Virgin Islands
Agricultural Experiment Station
Report No. 2
June 1974

FRUITS and VEGETABLES

Production and Consumption Potentials and Marketing Problems in the U.S. Virgin Islands

VIRGIN ISLANDS AGRICULTURAL EXPERIMENT STATION
Fenton B. Sands, Director
St. Croix, U.S. Virgin Islands

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College of the Virgin Islands
in Cooperation with
Commodity Economics Division
Economic Research Service
U.S. Department of Agriculture

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COVER PHOTO: Some of the fruits and vegetables raised on St. Croix. The vegetables include pumpkin, cabbage, carrots, onions, tomatoes, okra, turnips, bell peppers, eggplant, cucumbers, sweet corn and sweet potatoes. Fruits include bananas, pineapples, mangoes, coconuts, avocados, papayas, melons, oranges and grapefruit.

FOREWORD

This report, "Fruits and Vegetables: Production and Consumption Potentials and Marketing Problems in the U.S. Virgin Islands," is one of a series of feasibility studies sponsored by the newly created Virgin Islands Agricultural Experiment Station, College of the Virgin Islands. These investigations were financed totally with Federal funds made available to the Station under the provisions of the Hatch Act, Amended.

Preparation of this report was accomplished through a cooperative agreement with the Commodity Economics Division, Economic Research Service, U.S. Department of Agriculture. Dr. Troy Mullins and Dr. Robert W. Bohall, agricultural economists of the Economic Research Service, conducted the study and wrote the manuscript for this report.

The objective of these studies was to try to determine the agricultural enterprises, both plant and animal, that have economic potential on the Virgin Islands. It is my belief that the agricultural industry must be economically sound in order to be viable.

On the Virgin Islands, agriculture has been on the decline since the early part of the 1960's. The average number of farms, farmers, and production of agricultural commodities (with the exception of fluid milk) have all declined at a consistent rate. Among the questions which are uppermost in the minds of many people are: What factors have been responsible for these declines? Can these downward trends be stopped and perhaps reversed? What is the future of the agricultural industry, particularly on St. Croix where 85 percent of the farmland is located? This report on fruit and vegetable production, along with the others, sheds some light on these questions.

These feasibility reports have also revealed the areas where lack of training and education on the part of the farmers has adversely affected production. These subjects have now become part of the new program of the V.I. Extension Service. At the same time, the lack of information about the response of crops and livestock in this environment, which also limits production, has been recognized. These gaps in our knowledge have become the basis for the planned research program of the V.I. Agricultural Experiment Station. Thus, these studies have given more direction to the efforts of the Extension and research programs of this land-grant institution. More importantly, the results of these studies are expected to be beneficial to full- and part-time farmers, as well as to potential investors.

This series of reports rests squarely on the belief that a revival of agriculture would contribute substantially to the general welfare through increased output of goods and services and by providing additional employment. Moreover, expanded production and marketing of farm products could provide greater, and in some cases cheaper, sources of nutritious foods for consumers.

A more fully developed agriculture would complement the major industry—tourism—in two ways. First, visitors would be pleased to be served local products, especially tropical fruits and vegetables, by hotels and restaurants where such products are often not now available. Second—and perhaps more important—an expanded agriculture would tend to preserve the environment of exotic tropical islands. Most visitors and some permanent and semi-permanent residents come to the Virgin Islands to seek this environment. If this attraction is destroyed, the basis of the major industry of the Islands will be undermined.

The Virgin Islands Agricultural Experiment Station gratefully acknowledges the cooperative assistance and contributions from many St. Croix farmers; Rudolph Shulterbrandt, Commissioner, V.I. Department of Agriculture, and his staff; and Bennett S. White, Jr., project consultant and former USDA agricultural economist, now retired.

Fenton B. Sands, Director
March 1974

SUMMARY AND CONCLUSIONS

Crop farming, including the production of fruits and vegetables, has been declining for a number of years on St. Croix. At present, growing fruits and vegetables is a marginal enterprise, and the feasibility of developing a profitable industry is hampered with numerous problems, including uncertain climate, water shortages and deficiencies in management, labor and technology. Developing practical irrigation systems would reduce some of the uncertainties, but the economic feasibility of irrigation remains undetermined.

On the other hand, this study clearly shows that there are some basically favorable factors. The fact that Virgin Islands producers raise only a small portion of total local consumption means that a market exists if outside competition can be met. This potential market will be enlarged by prospective increases in population and higher real incomes of consumers. The attitude of buyers toward local produce is generally good, and marketing facilities are adequate to handle considerably greater quantities without additional investment by the industry. It is evident that improvement in management and technology could reduce costs and increase grower returns. Enterprise budgets which allow for some, but not all, opportunities for greater efficiency show an ability to compete effectively with other areas of supply for several crops.

There is a continuing need for substantial production of vegetables and fruits to supplement incomes in rural areas and to improve the diets of most Cruzan families. A strong effort to improve domestic food production and marketing is justified, even at significant expenditure of public funds. Possible economic recessions of varying durations are very real, and in such periods, food growing could provide a livelihood for many families. Even in periods of drought, truck gardeners often realize $40 or more per week from sales through produce stands. In addition, larger quantities and a better quality of local produce would be attractive to tourists. Currently, visitors who expect to find high quality vegetables such as tomatoes, lettuce and okra and tropical fruits such as mangoes, papayas and pineapples are frequently disappointed.

The level of economic activity prevailing at a given time influences the need for and the interest of rural families in growing food crops. Favorable tourist trade and significant construction programs in recent years have maintained a fair level of employment, and native Cruzans have had less need to rely on local production for income. However, there is an abiding interest in home gardens and a program to assist the dedicated small gardeners, who market through local stands, possibly would attract a reasonable number of participants. The major kind of help these growers need is information on variety selection, fertilization rates, insect and disease control, and standardization of products offered for sale.

Under a somewhat less vigorous economy, the economic environment might well be more favorable for starting profitable food production on a much larger scale. On the part of management, there would be more need for developing sources of income from farming. Labor supply possibly would be more ample and the attitude toward farming improved. Also, seeing the need for developing employment in agriculture, and for lower food prices to consumers, lending agencies possibly would extend assistance. Finally, retired or seasonal residents of St. Croix likely would rely more on locally grown produce, thus giving support to such a program. Although truck farming and the marketing of these products would not represent major sources of income and employment, the contribution would help to diversify and balance the economy.

In the meantime, possibilities for more commercialized units should not be neglected. An operation of 12 to 18 acres of vegetable crops that will permit orderly scheduling of planting, growing and harvesting, and balanced with fruits which need attention mainly in the off-season for vegetables would offer some promise. Depending on the amount of power equipment that could be utilized effectively, two or three full time laborers in addition to the operator would be needed. More time would have to be given to standardization, quality control, and supplying available markets on regular schedules.

The marketing system in the Virgin Islands is

reasonably sophisticated and operates much like that serving comparable population centers on the U.S. mainland. Produce imported from the mainland or from Caribbean areas is distributed by two regional chain stores, a few intermediate independent supermarkets, five or six purveyors servicing hotels and restaurants, and three merchant wholesalers which serve some 50 to 60 neighborhood groceries. The marketing facilities for locally grown fruits and vegetables are more than adequate for the level of output.

Total demand for fruits and vegetables will continue to expand. On a year-round equivalent, counting temporary visitors, the total population of the Virgin Islands in 1980 is expected to be about 136,000—an increase of 41 percent over 1973. If the Virgin Islands economy maintains its recent growth rate, the real incomes of families, including the low income segment of the population, could double by 1980 and add some 10 percent to the total demand for fresh fruits and vegetables.

The profit potential for St. Croix growers appears best for mangos, tomatoes, papayas and okra and possibly pineapples and onions. For most items, the volume needed for the Virgin Islands would not justify investment in packingsheds and specialized equipment necessary to compete with produce coming from the U.S. mainland. However, a lower-priced product could be offered to the local Cruzan trade with less marketing services. If St. Croix growers are going to market their product in St. Thomas, transportation would raise the consumer cost slightly.

Current marketing facilities on St. Croix are capable of handling up to 3 million pounds of produce annually, or roughly the production from 200 acres of fruits and vegetables. This is the acreage that might be needed if 8 or 9 commodities showing promise can be commercially produced for local consumption. With increased volume, some of the assembling, hand sizing and grading functions might have to be shifted back to the producer. But the storage, selling and distribution could continue to be handled by the Virgin Islands Department of Agriculture or through a cooperative using the same facilities.

The attitude of commercial buyers in the Virgin Islands toward local produce is generally favorable, but problems of dependable supplies and minimum grading and sizing of the produce will have to be overcome. In particular, a sufficient supply of quality produce for a long enough period to adjust procurement procedures is a prerequisite to a shift to local produce. Improvement of market information such as import volumes, values, and current prices made available to all segments of the industry through the Virgin Islands Department of Commerce would facilitate the development process.

Total year-round domestic requirements for nine selected fruits and vegetables could be produced on about 230 acres, assuming normal yield levels. Estimated demand increases by 1980 would adjust the land requirements upward to about 350 acres. Requirements for St. Croix only convert to slightly less than half these acreages. Furthermore, if only the domestic requirements during the months of favorable climate were met (that is, without irrigation which is essential to year-round production) the land required would be reduced to only about 130 acres for the total Virgin Islands and 60 acres for St. Croix alone.

Developing a viable fruit and vegetable industry in the Virgin Islands is a challenge to well-integrated extension programs. If past trends are to be reversed, all opportunities to reduce costs and improve quality in both production and marketing for the most promising products must be vigorously exploited. Research undertaken earlier on the island and research results from other sources where conditions are similar could contribute to solving problems of soil, climate, crop varieties and cultural practices. Socioeconomic research must deal with the extremely important problem of management. Extension must bear principal responsibility for arousing the interest of current and potential new growers and for demonstrating that new approaches will be profitable. Finally, the task of revitalizing the fruit and vegetable industry cannot be separated from the problems of agriculture as a whole. All segments compete to some extent for the same resources and all are affected by the poor public image of farming as a means of livelihood. This latter needs to be further identified, causative factors quantified insofar as possible, and corrective educational programs need to be undertaken.

FRUITS and VEGETABLES

Production and Consumption Potentials and Marketing Problems in the U.S. Virgin Islands

by

TROY MULLINS AND ROBERT W. BOHALL

CURRENT STATUS OF FRUIT AND VEGETABLE PRODUCTION AND REQUIREMENTS

Crop farming on St. Croix has been declining for a number of years and currently is practically at a standstill. The elimination of sugar cane as the major cash enterprise and closing of the sugar mill in 1966 apparently did little toward channeling attention in the direction of truck farming.

The U.S. Census of Agriculture reports that farmers selling vegetables decreased from 178 in 1950 to 29 in 1970, and planting of vegetables from 269 to 66 acres. For tomatoes which ranked first in sales ($7,405 in 1969) the farms reporting declined from 129 in 1950 to 12 in 1969; and peppers ($6,290) from 95 farms in 1950 to 14. Other items ranking in values in 1969 were cucumbers $3,800, lettuce $3,080, onions $3,215, okra $2,585, and carrots $2,070.

Fruits were grown on 130 farms in 1969 and accounted for 180 acres of land, or 1.4 acres per farm. Only 60 growers had as much as ½ acre in all fruits. Fruits that can be grown in home gardens continue to be produced but the numbers of plantings have declined. In 1969 (as compared with 1949 data) farms reporting mangoes declined from 195 to 80, bananas from 186 to 75, and avocadoes from 124 to 52 farms. Very small quantities of citrus fruits, papayas, plantains, and pineapples are being harvested.

The Virgin Islands Department of Agriculture currently is assisting interested vegetable growers in acquiring seeds of approved varieties, giving advice in planting, cultivating, disease-insect control, and in sorting, grading, and delivery to local markets. During the 1972–73 season, advice and counseling was given to many visitors to the Department, and 14 growers took advantage of services of the marketing center which generally included picking up the produce at the field, sorting (and grading), and delivery to local buyers. A charge of five percent of the gross returns is made for this service.

The marked decline in attention given to truck farming occurred along with, and in large measure as a result of, the marked increase in population, growth in tourism, and general economic growth in the past decade. Total Virgin Islands resident population doubled between 1960 and 1970, and numbers of tourists increased some fivefold. In addition, per capita incomes rose substantially, and in 1970 approximately a third of the resident families were receiving annual incomes of $10,000 or more. In this setting, and as of June 1973, farming in general, and especially crop enterprises, had possibly reached the lowest level in the history of the U.S. Virgin Islands.

MAJOR CONSTRAINTS TO FRUIT AND VEGETABLE PRODUCTION

Production of food crops on St. Croix depends on many factors. One is impressed first by the climate and how the total vegetative growth varies by seasons, but also by economic, sociological, and institutional restraints which are equally limiting.

As is true elsewhere, climatic factors, specifically rainfall, winds, and temperatures, very definitely dictate what can be accomplished each season. On St. Croix the sequence or pattern of weather is often only generally similar from one year to the next. Marked variations in amounts of rainfall in every month of the year, as well as between nearby locations at a given time, might be said to be the only dependable aspect of the rainfall pattern. Variation in rainfall each month is such that one standard deviation each month is equal to 51 to 81 percent of the mean (Table 1).

A check of rainfall by weeks shows that in September and November, the more favorable season, less than one inch of rain fell per week for more than half of the time during a recent 15-year period.

Average monthly rainfall ranges from 4.26 to 6.08 inches during August through November, and then generally declines to a low of 1.71 inches in March. In late August and September, conditions generally are favorable for planting and rainfall and temperatures in the October-January period often are suitable for rapid development. However, periods of 7 to 14 days without rain, coupled with high evaporation rates, are not unusual, making it necessary to plant a second time.

Dry weather is the rule in February and March (1.8 and 1.7 inches of mean rainfall respectively) and frequently extends through May. These are important months for maturing some crops, especially tropical fruits, and yields are often very much reduced. One farmer in the West end of St. Croix indicated that his mango orchard generally suffers from drought in these months once every three years. Rainfall records at the Frederiksted Station show that for 5 of the last 12 years (1959–72) less than one inch of rainfall fell in February, March, and May.

Evaporation strongly influences the level of moisture in the soil at a given time. In the warm months it takes a heavy toll, especially from unprotected soil surfaces. Together with the moisture retention capacity, which seems to be relatively high for most of the soil types, the evapotranspiration rate may become rather critical. At a number of locations, evaporation loss is approximately equal to the precipitation received on an annual basis. However, on a monthly basis it often exceeds the rainfall. This is particularly true in the January-April period, which corresponds with the maturing stage for a number of vegetable crops.

It is generally recognized that a sustained vegetable production program is not possible without supplemental irrigation. The serious shortage of water on St. Croix for domestic, municipal, and industrial uses, all of which are of high priority, places unusual limits on availability and cost of water for vegetable production. However, irrigation technicians have made limited investigation of the problem and concluded that with advanced technology recently developed in distributing water, an economically feasible operation is possible. It would necessitate, however, an island with water conservation-and-use program, including (1) extension of catchment areas and retention of water in well-located reservoirs; (2) recycling water where practical as a means of serving multiple purposes; (3) tapping any additional underground sources; and (4) installing devices or special measures which would reduce evaporation.[1]

[1] Additional details on feasible irrigation systems and vegetable-fruit crops best suited to St. Croix soils and climate are available in unpublished reports of H. H. Bryan and S. E. Malo, Ag. Research and Education Center, University of Florida, Homestead, Florida.

Table. 1.—Monthly rainfall data for St. Croix, 1852–1970

Month	*Average*	*Highest rainfall*		*Lowest rainfall*		*One std.deviation from mean*	
	Inches	*Inches*	*Year*	*Inches*	*Year*	*Inches*	*% of mean*
Jan.	2.52	8.91	1937	.37	1852	1.31	52
Feb.	1.84	9.48	1950	.15	1902	1.32	72
Mar.	1.71	7.34	1949	.0	1952	1.19	70
Apr.	2.67	16.39	1919	.05	1920	2.16	81
May	4.20	15.48	1969	.36	1923	3.27	78
June	3.52	10.80	1889	.39	1904	2.38	68
July	3.52	11.78	1901	.53	1873	1.99	56
Aug.	4.26	19.79	1924	1.01	1911	2.70	63
Sept.	5.81	16.61	1906	1.33	1912	3.16	54
Oct.	6.08	18.62	1854	1.03	1960	3.24	53
Nov.	5.26	13.50	1915	.81	1945	2.60	51
Dec.	3.51	11.24	1960	.84	1958	2.13	61

The Soil Conservation Service has planned and supervised construction of about 212 reservoirs over the past 30 years, almost entirely on livestock farms.[2] No information could be obtained as to whether any of these reservoirs are used for irrigating food crops.

Numerous efforts have been made to tap underground sources of water with low amounts of minerals (non-toxic to food crops) but success has been very limited. One grower made five attempts at an average cost of $1,000 and got only one well with a capacity of 10 gallons per minute, which is scarcely enough to water a kitchen garden.

Beyond the physical factors just discussed, there are a number of complex economic, social and institutional factors that have evolved over many decades.

One of these problems is the *secondary status* of agriculture in the whole St. Croix economy. Rural youth of St. Croix, on their own and often with considerable assistance from their parents, have sought nonfarm careers and, it is said, feel some stigma attached to working in agriculture. Except in cattle ranching and dairying, most rural residents do farming or truck growing only after hours from their regular jobs, or during periods when other employment is not available. The uncertainties attached to crop farming, under current management practices, are such that no lending agencies (including The Farmers Home Administration) will make loans to finance production.

More specifically, the number one problem in starting a food production program is the scarcity of management experience. Limited contacts indicate that those who are crop farming either are regularly employed (in government usually) or are retired (natives or Continentals) and often have taken an interest in farming largely to occupy their time rather than as the principal means of earning a living. The amount of capital in their operation usually is minimal, and though they often make a sincere effort to be efficient, their livelihood is not at stake. To cope with all the problems will require much study and planning, as well as aggressive and innovative management.

Among the labor-management aspects of the situation, a common ailment or complaint among farmers is the scarcity, poor quality and high cost of labor. Obviously, special provisions will have to be made to get more labor in agriculture, to hold them long enough to develop significant skills, and to provide opportunities for their economic advancement.

The second aspect of the labor-management problem is the low level of technology associated with labor. Other than land clearing, plowing, and power spraying (only for growers with sizeable acreages) which is performed by the Virgin Islands Department of Agriculture at custom rates, all operations are done with hand tools such as hoes, machetes, knap-sack sprays, etc. It is little wonder that laborers would seek employment elsewhere, and unless more mechanical aids can be used in weeding, spraying, harvesting, and loading to reduce drudgery, labor costs will continue to be high. Also mechanization is needed so that certain jobs can be done on a timely basis. No doubt there are small power units (12 to 18 hp.) available with attachments for light tillage, grass cutting, power spraying, and hauling. A farm with 12 to 15 acres of food crops possibly could provide 400 to 500 hours of operating time for such a unit. Unless vegetable growers can be stimulated to commit sufficient effort and capital to effectively use the latest technology, there is little chance for establishing a viable production program. Agricultural agencies generally, and the Virgin Islands Department of Agriculture in particular, could give special emphasis to the mechanization problem. Possibly the purchase and leasing of small power units with provisions for training in their operation and maintenance might be an appropriate starting point. This would be a means of assisting small growers.

ENTERPRISE BUDGETS FOR SELECTED CROPS

Enterprise budgets for selected fruits and vegetables were developed in June 1973, when, because of an extended drought, truck crop production was at a very low level. (See Tables 1 through 9 in the Appendix.) Estimates of the amounts of labor, materials, services, and other items required were developed largely by staff members in the Virgin Islands Department of Agriculture, and were based

[2] The number of reservoirs reported are 212 on St. Croix, 54 on St. Thomas, and 11 on St. John, with a combined storage capacity of 500 million gallons.

on limited records available and experience gained through working with farmers. Several farmers were interviewed about cost items for crops being grown and their major problems. Also records maintained at the experiment station operated by the Agricultural Research Service from 1952 to 1966 were gleaned for applicable information on inputs, particularly yields.

In these calculations, specific operations and cost items were treated as follows:

1. Land clearing and field preparation are performed by the Virgin Islands Department of Agriculture at a charge of $15 per hour for bull dozing, $7.50 for plowing, disking, etc. and $3 to $4 for power spraying.
2. Cost of containers refers to boxes or lugs used in the fields and to haul to the Virgin Islands Department of Agriculture market center. These costs were amortized over the estimated years of life.
3. The 5 percent charge (of gross value) for grading and packing covers the service provided by the Virgin Islands Department of Agriculture and includes delivering produce to major outlets.
4. The land charge of $25 per acre is included to reflect a return to land when priced at a nominal value based on crop agriculture. Obviously land in St. Croix could not be bought at such a price (about $400 per acre). See discussion of land values in text.
5. The estimated yields were derived after reviewing applicable records maintained at the Federal experiment station, and by drawing on the experience of staff members of Virgin Islands Department of Agriculture who have given attention to such crops. To reflect the influence of frequent dry seasons, estimates were made of yields following an approximate average or normal rainfall season were combined with estimates of yields during an unfavorable weather or drought season and weighted on a 2 to 1 basis. This ratio of favorable to unfavorable years appears to approximate the real situation over the past 12 to 15 years. However, the sequence of occurrence is unpredictable. It is not unlikely that two drought seasons would occur in succession, which further complicates the problem of financing seasonal production operations.
6. Wage rate assumed is $2 per hour. The current minimum wage for farm workers is $1.45 per hour. Some operators indicated they were paying $1.75, but others reported $2 per hour. In view of the difficulty of getting farm workers it was decided that a minimum of $2 per hour should be used for projecting costs 3 to 5 years in the future.

INCOME ESTIMATES FOR A FRUIT AND VEGETABLE FARM

To indicate an approximate level of income that would be feasible for a small fruit and vegetable farm, a "whole" farm budget is presented in Table 2. Based on 15 acres of cropland, of which 13 acres would be planted each season, total gross sales at prices prevailing during the 1972–73 season, would equal about $43,000, total costs about $12,400, and estimated returns above costs a little under $31,000. This is a net above the specified costs of near $2,400 per acre of crops grown, which is quite impressive. The 3 acres of onions grown at a cost of $2,200 accounts for 48 percent of this income.

These costs-income estimates reflect the unusually favorable prices prevailing in 1973. These prices may not be sustained over time. Another factor that might be questioned is the risk of establishing stands, having to replant, or of reductions in yield of some of the crops that may exceed the levels assumed in the crop enterprise budgets. Records of planting experience, yields, etc. continuing over a period of years would be required to more accurately evaluate these income estimates.

To indicate the approximate net returns under varying levels of prices received, and with somewhat higher wage rates for labor, calculations reflecting different levels of prices and wages are shown in Table 2. If prices of the various items sold were 20 percent lower than in the 1972–73 season, net income to the farm would be reduced to $22,000. If substantially higher wages ($2.75 per hour) were paid to insure laborers when needed, but prices were the same as in 1972–73, the income would only be reduced to $28,500. If both of the above situations prevailed (20 percent lower prices plus higher wages) the net income would be

Table 2.—Estimated gross sales, production costs and returns above cost for a 15-acre vegetable-fruit farm, 1972–73 season, St. Croix, V.I.

Item	*Tomatoes*	*Peppers*	*Okra*	*Onions*	*Pine-apples*	*Total*
Acres (number)	3	2	2	3	3	13[1]
Production (tons)[2]	18.6	8.8	13.2	28.0	38.0	--
Price rec'd. ($/ton)[2]	500	500	500	600	160	--
			Dollars			
Gross value	9,300	4,400	6,600	16,800	6,080	43,180
Production costs[3]						
Labor	1,764	768	744	1,128	1,542	5,946
Materials	216	116	98	141	2,229	2,800
Other	699	408	474	762	282	2,625
Fixed items	120	80	80	120	621	1,021
Total	2,799	1,372	1,396	2,151	4,674	12,392
Returns above costs						
Total	6,501	3,028	5,204	14,649	1,406	30,788
Per acre	2,167	1,514	2,602	4,883	467	----
Returns (prices rec'd at 80% of current level)						
Total	4,641	2,148	3,884	11,289	190	22,150
Per acre	1,547	1,074	1,942	3,763	33	----
Returns (labor at $2.75 per hr.)						
Total	5,839	2,740	4,925	14,226	828	28,558
Per acre	1,946	1,370	2,462	4,742	276	----
Returns (prices at 80% and labor at $2.75)						
Total	3,979	1,860	3,605	10,866	0	20,310
Per acre	1,326	930	1,802	3,622	0	----
Returns with onions at 67% and other items at 80% of current prices						
Total	4,641	2,148	3,884	9,049	190	19,912
Per acre	1,547	1,074	1,942	3,016	63	----
Returns with prices reduced to level of strongest competitor[4]						
Total	4,715	670	2,722	2,889	4,598	15,594
Per acre	1,572	335	1,361	963	1,533	----

[1] Two acres allowed for nursery, home garden, and to permit flexibility in cropping program.

[2] Per pound prices shown in Table 12.

[3] Per acre production and itemized costs shown in enterprise budget tables.

[4] Prices per pound for strongest competitor shown in Table 15.

about $20,000. If prices received for onions (exceptionally high in 1973) were reduced by 33 percent, and for other items by 20 percent from the 1972–73 level (wages remaining at $2 per hour), the estimated net return would be only slightly under $20,000. Finally,. if prices received by St. Croix producers were equal to the level of calculated prices for supplies from the strongest competitor, estimated returns would fall to less than $16,000.

The authors do not intend to imply that exactly any one of the above possibilities would actually

prevail. Rather, the intent is to show a number of alternative situations, all of which are within the range of what might result from economic changes which would not be foreseen when this study was made.

PROBLEMS OF LABOR DISTRIBUTION

One of the obvious problems with vegetable and fruit production, which must be concentrated in the high rainfall-cooler temperature months (Sept.–March) is the high labor requirements of this period in contrast to the minimal needs in April through August (Tables 3 and 4). The 15 acre vegetable-fruit farm, with acreages of tomatoes, peppers, okra, onions and pineapples would require about 2,400 hours of labor annually, or about 300 man-days. An additional 30 days or more likely would be required for general maintenance of the premises, care for the nursery, miscellaneous plantings, and preparations for the next season. Of the 300 man-days used with these crops, about 290 days would fall in the September-March period and the remainder during the April-July period. If the operator could contribute the equivalent of half time for a regular worker, the minimum number of workers required would be 1.5 to 2.0 for the September-March period. These projections assume an average distribution of rainfall during the weeks for planting, growing, and harvesting. However, because of the marked variations in the rainfall pattern, the timing of critical operations often would peak more than is reflected. To cope with this unpredictable demand on labor, the farm operator might (1) vary the acreages of the different crops grown as moisture conditions dictate; (2) extend the usual work days (possibly at the expense of overtime); or (3) introduce as much labor saving technology (power, equipment, chemicals, etc.) with the planting, weeding, and harvesting operations as can be effectively used.

It is likely that some over-employment would be necessary to meet the peak loads caused by unpredictable weather. This problem confronts farmers in all locations, but for a vegetable growing operation on St. Croix, it is somewhat exaggerated.

DEMAND FOR FRUITS AND VEGETABLES IN THE VIRGIN ISLANDS

Various factors influence the demand for any one fruit or vegetable marketed, including those that might be produced on St. Croix. Four of the most important variables are population, income, consumer tastes and preferences as reflected in per-capita consumption, and the availability of produce from other areas.

Population

According to the U.S. census of population for 1970, 62,468 persons resided in the Virgin Islands, an increase of over 94 percent from the 1960 census (Table 5).[3] The highest rate of increase occurred on St. Croix, which more than doubled its population between the two census years.

Although census data more recent than 1970 is not available, the Virgin Islands Department of Health estimates a total population of 89,620 in 1973. By 1980 the Department of Health is projecting a 37 percent increase in the 1973 population to 122,339 of which 62,035 would be inhabitants of St. Croix. This would indicate a substantial increase in the quantity of fresh fruits and vegetables needed in the Virgin Islands in the next 7 years.

Tourists are an important part of the economy of the Virgin Islands, particularly in St. Thomas but also in St. Croix. The tourist trade tends to vary, depending upon the season of the year. A total of 1,215,550 persons visited the Virgin Islands in 1972, spending an estimated $109 million.

Based on data available from the Virgin Islands Department of Commerce, from July 1, 1971 to June 30, 1972, the average number of tourists was estimated as follows:

1. Cruise ship passengers—average of one meal each, 3 meals = one tourist day. St Thomas 118,004 days, St. Croix 3,545 days, and total 121,549 days.
2. Air arrivals—average of 3 tourist days each (note the average tourist stay may be slightly longer, but this is partly offset by the fact that many Virgin Islands residents travel to other areas for business and vacation).
   St. Thomas 499,783 arrivals = 1,499,349 tourist days; St. Croix 243,067 arrivals = 729,201 tourist days; total Virgin Islands 742,850 arrivals = 2,228,550 tourist days.

[3] Despite the increase, officials of the Virgin Islands Department of Commerce indicate there may have been serious undercounting of residents in the 1970 census. Estimates of the undercounting have been as high as 22,000.

Table 3.—Estimated labor distribution for a 15-acre vegetable-fruit farm, St. Croix, V.I.

Crop and acres	Stage of growth	Approximate labor required by 15-day period													
		September		October		November		December		January		February		March	Total
		1–14	15–30	1–14	15–31	1–14	15–30	1–14	15–31	1–14	15–31	1–14	15–28	1–15	hours
		hours													
Tomatoes 3 acres	Plant	45	90												135
	Growing			16	30	63	63	55	51	10					288
	Harvest								124	184	124				432
Peppers 2 acres	Plant	30	60												90
	Growing			12	20	37	38	37	20	12					176
	Harvest									12	25	26	25	12	100
Okra 2 acres	Plant			25	39										64
	Growing					10	34	34	10						88
	Harvest										45	60	60	45	210
Onion 3 acres	Plant					135									135
	Growing							20	25	28	27	25	20		145
	Harvest													255	255
Pineapple 3 acres	Plant													87	87
	Growing	(About 42 to 50 hours—May through July)[1]													50
	Harvest		14	14	14	14	14	14	14	14	14				126
Total for 15-day periods		75	164	67	103	259	149	166	244	260	235	111	105	399	2,381

[1] These hours not included in totals on bottom line, but are included in totals in last column.

Table 4.—Estimated labor distribution for a 15-acre vegetable-fruit farm, St. Croix, V.I.

Months	Approximate labor time required		Full-time workers needed
	Hours	Days	Number
September	239	30	2.0
October	170	21	1.0
November	408	51	2.5
December	404	51	2.5
January	495	62	3.0
February	216	27	1.5
March	399	50	2.5
April–July	50	6	1.0
Total	2,381	298	—

3. Navy personnel—average of 2 days each, St. Thomas 38,533 personnel = 77,066 days; St. Croix 13,915 personnel = 27,830 days; total 52,448 arrivals = 104,896 days.
4. Ferry passengers and Antilles Air passengers were excluded from the analysis, since they tend to represent traffic which is offset by Virgin Islands businessmen and tourists visiting other areas.
5. Total estimated tourist days:

	St. Thomas	St. Croix	Total
Cruise ship passengers	118,004	3,545	121,549
Airline arrivals	1,499,349	729,201	2,228,550
Navy personnel	77,066	27,830	104,896
TOTALS	1,694.419	760,576	2,454,995
Average tourist population based on 365 tourist days per year	4,642	2,084	6,726

6. Average tourist population on St. Croix by months based on 1969–72 monthly average occupancy rate of available rooms (St. Croix Hotel Association data) is as follows:

	Tourist population	Index of tourist population (2084 = 100)
January	2,430	117
February	3,253	156
March	2,822	135
April	2,234	107
May	1,764	85
June	1,646	79
July	1,881	90
August	1,921	92
September	1,294	62
October	1,411	68
November	2,117	102
December	2,234	107

Table 5.—Virgin Islands: population for census years, 1930–1970 with projections to 1973, 1980 and 1985[1]

Year	Virgin Islands	Urban	Rural	St. Croix	St. Thomas	St. John
1930	22,012	13,501	8,511	11,413	9,834	765
1940	24,889	14,296	10,593	12,903	11,265	722
1950	26,665	15,581	11,084	12,103	13,813	749
1960	32,099	18,017	14,082	14,973	16,201	925
1970	62,468	15,240	47,228	31,779	28,960	1,729
1973	89,620	NA	NA	43,904	43,447	2,269
1980	122,339	NA	NA	62,035	57,277	3,027
1985	143,629	NA	NA	73,820	62,287	7,522

[1] Source: 1930–1970 US Census of population, projections 1973–1985 Virgin Islands Department of Health, Vital Statistics.
NA: Not Available

Based on an increase of 110 percent in air arrivals between 1965 and 1972 and upon an increase of 234 percent in cruise ship passengers during the same period, it is estimated that the average tourist population of 6,726 will double by 1980. This would represent an average tourist population of 13,452. Assuming a distribution comparable to the present time, this would result in an average of 9,284 tourists on St. Thomas and 4,168 on St. Croix.

Several things stand out as a result of this poulation study. First, the major food demand comes from permanent residents and is only modestly influenced by the tourist trade. Second, the tourist trade hits a peak in February and a low in September. Third, the population is increasing both through the birth rate exceeding the death rate and through a net immigration. The current population of 89,620 residents and 6,726 tourists should increase to 13,452 tourists and 122,339 residents by 1980. This will represent a 41-percent increase over the next 6 years and should result in a corresponding increase in the demand for fresh fruits and vegetables over the same period.

Income

The demand for fruits and vegetables in the Virgin Islands is influenced by the income level of the residents. According to the 1970 census, only 4 percent of the families had incomes of less than $250, while 31 percent of the families had incomes of more than $10,000 (Table 6). Statistics for St. Croix were comparable to the Virgin Islands percentages. In 1950 the median income for persons reporting was only $460 for the Virgin Islands. In 1970 the median income for all families and unrelated individuals was $4,583, which represents a significant increase of $4,123. Even if allowances

Table 6.—Income in 1969 of families and unrelated individuals, Virgin Islands, based on 1970 census

Number and Income level	*Virgin Islands*				*St. Croix*
	Total	*White*	*Negro*	*Other*	*Total*
Families					
Total number	13,135	2,987	8,940	1,217	6,744
Percent with incomes less than:					
$250	4	2	4	3	3
$3,000	17	7	21	14	17
$6,000	45	19	55	48	47
$10,000	69	35	79	75	70
$25,000	95	84	98	97	95
Median income	$6,612	13,373	5,512	6,272	6,442
Mean income	$9,062	16,082	6,884	7,889	8,926
Unrelated individuals					
Total number	8,112	1,605	6,444	393	4,137
Percent with incomes less than:					
$250	20	9	22	21	19
$3,000	56	27	64	47	54
$6,000	82	51	91	81	82
$10,000	92	75	98	95	93
$25,000	99	97	99	99	99
Median income	$2,479	5,845	1,948	3,221	2,637
Mean income	$3,467	7,269	2,512	3,596	3,633
All families and unrelated individuals					
Total number	21,577	4,583	15,384	1,610	10,881
Median income	$4,656	10,299	3,821	5,381	4,661
Mean income	$6,873	12,996	5,052	6,841	6,914

were made for inflation, real incomes have risen substantially in the Virgin Islands over the past two decades.

While the total income picture has improved, there still are major segments of the population that cannot afford to purchase fresh fruits and vegetables in large volume from local grocery stores and supermarkets. For example, 45 percent of the families have incomes of less than $6,000 and 56 percent of the unrelated individuals have incomes of less than $3,000. This would indicate that nearly half the households would be forced to limit their buying of fruits and vegetables to a considerable degree. The heaviest impact of low incomes falls upon Negro households which tend to be younger, larger in size, and with fewer years of schooling for persons 25 years and older than the population as a whole (Table 7).

Although an in-depth income projection is not feasible as part of this report, it appears likely that the real median income for families and unrelated individuals in the Virgin Islands could double between 1970 and 1980. The rapid growth of tourism and the development of retirement communities and industry in the area should bring incomes and living standards closer to those of the U.S. mainland by 1980. One result could be an increase in the demand for fresh fruits and vegetables of 10 percent by 1980. The portion of the population with low incomes can be expected to decline from the present 50 percent to about 30 percent, while higher incomes at all levels will make it easier to purchase fresh produce.

If both population and income effects are considered, a 50-percent increase in the total demand for fresh fruits and vegetables by 1980 appears likely. Assuming that supplies are available and relative prices remain about the same, total consumption would rise by about the same amount.

Per Capita Consumption

Total per-capita consumption of fresh fruits and vegetables in the Virgin Islands is about 61 percent of that of a resident of the U.S. mainland (Table 8). In 1972, per-capita consumption of fresh produce in the Virgin Islands was 176 pounds, consisting of 67 pounds of fruits, 8 of melons, and 101 of vegetables. Consumption of citrus, deciduous fruits, melons and most vegetables is higher in the U.S. mainland than in the Virgin Islands, while consumption of tropical fruits is about 15 pounds higher in the Virgin Islands. One major difference in the diet is potatoes. The average U.S. mainland resident consumed an average of 89 pounds in 1971 contrasted with 16.1 pounds for the Virgin Islander in 1972. To some degree, substitutes including dasheens, tanya, and cassava serve as replacements for potatoes in the Virgin Islands diet.

Availability of Produce from Other Areas

It was estimated that only 4 percent of the total fresh fruits and vegetables consumed is produced in the Virgin Islands; 96 percent is imported from other countries, Puerto Rico and the U.S. mainland. Data on domestic production are extremely sketchy so should be interpreted only as approximate.

Table 7.—Other population characteristics, Virgin Islands, 1970

Characteristic	*Virgin Islands*				*St. Croix*
	Total	*White*	*Negro*	*Other*	*Total*
Median age	23.0	30.0	21.7	20.5	23.2
Persons per household	3.42	2.71	3.60	3.97	3.44
Median schoolyear completed (persons 25 years and over)	9.5	13.1	8.0	8.6	9.4
Fertility (number of children ever born per 1,000 women)					
Women 15–24 yrs. old	568	371	579	766	673
Women 25–34 yrs. old	2,247	1,535	2,373	2,755	2,340
Women 35–44 yrs. old	3,223	2,247	3,492	3,520	3,286

Table 8.—Consumption of fresh fruits and vegetables in the Virgin Islands, 1972 and in the U.S. mainland, 1971

Commodity	Virgin Islands, 1972				U.S. per capita consumption[4]
	Imports[1]	Domestic production[2]	Total	Per capita consumption[3]	
	Thousand pounds			Pounds	
Citrus					
Oranges	684	7	692	7.2	16.2
Grapefruit	219	3	222	2.3	8.6
Lemons and limes	43	5	47	.5	2.4
Total citrus	966	15	98	10.2	29.3
Tropical fruit					
Avocados	140	5	145	1.5	.5
Bananas	857	100	957	9.9	18.2
Plantains	79		79	.8	NA
Mangoes	30	56	86	.9	NA
Total tropical	13,123	200	3,323	34.5	19.4
Other fruit					
Apples	446		446	4.6	16.8[5]
Grapes	66		66	.7	3.2
Peaches	4		4	.1	5.7
Pears	9		9	.1	2.3
Total other	558		558	5.8	31.7
Total all fruit	6,230	215	6,445	66.9	80.4
Melons					
Watermelon	575		575	6.0	13.9
Cantaloupe	6		6	.1	7.8
Total melons	760		760	7.9	21.7
Vegetables					
Tomatoes	768	90	858	8.9	11.3
Onions	836	10	846	8.8	12.0
Cabbage	305	8	313	3.2	9.2
Lettuce	735	38	773	8.0	21.3
Potatoes	1,556	--	1,556	16.1	89.2
Dasheen	203	NA	203	2.1	----
Total all vegetables	9,372	383	9,755	101.2	185.0
Total all fruits, vegetables and melons	16,362	598	16,960	176.0	287.1

[1] U.S. Virgin Islands Department of Commerce, Trade and Industry.

[2] Domestic production statistics represent crude estimates based on acreage data for the 1970 Census plus observations on what is produced by local growers.

[3] Based on a population of 96,346 including 89,620 residents and 6,726 tourists.

[4] Farm weight, based on Food Consumption, Prices and Expenditures, Supplement for 1971 Economic Research Service, U.S. Department of Agriculture.

[5] Retail weight.

Over 89 percent of the 16.3 million pounds of imported produce comes from Puerto Rico and the U.S. mainland (Table 9). Most of this volume comes into the Virgin Islands via San Juan, Puerto Rico although some shipments are received direct from the U.S. mainland, particularly from Miami but also from New York. U.S. produce that goes to Puerto Rico and is transshipped to the Vrigin Islands is recorded as coming from San Juan. Hence, there is no way to differentiate between San Juan shipments from the U.S. mainland versus Puerto Rico. However, most of the

Table 9.—Fresh fruits, vegetables and melons imported into the Virgin Islands by point of origin, 1972[1]

Commodity	U. S. and Puerto Rico				Dominican Republic	Leeward and Windward Islands	Other foreign	Total imports
	New York	Miami	San Juan	Total				
	Thousand Pounds							
Citrus								
Oranges	7	61	616	684				684
Grapefruit		16	189	205			15	219
Tangerines			17	17				17
Lemons		10		10				10
Limes		32		32				32
Citrus fruit NEC			3	3				3
Total	7	119	824	951			15	966
Deciduous fruit and berries								
Apples	16	31	400	446				446
Grapes	3	5	57	65			1	66
Pears			9	9				9
Peaches and nectarines			4	4				4
Prunes and plums			8	8				8
Cherries			5	5				5
Strawberries			6	6	5			11
Berries NEC			8	8				8
Total	19	36	497	552	5		1	558
Tropical fruit								
Avocados					118	23		140
Bananas					766	86	5	857
Mangos					15	15		30
Plantains					50	28		79
Total			2,018	2,018	949	151	5	3,123
Fresh NEC	39		1,543	1,582	2			1,583
Total all fruit	66	155	4,882	5,103	996	151	21	6,230
Melons								
Watermelon			575	575				575
Cantaloupe					5		2	6
Melons, Fresh NEC[2]		101	49	150	27		2	178
Total		101	624	725	31		3	760
Vegetables								
Tomatoes	2	166	497	664	100		4	768
Onions		203	633	836				836
Peppers			11	11	4	3		18
Cabbage		46	255	301			4	305
Carrots			38	38			1	39
Celery			13	13				13
Lettuce	6	365	364	735				735
Beans							1	1
Corn							1	1
Cucumbers					2	2		4
Egg Plant					41			41

[1] Compiled from customs data supplied by the Virgin Islands Department of Commerce, Trade and Industry.

[2] Not Elsewhere Classified.

[3] Less than 500 pounds.

citrus, deciduous fruit, and imported vegetables originate in the U.S., while Puerto Rico would supply a large proportion of the tropical fruits.

The Dominican Republic supplied 9 percent of the total Virgin Islands imports or nearly 1.5 million pounds. Slightly over half of this volume was bananas. The Leeward and Windward Islands supplied 0.3 million pounds in 1972, tropical fruits and dasheens being most important. Imports from other foreign countries were minor, the most important in terms of volume consisting of grapefruit—mostly from Israel.

The influflence of the tourist trade and climate on imports is illustrated in Table 10. Imports were heavy through the first half of the year but declined in the late summer and fall consistent with fewer tourists and also better growing conditions in the late fall. A deviation in the data apparently occurred in December, 1972 since reported imports from San Juan were only 231,000 pounds or only about 20 percent of normal.

Value—The value in the exporting country of produce shipped to the Virgin Islands was $2,664,000 in 1972, vegetables equalling 59 percent and fruits and melons 41 percent of the total value (Table 11). The United States and Puerto Rico provided 91 percent of $2.4 million followed by the Dominican Republic with $.2 million.

Wholesale Prices—Wholesale price information for produce coming into the Virgin Islands was derived from the customs data of the Virgin Islands Department of Commerce and from other selected sources (Table 12). Considerable variation between countries in part reflects differences in quality and the season of the year. Prices were generally less than 20 cents per pound for most produce. Prices received in the Virgin Islands tended to be on the high side relative to countries exporting into the Islands. This indicated that currently there is a premium for locally produced produce, although this premium would decline if local fruits and vegetables were available in volume.

Transportation Costs—Transportation rates to bring produce into the Virgin Islands were obtained from local transportation companies and importers. The June 1973 rates were 4.5 cents per pound for surface transportation from Miami or New York, 2.2 cents by water from Puerto Rico, 5.3 cents by air from the Dominican Republic, and 5.1 cents by air from areas such as Dominica in the British West Indes.

Surface transportation out of Puerto Rico and the U.S. mainland consists of refrigerated vans loaded onto ships or barges for shipment to the Virgin Islands. Transportation rates were geared to full loads and importers are quite conscious of the need to fill out or squeeze in a load to take advantage of available equipment. One drawback in attempting to use local produce on a sporadic basis is the problems created in balancing out trailers with other types of produce. For example,

Table 9.—Fresh fruits, vegetables and melons imported into the Virgin Islands by point of origin, 1972[1] (continued)

Commodity	U. S. and Puerto Rico			Total	Dominican Republic	Leeward and Windward Islands	Other foreign	Total imports
	New York	Miami	San Juan					
	Thousand Pounds							
Peas					[3]			[3]
Parsnips					2			2
Garlic			2	2	1			3
Potatoes		439	1,087	1,526	29		1	1,556
Roots or Tubers		12	4	16				16
Dasheens					90	113		203
Vegetables, Fresh NEC[2]	60	5	4,505	4,570	222	38	2	4,832
Total all vegetables	68	1,236	7,407	8,711	492	155	14	9,372
Total all fruits, vegetables and melons	271	1,493	12,913	14,539	1,479	306	38	16,361

Table 10.—Monthly imports of fresh fruits, vegetables and melons into the Virgin Islands by point of origin, 1972[1]

Month	U.S. and Puerto Rico				Dominican Republic	Leeward and Windward Islands	Other foreign	Total all imports
	New York	Miami	San Juan	Total				
	Thousand Pounds							
Jan.	--	92	1,293	1,385	175	--	6	1,565
Feb.	42	200	1,051	1,292	134	6	2	1,434
Mar.	33	47	1,349	1,428	146	--	3	1,477
Apr.	--	160	985	1,146	141	14	--	1,301
May	--	72	1,375	1,447	127	11	3	1,587
June	130	116	1,732	1,977	73	--	--	2,050
July	--	156	1,522	1,678	172	25	--	1,875
Aug.	67	90	1,009	1,166	111	6	4	1,287
Sept.	--	74	811	885	91	27	9	1,012
Oct.	--	113	727	840	118	69	--	1,027
Nov.	--	158	819	977	118	16	6	1,117
Dec.	--	204	231	434	86	139	--	659
Total[2]	271	1,481	12,904	14,656	1,489	313	33	16,490

[1] Compiled from customs data supplied by U.S. Virgin Islands Department of Commerce, Trade and Industry.
[2] Total imports in Table 10 do not equal totals reported in Table 9 due to minor statistical corrections; however, differences are generally small.

Table 11.—Value of fruits and vegetables shipped to the Virgin Islands by country of origin, 1972[1]

Origin	Fruits and melons	Vegetables	Total
	Dollars		
New York	10,642	50,596	61,238
Miami	37,542	162,751	200,293
San Juan	881,890	1,272,680	2,154,570
Total U.S. and Puerto Rico	930,074	1,486,027	2,416,101
Dominican Republic	133,080	70,941	204,021
Leeward and Windward Islands	15,144	20,190	35,334
Other foreign	5,203	3,105	8,308
Total all imports	1,083,501	1,580,263	2,663,764

[1] Wholesale value in the country of origin. Source: Virgin Islands Department of Commerce, Trade and Industry.

one firm manager said if Virgin Islands tomatoes are available for two weeks only it may not be desirable to cut a produce order by say 2,000 pounds of tomatoes simply because 2,000 pounds of onions or some other commdity would need to be used to fill in the van. This could result in spoilage or in further loading problems the following week. Generally, daily deliveries by water are available out of Puerto Rico, while less frequent schedules are maintained with Miami and New York.

Air transportation is predominantly used to bring in produce out of the Dominican Republic and islands such as Dominica. Quoted rates are about $750 or $725 per planeload of 14,000 pounds. This activity apparently has been increasing; several planeloads per week are currently coming into both St. Croix and St. Thomas.

In the future, it appears likely that transportation services to the Virgin Islands will continue to improve and the relative costs of their service will decline. With increasing volume of product comes more frequent delivery, improved harbor facilities, and a generally more efficient distribution system. To some extent this will make the produce of the United States, Puerto Rico, Santo Domingo and the British West Indes even more competitive with local produce.

A large part of the decline in the Virgin Islands fruit and vegetable industry over the past 20 years

Table 12.—Wholesale prices of imported and local produce, 1972[1]

Commodity	Miami	Puerto Rico	Dominican Republic	Leeward and Windward Islands	St. Croix[2]
			Dollars per Pound		
Oranges	.111	.145			
Grapefruit	.161	.120			
Apples	.211	.151			
Avocados			.133	.169	
Bananas			.132	.102	.120
Papayas					.150
Mangoes			.158	.126	.200
Plantains			.133	.091	
Pineapple		.100[3]	.250[4]		.080
Tomatoes	.302	.247	.149		.250
Onions	.093	.068	.125[4]		.300
Peppers	.170[5]	.094	.219	.317	.250
Cabbage	.073	.048	.192		.130
Carrots	.063[6]	.081			.150
Okra				.100	.250
Potatoes	.070	.143	.091		.130[7]
Lettuce	.153	.161			.150
Green beans	.159[5]		.081[4]		.200
Cucumbers	.092[5]	.092	.150	.203	.160
Eggplant	.088[5]	.088	.145		.150
Roots or Tubers	.106	.208			.200[8]
Tanya			.050[4]		
Dasheens			.184	.128	

[1] Source: Derived from data provided by Virgin Islands Department of Commerce, Division of Trade and Industry. Wholesale price in the country of origin.

[2] Estimates supplied by staff of the Virgin Islands Department of Agriculture. 1972–73 prices were generally high relative to prices received during the past few seasons.

[3] Quotation of St. Croix firm.

[4] June 21, 1973 prices provided by La Division de Mercadeo Agricola, Dependencia del Depto. de Economia, Agropecuaria de la Secretaria de Estado de La Republica Dominica.

[5] Florida prices Vegetables-Fresh Market. Statistical Reporting Service, U.S. Department of Agriculture Vg 2–2 (72).

[6] Texas prices, Ibid.

[7] Sweet potatoes.

[8] Yams.

can be attributed to improvements in the delivery and distribution system of competing export areas.

Delivered Prices—By adding transportation costs to the wholesale prices in Table 12, delivered prices to the Virgin Islands were derived for 1972 (Table 13). No customs duties are levied on fresh produce entering the Virgin Islands.

The competitive picture for most items is intense. Generally one or more areas are able to provide a given commodity at prices below what St. Croix has received locally. This suggests that with increased production in the Virgin Islands, prices would tend to decline for most items depending on quality and size.

Items which would compete effectively with U.S. and Puerto Rican produce include pineapple, tomatoes and lettuce. Items that would suffer price declines include onions, peppers, cabbage, carrots, okra, green beans, cucumbers, and eggplant. It should be noted that prices for Miami and Puerto Rico include considerable marketing services such as grading, sizing, washing, and containers, while local St. Croix produce has less built-in services. An offsetting benefit of local produce may be freshness, since it may take a week or more to bring in produce from the U.S. mainland.

Items where St. Croix could compete effectively against the Dominican Republic and the British West Indies include bananas, mangoes, pineapple, peppers, cabbage, cucumbers, and eggplant. For items such as tomatoes, onions, okra, and green beans, delivered prices from these areas are generally lower than for domestic produce.

When all competing supply areas are considered, bananas, papayas, mangoes, pineapple, lettuce and possibly tomatoes appear to bo possibilities for in-

Table 13.—Wholesale prices of produce delivered to St. Croix in 1972 from selected origins[1]

Commodity	*Miami*	*Puerto Rico* [2]	*Dominican Republic*	*Leeward and Windward Islands*	*St. Croix* [3]
	Dollars per Pound				
Transportation cost	.045	.022	.053	.051	0
Oranges	.156	.167			
Grapefruit	.206	.142			
Apples	.256	.173			
Avocados			.186	.220	
Bananas			.185	.153	.120
Mangoes			.211	.177	.200
Plantains			.186	.142	
Pineapple		.122	.303		.080
Tomatoes	.347	.269	.202		.250
Onions	.138	.090	.178		.300
Peppers		.116	.272	.368	.250
Cabbage	.118	.070	.245		.130
Okra			.153		.250
Carrots		.103			.150
Potatoes	.115	.165	.144		.150
Lettuce	.198	.183			
Green beans			.134		.200
Eggplant		.110	.198		.150
Roots or Tubers	.151	.230			
Cucumbers		.113	.203	.254	.160
Tanya			.103		
Dasheens			.237	.179	

[1] Source: Derived from Table 12 by adding transportation costs per pound.
[2] Generally U.S. produce transhipped in Puerto Rico.
[3] See footnote 2, Table 12.

creased local production without severe price declines.

It was not possible to consider the seasonal price patterns for each commodity that might be produced on St. Croix or the Virgin Islands but certain periods of the year may present the best local marketing opportunities. For example in looking at monthly prices of lettuce and tomatoes, different patterns emerge (Table 14). At 15.0 cents per lb., St. Croix producers could effectively compete in the lettuce market all year around. At 25.0 cents per lb., the late fall, winter and spring months would provide local producers with an edge over shipments from Puerto Rico and the United States. However, tomatoes from the Dominican Republic, which currently tend to be of lower quality, would provide a potential lid on prices nearly all the year round.

Complete price data and an analysis of seasonal patterns can help to identify other marketing opportunities for local Virgin Islands producers.[4]

POTENTIALLY PROFITABLE ITEMS FOR ST. CROIX PRODUCERS

An estimate of the potential profit that might be realized by St. Croix produce growers was made by subtracting production and marketing costs from possible returns (Table 15). On a per-pound basis, commodities such as mangoes, tomatoes, papayas, and okra appear to have the best prospects, pineapple and onions offer a smaller profit potential per pound. Peppers resulted in negative rates of profit with normal yields and onions were barely profitable.

Returns to St. Croix growers were assumed to

[4] See Appendix Tables 10 to 14 for monthly price information on other fruits and vegetables.

Table 14.—Monthly wholesale prices of lettuce and tomatoes in country of origin and delivered to St. Croix, 1972[1]

Month	Puerto Rico		Florida		Dominican Republic	
	San Juan	St. Croix	Miami	St. Croix	Santo Domingo	St. Croix
	Cents per Pound					
	Lettuce—local price 15.0					
Jan.	15.3	17.5	21.1	25.6		
Feb.	17.0	19.2	15.9	20.4		
Mar.	15.3	17.5	12.1	16.6		
Apr.	15.1	17.3	14.4	18.9		
May	20.0	22.2	10.3	14.8		
June	13.6	15.8	15.7	20.2		
July	15.6	17.8	12.5	17.0		
Aug.	14.3	16.5	13.9	18.4		
Sept.	17.9	20.1	15.4	19.9		
Oct.	16.1	18.3	14.1	18.6		
Nov.	19.4	21.6	16.4	20.0		
Dec.	23.1	25.3	17.3	21.8		
Aver.	16.1	18.3	15.3	19.8		
	Tomatoes—local price 25.0					
Jan.	30.0	33.0	35.5	40.0	10.5	15.8
Feb.	29.6	31.8	31.5	36.0	16.1	21.4
Mar.	29.6	31.8	20.8	25.3	10.8	16.1
Apr.	25.4	27.6	30.6	35.1	14.0	19.3
May	30.0	32.2	28.8	33.3	21.2	26.5
June	24.0	26.2	33.0	37.5	21.8	27.1
July	29.6	31.8	30.0	34.5	14.3	19.6
Aug.	20.0	22.2	33.7	38.2	34.7	40.0
Sept.	20.4	22.6	32.9	37.4	----	----
Oct.	23.3	25.5	27.1	31.6	----	----
Nov.	31.4	33.6	30.2	34.7	17.3	22.6
Dec.	38.5	40.7	27.5	32.0	21.2	26.5
Aver.	24.7	26.9	30.2	34.7	14.9	20.2

[1] Derived from data supplied by the U. S. Virgin Islands Department of Commerce, Trade and Industry. St. Croix prices include point of origin price plus transportation costs to the Virgin Islands.

equal the lesser of the current St. Croix price or the delivered price of imports from the strongest price competitor. With increased production, St. Croix growers would be forced to meet the competition of other potential suppliers. It should also be pointed out that in particular months imported produce may be available at prices below those shown in Table 15. For example tomatoes in January and March of 1972 were available from the Dominican Republic at 15.8 and 16.1 cents per pound respectively (Table 14), a price which would leave St. Croix producers with little or no profit based on Table 15.

As indicated previously, imported produce usually arrives graded, sized, and packaged. These marketing services would have to be provided to market any substantial volume of St. Croix produce in the local supermarkets. Costs of these services were approximated in Table 15 to give an indication of the effect of incurring marketing costs on grower profits. Actual marketing costs would vary considerably. In particular, efficient marketing usually requires specialized equipment, packages, and considerable water to provide a quality product. The acreage of tomatoes required to meet the needs of St. Croix consumers, for example, might not justify the establishment of a packing plant on the island. However some reduction in grower

Table 15.—Potential margins for St. Croix producers: selected commodities

Commodity	St. Croix grower price [1]	St. Croix import price from strongest competitor [2]	St. Croix production costs [3]	Potential profit [4]	Marketing costs [5]	Potential profit if marketing costs are incurred	Potential profit with 80% yields or 25% higher production costs
			Cents per Pound				
Cucumbers	16.0	11.3 [6]	11.7	—0.4	3.8	—4.2	—6.9
Onions	30.0	9.0 [6]	3.8	5.2	3.0	2.2	1.2
Okra	25.0	15.3 [7]	5.4	9.9	5.1	4.5	3.1
Peppers	25.0	11.6 [6]	7.4	4.2	3.9	0.3	—1.6
Tomatoes	25.0	20.2 [7]	7.5	12.7	6.7	6.0	4.1
Mangoes	20.0	17.7 [8]	2.2	15.5	5.9	9.6	9.0
Papayas	15.0	NA	4.8	10.2	5.0	5.2	4.0
Pineapple	8.0	12.2 [6]	2.1	5.9	2.7	3.2	2.7

[1] See footnote 2, Table 12.
[2] See Table 13.
[3] See Table 1 through 9, Appendix.
[4] Lower of import price or grower price minus production costs.
[5] Assumed to equal ⅓ of lower of import price or grower price.
[6] Puerto Rico
[7] Dominican Republic
[8] Leward and Windward Islands
NA Not available.

returns might be substituted for a lower quality with fewer built in marketing services.

Finally, the data in Table 15 was derived from a normal yield basis. Lower yields or higher production costs could lower profits as indicated in the last column.

An item of expense not included is transportation costs. If St. Croix growers are going to take advantage of the demand for fruits and vegetables in St. Thomas, an additional 1.5 to 2.0 cents per pound would be required for transportation to Charlotte Amalie. With 80 percent yields, this would reduce profit margins for all the selected commodities except mangoes to very thin levels.

MARKETING CHANNELS AND PRACTICES

Retail outlets for the fruit and vegetable industry of the Virgin Islands include two regional chain stores, several intermediate size independents, and a sizable number of neighborhood or "mom and pop" groceries. Two local merchant wholesalers service the mom and pop groceries while three purveyors operating from five locations provide the restaurants and hotels with their produce. A few independent importers are also bringing in produce from Santo Domingo and the British West Indies.

The regional supermarkets account for 60 to 65 percent of the produce from Santo Domingo and other points in the West Indies. Supermarket sales are made primarily to year-round residents, usually those with middle to high incomes. Roughly 85 to 90 percent of the produce sold comes from the U.S. mainland or Puerto Rico. Local produce is handled infrequently if available. Overall quality of produce handled is not as high as in the United States, but perfectly adequate for normal consumption.

Hotels and restaurants buy their produce primarily from purveyors operating on both St. Thomas and St. Croix. About 18 percent of the total fruits and vegetables sold moves through the hotels and restaurants. Quality is of high priority to the hotels and restaurants and most produce used comes from the U.S. mainland. Local produce is used infrequently when available, especially items like mangoes and papayas. Primary outlets for the hotels and restaurants are tourists, although there is considerable "eating out" by middle and upper income residents.

Independent and neighborhood groceries obtain their produce from three specialized merchant wholesalers and from purveyors. Their predomi-

nant sales outlet is to middle and low income groups so that marketing services such as sizing, grading, and containers are not as essential as in the regional supermarkets.

The local grocery stores handle about 14 percent of the total produce sold and rely more heavily on local produce than do the regional chain stores. It is estimated that 70 to 75 percent of their produce comes from Puerto Rico and the U.S. mainland, 20 to 25 percent from other foreign countries and possibly 5 percent from local production, although this is difficult to pin down. It is estimated that about half the food needs of the low income segment of the population comes from the regional chain stores and about half from the intermediate and neighborhood groceries.

A number of roadside markets operate in the Virgin Islands plus a daily farmer's market in St. Thomas and a weekly market in Christiansted, St. Croix. Boats from nearby islands such as Tortola bring some produce to sell at dockside in St. Thomas. In total, the above outlets account for possibly 3 to 4 percent of total produce sales. They rely heavily on produce from the Dominican Republic and the British West Indies such as Dominica and may obtain up to 75 percent of their fruits and vegetables from importers operating from these islands. It is also believed that considerable local produce may be handled through roadside outlets, but again the volume of local produce is difficult to establish or find displayed.

The main outlet for local produce apparently is home consumption and a small volume of sales through the neighborhood groceries and roadside stands. The Virgin Islands Department of Agriculture assists in assembling, grading, sizing, packing, cooling, storing, delivering, and selling larger lots of local fresh fruits and vegetables. Sales are to the larger supermarkets and to a few hotels and restaurants. A fee of five percent of the sales prices is charged for this service. While the total volume handled is not large, the present organization is a viable mechanism to enable local producers to market their produce. A few producers will make sales directly to hotels or supermarkets but the volume is small.

If the volume of local produce can be expanded, the present storage and refrigeration facilities at the Marketing Building should be adequate up to a volume of 2,000 cubic feet of produce per day—about equivalent to one trailer lot. Three separate cooling units are available so different temperatures can be maintained. Grading and sizing of produce is done by hand but given present levels of production, extra equipment does not appear warranted. Containers consist of cardboard boxes from local groceries and liquor stores, but again are sufficient for the present volume of produce.

The major problems encountered in marketing produce by the Virgin Islands Department of Agriculture are in coordinating the flow of produce from growers to buyers. Growers may not provide enough notice in advance of their harvest to line up buyers for the produce. Timing of harvests may be inconsistent with the weekend specials planned by the supermarkets. If advance notice is given, other priorities may prevent growers from harvesting, resulting in cancelled sales and unhappy buyers.

ATTITUDES OF LOCAL FIRMS TOWARD VIRGIN ISLANDS PRODUCE

In general, nearly all the local firms contacted were interested and receptive to the idea of marketing local produce. They find that local produce sells well and that residents are interested in what is produced in the Virgin Islands. The problems are availability and dependability. Uniform size and consistent quality were also cited.

Supermarkets

Local supermarket managers were unanimous in their interest in local produce. The comment by one firm manager was that "We don't get much local produce, but what we can get sells well." The major need cited is for a constant and dependable supply. Produce managers indicated they need to plan in advance, need supplies on a steady basis and find it difficult to interrupt normal marketing channels for short periods of time. For example, buying local produce without advance planing interrupts marketing plans made 10 days to two weeks previous. This can cause financial losses and hard feelings on the part of more dependable suppliers in Puerto Rico or on the U.S. mainland.

Managers indicated that minimum grading and sizing is important and that uniformity in appear-

ance is desirable. Consistent quality and freedom from rot were stressed, but minor defects can be tolerated. Standards do not have to be as high as would be demanded for, say, exports to the United States.

Questions have been raised by local growers about retail markups by the local supermarkets. In general, markups on both St. Croix and St. Thomas were in line with practices elsewhere. Generally 30 to 35 percent of gross sales is taken on produce by retailers to cover their labor and overhead. This means $1 worth of produce at wholesale would be sold for $1.40 to $1.45 at retail. Individual produce items will vary considerably depending on their volume and movement. The main consideration should be the price received by the grower and not the price charged by the retailer for the produce.

Purveyors

Local purveyors or wholesalers predominantly servicing hotels and restaurants were more critical in their comments on local produce than were the supermarkets. They indicated they would like local produce such as bananas, lettuce, tomatoes and papayas if they could obtain a reliable supply of high quality produce. Sizing and uniformity was also stressed. One purveyor said he could use 100 crates of lettuce and tomatoes per week if available but his previous experiences with the quality of local produce were bad. Scheduling problems were cited by some purveyors. Plans are based on filling out a full trailer load to minimize unit transportation costs. If supplies of produce are undependable, problems can be caused by occasionally buying locally. The broker or exporter on the mainland will be left with excess produce if sporadic local purchases are made. In addition, the local purveyor has to fill out the trailer with "hardware" such as onions or potatoes which may not be desirable. The problem is reversed when a local grower sells direct to a hotel or restaurant and the purveyor is left with excess produce.

Local purveyors generally indicated they would take all the local produce they could get if the quality is good and the supply dependable.

Merchant wholesalers selling dry goods, meats, and fruits and vegetables to local neighborhood groceries had mixed feelings about local fruits and vegetables. The problem of a consistent supply was mentioned, but quality was not stressed. There was also a lack of interest in local produce since it tends to cut into their business. Local growers can easily arrange to sell extra produce at the neighborhood grocery, which might reduce the volume of produce handled by the merchant wholesalers.

REQUIREMENTS TO MEET DOMESTIC CONSUMPTION

A total of 229 acres of land would be required to grow enough of 9 selected fruits and vegetables to meet the needs of the Virgin Islands (Table 15). The major requirements would be for tomatoes, lettuce, onions and cucumbers. If St. Croix only was going to be supplied, the acreage required would be 109 acres or less depending on the possibility of double or triple cropping and year-round production. By 1980, supplying the annual needs of the Virgin Islands would require 343 acres and for St. Croix only 168 acres, based on an expected gain of 50 percent in the quantity of produce demanded from increases in population and real income. The possibility of improved varieties and increased yields would modify acreage requirements by 1980.

Although the selected commodities could be produced all the year around with proper irrigation and cultural practices, a favorable production period was designated for each consistent with growing conditions on St. Croix. A total of 130 acres of the 9 crops would be required to meet the current needs of the Virgin Islands during favorable production periods. This would include 62 acres to meet St. Croix requirements (Table 16). By 1980, 196 acres would be necessary to grow the Virgin Islands needs and 96 acres for St. Croix alone.

In terms of small farms of 12 to 15 acres, the 1973 requirements translate to some 9–11 farms for the total Virgin Islands and 4 or 5 farms for St. Croix for favorable production periods only. By 1980, 13 to 16 farms would be required for the Virgin Islands and 6 to 8 farms for St. Croix. This assumes local producers could adequately meet the needs of the supermarkets, hotels and restaurant trade. If this were not the case, the number of farms required would be much smaller.

Assuming sufficient production of 9 commodi-

Table 16.—Acreage of selected fruits and vegetables required to meet annual Virgin Islands consumption requirements, 1973 and 1980

Commodity	Estimated yield per acre [1]	Consumption requirements				Acreage requirements			
		1973		1980		1973		1980	
		Virgin Islands	St. Croix [2]	Virgin Islands [3]	St. Croix [4]	Virgin Islands	St. Croix	Virgin Islands	St. Croix
		Thousand pounds				Acres			
Tomatoes	14.0	858	409	1,287	627	61.3	29.2	91.9	44.8
Onions	18.6	846	403	1,269	618	45.5	21.7	68.2	33.2
Cucumbers	5.8	193 [5]	92	289	141	33.2	15.8	49.8	24.3
Peppers	10.0	145 [5]	69	217	106	14.5	6.9	21.7	10.6
Okra	14.0	48 [5]	23	72	35	3.4	1.6	5.2	2.5
Lettuce	15.0 [6]	773	369	1,159	565	51.5	24.6	77.2	37.7
Pineapples	28.0	289 [5]	138	434	211	10.3	4.9	15.5	7.6
Papayas	22.0	96 [5]	46	145	70	4.4	2.1	6.6	3.2
Mangoes	16.6	86	41	129	63	5.2	2.5	7.8	3.3
Total 9 crops		3,333	1,590	5,000	2,437	229.3	109.3	343.9	167.7

[1] Estimated in cooperation with the Virgin Islands Department of Agriculture.
[2] Based on 47.7 percent of total Virgin Islands population on St. Croix.
[3] Based on a 50 percent increase in quantity demanded by 1980 due to gain in population and income.
[4] Based on 48.75 percent of projected 1980 Virgin Islands population on St. Croix.
[5] Based on estimated per capita consumption of 1.5 lbs. cucumbers, 2.0 lbs. peppers, .5 lb. okra., 30 lbs. pineapples and 1.0 lb. papayas.
[6] 75 percent of U. S. winter crop average, 1972.

Table 17.—Acreage of selected fruits and vegetables required to meet Virgin Islands consumption requirements during favorable production periods, 1973 and 1980

Commodity	Season [1]	Total months	Acerage required to meet consumption requirements during production periods [2]			
			1973		1980	
			Virgin Islands	St. Croix	Virgin Islands	St. Croix
			Acres			
Tomatoes	Oct.–Mar.	6	30.6	14.6	46.0	22.4
Onions	Oct. May	8	30.3	14.5	45.5	22.1
Cucumbers	Oct.–Mar.	6	16.6	7.9	24.9	12.2
Peppers	Oct.–Mar.	6	7.2	3.5	10.8	5.3
Okra	All year	12	3.4	1.6	5.2	2.5
Lettuce	Oct.–Mar.	6	25.8	12.3	38.6	18.9
Pineapples	All year	12	10.3	4.9	15.5	7.6
Papayas	All year	12	4.4	2.1	6.6	3.2
Mangoes	Apr.–July	4	1.7	.8	2.6	1.3
Total 9 crops			130.3	62.2	195.7	95.5

[1] Estimates supplied by officials of Virgin Islands Department of Agriculture.
[2] See footnotes Table 16.

ties to meet local needs on St. Croix were produced, present marketing facilities appear adequate. Average daily needs would equal 4,356 pounds, which could be handled through existing cooler capacities. With an annual budget of $32,000 (1972 fiscal year) the Agricultural Marketing Program would cost two cents per pound of produce marketed. Some shifting of the assembly, grading and sizing functions back to the producer might be necessary as volume increases.

If total marketings approach 10,000 pounds per day, then additional storage and refrigeration facilities would be requred to provide space for two days of production. With enough production, the agricultural marketing building could be operated as a cooperative on a self-sustaining basis.

Under the present 5 percent fee, a volume of 3,200,000 pounds of produce would make the present program self-supporting, assuming a sales value of 20 cents per pound or $640,000 of gross sales annually.

An improved market information system would be desirable such as wholesale reports from Miami, New York, Puerto Rico, and Santo Domingo. The present phone system is inadequate for easy communications with buyers and growers. A system of gathering retail prices sporadically, say, every three months would also be helpful.

APPENDIX

Table 1.—Estimated cost per acre for growing mangoes, St. Croix, U.S. Virgin Islands

Item	*Quantity and/or hours*	*Cost*
Labor		*Dollars*
Pruning (2 hours per tree)	100	200.00
Picking 2500 fruits per 8 hrs. times 50,000 fruits	160	320.00
	Sub-total	520.00
Material		
Boxes, ladders, poles, etc.		35.00
Other		
Spray—custom 4 hrs., including chemicals		80.00
Hauling		40.00
Fixed Cost		
Land charge		25.00
Bookkeeping and misc.		50.00
Amortization cost		110.00
Annual interest on investment		97.00
	Total	$957.00
Estimated production 44,167 [1] fruits		
Cost per fruit—cents		2.2

[1] Yield with average rainfall is 1000 fruits per tree, and in drought year about 650 fruits.

Table 2.—Estimated cost per acre for establishing mangoes, St. Croix, U.S. Virgin Islands

Item	*Quantity and/or hours*	*Cost*
Labor		*Dollars*
Dig and prepare holes	50 hrs.	100.00
Plant trees	15 hrs.	30.00
Mulch around trees	15 hrs.	30.00
Water and care for trees twice week	164 hrs.	328.00
Spray trees—2 times by hand	16 hrs.	32.00
	Sub-total	520.00
Second year		
Water trees	164 hrs.	328.00
Spray—hand	16 hrs.	32.00
Third thru fifth year		
Water and care (80 hrs. annually)	240	
Spray—custom ($10 per hour for 8 hours.)		160.00
	Sub-total	520.00
Materials		
Plants—$4 each		400.00
Spray (1st and 2nd years)		8.00
Mulch		60.00

Table 2.—Estimated cost per acre for establishing mangoes, St. Croix, U.S. Virgin Islands—Cont.

Item	*Quantity and/or hours*	*Cost*
Other		*Dollars*
Land preparation		34.00
Fixed Costs		
Land charge (5 seasons)		125.00
Misc. (5 seasons)		50.00
Interest charge at 8% on $1200 for 5 years		480.00
Total establishments costs		$2,197.00
Annual amortization charge—5%		110.00

Table 3.—Estimated cost per acre for growing pineapples, St. Croix, U.S. Virgin Islands

Item	*Quantity and/or hours*	*Cost*
Labor		*Dollars*
Apply fertilizer, mulch, and fumigate	46 hrs.	92.00
Preparation of slips for planting	16 hrs.	32.00
Plant	35 hrs.	50.00
First Season		
Fertilizer, by hand—2 times	8 hrs.	16.00
Spray, by hand—2 times	6 hrs.	12.00
Harvest		
Cut and load (3 times over)	32 hrs.	64.00
Prepare fruit for market and haul	16 hrs.	32.00
Second Season		
Fertilizer and spray	14 hrs.	28.00
Harvest etc.	42 hrs.	84.00
Third Season		
Fertilizer and spray	14 hrs.	28.00
Harvest etc.	38 hrs.	76.00
	Sub-total	514.00
Materials		
Slips—5 cents per slip for 9,400		470.00
Mulch paper—5 rolls, $30 each		150.00
Sprays for 3 seasons		18.00
Fertilizer for 3 seasons—1500 lbs		90.00
Containers		15.00
	Sub-total	$743.00
Other		
Land preparation etc.		34.00
Truck operation (3 seasons)		60.00
Fixed Costs		
Land charge (3 seasons)		75.00

Table 3.—Estimated cost per acre for growing pineapples, St. Croix, U.S. Virgin Islands—Cont.

Item	Quantity and/or hours	Cost
		Dollars
Bookkeeping and Misc. (3 seasons)		50.00
Interest charge 8% on $1400 for 2 years		112.00
	Total	$1,588.00
Labor		
Estimated production 38 tons [1]		
Cost per ton		42.00
Cost per pound—cents		2.1

[1] Yield with average rainfall about 14 tons per acre and in drought year about 10 tons.

Table 4.—Estimated cost per acre for growing papayas, St. Croix, U.S. Virgin Islands

Item	Quantity and/or hours	Cost
Labor		*Dollars*
Nursery	51 hrs.	102.00
Field		
Lay out hills and plant	25 hrs.	50.00
Mulch	20 hrs.	40.00
Screen and thin	10 hrs.	20.00
Hand Weed	45 hrs.	90.00
Harvest		
Picking	80 hrs.	160.00
Sort, cull, and size	40 hrs.	80.00
Haul	40 hrs.	80.00
	Sub-total	$622.00
Material		
Seed		6.00
Spray		33.00
Fertilizer		26.00
Mulching material		30.00
Containers		16.00
Other		
Land preparation		34.00
Truck operation		30.00
Grading and packing 5% of 3500 lbs.		84.00
Fixed Costs		
Land charge		80.00
Bookkeeping and misc.		20.00
Interest on prod. cost ($800)		64.00
	Total	$1,045.00
Estimated production—22,000 lbs. [1]		
Cost per pound—cents		4.75

[1] Yield with average rainfall is about 26,700 lbs. per acre and drought year about 13,000 lbs.

Table 5.—Estimated cost per acre for producing okra, St. Croix, U.S. Virgin Islands

Item	Quantity and/or hours	Cost
Labor		*Dollars*
Plant, by hand	20 hrs.	40.00
Apply Fertilizer by hand	12 hrs.	24.00
Hand weed—2 times	32 hrs.	64.00
Spray—6 times	12 hrs.	24.00
Harvest		
Pick	96 hrs.	192.00
Sort and haul	14 hrs.	28.00
	Sub-total	$372.00
Materials		
Seed 8 lbs at $1.25 per pound		10.00
Fertilizer		21.00
Spray		12.00
Containers		6.00
	Sub-total	$49.00
Other		
Land preparation		34.00
Truck operation—14 trips, 350 miles 8 cents per mile		28.00
Grading and packing		175.00
Fixed Costs		
Land Charge		25.00
Bookkeeping and misc		15.00
	Total	$698.00
Estimated production [1] 6.5 tons		
Cost per ton		107.00
Cost per pound—cents		5.4

[1] Estimated yield with average rainfall is 7.0 tons and for a drought year 5.6 tons.

Table 6.—Estimated cost per acre for producing tomatoes, St. Croix, U.S. Virgin Islands

Item	Quantity and/or hours	Cost
Labor		*Dollars*
Nursery	9 hrs.	18.00
Field		
Plant	30 hrs	60.00
Water—2 times	15 hrs.	30.00
Hand Weed—3 times	48 hrs.	96 00
Apply fertilizer—3 times	24 hrs.	48.00
Spray—10 times	24 hrs.	48.00
Harvest		
Picking	120 hrs.	240.00
Sort and haul	24 hrs.	48.00
	Sub-total	$588.00
Materials		
Seed		2.00
Fertilizer (nursery)		5.00
Field—500 lbs		35.00

Table 6.—Estimated cost per acre for producing tomatoes, St Croix, U.S. Virgin Islands—Cont.

Item	Quantity and/or hours	Cost
		Dollars
Spray		20.00
Containers		10.00
	Sub-total	$72.00
Other		
Land preparation—custom		34.00
Truck operation—12 trips 300 miles at 8 cents		24.00
Grading and packing—5% of gross value		175.00
Fixed Cost		
Land charge		25.00
Bookkeeping and misc.		15.00
	Total	$933.00
Estimated production [1] 6.2 tons		
Cost per ton		150.00
Cost per pound—cents		7.5

[1] Estimated yield with average rainfall is 7.0 tons and for a drought year is 4.6 tons.

Table 7.—Estimated cost per acre for producing peppers, St. Croix, U.S. Virgin Islands

Item	Quantity and/or hours	Cost
Labor		*Dollars*
Nursery	9 hrs.	18.00
Field		
Plant	39 hrs.	60.00
Water—2 times	15 hrs.	30.00
Hand Weed—3 times	48 hrs.	96.00
Apply fertilizer	16 hrs.	32.00
Spray—10 times	24 hrs.	48.00
Harvest		
Pick and haul	50 hrs.	100.00
	Sub-total	$384.00
Materials		
Seed—¼ lbs at $10		2.00
Fertilizer		
Nursery		5.00
Field		25.00
Spray		20.00
Containers		6.00
	Sub-total	$58.00
Other		
Land preparation—custom		34.00

Table 7.—Estimated cost per acre for producing peppers, St. Croix, U.S. Virgin Islands—Cont.

Item	Quantity and/or hours	Cost
Other—Cont.		*Dollars*
Truck operation		20.00
Grading and packing		150.00
Fixed Costs		
Land charge		25.00
Bookkeeping and misc.		15.00
	Total	$686.00
Estimated production [1] 4.4 tons		
Costs per ton		149.00
Cost per pound—cents		7.4

[1] Estimated yield with average rainfall is 5.0 tons and for a drought year is 3.8 tons.

Table 8.—Estimated cost per acre for producing cucumbers, St. Croix, U.S. Virgin Islands

Item	Quantity and/or hours	Cost
Labor		*Dollars*
Plant by hand	20 hrs.	40.00
Apply Fertilizer by hand	12 hrs.	24.00
Hand weed—3 times	48 hrs.	96.00
Spray—8 times	16 hrs.	32.00
Harvest		
Pick—3 times for 8 wks	120 hrs.	240.00
Sort and haul	24 hrs.	48.00
	Sub-total	$480.00
Materials		
Seed—3 lbs at $3.00		9.00
Fertilizer—350 lbs		21.00
Spray—$2 per time		16.00
Containers		6.00
	Sub-total	$52.00
Other		
Land Preparation		34.00
Truck operation—24 trips		20.00
Grading and packing		52.00
Fixed Costs		
Land Charge		25.00
Bookkeeping and misc.		15.00
	Total	$678.00
Estimated production [1] 2.9 tons		
Cost per ton		234.00
Cost per pound—cents		11.7

[1] Estimated yield with average rainfall is 3.5 tons and for a drought year is 1.8 tons.

Table 9—Estimated cost per acre for producing onions, St. Croix, U.S. Virgin Islands

Item	Quantity and/or hours	Cost
Labor		Dollars
Nursery	9 hrs.	18.00
Field		
Plant	45 hrs.	90.00
Hand weed—2 times	32 hrs.	64.00
Apply fertilizer	12 hrs.	24.00
Spray—2 times	5 hrs.	10.00
Harvest		
Pull	45 hrs.	90.00
Remove top and haul	10 hrs.	20.00
Haul—10 trips	30 hrs.	60.00
	Sub-total	$376.00
Materials		
Seed—1 lb		5.00
Fertilizer—Nursery		5.00
Field		26.00
Spray—2 times		5.00
Containers		6.00
Other		
Land preparation—customs		34.00
Truck operation 10 trips 250 miles at 8 cents		20.00
Grading etc.— 5% of gross value		200.00
Fixed Costs		
Land charge		25.00
Bookkeeping, and misc.		15.00
	Total	$717.00
Estimated production 9.3 tons [1]		
Cost per ton		77.00
Cost per pound—cents		3.8

[1] Estimated yield with average rainfall is 10.0 tons and for a drought year 8.0 tons.

Table 10.—Monthly wholesale prices of potatoes and onions delivered to St. Croix, Virgin Islands, 1972[1]

Month	Puerto Rico		Florida		Dominican Republic	
	San Juan	St. Croix	Miami	St. Croix	Santo Domingo	St. Croix
	Cents per pound					
	Potatoes					
January	13.5	15.7	--	--	9.9	15.2
February	14.6	16.8	5.4	9.9	13.0	18.3
March	16.2	18.4	4.7	9.2	5.0	10.3
April	13.4	15.6	4.1	8.6	11.9	17.2
May	17.1	19.3	6.1	10.6	--	--
June	15.4	17.6	7.1	11.6	--	--
July	13.1	15.3	7.7	12.2	--	--
August	12.9	15.1	8.6	13.1	--	--
September	16.4	18.6	6.6	11.1	--	--
October	14.8	17.0	9.7	14.2	--	--
November	12.5	14.7	8.0	12.5	--	--
December	--	--	8.2	12.7	6.0	11.3
Average	14.3	16.5	7.0	11.5	9.1	14.4
	Onions					
January	5.4	7.6	--	--		
February	7.4	9.6	9.6	14.1		
March	6.1	8.3	6.3	10.8		
April	8.0	10.2	6.7	11.2		
May	5.0	7.2	--	--		
June	6.8	9.0	12.6	17.1		
July	8.4	10.6	13.2	17.7		
August	6.3	8.5	12.4	16.9		
September	6.6	8.8	12.3	16.8		
October	9.9	12.1	10.0	14.5		
November	9.6	11.8	8.0	12.5		
December	5.0	7.2	7.2	11.7		
Average	6.8	9.0	9.4	13.9		

[1] See footnote Table 14.

Table 11.—Monthly wholesale prices of cabbage and melons delivered to St. Croix, Virgin Islands, 1972[1]

Month	Puerto Rico		Florida		Dominican Republic	
	San Juan	St. Croix	Miami	St. Croix	Santo Domingo	St. Croix
	Cents per pound					
			Cabbage			
January	4.7	6.9	--	--	--	--
February	6.1	8.3	--	--	15.0	20.3
March	--	--	--	--	25.0	30.3
April	11.3	13.5	--	--	--	--
May	3.9	6.1	6.4	10.9	--	--
June	4.2	6.4	7.8	12.3	--	--
July	--	--	7.5	12.0	--	--
August	--	--	--	--	--	--
September	3.9	6.1	--	--	--	--
October	5.4	7.6	--	--	--	--
November	--	--	8.2	12.7	--	--
December	--	--	6.8	11.3	--	--
Average	4.8	7.0	7.3	11.8	19.2	24.5
			Melons			
January	13.3	15.5	6.0	10.5	--	--
February	13.3	15.5	6.0	10.5	--	--
March	13.3	15.5	26.2	30.7	--	--
April	--	--	--	--	--	--
May	--	--	--	--	--	--
June	13.3	15.5	36.1	40.6	--	--
July	13.3	15.5	21.5	26.0	--	--
August	13.4	15.6	--	--	21.5	26.8
September	--	--	16.8	21.3	21.3	26.6
October	--	--	15.8	20.3	--	--
November	--	--	19.4	23.9	17.9	23.2
December	--	--	28.1	32.6	--	--
Average	13.4	15.6	15.3	19.8	20.0	25.3

[1] See footnote Table 14.

Table 12.—Monthly wholesale prices of selected fruits and vegetables delivered to St. Croix, Virgin Islands, 1972[1]

Month	Dominican Republic		Dominican Republic		Dominican Republic	
	Santo Domingo	St. Croix	Santo Domingo	St. Croix	Santo Domingo	St. Croix
	Cents per pound					
	Plantains		Dasheens		Eggplant	
January	12.1	17.4	24.3	29.6	--	--
February	13.8	19.1	25.6	30.9	--	--
March	14.0	19.3	19.7	25.0	--	--
April	12.5	17.8	18.5	23.8	13.0	18.3
May	--	--	17.0	22.3	12.1	17.4
June	--	--	16.0	21.3	11.5	16.8
July	7.1	12.4	12.4	17.7	11.2	16.5
August	13.3	18.6	20.3	25.6	19.8	25.1
September	--	--	--	--	--	--
October	--	--	8.2	13.5	18.5	23.8
November	14.0	19.3	18.6	23.9	--	--
December	--	--	15.3	20.6	--	--
Average	13.3	18.6	18.4	23.7	14.5	19.8
	Avocados		Bananas		Mangoes	
January	--	--	14.5	19.8	--	--
February	--	--	12.9	18.2	--	--
March	--	--	13.1	18.4	--	--
April	20.0	25.3	12.5	17.8	12.8	18.1
May	--	--	13.3	18.6	--	--
June	--	--	13.2	18.5	--	--
July	11.1	16.4	13.2	18.5	16.4	21.7
August	14.1	19.4	13.1	18.4	21.5	26.8
September	13.5	18.8	13.3	18.6	--	--
October	11.1	16.4	13.0	18.3	--	--
November	14.5	19.8	13.1	18.4	--	--
December	15.4	20.7	13.2	18.5	--	--
Average	13.3	18.6	13.2	18.5	15.8	21.1

[1] See footnote Table 14.

Table 13.—Monthly wholesale prices of oranges, grapefruit and apples delivered to St. Croix, Virgin Islands, 1972[1]

Month	Puerto Rico		Florida		Puerto Rico		Florida		Puerto Rico		Florida	
	San Juan	St. Croix	Miami	St. Croix	San Juan	St. Croix	Miami	St. Croix	San Juan	St. Croix	Miami	St. Croix
	Cents per pound											
	Oranges				Grapefruit				Apples			
January	14.8	17.0	10.4	14.9	22.5	24.7	--	--	15.6	17.8	21.1	25.6
February	15.6	17.8	9.9	14.4	16.4	18.6	11.5	16.0	14.1	16.4	18.5	23.0
March	14.7	16.9	--	--	18.1	20.3	--	--	15.0	17.2	--	--
April	14.9	17.1	9.8	14.3	16.4	18.6	--	--	15.3	17.5	20.0	24.5
May	15.5	17.7	--	--	7.7	9.9	--	--	15.8	18.0	--	--
June	14.7	16.9	--	--	9.2	11.4	--	--	15.7	17.9	--	--
July	15.4	17.6	13.2	17.7	20.9	23.1	12.0	16.5	14.3	16.5	23.6	28.1
August	16.8	19.0	--	--	14.3	16.5	18.4	22.9	14.8	17.0	--	--
September	10.4	12.6	17.0	21.5	22.1	24.3	--	--	14.8	17.0	21.2	25.7
October	16.3	18.5	--	--	--	--	--	--	15.3	17.5	--	--
November	15.3	17.5	8.6	13.1	20.9	23.1	36.5	41.0	14.8	17.0	--	--
December	--	--	12.0	16.5	--	--	--	--	20.4	22.6	22.1	26.6
Average	14.5	16.7	11.1	15.6	12.0	14.2	16.2	20.7	15.1	17.3	21.1	25.6

[1] See footnote Table 14.

Table 14.—Monthly wholesale prices of grapes, tropical fruits, and watermelon delivered to St. Croix, Virgin Islands, 1972[1]

Month	Puerto Rico		Puerto Rico		Puerto Rico	
	San Juan	St. Croix	San Juan	St. Croix	San Juan	St. Croix
	Cents per pound					
	Grapes		Tropical fruits		Watermelon	
January	22.6	24.8	10.6	12.8	--	--
February	20.5	22.7	9.5	11.7	--	--
March	25.0	27.2	8.8	11.0	--	--
April	--	--	14.5	16.7	--	--
May	31.1	33.3	10.4	12.6	3.6	5.8
June	25.0	27.2	10.1	12.3	3.7	5.9
July	--	--	25.2	27.4	3.4	5.6
August	25.0	27.2	19.6	21.8	4.0	6.2
September	28.6	30.8	--	--	3.4	5.6
October	30.7	32.9	13.8	16.0	2.7	4.9
November	29.2	31.4	21.4	23.6	--	--
December	--	--	18.6	20.8	--	--
Average	26.6	28.8	15.6	17.8	3.5	5.7