can be achieved.

Part I: Retail Markup Behavior

This part of our report lists the steps taken to study retail markups for papaya and some of the dynamic forces which affect markup changes.

1. Average papaya retail prices covering a period of 51 weeks (July 21, 1971 to July 14, 1972) were obtained from the weekly retail price survey of the State Department of Agriculture. Papaya retail price notations obtained each Wednesday from about 25 stores were averaged out for each week.
2. From the Hawaii Crop and Livestock Reporting Service, we obtained weekly papaya wholesale prices for Monday of each survey week covering a period of 51 weeks.
3. The difference between Monday average wholesale prices and Wednesday average retail prices was established for each week and represented weekly retail markups for papaya. Markups were then expressed in both monetary and percentage terms. More specifically, the retail price was expressed at 100 percent and the markup as the percentage residual. We found average retail markups on papaya in Honolulu retail stores to be about 31.8 percent of the total retail price.
4. All data were plotted in graphic form.

Figure 1. A graph of retail and wholesale prices covering a 51-week period (July 21, 1971 to July 12, 1972).

Figure 2. A graph depicting the relationship of wholesale prices to percent retail markup over the same time period.

Figure 3. A scattergram of wholesale prices and percent retail markups from July 21, 1971 to July 12, 1972.

Figure 2 gave indication of a mirror image between wholesale prices and retail markups showing that, if wholesale prices rose, markups generally were reduced. This means that, in effect, retailers absorb some of the wholesale price increases but that their price reductions subsequent to wholesale price declines may be quite sticky.

The design of the scattergram of markup percent and wholesale prices enabled us to make hand approximation of a regression line indicating a negative relationship. We then developed mathematically the regression and correlation of these variables, making percent markups (Y) the dependent variable and wholesale prices (X) the independent variable.

PAPAYA RETAIL AND WHOLESALE PRICE
AND RETAIL MARKUP
JULY 21, 1971 - JULY 12, 1972

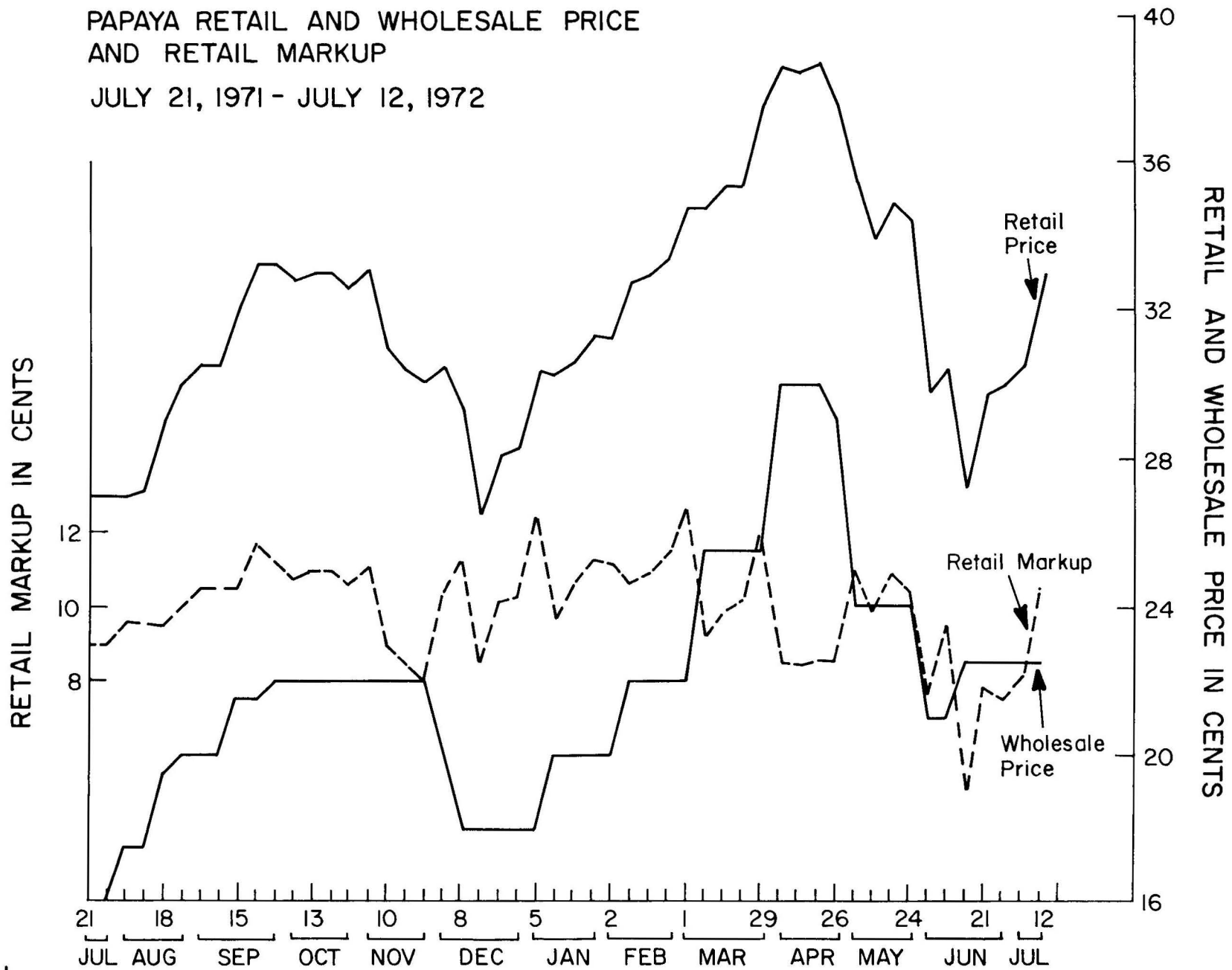


FIG. 1

WHOLESALE PRICE AND PERCENT RETAIL MARKUP JULY 21, 1971 - JULY 12, 1972

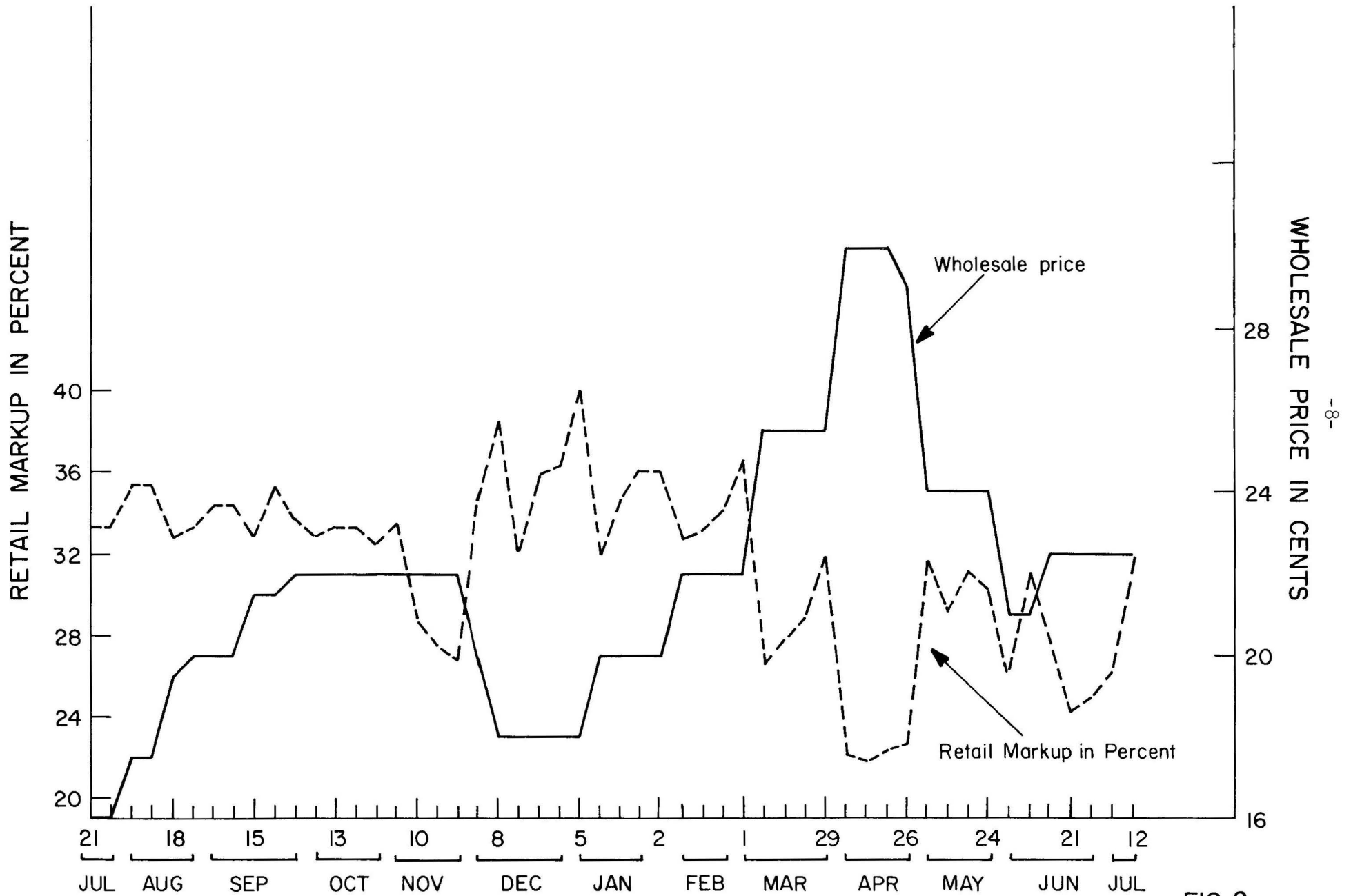


FIG. 2

SCATTERGRAM OF PERCENT RETAIL MARKUP AND WHOLESALE PRICE OF PAPAYA (JULY 21, 1971-JULY 12, 1972)

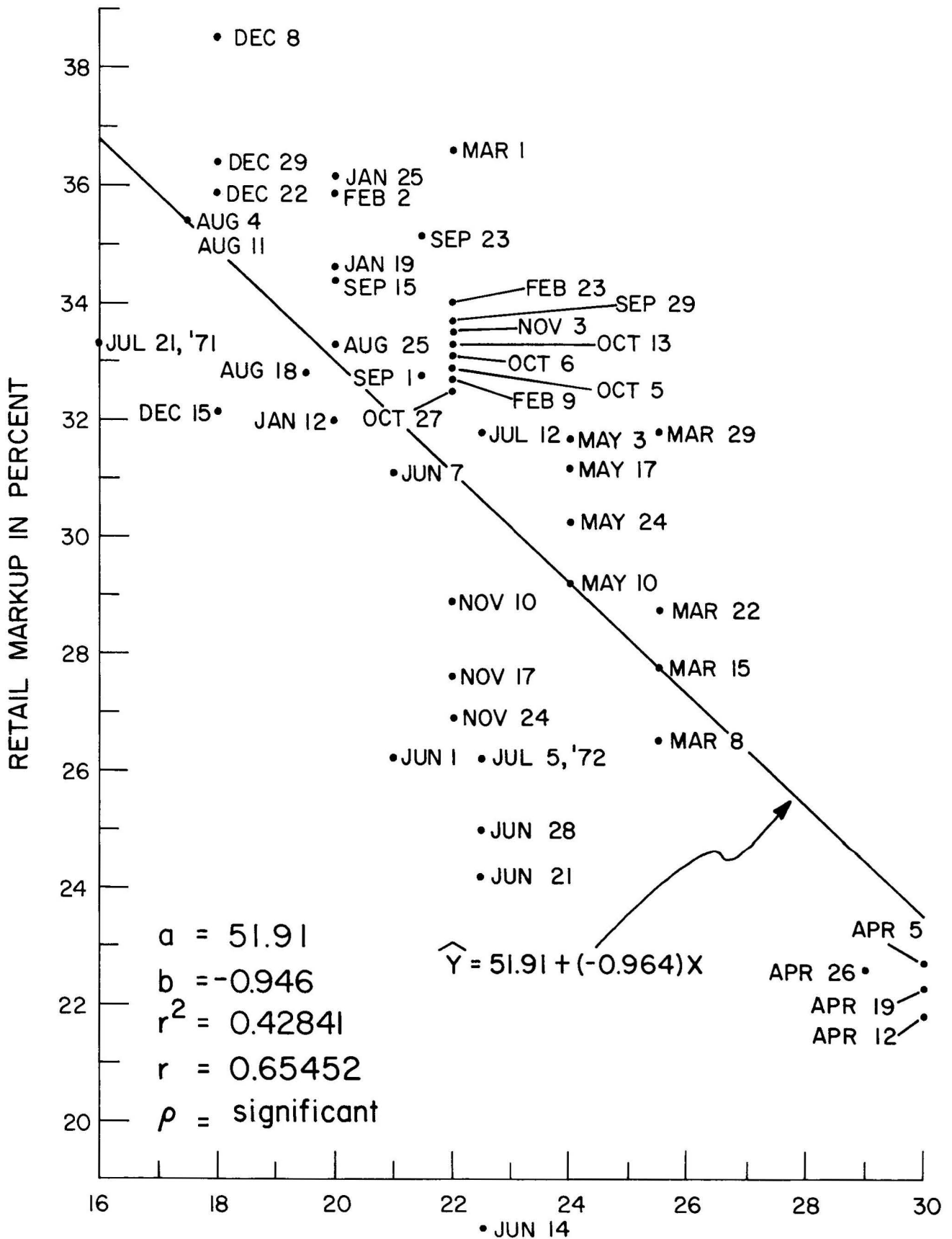


FIG. 3

WHOLESALE PRICE IN CENTS

The result was:

$$\hat{Y} = 51.91 + (-0.946) (X) \quad *$$

The slope of the regression line is, as we said, negative ($b = -0.964$).

The coefficient of determination is $r^2 = 0.42841$, which indicates that the correlation between these two variables is not very high. In fact, the wholesale price explains only 43 percent in changes in retail markups. We suspect, however, that the actual correlations would be considerably higher, since we were able to make use only of averages of both wholesale prices which are given only in a range (i.e., 18¢ to 24¢) and retail prices. More importantly, we found that our correlation findings are significant at both the 1 percent and 5 percent levels, indicating that there is a 95 to 99 percent probability that the relationship between wholesale prices and retail markups does not occur by sheer chance.

On the basis of our regression, we also measured the degree of elasticity that exists between changes in wholesale prices and retail markups.

In brief, we asked ourselves what percent changes will take place in the retail markup with a 1 percent change in wholesale price. The elasticity turned out to be $E = -1.5$. Thus, a 1 percent increase in the wholesale price will generate a 1.5 percent decrease in the retail markup percentage.

For example, assume:

Wholesale price is 20¢
Retail markup is 30%

A 10% increase in wholesale price will mean:

Wholesale price is 22¢
Retail markup is 25.5%

In terms of actual prices:

Before increase: Wholesale price is 20¢
Retail price is $(20 \div 70) \times 100 = .285¢$
Markup is equal to 8.5¢

After 10% increase in wholesale price:

Wholesale price is 22¢
Retail price is $(22 \div 74.5) \times 100 = .295¢$
Markup is 7.5¢

Thus, with a 2¢ increase at the wholesale level, the retail price increases only by 1¢ and the markup was reduced by 1¢ from 8.5¢ to 7.5¢. Conversely, in the event of a 10 percent reduction in the wholesale price, the retail price

* All required data and the computational methodology are contained in Appendix I and II.

would have declined to 27.5¢ and the markup would have increased by 1¢ from 8.5¢ to 9.5¢. In brief, the retailer does absorb some wholesale price increases in his markup; but he also is reluctant to change his price downward with a downward shift in the wholesale price.

To round out this picture and to search for reasons of an average of 31.8 percent retail markup for papaya, we interviewed a produce wholesaler and a number of produce managers of the largest retail food chains on Oahu. The following picture seems to have emerged: All managers indicated that their average markup for papaya varied from 32 to 33 percent (fairly close to our statistical findings). In some cases, markups were indicated to be somewhat higher for papayas than they are for other fruits such as oranges, apples, grapefruits (MU = 25 to 28%). In other cases, a generalized markup for fruit of 32 to 33 percent was automatically taken by the retailers.

Most prominent reasons for the somewhat higher markups for papaya are:

1. The spoilage rate is quite high, averaging 25 to 30 percent per annum. This is largely due to the fact that some papaya arrive damaged or are damaged within 24 to 48 hours after display. Some of this is due to consumer handling of the fruit, but much of it is due to rough handling during transit. Finally, it may be due to some diseases, particularly stem end rot.
2. The flow of supply is quite irregular. While apples and grapefruit seem to be immediately available and in the quantity and quality required, no such assurance exists with papaya. Shortages (particularly in recent times) have been considerable. Hence, display in stores has also been irregular. Some of the managers indicated that shortages occur even after the retail outlet has undertaken advertising campaigns for papayas.
3. Prices fluctuate too widely and are becoming very high. Although papayas are still a high turnover item, turnover has slowed due to consumer resistance, making papaya a less profitable item. Since low markup is associated with high turnover, a slower turnover would mean higher markups.
4. All managers indicated that, in the event of large papaya supply, they are prepared to place large quantities of papayas as loss leaders on the shelves. Some of these losses are recovered later through higher markups. Managers generally indicated that they would be prepared to assist the papaya industry in any way possible if large supplies were placed on the market. Some went as far as to say that they would reduce purchases of other fruits in favor of papaya.

All retailers indicated that they work through wholesalers in their papaya acquisition. However, some complained of inequitable treatment by wholesalers, particularly during periods of product shortages. The consequent fluctuations in price and supply also introduce an element of uncertainty into the papaya retail market, which in turn accounts for the relatively higher markups.

A number of suggestions were derived from these interviews, and we offer here what we consider a worthwhile addition to our findings:

1. Some retail managers suggested that Mainland promotion for papaya be reduced, particularly in times of considerable product shortages on the local market.
2. Some retail managers suggested that packaging and handling to avoid product damage in transit be considered. One suggested that a container may be developed which may go directly from the packer on the Big Island to the retail outlet.
3. Product shortages should be avoided by improved production planning. Retailers appear prepared to help producers in time of oversupply by making papayas loss leaders and (as one manager pointed out) by buying less of other fruits.
4. Some of the managers suggested that there should be a field man who represents the industry and who would call upon the various stores to assist not only in their papaya marketing and merchandising problems but who also would take some of the retailer and consumer feedback to the industry for possible correction.

While we concur with most of the suggestions proposed by our respondents, we do not subscribe to others. For example, promotion reduction on the Mainland is not justifiable. On the contrary, the existing promotional activities on the Mainland must be continued since, of course, a considerable effort would be required to continue to build and maintain the market for papayas there. The answer most likely rests in increased production here and assurance that the flow of supply to the Oahu market be maintained at the required level to meet local demand. This effort, in turn, will demand even more coordinated action on the part of papaya producers than exists at this stage.

The suggestion that special packaging and reduction in handling requirements be considered is particularly indicated in view of the high spoilage rate encountered by retailers. Reduction in handling not only reduces the damage potential to the product (and therefore spoilage) but it also means reduced distribution costs. Development of a centralized distribution system in which wholesalers would act more in the fashion of brokers than wholesale distributors is suggested here. That is, they would not take actual possession of papaya but mainly act as a link between producers and retailers on some sort of commission basis. The fruit in this case would be shipped directly to the retailer from a central storage facility to which all producers would deliver their product. We realize that this would entail maximum cooperation by competing papaya handlers. In any event, discussions along these lines should be encouraged.

Display of the fruit would require proper packaging--a package which could serve as a reusable display container on the retailer's shelf, somewhat as better peaches or pears are displayed. The loose bin display that now exists in the retail outlets contributes much to the high rate of product spoilage. Store customers tend to handle the fruit and throw it back into the bin, causing

serious bruising and eventual spoilage. A thorough study of packaging methods and costs, as well as economic means of distribution under this suggested system would be required before it can be implemented.

The suggestion for a coordinated production and distribution system in the industry warrants special consideration today, to eliminate product spoilage on the local market and to keep operating costs to a bare minimum. That is, a constant effort must be made to bring production in line with market requirements. Individual farm firms generally are not by themselves able to perform this task effectively and efficiently. Cooperative marketing groups will tend to reduce marketing costs because of specific economies of scale in the various marketing functions (e.g., assembly, storage, transportation, distribution, financing, etc.). At the same time, cooperative marketing groups have a greater capability of receiving, interpreting and coordinating market signals on a season-to-season and even on a day-to-day basis than would individual farm firms. By intergrating this activity with producer plans, the cooperative entity can bring about orderly marketing of papayas more nearly than would be possible in an uncoordinated, atomistic distribution system. By implication, this system of coordination can also prevent any glut on the market that might arise, by being able to divert surplus product into other markets for other uses. In that conjunction, some linkup with a processing facility might be given consideration. However, this form of arrangement will require a thorough assessment of cost-benefit coefficient, industry preparation toward involvement in this type of activity and the availability of suitable financing and facilities. Indications, however, show the need for implementation of such a system. If it does not exist now, it will certainly be present in the not too distant future.

The suggestion to use fieldmen to establish a direct liaison between the industry and the retailer is most pertinent at this point, not only on the Mainland market (where fieldmen are already used) but also on the local market. Retailers have pointed out repeatedly that direct contact with the industry is required, particularly in matters of quality control, merchandising and promotion. Since the retailer's display shelf is the contact point between the consumer and the industry, it is indeed important that the industry be presented by someone who understands the product, who has a direct interest in it and who can act as a two-way link of communication between the retailer and the industry. Many of the problems that now exist between these points in the chain of distribution could thus be alleviated or discovered long before they would cause costly disturbances and delays in the required supply flow. It is possible that, with this suggestion, retailers also implied that a greater awareness and consideration of consumer needs on the part of the industry be developed. We shall discuss this particular point more thoroughly in Part II of this report.

In general, managers concurred in our findings of the wholesale price-markup mirror relationship. They warn, however, that continued increases in papaya prices will impair their profit picture sufficiently for them to forego continuing purchases of papaya. The papaya industry should keep in mind that, in many of our largest food retail chains, papayas are among the ten top items in the produce department. At the same time it is incumbent on industry to communicate to wholesale and retail sellers that we need to maintain "reasonable" prices to preserve a viable papaya industry. In any event, it is important that this market be nurtured and aided in any way possible.

Part II: Consumer Profile and Consumption Analysis

As was indicated in Part I of this report, there is a definite need for producers of papaya to have some insight of the needs of the consumers of the product so that (a) certain qualitative and quantitative needs of the market may be met, and (b) through market segmentation, appropriate market development and more effective promotional steps may be taken.

To obtain these insights, we developed a schedule (Appendix III) which was sent to 1000 households on Oahu to elicit information on:

1. Location of household,^{1/}
2. Purchasing habits (frequency and quantity of purchases) of respondents,
3. Consumer qualitative requirements (maturity, size, etc.) and quality ratings of papayas purchased,
4. Position of papayas in consumer's assessment relative to six competing fruit items, and
5. The consumer profile (age, ethnic origin, size of family, approximate income, etc.).

Of the 1000 questionnaires mailed to households randomly chosen from the Oahu telephone book, some 336 schedules were returned to us. However, since 30 of them contained information too incomplete to be useful to us for analytical purposes, we eliminated them from our collection. On the basis of information available to us, we conducted four different forms of analysis:

1. We developed a purely tabular structure designed to depict all demographic data in table form. We compared this structure with demographic data pertaining to the whole county to determine whether and to what extent our relatively small sample was representative of the total population of the county of Oahu. We found that, aside from the income distribution, the demographic distribution of our sample was quite closely aligned with that of the total population of the country. We obtained a rather good fit with respect to age and family size distribution; however, our sample seems to show a

^{1/} To include location of sample households in our variables, we requested respondents to include the zip code of their residence on their schedule. From this the following location codes were developed:

- Region 1 - 968 [13, 14, 16, 21, 22, 25] East Honolulu
- Region 2 - 968 [17, 18, 19] West Honolulu
- Region 3 - 968 [15] Waikiki-Kahala
- Region 4 - 967 [30, 31, 34, 44, 62, 95] Koolau Poko
- Region 5 - 967 [01, 06, 12, 59, 82, 89, 91, 92, 97] North Central-Leeward
- Region 6 - All remaining zip codes.

slight upward bias in income which may be due to the fact that we picked our sample from the telephone book, which in itself does imply a certain level of affluence which may not be found in a totally unbiased population sample. We considered the difference, however, insufficiently significant to interfere seriously with our analysis and inference. Our tabular presentation also includes certain data on consumption habits and on consumer attitudes toward papaya.

2. We constructed tables of average per household annual consumption of papaya as it relates to specific demographic parameters such as ethnic origin, location, income, and many others.
3. Next, we developed sets of contingency tables which show the impact that demographic as well as qualitative and use variables have upon consumption patterns.
4. Finally, we made use of step-wise regression analysis to determine those variables contained in our schedule which have the most important relative impact on papaya consumption patterns on Oahu.

We employed for our analyses three BMD Programs, 01D, 03S, and 02R to obtain analyses 2, 3, and 4, respectively.

Tabular Presentation (Demographic Section)

The following demographic factors were included in this section: ethnic composition of household, the age of the woman of the house, the age of the man of the house, 2/ and the household income.

To describe the ethnic composition of the households in the sample, we asked respondents to indicate the ethnic origin of the man of the house and the woman of the house. For example, the resulting composition, shown in Table 1, indicates that, of all the households in the sample, 38.1 percent had Japanese housewives or Japanese female heads of the family, and 32.1 percent had Japanese male heads of the family or husbands. It also indicates that 11.5 percent of the households in the sample had Chinese housewives and 11.5 percent had Chinese males in the households.

We now turn to the age distribution in the sample, which is depicted in Table 2. To obtain the income structure in our sample, we asked that data on family income before taxes be indicated. It was assumed that the respondents would be apt to be more familiar with income in these terms than in any other form. To prevent disclosure of any individual respondent's actual income, we broke income into five categories as shown in Table 3.

2/ We define the woman of the house as the housewife or the female head of the household. The man of the house is defined as the husband or male head of the household.

Table 1. Ethnic composition of households

Ethnic origin	Women (Percent)	Men (Percent)
Caucasian	32.9	32.9
Chinese	11.5	11.5
Filipino	4.1	3.3
Hawaiian	2.5	1.2
Part Hawaiian	3.3	4.5
Japanese	38.1	32.1
Other groups	3.3	3.3

Table 2. Age distribution in the sample

Age	Women (Percent)	Men (Percent)
60+	11.9	10.3
35 - 59	58.0	56.2
Less than 35	24.1	26.4
No response	6.2	8.1

Table 3. Income distribution of the sample

Income	Households (Percent)
Less than \$ 4,000	2.5
4,000 - 6,999	7.0
7,000 - 9,999	15.1
10,000 - 14,999	26.7
15,000 - 24,999	34.3
25,000 +	14.4

Since 51.3 percent of our respondents had an income of \$15,000 or less and 48.7 percent had an income of more than \$15,000, we may conclude that the median income of our sample is somewhat above the \$15,000 level which, as we have previously indicated, is somewhat higher than existing demographic data pertaining to Honolulu show.

We now turn to those categories which deal with frequency of purchase, usage of papayas, and size and color preferences of the product:

Some 48.6 percent of the families in the sample indicated that they had purchased papayas within 30 days prior to receipt of the questionnaire. About 45.3 percent indicated that they had not done so, while the remaining 6.1 percent did not respond to this question.

In terms of frequency of purchase, we determined that: 46.7 percent of households in the sample purchased papayas less than once a week, 24.6 percent purchased them at least once a week, 10.3 percent more than once a week, while 16.8 percent indicated that they never bought the product (either because they do not consume it or because they have their own papaya trees).

To determine the quantities that families purchased on an average during any one given shopping event, we asked the respondents to indicate how many pounds of papayas they had bought the last time they purchased them at the store. The following response was obtained:

About 4.5 percent of respondents had purchased less than 1 pound, 34.4 percent 1 to 2 pounds, 43.6 percent more than 2 pounds, and 16.8 percent said that they had never bought any papayas.

From consumption estimates indicated by various respondents in the sample, we determined that the average per family consumption of papayas amounts to about 95 pounds per annum.

Looking at the characteristics of papayas preferred by our sample households, the following preferences regarding maturity and size were established:

Some 11.1 percent preferred papayas with a tinge of yellow, 10.2 percent preferred them a quarter-ripe, 45.5 percent indicated preference for half-ripe papayas, and 25.8 percent desired fully ripe fruit. The remaining 0.7 percent did not respond to this question.

In terms of size preference, the following was indicated: Approximately 22.5 percent of the respondents preferred papaya below 1 pound, 32.4 percent preferred 1-pound size, 33.2 percent preferred 1 to 2 pounds, and 2.1 percent liked them to be 2 pounds and above. This question was not responded to by 9.8 percent of the sample.

Our inquiry into the usage of papayas by our sample households shows that 83.1 percent of all respondents use papayas as a breakfast fruit, 11.5 percent use them to prepare salads, 0.8 percent use them for baking and cooking and 4.6 percent did not respond to this question.

Two additional statistics of interest were developed. In one questionnaire we requested our respondents to indicate the value they themselves would place on a pound of papaya. In brief, we asked them what they regarded to be a fair price for 1 pound of papaya. The results are indicated in Table 4.

Table 4. Fair price valuation of papaya by sample households

Fair price per pound (Cents)	Households (Percent)
Less than 14	27.5
15 - 19	23.4
20 - 24	28.7
25 - 29	8.6
30 - 34	2.5
35 +	0.4

The largest group of values was at the 20¢ to 24¢ level. After this point, the percentage of those indicating higher values drops sharply. In fact, the table clearly indicates that 79.6 percent of all respondents would be prepared to pay less than 25¢ per pound of papaya at the retail level.

The other statistic dealt with the preference relationship that papaya has with other fruits (apples, bananas, grapefruit, grapes, mangoes, and oranges) which are commonly consumed within the household in our sample.

To obtain this information, we requested respondents to indicate which of the above-mentioned fruits are most often consumed in the household and to show the less frequently consumed fruit in descending order from a rating of 7 to 1. Thus, if a household consumed apples most often, for example, apples would be given the number 7. The next most often consumed fruit (say papaya) would be given number 6, oranges number 5, etc. until the least consumed fruit was reached, it was given number 1.

From Table 5 we see that nearly one-fourth of the respondents in the sample indicated that papaya is the most consumed fruit in their household, oranges and bananas are next. Least frequently mentioned were grapes and grapefruit. It may be inferred, then, that papayas hold a relatively good competitive position with other fruits in Honolulu households. However, it may also be concluded that this situation may be in part price-induced, and that a continued increase in papaya prices may reduce its preferred position in the household over time.

Table 5. Relative position of consumption preference of seven fruits commonly used by sample household

Fruit commonly consumed by household	Relative consumption frequency rating ^{a/}						
	1	2	3	4	5	6	7
	(Percent of household indicating)						
Apples	5.3	8.6	11.5	12.7	15.6	20.1	18.4
Bananas	4.1	7.1	12.3	12.3	16.0	20.9	19.3
Grapefruit	34.0	17.6	13.8	11.5	5.3	5.3	3.7
Grapes	19.3	19.3	15.2	15.6	10.7	7.4	3.3
Mangoes	14.4	18.1	14.8	14.0	11.9	9.5	8.2
Oranges	4.1	6.6	7.8	15.6	20.5	18.0	20.1
Papaya	13.1	11.5	13.9	7.8	13.5	12.3	23.4

^{a/} Most frequently consumed fruit in household rated 7 - least frequently rated 1.

Consumption Patterns Related to Demographic and Preference Variables

In this part of our analysis, we relate per household consumption to specific attitudinal and demographic variables, including location of households, usage of papayas, quality rating by respondents, ethnic origin, and income levels of respondents. Since the annual quantity consumed is the relevant dependent variable, it was necessary to eliminate those schedules which indicated no response on this particular variable. This reduced our sample by about 40 units, so that 266 schedules remained for our analysis. It is our belief, however, that this should not reduce the trustworthiness of results obtained.

As was indicated previously, we had divided the area of operation into six regions, the delineation of which is shown in this report. Table 6 shows average per household consumption of papaya in each of the regions. Region 6 was eliminated from this table since it encompassed fewer than 10 households. It may be of interest to note that average per household consumption there was indicated to be 45 pounds. This may be due to the fact that some of the households in that district have their own papaya trees.

Note that regions 1, 2, 4, and 5 conform quite closely to the sample average annual consumption of 95 pounds. Region 3 lags behind. Again, we might conclude that, just as in region 6, many of these households may have their own papaya trees. However, another possibility might be that the ethnic composition of the region may contain traditionally low per household consumers of papaya.

Next, we related per household consumption to the ethnic origin of the woman of the house (including female head of household) and the man of the house (including male head of the household). Tables 7A and 7B show that Filipino and Japanese households are the largest consumers of papaya, followed by Caucasian and Chinese households.

Table 6. Per household annual consumption of papaya on Oahu by regions

Region	Average per household papaya consumption (Pounds)	Sample households in region (Number)
1	100.15	102
2	101.06	43
3	68.14	23
4	103.00	32
5	94.23	59

Table 7A. Annual per household consumption of papaya according to ethnic origin of woman of the house a/

Ethnic origin	Annual per household consumption
	(Pounds)
Caucasian	84.90
Chinese	67.18
Filipino	146.30
Hawaiian	57.80
Part Hawaiian	57.86
Japanese	123.24
Other	55.75
Single woman in household	70.56

a/ Note: Woman of the house is defined as housewife or female head of household.

Table 7B. Annual per household consumption of papaya according to ethnic origin of man of the house a/

Ethnic origin	Annual per household consumption
	(Pounds)
Caucasian	81.77
Chinese	77.00
Filipino	144.89
Hawaiian	23.00
Part Hawaiian	64.64
Japanese	127.25
Other	47.43
Single man in household	48.43

a/ Note: Man of the house is defined as husband or male head of household.

Households with single women consume more papayas than households with single men. The latter may be due to the fact that single men eat more of their meals away from home than do women.

It may also be of interest to note that, while households with, say Caucasian housewives, consume 84.9 pounds per year, those with Caucasian husbands consume 81.7 pounds. The difference in this case (as in all other ethnic groups) may be due to the internal ethnic composition of the household (i.e., not all Caucasian housewives have Caucasian husbands) and the predominance of shopping choice in each household. Therefore, information from these variables can only be quite general.

Table 8 shows the relationship of income to per household papaya consumption. For convenience of presentation, we have broken income down into those groups which are shown in the table.

Table 8. Per household papaya consumption related to per household income

Income group	Annual per household consumption (Pounds)	Households reporting (Number)
Less than \$ 4,000	54.17	10
4,000 - 6,999	130.00	22
7,000 - 9,999	106.52	29
10,000 - 14,999	89.64	59
15,000 - 24,999	83.49	90
25,000 +	116.20	41

Note that the total number of households responding here is short of the 266 in the sample. This is because a number of respondents failed to indicate their income group. We also note that there really is no consistent pattern relating income to consumption. While we would expect lower income to be associated with lower consumption and higher income with higher consumption, this seems to hold mainly in the extreme ranges of high or low income in our sample. Thus, households with incomes of less than \$4000 per annum consume only 54 pounds (41 pounds below the average) while households with incomes exceeding \$25,000 consume 116.2 pounds (21 pounds above the average). But this pattern changes drastically in the income ranges between \$4000 to \$24,999. Here consumption tends to decline with increasing incomes, from 130 pounds per

household in the \$4000 to \$7000 bracket to 83.49 pounds in households in the \$15,000 to \$25,000 bracket. There does not seem to be a good explanation for this discrepancy. It may, however, be that a relatively large part of the high-consuming Filipino and Japanese households may fall into the lower income bracket (\$4000 to \$7000), while a smaller proportion of these households and a larger proportion of low-consuming Caucasian and Chinese households may fall into the somewhat higher income bracket. The actual impact that income has on papaya consumption will be discussed in a later section of this report.

We next show the relationship of a number of nondemographic factors to consumption. The first one was a group of use factors, such as household use for breakfast, salads, baking, and others (Table 9).

The majority use papaya for breakfast, in which case household rates of consumption come close to the sample average. However, where papaya is used for special purposes, such as cooking, and preparation of salads, per household consumption increases markedly, as will be seen later. Households where papayas are predominantly used for cooking and for salad preparation are mainly of Hawaiian, part Hawaiian and Japanese ethnic origins.

Table 9. Annual per household consumption of papaya related to usage of papaya

Usage	Per household consumption	Households reporting
	(Pounds)	(Number)
Breakfast	101.13	198
Salads	145.21	28
Baking	509.50	12
Other	166.58	26
No response	- -	2

Table 10 shows a rather surprising relationship between quality ratings of papaya by households (excellent, good, fair, poor) and annual per household consumption.

That the largest per household consumption should be among those who rate the quality of available papaya as excellent is not surprising, nor is it surprising for those households that rate quality as poor to be also low consumers. However, that household consumption among those who rate the quality of papaya to be good should be below the average and also below those who rate quality

Table 10. Papaya quality ratings of sample households to consumption

Quality ratings	Annual per household consumption	Households reporting
	(Pounds)	(Number)
Excellent	128.75	46
Good	84.40	125
Fair	111.74	64
Poor	77.00	19
No response	- -	12

as only fair is somewhat harder to explain. We suspect, however, that those households of low-consuming ethnic origins predominate in the group that has rated papaya as good. We can conclude that, while quality assessment is an important factor in per household consumption, tradition based on ethnic origin and some other factors also maintain their influence.

A final relationship in this group deals with a value assessment of papayas and its relationship to consumption. We asked our respondents what in their opinion a fair price (value) of a pound of papaya would be. We related this information to per household consumption in Table 11.

Table 11. Fair price (per pound) of papaya assessment by households related to annual per household consumption

Assessed fair price per pound	Annual per household consumption	Households reporting ^{a/}
(Cents)	(Pounds)	(Number)
Less than 14	96.51	126
15 - 19	82.89	65
20 - 24	91.84	57
25 - 29	96.36	71
30 - 34	142.57	21
35 +	199.87	11

^{a/} Sum of households greater than in sample due to duplication.

It is of interest to note that households assessing papayas at higher values also tend to consume more. However, only a small number of households in the sample would consider the presently prevailing retail price of 38.5¢ for papaya as fair.

Impact of Certain Demographic and Nondemographic Variables on Consumption

The relationship discussed in the previous section can now be analyzed in terms of an impact dimension. That is, we can establish the percentage rate of relatively low or high consumption as it is affected by the various demographic and nondemographic variables such as income, ethnic origin of the household, quality rating of papaya, etc. To implement this impact test, we made consumption the dependent variable and segmented it into six groups as shown in the contingency tables. Since median consumption seems to rotate about the 50-pound level, we chose to make this our dividing line of low and high consumption.

The first relationship considered is the effect of ethnic origin of the woman of the house (or female head of household) on consumption. We chose this as our determining parameter since it is predominantly the woman who makes most of the shopping decisions.

Table 12. Effect of ethnic origin of woman of the house on annual per household papaya consumption by percent of sample households

Ethnic origin (percent household)	Annual per household consumption (pounds)							
	0-9.9	10-19.9	20-49.9	50-99.9	100-499.9	500+	Less than 50	More than 50
Caucasian	30.0	8.7	16.2	21.2	22.5	1.5	54.9	45.1
Chinese	21.4	7.1	57.1	0	14.3	0	86.7	14.3
Filipino	40.0	10.0	30.0	10.0	10.0	0	80.0	20.0
Hawaiian	16.7	16.7	16.7	16.7	33.3	0	50.0	50.0
Part Hawaiian	37.5	12.5	12.5	25.0	12.5	0	62.5	37.5
Japanese	30.1	14.0	12.9	17.2	20.4	5.4	57.0	43.0
Other	12.5	0	50.0	0	37.5	0	62.5	37.5
Total	28.3	11.1	20.9	15.6	21.3	2.9	60.2	39.8

Table 12 shows that 39.8 percent of all sample households consume in excess of 50 pounds of papayas per annum. The largest group was that with Hawaiian housewives, which indicated consumption above 50 pounds per annum; households with Caucasian housewives were next with 45 percent; then Japanese with 43 percent. All other households are below the average percentage. It will take a separate study to determine the reason for consumption differences among ethnic groups.

Income was the second relationship pertaining to consumption. What is the impact that income generally has on consumption?

Table 13 shows that only incomes below \$4000 and those above \$25,000 show some specific effect on papaya consumption by our sample households. We find that only 33.3 percent of households with incomes below \$4000 consume over 50 pounds per year. This picture does not change much in the higher income brackets. Only about 38.5 percent of households in income brackets from \$7000 to \$15,000 consume 50 pounds or more per annum, approximately the same holds for incomes in the \$15,000 to \$25,000 bracket (37.3%). All these are somewhat below the average of 39.8 percent of all households. Only households with an income level at or above \$25,000 show some difference. Here 45.5 percent of all households consume 50 pounds or more of papaya per year--well above the levels of the total sample.

Table 13. Effect of income on annual per household papaya consumption by percent of sample household

Per household income (percent household)	Annual per household consumption (pounds)							
	0-9.9	10-19.9	20-49.9	50-99.9	100-499.9	500+	Less than 50	More than 50
Less than \$ 4,000	66.7	0	0	33.3	0	0	66.3	33.3
4,000 - 6,999	47.1	5.9	17.5	11.8	11.8	5.9	70.5	29.5
7,000 - 9,999	26.9	15.4	19.3	15.4	19.2	3.8	61.6	38.4
10,000 - 14,999	33.8	10.8	16.9	18.5	18.5	1.5	61.5	38.5
15,000 - 24,999	20.5	10.8	31.4	11.4	20.0	5.9	62.7	37.3
25,000 +	20.0	11.4	24.1	15.7	27.1	1.7	54.5	45.5
Total sample	28.3	11.1	20.9	15.6	21.3	2.9	60.2	39.8

At the lower consumption level, income seems to have a more definitive impact. Note that 66.7 percent and 47.1 percent, respectively, of all households in the income bracket of less than \$4000 and the \$4000 to \$7000 bracket consumed less than 10 pounds of papaya per year. This percentage of low consumption is much larger than the data shown for households in the higher income brackets and the total sample (28.3 percent).

Next, we examined the effect of certain attitudinal aspects on papaya consumption. The first deals again with the quality ratings which were given to available papaya supply by responding households. The results of this relationship are shown in Table 14.

Table 14. Effect of quality ratings on annual per household papaya consumption by percent of sample households

Annual per household consumption (Pounds)	Quality ratings by sample households				
	(1) Excellent	(2) Good	(3) Fair	(4) Poor	(5) Total sample
	----- Percent households -----				
0 - 9.9	16.7	23.5	18.8	38.4	28.3
10 - 19.9	8.2	15.1	10.4	0	11.1
20 - 49.9	13.9	24.4	27.0	15.4	20.9
50 - 99.9	16.7	12.6	20.8	23.1	15.6
100 - 499.9	38.4	22.7	16.7	23.1	21.3
500 +	5.6	1.7	6.3	0	2.9
Less than 50	38.8	63.0	56.2	53.8	60.2
More than 50	61.2	37.0	43.8	46.2	39.8

Note that 61.2 percent of all households that rated papayas now available as excellent, consume over 50 pounds per year. This appears to be a clear indication that ranking in itself affects consumption. However, the picture is confused by the fact that only 37 percent of all households rating papayas as "good" consume 50 pounds or more per year. Of those who rated papaya as poor, 46.2 percent had consumed over 50 pounds per year. The only conclusion is that per household consumption of those who say that papaya are "good" is lower than in any of the other classes of ratings. We shall see in the following pages that this assumption was borne out by another test.

An additional relationship was developed between consumption and the preference relations between papayas and other fruit consumed in our sample households. The question is: Does the level at which papaya is preferred over other fruit in a household affect consumption? The response to this question is contained in Table 15. As in the previous sections, we depicted papaya preference ratings from 1 to 7, with 7 being the highest and 1 the lowest preference among 6 other fruits normally consumed by our sample households.

Table 15. Effect of papaya preference over other fruit used in sample household on per household papaya consumption by percent of households

Annual per household consumption (Pounds)	Papaya preference ratings over other fruit							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	1	2	3	4	5	6	7	Total sample
	----- Percent household -----							
0 - 9.9	56.3	35.3	23.5	10.5	30.3	13.3	14.0	28.3
10 - 19.9	18.3	28.0	23.6	5.3	3.1	0	3.5	11.1
20 - 49.9	6.6	26.0	38.2	52.6	24.2	26.7	3.5	20.9
50 - 99.9	9.4	7.1	5.9	26.3	18.2	26.7	21.1	15.6
100 - 499.9	9.4	3.6	8.8	5.3	24.2	30.0	47.4	21.3
500 +	0	0	0	0	0	3.3	10.5	2.9
Less than 50	81.2	89.3	85.3	68.4	57.6	40.0	21.0	60.2
More than 50	18.8	10.7	14.7	31.6	42.4	60.0	49.0	39.8

Evidently, preference of papaya over other fruits normally consumed in the household does have a marked effect on annual per household consumption. About 79 percent of those households which showed a large preference for papaya consumed 50 pounds or more, compared to 18.8 percent of those households that showed relatively lower preference for papaya. It follows that papaya does compete with other fruit. Evidently the above statistic clearly indicates that efforts toward an improved competitive position of papayas in the household has its rewards.

We can now also test the impact that consumer evaluation of papaya via the concept of fair price has on consumption. In this relationship, we obtained the result shown in Table 16.

Table 16. Effect of price valuation of papaya by households on per household consumption by percent of households

Annual per household consumption	Fair price valuation of papaya (per pound)						
	(1) Less than 14¢	(2) 14-19¢	(3) 20-24¢	(4) 25-29¢	(5) 30-35¢	(6) 35¢+	(7) Total sample
(Pounds)	----- Percent households -----						
0 - 9.9	36.1	26.3	18.6	9.5	16.6	0	28.3
10 - 19.9	16.7	12.3	10.0	4.8	0	0	11.1
20 - 49.9	19.4	24.6	22.9	19.0	16.7	0	20.9
50 - 99.9	13.9	12.3	17.1	23.8	16.7	100	15.6
100 - 499.9	11.1	21.1	30.0	38.1	33.3	0	21.3
500 +	2.8	3.5	1.4	4.8	16.7	0	2.9
Less than 50	72.2	63.1	51.5	33.3	33.3	--	60.2
More than 50	27.8	36.9	48.5	66.7	66.7	--	39.8

Again, we find that those households that value papaya more (i.e., those households that consider a higher price as a fair price for the product) also individually tend to consume more of it. We find that 66.7 percent of those households which have indicated a fair price of 30¢ to 35¢ per pound would consume more than 50 pounds per annum, compared to only 27.8 percent of those households which would be prepared to pay less than 14¢ per pound for papayas. Column 6 of this table may be ignored, since the number of households indicating that they considered a price higher than 35¢ to be fair was rather small.

Two demographic relationships remain to be discussed. One deals with the impact of size of the household on annual per household papaya consumption. The other one deals with the impact of age of the woman of the household on consumption. Size of household means the total number of individuals, irrespective of age and relatedness, living in a household. To construct this table, we divided the size of households into six groups: 1 person, 2 persons, 3-4 persons, 5-8 persons, 9-12 persons, and 13-25 persons. Our findings are shown in Table 17.

Table 17. Effect of size of household on annual per household papaya consumption by percent of households

Annual per household consumption (Pounds)	Size groups of households (number of persons)						
	(1) 1	(2) 2	(3) 3-4	(4) 5-8	(5) 9-12	(6) 13-25	(7) Total sample
	----- Percent households -----						
0 - 9.9	41.7	31.8	26.8	28.1	28.6	0	28.3
10 - 19.9	8.3	4.5	11.6	11.2	14.2	50.0	11.1
20 - 49.9	8.3	18.3	22.3	23.6	0	0	20.8
50 - 99.9	16.7	18.2	15.2	12.4	42.9	50.0	15.6
100 - 499.9	16.7	22.7	22.3	22.5	0	0	21.3
500 +	8.3	4.5	1.8	2.2	14.3	0	2.9
Less than 50	58.3	54.6	60.7	62.9	42.8	50.0	60.2
More than 50	41.7	45.4	39.3	37.1	57.2	50.0	39.8

Household size does not seem to be a decisive factor in the quantity of papaya consumed except in cases where the household is extremely large. Otherwise, the various sized households seem to remain in much the same consumption pattern as is indicated for the whole sample. Experiments including number of children in the household were equally inconclusive.

To determine whether age of household members has any effect on consumption patterns, we took the age of the woman of the household as our basic criterion, for the same reason as indicated in the last section. To develop this analysis, each group was broadly divided into over 60, 35 to 59, and under 35 years of age as shown in Table 18.

There seems to be strong evidence that the age of the woman of the house does directly affect consumption patterns in our sample households. We note, for example, that 62 percent of those households where the housewife was over 60 years of age consumed more than 50 pounds of papaya per year. Conversely, in younger households where the age of the housewife was less than 35 years, only 27.2 percent of the households consumed 50 pounds or more of papaya. Some of this undoubtedly is related to income, but it may also be due to the fact that, in many households, papayas are assumed to be a health food and may represent an attempt by the elderly to maintain their well-being through increased papaya consumption.

Table 18. Effect of age of woman of the house on annual per household papaya consumption by percent of household

Annual per household consumption (Pounds)	Age group of woman of the house (years)			
	(1) Over 60	(2) 35-59	(3) Under 35	(4) Total sample
	----- Percent household -----			
0 - 9.9	13.8	25.5	40.7	28.4
10 - 19.9	3.5	9.9	13.6	11.1
20 - 49.9	20.7	22.0	18.5	21.0
50 - 99.9	31.0	15.6	13.6	15.6
100 - 499.9	31.0	22.7	11.9	21.0
500 +	0	4.3	1.7	2.9
Less than 50	38.0	57.4	72.8	60.5
More than 50	62.0	42.6	27.2	39.5

The final relationship to be discussed deals with maturity and size preferences of sample households as they relate to ethnic origin of the woman of the house.

Table 19 shows, for example, that a preference for half-matured fruit is very prominent among Chinese households but much less pronounced in Hawaiian households. Note also that, among Filipino households, all respondents require their papaya to be either half or fully matured. Among part Hawaiian households, a preference for fully matured fruit is predominant.

We note further that size preference of papayas also differs among various ethnic groups. For example, 66.6 percent of Hawaiian households prefer sizes up to 1 pound, while nearly 67 percent of part-Hawaiian households prefer sizes above 1 pound. Japanese housewives prefer the smaller sizes.

Differences on the size and maturity evidently are due to different uses to which papayas are put in the household. Thus, our survey shows that part-Hawaiian housewives prefer to use papaya for baking and cooking (hence, the larger size preference), while Japanese housewives prefer to use papaya predominantly for the preparation of salads.

Table 19. Maturity and size preferences of papaya in sample households related to ethnic origin of woman of the house by percent of household

Preference of household	Ethnic origin of woman of the house							
	(1) Caucasian	(2) Chinese	(3) Filipino	(4) Hawaiian	(5) Part Hawaiian	(6) Japanese	(7) Other	(8) Total sample
----- Percent household -----								
<u>A. Maturity</u>								
Tinge of yellow	12.5	10.7	0	16.7	12.5	10.8	12.5	11.1
Quarter mature	6.3	10.7	0	16.7	0	15.1	12.5	12.5
Half mature	40.0	60.7	50.0	16.7	62.5	48.4	37.5	45.5
Fully mature	28.7	17.9	40.0	48.0	17.5	18.3	37.5	25.3
Total <u>a/</u>	87.5	100.0	90.0	96.1	92.5	92.6	100.0	94.4
<u>B. Size</u>								
Less than one pound	11.2	7.1	10.0	33.3	27.5	34.5	25.0	22.5
One pound	37.5	46.4	40.0	33.3	12.5	23.7	37.5	32.5
One to two pound	36.2	42.4	40.0	16.7	52.5	28.0	37.5	33.2
More than two pound	0	3.6	0	16.7	0	3.2	0	2.0
Total <u>a/</u>	84.9	100.0	90.0	100.0	92.5	88.9	93.0	90.2

a/ Note: Totals do not add to 100 percent in every case because of nonresponses.

Ranking of Significance of Variables Affecting Papaya Consumption

A final measurement of the importance of the various variables in our schedule as they affect consumption was made through step-wise regression. This method mainly ranks the variables contained in our questionnaire according to the significance they have in relation to papaya consumption. In somewhat more precise terms, step-wise regression reveals the extent to which each of the independent variables in the schedule accounts for changes in the dependent variable (consumption).

The program considered the following variable groups as most significant, ranked here according to their importance:

1. The competitive position of papaya among other fruit in the household has proven to be the most significant variable. Those households that rank papaya highest among the various other fruits had by far the highest influence on consumption changes (Question 9, Appendix III). This points up the importance of maintaining a high product image in the eyes of the public through good merchandising, good quality control and general adherence to the wishes of the consumer.
2. The second most significant group was that dealing with the frequency at which households purchase papayas (Questions 3 and 4). We found that a combination of those who purchased less than once a week but more than 2 pounds per purchase have the highest consumption effect. That is, they account for greater positive changes in total consumption than would those, for example, who purchase 1 pound more frequently than once a week.
3. The third most significant group is concerned with the usage of papayas (Question 10). The biggest impact on consumption in this group is by those who use papaya for baking and cooking purposes, followed by those who use them for salads. This indicates that recipes for papaya should be most often directed toward cooking and baking and preparation of salads.
4. The quality assessment by consumers (Question 11) has a significant impact on consumption changes. Of this group, those who contend that quality is good have the most important influence; those who regard papaya quality as poor have the next most significant impact on consumption.
5. As is demonstrated throughout this report, the ethnic origin of the household, and particularly that of the woman of the house, has a significant effect on consumption. As is to be expected, Filipino, Japanese, and Hawaiian households have the most profound impact on consumption.
6. Finally, a rather interesting variable which appears in Question 3 seems to have an important influence on consumption. A number of respondents indicated that they had never bought papayas (the last element in the question) but at the same time indicate substantial consumption patterns. These are the households that produce papaya in their own yards.

The remaining variable groups (those dealing with age, size of household, income, etc.) showed somewhat lower significance, and others were totally insignificant in their effect on changes on papaya consumption.

As we indicated previously, income per se does not have a significant effect on consumption, although special areas (low and high brackets) evidently do. The same thing may be said about price evaluation of papayas by individual households. It should, however, be pointed out here that many of the schedules received by us contained messages from respondents to the effect that the price of papaya in Honolulu is sufficiently high at the retail level so as to make future purchases either impossible or to force a drastic reduction in the quantity that will be consumed.

Conclusion

We have demonstrated some of the factors and their impact on consumption of papaya. We have also shown some of the buying habits and taste or preference patterns by individual consumers.

In general, we have determined that adherence to these patterns and consideration of the desires expressed by consumers will assure a good and steady market in Hawaii. However, continued quality and supply control as well as good merchandising practices will be required for the development of this market.

Employment of fieldmen to act as liaison between producers and consumers (via the retailer) is urged. Although prices were not found to have a highly significant impact on consumption, voices were raised against their continued increase; or put in another way, "high" papaya prices must be made justifiable in the consumers' mind. Hawaii consumers are conditioned to view papaya as being high at prices exceeding 25¢. The fact that papaya prices have been historically below parity is unknown to the average consumer. Hence, it is incumbent upon the industry to educate the housewife that prices above 25¢ are indeed fair. At the same time, further research toward implementation of cost-saving production, and particularly distribution systems, should be continued and a high level of supply response be maintained.

Development of suitable and attractive packaging and display should be encouraged so that product losses due to spoilage may be prevented. Reduction in the product spoilage rate may either be conducive to a reduction in the retail markup or may help in holding the line on further increases.

Appendix I

Papaya retail, wholesale prices, and retail markups
in cents and percents (July 14, 1971 to July 12, 1972)

Date	Retail (Cents)	Wholesale (Cents)	Average markup (Cents)	Average markup (Percent)
1971				
JUL 14	24.0	16.0	9.0	33.3
21	24.0	16.0	9.0	33.3
28	24.0	16.0	9.0	33.3
AUG 4	27.0	17.5	9.6	35.4
11	27.1	17.5	9.6	35.4
18	29.0	19.5	9.5	32.8
25	30.0	20.0	10.0	33.3
SEP 1	30.5	20.0	10.5	34.4
8	30.5	20.0	10.5	34.4
15	32.0	21.5	10.5	32.8
22	33.2	21.5	11.7	35.2
29	33.2	21.5	11.7	35.2
OCT 6	32.8	22.0	10.8	32.9
13	33.0	22.0	11.0	33.3
20	33.0	22.0	11.0	33.3
27	32.6	22.0	10.6	32.5
NOV 3	33.1	22.0	11.1	33.5
10	31.0	22.0	9.0	28.9
17	30.4	22.0	8.4	27.6
24	30.1	22.0	8.1	26.9
DEC 1	30.5	20.0	10.5	34.4
8	29.3	18.0	11.3	38.5
15	26.5	18.0	8.5	32.1
22	28.1	18.0	10.1	35.9
29	28.3	18.0	10.3	36.4

Appendix I. Continued

Date	Retail	Wholesale	Average markup	Average markup
	(Cents)	(Cents)	(Cents)	(Percent)
1972				
JAN 5	30.4	18.0	12.4	40.7
12	30.3	20.0	9.7	32.0
19	30.6	20.0	10.6	34.6
26	31.3	20.0	11.3	36.1
FEB 2	31.2	20.0	11.2	35.9
9	32.7	22.0	10.7	32.7
16	32.9	22.0	10.9	33.1
23	33.4	22.0	11.4	34.1
MAR 1	34.7	22.0	12.7	36.6
8	34.7	25.5	9.2	26.5
15	35.3	25.5	9.8	27.8
22	35.3	25.5	10.2	28.8
29	37.4	25.5	11.9	31.8
APR 5	38.5	30.0	8.5	22.1
12	38.4	30.0	8.4	21.8
19	38.6	30.0	8.6	22.3
26	37.5	29.0	8.5	22.6
MAY 3	35.4	24.0	11.0	31.7
10	33.9	24.0	9.9	29.2
17	34.9	24.0	10.9	31.2
24	34.4	24.0	10.4	30.2
JUN 1	29.8	21.0	7.8	26.2
7	30.5	21.0	9.5	31.1
14	27.3	22.5	9.8	17.5
21	29.7	22.5	7.2	24.2
28	30.0	22.5	8.0	26.2
JUL 5	30.5	22.5	8.0	26.2
12	33.0	22.5	10.5	31.8

Appendix II

Regression and correlation - retail markup on wholesale price

$$\sum Y = na + b \sum X$$

$$\sum XY = a \sum X + b \sum X^2$$

$$b = \frac{\sum XY - \frac{\sum X \sum Y}{n}}{\sum X^2 - \frac{(\sum X)^2}{n}}$$

$$a = \frac{1}{n} (\sum Y - b \sum X)$$

$$r^2 = \frac{(\sum XY - \frac{\sum X \sum Y}{n})^2}{(\sum X^2 - \frac{(\sum X)^2}{n}) (\sum Y^2 - \frac{(\sum Y)^2}{n})}$$

Where:

$$Y = \text{MU (percent)} = \frac{\text{retail price} - \text{wholesale price}}{\frac{\text{retail price}}{100}}$$

X = wholesale price

\bar{Y} = mean of markup percent = 31.8 percent

\bar{X} = mean of wholesale price = 21.8 cents

$$\sum Y = 1592.1$$

Appendix II. (continued)

$$\begin{aligned}\sum X &= 1116.0 \\ \bar{Y} &= 31.2 \\ \bar{X} &= 21.9 \\ (\sum Y)^2 &= 2,534,782.4 \\ (\sum X)^2 &= 1,245,456.0 \\ \sum XY &= 34,320.8 \\ \sum Y^2 &= 50,845.4 \\ \sum X^2 &= 24,968.5\end{aligned}$$

$$b = \frac{34,320.8 - 34,839.9}{24,968.5 - 24,420.7} = -0.946$$

$$a = \frac{1592.1 + 1055.7}{51} = +51.91$$

$$r^2 = \frac{(34,320.8 - 34,838.9)^2}{(547.8)(1143.8)} = 0.42841 \text{ (significant at 0.05 level)}$$

$$r = \sqrt{0.42841} = 0.65452 \text{ (significant at 0.05 level)}$$

$$\hat{Y} = 51.91 + (-0.946)(X)$$

Appendix III

COLLEGE OF TROPICAL AGRICULTURE, UNIVERSITY OF HAWAII
HAWAII DEPARTMENT OF AGRICULTURE

P A P A Y A H O U S E H O L D S U R V E Y

IBM CODES
(FOR OFFICE
USE ONLY)

- 1 1. PLEASE INDICATE THE ZIP CODE OF THE ADDRESS YOU NOW LIVE AT: _____
 2 ZIP CODE
 3
 4
 5
 6
- 7 2. HAVE YOU BOUGHT PAPAYAS IN THE PAST 30 DAYS?
 8 YES
 9 NO
 10 NEVER BOUGHT
- 11 3. HOW OFTEN DO YOU USUALLY BUY PAPAYAS? (CHECK ONE)
 12 LESS THAN ONCE A WEEK
 13 ONCE A WEEK
 14 MORE THAN ONCE A WEEK
 15 NEVER BOUGHT
- 16 4. THE LAST TIME YOU BOUGHT PAPAYAS, HOW MANY POUNDS DID YOU BUY? (CHECK ONE)
 17 LESS THAN ONE POUND
 18 ONE TO TWO POUNDS
 19 MORE THAN TWO POUNDS
 20 NEVER BOUGHT
- 21-23 5. PLEASE ESTIMATE HOW MANY POUNDS OF PAPAYAS YOUR FAMILY CONSUMES IN ONE YEAR: _____
 24 POUNDS
- 25 6. WHAT IS YOUR USUAL PREFERENCE FOR MATURITY? (CHECK ONE)
 26 TINGE OF YELLOW
 27 ONE-QUARTER RIPE
 28 ONE-HALF RIPE
 29 FULL RIPE
 30 NEVER BOUGHT
- 31 7. WHAT IS YOUR USUAL PREFERENCE FOR SIZE? (CHECK ONE)
 32 LESS THAN ONE POUND
 33 ONE POUND
 34 ONE TO TWO POUNDS
 35 MORE THAN TWO POUNDS
 36 NEVER BOUGHT
- 37 8. WHAT WOULD YOU CONSIDER AS A FAIR PRICE FOR PAPAYAS? (CHECK ONE)
 38 LESS THAN 14¢ PER POUND
 39 15 - 19¢ PER POUND
 40 20 - 24¢ PER POUND
 41 25 - 29¢ PER POUND
 42 30 - 34¢ PER POUND
 35¢ AND OVER PER POUND

PAGE 2
PAPAYA HOUSEHOLD SURVEY

IBM CODES
(FOR OFFICE
USE ONLY)

9. WHICH OF THE FOLLOWING FRUIT IS CONSUMED MOST OFTEN IN YOUR HOUSEHOLD? (PLEASE GIVE A NUMBER 7 TO THE ONE YOU CONSUME MOST OFTEN, A 6 TO THE ONE YOU CONSUME A LITTLE LESS OFTEN, A 5 TO THE ONE YOU CONSUME STILL LESS OFTEN UNTIL YOU GET TO THE ONE CONSUMED LEAST OFTEN --- THAT ONE YOU GIVE A NUMBER 1.)

		NUMBER
44	APPLES	_____
45	BANANAS	_____
46	GRAPEFRUIT	_____
47	GRAPES	_____
48	MANGOES	_____
49	ORANGES	_____
50	PAPAYAS	_____

51 10. HOW ARE PAPAYAS MOST FREQUENTLY USED IN YOUR HOUSEHOLD?

- 52 BREAKFAST
- 53 FRUIT SALAD
- 54 BAKING
- 55 OTHER _____

PLEASE EXPLAIN

56 11. HOW WOULD YOU RATE THE QUALITY OF PAPAYAS YOU BOUGHT LAST? (CHECK ONE)

- 57 EXCELLENT
- 58 GOOD
- 59 FAIR
- 60 POOR

61 12. RACE OF MAN-OF-HOUSE: TO WHICH OF THE FOLLOWING RACIAL GROUPS IS THE HUSBAND OR MAN-OF-THE-HOUSE MOST CLOSELY RELATED? (CHECK ONE)

- 62 CAUCASIAN
- 63 CHINESE
- 64 FILIPINO
- 65 HAWAIIAN
- 66 MIXED HAWAIIAN
- 67 JAPANESE
- 68 OTHER
- 69 NO MAN IN HOUSE

70 13. RACE OF WOMAN-OF-HOUSE: TO WHICH OF THE FOLLOWING RACIAL GROUPS IS THE HOUSEWIFE OR WOMAN-OF-THE-HOUSE MOST CLOSELY RELATED? (CHECK ONE)

- 71 CAUCASIAN
- 72 CHINESE
- 73 FILIPINO
- 74 HAWAIIAN
- 75 MIXED HAWAIIAN
- 76 JAPANESE
- 77 OTHER
- 78 NO WOMAN IN HOUSE

79

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PAPAYA HOUSEHOLD SURVEY

CARD II

IBM CODES
(FOR OFFICE
USE ONLY)

14. PLEASE GIVE NUMBER OF ADULTS AND CHILDREN IN YOUR HOUSEHOLD WITHIN THE FOLLOWING AGE GROUPS:

1 ADULTS 18 AND OVER _____
2-3 CHILDREN UNDER 18 _____

4

15. PLEASE CHECK YOUR PROPER AGE GROUP (HOUSEWIFE)

5 60 AND OLDER
6 35 - 59
7 34 AND YOUNGER
8 NO WOMAN IN HOUSE

9

16. PLEASE CHECK YOUR PROPER AGE GROUP (HUSBAND)

10 60 AND OLDER
11 35 - 59
12 34 AND YOUNGER
13 NO MAN IN HOUSE

14

17. PLEASE CHECK APPROXIMATE YEARLY FAMILY INCOME BEFORE TAXES: (INCLUDE TOTAL INCOME OF ALL MEMBERS OF YOUR FAMILY LIVING IN YOUR HOUSEHOLD)

15 UNDER \$4,000
16 \$4,000 - \$6,999
17 \$7,000 - \$9,999
18 \$10,000 - \$14,999
19 \$15,000 - \$24,999
20 \$25,000 AND OVER

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