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ST. VINCENT'S PILOT PROJECT IN EXPORTING WINTER VEGETABLES
TO WORLD MARKETS

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INTRODUCTION

A series of events points to the need for viable alternatives to traditional crops grown in St. Vincent, especially in the upper Windward area. In April 1985, the Government made a decision to stop production of sugar, with the need to find alternative crops to sugar cane. About the same time, the Government acquired Orange Hill Estates, and this posed a question of what would be the most economically attractive crops for this plantation. Arrowroot was already depressed, due to competition from Brazil and other countries. And the future of preferential pricing of bananas by the United Kingdom could not be taken for granted.

RONCO Consulting Corporation was asked to bring in consultants to look at the basic resources and to suggest possible economically attractive crops that might be grown on Orange Hill Estates and the former sugar lands, with the possibility of their being grown also by small farmers throughout the country. Two consultants were brought in in early May 1985. They were favorably impressed with the resources and the prospects and suggested that certain vegetables for the winter market in the United States should be worth consideration.

The Winter Vegetable Concept

The basic idea was that there is an attractive market in the United States, perhaps including Puerto Rico and the Virgin Islands, during January, February and March of each year for certain vegetables that can be produced in St. Vincent: sweet pepper, cucumbers, eggplant, zucchini squash, and watermelon.

To take advantage of that market, certain kinds of infrastructure are required. The vegetables must be cooled very shortly after harvest, to remove the field heat and prolong the shelf life of the produce. Packing facilities need to be constructed, and a reliable way of transporting the produce from the packing station to the cooling facilities and the port has to be in place. It has been estimated that in order to justify these facilities, particularly the cooling facilities, a core operation of 500-1000 acres of these vegetables would be required. Experience in other countries indicates that the most secure way to begin such a core operation is by having a private company take complete control and responsibility for all of the operations, managed by persons who have had similar experience elsewhere. Once the core operation is effectively in place, then small to medium size farmers would be encouraged and assisted to participate in the total project. To accomplish the latter, extensive training and educational programs would be needed to convey to farmers the exact techniques for producing the vegetables to achieve the quality of produce

demanded by the export market. In addition, water users associations or some method of grouping several farmers around an irrigation system so they can share the use of the water would have to be instituted, because irrigation is deemed to be essential to a successful effort.

Such a project would have numerous employment opportunities in both the production and the post-harvest handling of the produce.

While some thought was given initially to the possibility of starting a 500-1000 acre core operation in 1985, looking toward the January to March 1986 market, it was ultimately decided that there was insufficient time to get the larger scale vegetable cooling facility erected and operational in time to assure that the early 1986 market could be met. Also, firm shipping arrangements for getting to the U.S. market were not in place.

Purpose of the Pilot Project

Since a full-scale project in winter vegetables could not be mounted in 1985, it was decided that a pilot project in winter vegetables would be desirable, for two reasons: (a) to keep at least some of the land occupied, and (b) to learn as much as possible about growing these vegetables so as to have a more solid basis for an eventual full-scale project, to reduce some of the uncertainties that existed. It was determined that funds in the St. Vincent Agricultural Development Project (USAID Project 538-0101) could be programmed for this purpose without unduly jeopardizing the planned original activities, and that such a pilot project would be consistent with the scope of the Agricultural Development Project.

More specifically, the primary purpose of the pilot project was to find out whether winter vegetables could be produced commercially in St. Vincent with yields and qualities that would make production for export financially feasible. What kinds of production problems would be encountered, and could they be economically managed? Which varieties would perform the best? How could local labor perform in a commercial farm operation? Is it feasible to grow melons without irrigation? What is the availability of water for irrigation during the winter, dry season? What kind of irrigation system would work the best?

It was recognized from the beginning that getting to the desired markets might be a problem in a pilot project, but the decision to do the pilot effort was based mainly on learning as much as possible about production. If the produce could be marketed, so much the better. What could be learned on the marketing side would add that much more to the value of the effort. While shipping to the United States seemed to be possible, arrangements were not firm. However, arrangements were firmed up for shipping produce from the pilot project to Puerto Rico, which had been importing vegetables from the U.S. mainland during the winter months. By shipping to Puerto Rico, that market could be tested, as well as all of the logistics of grading, packing, local transportation, cooling, storing, and shipping.

Summary of Conclusions

Descriptions of what was learned from the pilot project are included

throughout this paper and implications for the future are analyzed in the last section. This summary highlights some of the main conclusions:

- o It is possible to produce high-quality vegetables in St. Vincent on a commercial scale, using advanced techniques;
- o Viruses occurred in all of the crops grown in the pilot project;
- o It is possible to attain a reasonable degree of control of, but not completely eliminate, viruses by applying stylet oil with a high-pressure sprayer;
- o Yields of sweet peppers equaled and yields of eggplant surpassed the earlier projections;
- o Yields of cucumbers fell somewhat short of original projections;
- o Watermelon yields were less than had been projected earlier, due mainly to too much rain in the early stages of growth, which fostered viruses and blossom-end rot; to damage from sunburn in the later period (April); and to a limited extent to stress from lack of rain or irrigation during critical stages;
- o A combination of problems in zucchini squash was so formidable that it may not be possible to produce this crop economically on a commercial scale in St. Vincent;
- o It is possible to grow high-quality watermelons without irrigation;
- o For all the crops, supplemental irrigation is required during periods when there is insufficient rainfall, to avoid stress to the plants and to assure high yields;
- o For the pilot project, there was no evidence of insufficient supplies of water for irrigation;
- o Best results from sweet peppers and eggplant were obtained when plants were grown in seedbeds and transplanted to the field, as opposed to direct seeding;
- o Ample labor was available locally for the pilot project, their attitudes were generally good, and a bare minimum of labor problems were encountered; labor efficiency needs to be, and can be, improved;
- o Markets generally reacted positively to the quality of the vegetables shipped from St. Vincent;
- o The best returns for exported produce were from loose-packed watermelons shipped to Puerto Rico;
- o Puerto Rico is not a dependable market for any significant volume of the other vegetables produced in the pilot project;

o Several shipments of watermelons retained good quality after 17 days in transit from Kingstown to northern U.S. ports (Philadelphia);

o Except for a shipment that was waxed and packed in large boxes, several consignments of sweet peppers sent to London by air were well accepted and gave positive returns over shipping, handling and selling costs;

o While London buyers were laudatory about the quantity of airshipments of eggplant, the prices received for three consignments were insufficient to cover shipping and handling costs, let alone costs of production;

o Three small mixed shipments to Martinique, two by sea and one by air, gave favorable returns;

o Martinique, and perhaps Guadeloupe, may offer a viable market for small quantities of selected vegetables from St. Vincent on a year-round basis;

o St. Lucia and St. Vincent offer an excellent market for small quantities of watermelons;

o Farmers in St. Vincent were extremely interested in the pilot project and often enquired how they might participate in any future effort;

o Reliable sea shipping for transporting refrigerated containers within a few days from St. Vincent to the United States, preferably on a twice-per-week basis, is absolutely crucial to the success of any large-scale future venture;

o The feasibility of using the "controlled atmosphere" technique for produce shipped in containers, to prolong shelf life, should be investigated;

o It will likely be difficult over the long run for St. Vincent to compete with Mexico, Central America, and the larger Caribbean countries in the production of "main-line" vegetables of the type grown in the pilot project because of those countries' advantages in scale and proximity to the market;

o The viability of any future effort in St. Vincent will be enhanced by the extent to which specialty crops are grown for particular buyers who will guarantee a market for what would be relatively small volumes for a larger country but relatively larger for St. Vincent, for high quality, high value vegetables which are similar enough to the crops grown in the pilot project that it can be reasonably assured that they can be produced on a commercial basis in St. Vincent.

MANAGEMENT OF THE PILOT PROJECT

The pilot project was implemented by the Ministry of Trade, Industry and Agriculture. At the request of the Minister, the RONCO Technical Assistance team was asked to coordinate the day-to-day activities of the

winter vegetable pilot effort, following Ministry procedures for paying bills and under the policy guidance of the Ministry. Hugh Johnson, Senior Agricultural Extension Officer in the Georgetown area, was assigned to work full-time on the pilot project. Weekly meetings with a written agenda were set up in which the RONCO Coordinator would brief senior staff of the Ministry on progress and issues. These meetings were attended usually by the Minister and the Ministry's Project Manager, Hugh Phillips, for the Agricultural Development Project; frequently by the Chief Agricultural Officer; and occasionally by the Minister of State, the Permanent Secretary, and Mr Johnson. The meetings proved quite useful in solving implementation problems and resolving issues.

Technical Management Contract

With assistance of the Project Coordinator, the Ministry contracted with Caribbean Management Services, a U.S. firm, to provide the following persons to manage the technical aspects of production, harvesting and post-harvesting handling:

- o A full-time resident Farm Manager who has successfully produced vegetables commercially in North Carolina;
- o A part-time Technical Specialist from North Carolina who has specialized training in Plant Protection and Agronomy, who has produced vegetables commercially in the U.S., and who has had experience in Jamaica, Haiti, and other Caribbean countries in implementing similar projects; and
- o A specialist for three months who has spent his career in the U.S. supervising the picking and packing of vegetables for shipment.

THE BASIC RESOURCES

Land

Originally, it was indicated that 100 acres at Orange Hill Estates and as much of the land as needed at Langley Park would be available for the pilot project. The area at Orange Hill was potentially irrigable with an existing hand-set sprinkler irrigation system. No irrigation facilities were available at Langley Park.

Ultimately, it was decided not to remove some of the existing banana stands at Orange Hill Estates, with the result that 46 acres were available for the pilot project. An additional 17 acres with access to water for irrigation was leased from Mt. Bentinck Plantations Limited. The intention was to install a drip irrigation system on this land, to compare results with the sprinkler system at Orange Hill.

The soils at Langley Park, Mt. Bentinck and Orange Hill are mostly loamy sand and are basically good soils for growing vegetables, although they are slightly low in pH and are deficient in certain trace elements as well as the basic elements. None of the land in the pilot project had more than 5 per cent slope.

Irrigation Infrastructure and Water

The irrigation system at Orange Hill is about 15 years old. It is a hand-set sprinkler system, with 5" main lines and 3" sprinkler lines, all of aluminum pipe. There are four hydrants. The system requires no pumping, since it is gravity fed. The water source is about a mile or so up the mountain side. The structure at the source is a concrete cistern. Water is run from a stream into the cistern by placing rocks by hand to form a small diversion dam. Additional rocks are used when a greater volume of water is needed. While the system works reasonable well, leaks sometimes develop in the main line running down the mountain, and many of the aluminum pipes of the field irrigation system have holes.

The water for Mt. Bentinck Plantations is also piped down from the mountains and is shared with the Distillery at Georgetown.

Land Clearing

About 13 acres of the land available at Orange Hill had been in old bananas. Most of the other 33 acres had been in tobacco in 1984. Those fields were overgrown with weeds. The land at Langley Park was in sugarcane, which was generally 6 to 8 feet tall. The Mt. Bentinck land had been in arrowroot. Considerable time and expense (US\$13,853) were required to clear the land adequately so it could be prepared for planting vegetables.

Available Machinery

Arrangements were made by the Ministry to use for the pilot project several pieces of farm machinery owned by the defunct Sugar Company:

- o One four-wheel drive Massey Ferguson tractor;
- o Two two-wheel drive Massey Ferguson tractors;
- o A disc plow;
- o An offset tandem disc;
- o A two wheel trailer.

While these had been basically good, solid pieces of equipment, they were without exception in need of substantial rehabilitation before they could be used. Many parts were purchased from the storeroom of the Sugar Company, in addition to parts that were ordered from outside the country, mainly from Plantrac in Barbados. Even after rehabilitation, breakdowns were frequent, causing considerable downtime for the equipment and management time of the project coordinators to keep things going. Fortunately, competent mechanics were available in the Georgetown area. Even with the difficulties associated with the equipment, being able to use it reduced considerably the capital costs associated with doing the pilot project.

PROCUREMENT OF MACHINERY AND SUPPLIES

Machinery

One new four-wheel drive Massey Ferguson tractor was purchased, so that the project would have at least one reliable power source. In addition, the following pieces of specialized new equipment were procured from two dealers in the United States, following an informal bidding process in which three firms were solicited:

- o One four-row planter
- o One four-row rowbedder
- o One two-row planter
- o One two-row cultivator with fertilizer hopper
- o One four-row S tine cultivator
- o One six-ton lime and fertilizer spreader
- o One eight-row high-pressure sprayer

Fertilizer, Chemicals, and Other Inputs

Soil tests indicated that about one ton per acre of dolomitic lime would be needed, and that fertilizer mixtures, including trace elements, other than what was available locally would be required. In addition, most of the chemicals needed for pest management and disease control were not available locally. Furadan was available and was purchased locally. Caribbean Management Services personnel decided what specific inputs and quantities were needed and the RONCO Coordinators carried out the procurement and import procedures.

Since the pilot project was being financed by a USAID grant, supplies were to be purchased either locally or in the United States, because a waiver had not been issued to allow procurement from other countries. The lime, fertilizer and most of the chemicals were procured in the U.S. Following informal competitive business procedures, it was decided that an offer made by Atlantic-Florida East Coast was the most advantageous to the project. (It would have been more economical to have bought the fertilizer in the region, but time did not permit getting the required waivers in time to solicit bids, place orders, and get delivery in time to plant. Given enough lead-time, it may be that local suppliers could provide competitively most of the needed chemicals for any future activity).

Irrigation Equipment

It was originally planned to purchase a drip, or trickle, irrigation system to install at Mt. Bentinck Plantations, so as to compare the results with those obtained with the sprinkler system at Orange Hill. An irrigation consultant was engaged to outline the specifications for the drip system and, upon his recommendation, a U.S. company was contacted

about supplying the system. It took several weeks to get a price quote from the company. When the quotation arrived, it was accompanied by a list of requisites that would have given ample protection to the company but little assurance that the system would be delivered and installed in time that its use would make a valid comparison with the sprinkler system. With mixed feelings, the Ministry decided not to make the investment.

THE CROP PLAN

It was decided to plant watermelons at Langley Park, to test the proposition that they would grow reasonably well without irrigation. It was proposed to plant slightly fewer acres in watermelons at Langley Park than were available in total for the other four crops at Orange Hill. It was originally planned to put about 80 acres of watermelons at Langley Park, when it was thought that 100 acres would be available at Orange Hill. The watermelon area was reduced to about 40 acres when it was determined that only 46 acres were available at Orange Hill. Only 5 acres of vegetables were planted at Mt Bentinck when it was decided not to acquire the drip irrigation system. One early field of cucumbers was replanted to sweet peppers after the cucumber harvest was completed.

The actual areas of production were reduced by the following factors:

- o Seed beds for peppers and eggplant;
- o A series of variety-trial test plots;
- o Turning areas at the ends of fields; and
- o Rows of sugarcane left for windbreaks, in the case of watermelons.

Varieties planted were based on the judgement of the Caribbean Management Services technical specialist, based on experience in similar areas of the Caribbean, in consultation with Vegetable Specialists at the University of Florida and North Carolina State University. The varieties planted in the commercial plots and the varieties tested in the trial plots are listed in the following table:

<u>Varieties Used in the Pilot Project</u>				
<u>Cucumber</u>	<u>Zucchini</u>	<u>Sweet Pepper</u>	<u>Eggplant</u>	<u>Watermelon</u>
<u>In Production Fields</u>				
Dasher II	Seneca	Gator Belle	Hi-Bush	Royal Jubilee
Maximore 101	Elite	KR3	Elite	Charleston Gray #5
<u>In Test Plots</u>				
Dasher II	Elite	Early Calwonder	Hi-Bush	Royal Jubilee
Maximore 101	Green Magic	Gator Belle	Classic	Charleston Gray
Maximore 100	Classic	Keystone Giant	Midnight	#5
Maximore 102		Jupiter	Dusky	Jubilee
Slice Nice		Espadon	Florida Market	Prince Charles
Centurion		Belltower		Crimson Sweet
Early Triumph				Royal Sweet
				Dixie Lee

Results of the test plots were inconclusive. The plots were set up in a randomized block system, with four blocks for each variety. Analysis of variance of the yield data showed no significant differences in yields at the 5% level of confidence. This may be because of any of the following:

- o There were in fact no differences;
- o Insufficient care was used in growing the test plots; or
- o Insufficient care was used in harvesting and weighing the produce from the plots.

THE PRODUCTION PROCESS

Caribbean Management Services personnel were in charge of production. The Farm Manager arrived on October 13, 1985 to take charge. A few days before that, RONCO personnel had organized the beginning of land clearing and land preparation.

Land Preparation

A few items of equipment were needed that were neither available from the Sugar Company machinery nor had been purchased new; a bush hog for cutting weeds, sugarcane, etc., and a rotavator, for instance. These were leased from private farmers in the Georgetown area. A disc plough was leased from Diamond Dairy for one week to begin breaking land before the disc plough from the Sugar Company could be rehabilitated.

Because of the frequent breakdowns of the Sugar Company tractors and machinery, and because it sometimes took many days to get parts, it was decided to hire a custom operator with a tractor, driver and tillage implements to assist in land preparation.

Fortunately, three or four good tractor drivers were available, who were hired to work on the project. While they were experienced tractor drivers, they had not had experience with the special implements that were to be used in the vegetable project. Therefore, considerable time was required of the Farm Manager to train and supervise the drivers in the use of those implements.

Planting, Spraying, Cultivating and Weeding

A Caribbean Management Services report on the pilot winter vegetable project contains some detail on planting, spraying, cultivating and weeding, which will not be repeated here, except for a few selected points.

Some problems in germination were encountered in sweet peppers and eggplant from direct seeding. On the other hand, excellent stands resulted from transplanting of sweet pepper and eggplant seedlings taken from seedbeds. Thus, it has been concluded that any future production of these crops would best be done by using planting materials from seedbeds, or perhaps even better, from seedling nurseries.

A systematic spraying program was carried out to control insects, diseases, and weeds. Viruses, downey mildew, fungi, and blossom-end rot were prevalent in some of the crops. Early yields of the cucurbits were reduced after the first few pickings because of these diseases. For the most part, the diseases were controlled in subsequent crops by use of stylet oil applied under high pressure and by the use of fungicides and pesticides. The exception was in zucchini squash, where the combination of problems proved formidable, and it seems that it may be impossible to control the diseases well enough to make production of zucchini economical.

Weeds turned out to be a major problem. A combination of herbicides, mechanical cultivation, and hand weeding was required to keep them under control. Much more hand weeding was needed than was anticipated earlier.

REALIZED YIELDS

Without exception, the quality of produce from the five crops was excellent. One agent reported the following reaction in London: they were "very impressed with the quality of the eggplant. It is beautiful fruit." Others indicated that they "liked the sweet peppers and want more." Likewise, the watermelon, cucumbers and zucchini were well accepted in the market.

The percentage of rejects (quality being less than that demanded by export markets) was smaller than had been projected. Whereas it had been estimated that 30% would be rejects, the actual experience was less than 20% of the fruit was substandard for international markets.

Table 1. Realized yields of marketable produce, compared with original projections by Caribbean Management Services.

Item	Crops				
	Cucumbers	Zucchini	Eggplant	Peppers	Watermelon
	pounds per acre				
Marketable Produce	6,361	1,669	19,800	11,200	10,230
Original Projections	15,000	12,600	16,500	14,000	20,000

The realized yields were affected by several factors which in the future should be correctable, with the likely exception of those affecting yields of zucchini squash. By design, the pilot project was largely experimental. It was anticipated that viruses would be a problem, but it was decided not to use control measures until and unless evidence of viruses appeared. Most of the cucumber acreage was planted early, for January and early February harvest. After the first two pickings, virus reduced yields substantially and most of the cucumbers (and squash) were turned under to control spread of the viruses. The stylet oil program was started immediately, and this gave reasonable control over viruses in subsequent crops.

By the time the final decision was made to do the pilot project, insufficient time remained to accommodate all of the logistics of getting the inputs and getting land cleared and prepared to plant the longer-growing crops (eggplant, sweet peppers, watermelons) in time to start harvesting in early January. Some peppers and watermelons were ready in late February, but most of those and the eggplant were ready for harvest in March and April. The heaviest volume was picked in April. The best growing conditions for all of these crops would be for harvest beginning early in the January through March period.

Yields of watermelons were apparently affected by heavy rainfall early in the season, which fostered several diseases (blossom end rot, virus, etc.). About five acres of watermelon that were heavily infected with virus were destroyed before maturity, so as to control spread of the virus. The stilet oil spraying program was begun at that time, which kept the viruses reasonably well under control.

The late watermelons suffered from sunburn damage, which reduces shelf life and marketable yields substantially.

Some breakdowns were experienced with the water pipes in the irrigation system at Orange Hill. At times, the plants were stressed from lack of water while the system was being repaired. Also, by prior arrangement with the management of Orange Hill Estates, the irrigation system was shared with them for their banana fields. Two shifts were used to keep the system going about 20 hours per day, but during much of March and April, the dry-est period, the system was inadequate to service both the bananas and the vegetables.

Considering what was learned in the pilot project about the above factors which adversely affected yields, and how to correct for them, it seems reasonable to predict that future yields should be within the following ranges, as percentages of the original projections:

<u>Crop</u>	<u>Percentage</u>
Cucumbers	80-100
Sweet peppers	90-110
Eggplant	110-130
Watermelon (rainfed)	60-80
Watermelon (irrigated)	80-100

In the future, it appears that watermelons would do better in the southern part of St. Vincent, say around Diamond Estates, where there would be less danger of heavy rains. If supplemental irrigation could be made available in these areas, for light irrigations during potential stress periods, it would likely be an ideal situation for watermelons.

Larceny was a problem in watermelons. Estimates range from 10% to 100% as many watermelons as were exported had been taken from the field by unauthorized personnel. While it is quite obvious that watermelons are a desired fruit by the local population, it seems unreasonable that as many walked off the field as were marketed. For yield estimating purposes, it is assumed that 15% of the quantity that was marketed was

carried off unofficially. The larceny occurred even though a night watchman with a high-powered flashlight was posted in the field at night.

HARVESTING AND POST-HARVEST HANDLING

Field Harvesting

Harvesting was carried out by hand labor, mostly women, under the supervision of the Caribbean Management Services specialist in picking and packing. Hard plastic field boxes were used for field harvesting (fifty boxes were purchased new and four hundred were burrowed from ORD). Tractors and trailers were used to haul the produce from the fields to the packing shed.

Grading and Packing

The banana packing shed at Orange Hill was used for grading and packing the vegetables. This was done mainly with women workers under the supervision of the picking and packing specialist. Cucumbers were washed and treated with a light coat of wax before packing. Eggplant and zucchini were wrapped in a fine tissue to protect their delicate skins. Initially, some of the sweet peppers were coated with wax. However, the market, especially London, reacted negatively to the wax and this practice was stopped.

The vegetables were packed in cartons provided by Battaglia Produce Company. Except for the watermelon cartons, these were wax coated inside and out, to protect the vegetables.

Samples of the cartons were taken to the management of St. Vincent Container Corporation Limited to see if they could be fabricated locally. The company does not yet have capability of manufacturing boxes with wax coating inside and out. However, they do have capability for manufacturing packaging for watermelons, apparently cheaper than those imported from the United States. St. Vincent Container Corporation should be considered as a potential supplier in any future need for watermelon cartons, and perhaps also for the other needs.

Local Transportation

The project leases a truck by the month for hauling produce to Kingstown to the cooler, and for use at the farm for a variety of purposes. When large shipments were ready to move, the project leased trucks on a trip basis to supplement the use of the truck that had been leased on a longer term basis. The charge for a full truck load was generally EC \$200.00.

Cooling and Storage

For the pilot project, a 40 ft. refrigerated trailer was leased for five months from TMT Shipping Corporation, and modified with a fan and used as a pre-cooling unit. For the volume of produce in the pilot project, this system worked quite well. After the produce was cooled sufficiently, it was stored in refrigerated trailers that were left by TMT for shipment of produce the following week. The refrigerated trailers were all equipped with both electrical and diesel power units. The pre-cooling unit was

generally operated by electricity. The other trailers were operated on diesel when they had produce in storage ready for shipment.

An arrangement was made with the St. Vincent Marketing Corporation on a cost basis to provide personnel to oversee the operation of the cooling and storage units, and to take responsibility for cutting the papers for shipment of the produce. Data needed for cutting the papers was provided by the RONCO Marketing Specialist, who gave general supervision to the post-harvest handling and shipping of produce. The Marketing Corporation paid for shipping in advance, from their own funds, and were reimbursed later from receipts. The services provided by the St. Vincent Marketing Corporation were quite satisfactory.

SHIPPING AND HANDLING

Recognizing that shipping of produce was a crucial issue with regard to any future large scale project, four U.S. shipping companies were contacted during the Summer of 1985 to see about their interest and capability of transporting refrigerated containers of produce from St. Vincent to the United States. Tropical Shipping gave a positive indication that they could make shipments once per week to the United States and perhaps which would make it financially feasible for them. While they expressed interest, they were not in position to make a firm commitment. Subsequently, Trailer Marine Transport (TMT) Corporation initiated weekly service from St. Vincent to Puerto Rico in October 1985, with the possibility of trans-shipments to Miami and Northern Coast ports in the United States. This service was announced by TMT in early September 1985, which appeared to make it feasible to market produce at least to Puerto Rico, from the pilot project. TMT was interested enough in the project to provide a 40 ft. refrigerated trailer to be modified as a pre-cooling unit, at their costs. The pilot project was initiated on the basis of shipments by TMT to Puerto Rico once per week. Whereas earlier indications had been that the Puerto Rico market could take the volume of produce expected from the pilot project, it turned out that the Puerto Rico market was quite soft, making it imperative to get to the U.S. or other markets if possible.

Concord Nopal shipping line had been coming into St. Vincent about once every two weeks. Whereas Concord Nopal had indicated in the late Summer of 1983 that they were not especially interested in hauling produce from St. Vincent, they were contacted in mid-January 1986 to reopen the question. They indicated that they were planning immediately to begin weekly shipments to Miami, reaching there in six days from Kingstown. Arrangements were made to send a load by Concord Nopal. Before it was loaded, a telegram was received indicating that Concord Nopal had gone bankrupt.

CGM, a French shipping line, calls in St. Vincent occasionally, when there is sufficient volume. The Project Coordinator met with CGM officials in Martinique to see about their interest in hauling vegetables from St. Vincent. They indicated that for a full-scale project, they would call once each week for delivery to Puerto Rico with good connections by Sea Land or other shipping lines to the United States. They also indicated that they could trans-ship from Martinique to Paris, with a total of ten days transit time from St. Vincent.

TMT announced in May 1986 that they would be initiating another weekly service beginning late June 1986 from Trinidad north to Puerto Rico, stopping at Grenada, St. Vincent, St. Lucia and Dominica. The TMT representative said they would consider an arrangement with another shipping line to tranship their containers from Puerto Rico to U.S. ports if the equipment were compatible. With TMT having two ships per week and the possibility of getting better connections and faster transit time to the U.S. ports than was possible in the pilot project should be enhanced.

Bernuth Shipping Lines, for which a Vincentian is Operations Manager, has eight ships operating out of Miami into the Caribbean. As of February 1986, they did not handle refrigerated containers, although they indicated they expected to have 20' reefers soon. They do not plan to handle 40' reefers, because the demand for them coming south out of Miami is small. One of their eight ships is a refrigerated ship which carries 500 tonnes; the transit time with it from Kingstown to Miami would be six days each way.

It is deemed highly desirable to have twice per week shipping from St. Vincent, with not more than six days to the port of destination. While it would require negotiations and confirmation, it appears possible that among Tropical, TMT and CGM, it may be possible to arrange twice per week shipping for a full-scale project.

One possible alternative to twice per week shipping and to the need to reach the market within six days is use of a technique called "modified atmosphere". This technique is being used in some Central American and Caribbean countries. The cost of this is reported to be US \$1.00 per carton. The technique consists of filling the container with a gas which reduces respiration of the fruit while in transit and therefore prolongs the shelf life.

Selected Case Histories of Shipping

Martinique, January 14, 1986: Cucumbers and zucchini squash were ready for harvest in the first few days of January 1986. The packing boxes supplied by Battaglia Produce Company had not yet arrived. Therefore, shipment to Martinique was prepared to be packed in banana boxes purchased locally. A small ship that carries freight among islands in the region was contracted to transport the vegetables. The shipping date was delayed several times for a total of five or six days after it was originally to have been shipped. Even so, and with no refrigeration on the ship, the produce arrived in Martinique in generally good condition.

Puerto Rico, January 15, 1986: Meanwhile, the Battaglia boxes arrived and a container with cucumbers and zucchini was sent by TMT to Puerto Rico. The shipping worked smoothly; the market was soft.

Puerto Rico, January 20, 1986: The same as above, except the market was even softer. Sales of 103 of the 536 boxes of cucumbers and 77 of the 171 boxes of zucchini took place on January 27. The balance of the cucumbers were inspected by USDA on February 7. The inspector reported the condition as: "Mostly fresh and firm. From 10 to 34%, average 23% decay, Cottony Leek Rot in various stages". The same load was inspected by USDA again on February 11. The inspectors reported the condition as "Mostly fresh and

firm. From 26 to 58%, average 40% decay, Cottony Leek in various stages. From 10 to 24%, average 17% damaged by Soft and Shriveled ends....Applicant states above lot to be dumped."

Miami, January 27, 1986: This shipment of cucumbers and zucchini was destined for Puerto Rico when it left Kingstown, but the order was changed in route to trans-ship it to Miami, which was expected to be a better market. This shipment was "lost". It arrived in Miami nearly four weeks after departing St. Vincent, and was spoiled. Claims have been filed. This load was inspected by USDA on March 11. The condition was reported as: "Green Squash: From 92 to 100%, average 96% Bacterial Soft Rot and Black Rot affecting chipped end. Remainder firm. Cucumbers: From 84 to 88%, average 86% Cottony Leek, remainder fresh and firm with green color. Sweet Peppers: Mostly fresh, firm, and crisp. From 4 to 22%, average 14% including 9% affecting walls, 5% affecting stems, Bacterial Soft Rot and Gray Mold Rot. Watermelons: Generally firm. In most samples from 10 to 15%, in many none, average 8% Black Rot and Stem End Rot".

Philadelphia, February 4, 1986: This shipment was originally scheduled for Miami, being carried by TMT for trans-shipment out of Puerto Rico. While it was awaiting trans-shipment in Puerto Rico, USDA inspectors advised that zucchini was not on the list of eligible commodities to go to Miami from St. Vincent. (This raises the question how the previous shipment with some zucchini had made it past the USDA inspectors). An immediate decision was made to trans-ship to Philadelphia rather than Miami, based on indications from the local agent for TMT that the transit time to Philadelphia was thought to be about the same as to Miami. This was a mixed shipment of cucumber and zucchini. It was learned too late that transit time to Philadelphia is 17 days, which is too long for any of the commodities except watermelon.

Philadelphia, February 17, 1986: This was a mixed shipment with mostly watermelons, but some cucumbers, zucchini and sweet peppers. TMT had indicated after this shipment was on the seas that the transit time from St. Vincent to Philadelphia was 17 days. Only the watermelon arrived in good condition. Thereafter, only watermelons were shipped to Philadelphia. They all arrived in good condition.

Philadelphia, February 25, 1986: This was a 20 ft. container of watermelons (280 boxes). It was inspected by USDA on March 19. Condition was reported as: "Grade defects from 1 to 2 melons (5 to 10%) in most samples, in some samples none, average 6% scars. Firm. Damage by numerous sunken discolored areas in most samples 1 to 4 melons (5 to 20%), in many samples none, average 7%. Average 4% serious damage by over-ripe melons. No decay. Grade: Meets quality requirements but fails to grade U.S. No. 1 only account of condition."

Martinique, February 26, 1986: A small shipment of 100 boxes of watermelons and 25 boxes of sweet peppers was sent to Martinique by a small (50 ton) chartered boat. The intention was that the ship would sail at night and arrive in Fort-de-France within 12 hours, so that the produce would be fresh. Problems arose at the port in Martinique. The main problem was that stevedors, who had been making excessive demands, and for which labour negotiations with the government were imminent, wanted an

exorbitant fee for off-loading the small shipment. They insisted on groups of ten stevedors, one group of ten in the hold and one group of ten on the dock, and would not work for less than one hour's pay. The consignee would not pay their asking price. Negotiations continued for four to five days. Meanwhile, customs officials insisted that the boxes be labelled in French, rather than English, which meant pasting new labels and moving all of the boxes in the hold. In the process, boxes were incorrectly stacked, some fell over, and several melons were damaged. Because of this and stevedors sampling the wares, about 20 boxes of melons were lost. (Subsequent shipments to this consignee went by air, because of the port problems).

Philadelphia, March 4, 1986: This was a 20 ft. container of water-melons. It was inspected by USDA on March 25. Quality and condition were reported as: "Firm. No decay." Sales were: 223 boxes of 3's, US \$8.00; 45 boxes of 4's US \$4.75.

Philadelphia, March 17, 1986: This was a 20 ft. container of water-melons. It was inspected by USDA on April 8. Quality and condition were reported as: "Grade defects average 3% scars. Firm. Average 2% transit scars. No decay. Grade: U.S. No. 1." Sales were 246 boxes of 3's, US \$14.00; 23 boxes of 2's, US \$12.00.

Philadelphia, March 25, 1986. This was a 40 ft. container of water-melons. No USDA inspection. Sales were 550 boxes at US \$10.00 (14.3 cents per lb.).

Puerto Rico, April 1, 1986: This was a 40 ft. container of loose watermelons. Sold prior to shipping at US \$0.15 per lb.

Philadelphia, April 1, 1986: This was a 40 ft. container of water-melons. No USDA inspection. Sales were 304 boxes of 3's, US \$12.75; 146 boxes of 2's, US \$12.75; 50 loose melons, US \$2.50 each.

Puerto Rico, April 7, 1986: This was one 40 ft. and one 20 ft. container of loose watermelons. Sold prior to shipment at US \$0.15 per lb.

MARKETING

The Original Strategy

The original marketing strategy for the pilot project was to ship to Puerto Rico on TMT, with a four and a half day transit time. Battaglia Produce Sales Company, with offices in Pompano Beach, Florida, and Elizabeth City, North Carolina, has agreed to handle sales of produce from the pilot project on a consignment basis. Annex E contains the Memorandum of Understanding with Battaglia. While the memorandum was agreed in principle by the Ministry, Battaglia, and the St. Vincent Marketing Corporation, it was not signed for lack of clearance by the Attorney General. Even so, the spirit of the memorandum was adhered to by all parties. While Battaglia had indicated earlier that perhaps as many as six container loads of produce per week could be sold at U.S. prices in Puerto Rico, by the time the Memorandum of Understanding was written, the marketing agent had begun to suspect that Puerto Rico might not be the best market for the produce, but

it seemed worth a try, particularly with the possibility of getting to the U.S. if Puerto Rico turned out to be soft. As indicated in the section on shipping, it turned out that the Puerto Rico market was extremely soft for cucumbers and zucchini in the early part of the shipping period, although watermelons were welcome in the latter part of the period, even into April.

Problems Encountered

The softness of the Puerto Rico market was but one of a series of marketing problems encountered. It has already been mentioned that Concord Nopal, which otherwise could have delivered produce from St. Vincent to Miami in six days, went bankrupt as the first shipment by them was being prepared.

Low International Prices: Prices during the January to March 1986 period were generally lower than the previous five year average. Prices are known to vary from year to year, depending to a large extent on weather in Florida. In the 1985-86 Winter, Florida did not have killing freezes that they have periodically from year to year. In addition, supplies to the U.S. from Mexico, the principal country from which vegetables are imported to the United States during the Winter months, were higher than the USDA had earlier predicted. While it has been known that prices vary from year to year, the pilot project had the misfortune of beginning in a year when prices were below the five year average.

Cucurbits Not Welcome in Miami: The U.S. produce broker had assured the project coordinators that his company was importing similar vegetables from Jamaica, Haiti, and other sources, and that his license to import (Number 56-20539) assured that these items could be imported from the pilot project. What he apparently did not realize is that the U.S. Department of Agriculture maintains a list of commodities by country of origin that are permitted to be imported into various ports. While cucumbers were on the list for Miami, watermelon and zucchini were not and those commodities are carefully controlled by USDA because of the possibility of their transmitting harmful pests. When this became known, the project coordinators held discussions with top officials of the USDA/APHIS, who have jurisdiction over imported vegetables. The officials indicated that if a request were made by the Government of St. Vincent and the Grenadines, stating specifically which vegetables were desired to be shipped, they would process a request, with an assured high probability of the request being granted. However, they said it would take approximately three months to process the request. The written request was made by the Minister of Trade, Industry and Agriculture in February 1986.

Excessive Transit Time to the U.S.: As indicated in the section on shipping, the transit time by TMT to Philadelphia was 17 days, which was satisfactory for watermelon, but not for the other commodities.

London as a Market

With the problems encountered in getting to the U.S. market, the project coordinators worked with CATCO to explore possibilities of air shipment to London. Several shipments were made, with mixed results.

The first three air shipments had both sweet peppers and eggplant. Even though the quality was excellent, the prices received for eggplant were never high enough to cover the freight and commission and handling charges, let alone return anything to cover costs of production and post-harvest handling. The sweet peppers in the first shipment were waxed and in 1 1/9 bushel boxes. The London market prefers small boxes and did not want the wax coating. The last four shipments of peppers were sent in small boxes and not waxed. These generally covered marketing costs but gave no significant return toward costs of production and post-harvest handling.

The first shipment went by British Airways out of Barbados; the freight cost per pound was EC \$0.715. The remaining shipments by CATCO went by BWIA, at a cost per pound of EC \$0.325, which obviously helped immensely in showing a positive return for the peppers.

Air shipment to London is on a space-available basis. Usually there was no problem getting space for 300 to 500 half-bushel boxes. One shipment was confined to 150 boxes due to lack of space.

One additional shipment by air was made through ECA to J.O. Simms in London, to compare the results with those obtained by CATCO. This was mixed shipment of sweet peppers and eggplant and went by BA. The gross sales price in London was less than for the shipments through CATCO and returns did not cover the costs of freight.

Regional Markets

Three small shipments of produce were made to Martinique, two by small ship and one by air. The results were reasonably good, although the volume was small. Martinique may be worth some effort in planning and coordination with agents there, with the objective of developing a sustained relationship, perhaps for periods substantially longer than the three month window in the United States and Europe.

Another small amount of produce (watermelons and peppers) was sold in St. Lucia by the St. Vincent Marketing Corporation, on behalf of the pilot project. It is noteworthy that both St. Lucia and Martinique claim to have been importing sweet peppers from Miami during the winter months.

Trinidad apparently has rules against importing watermelon during the production season of the pilot project, to protect local producers. Barbados, while not prohibiting imports from St. Vincent in keeping with a CARICOM agreement, had low prices because of local production so that it did not offer a feasible alternative for the pilot project.

COSTS AND RETURNS FOR THE PILOT PROJECT

In considering costs and returns, it must be kept in mind that this was a pilot project. The average costs per acre for a pilot project can be expected to be considerably higher than those for a full-blown commercial venture, for several reasons:

- o The efficiency of labor and the operation of equipment would be higher on a larger scale effort;

o Supplies could be purchased in bulk, with lower unit cost, in a larger effort;

o The test plots and, to some extent, the entire pilot effort were experimental in nature; and

o The cost of management and the investment in machinery were essentially the same for the pilot project as they would have been for a much larger effort;

Nevertheless, it is instructive to compare the costs of the pilot project with those which had been projected in August 1985 for a full-blown project, and to make some observations.

Variable Costs of Production

Data on following production costs for the 97 acre pilot project are presented in Table 2.

Table 2. Variable production costs for the pilot project, U.S. dollars

	Projected Aug. 1985 ^{1/}	Actual Costs	Less Stocks on Hand (FOB Miami)	Adjusted Costs
Seed	8,900	13,027	700	12,327
Lime, fertilizer, chemicals	39,953	86,279	20,606	65,673
Fuel and oil	6,428	5,971	--	5,971
Parts and repairs	2,910	4,776	--	4,776
Labor [^]	21,039	41,460	--	41,460
Bee hive rental	1,528	1,339	--	1,339
Total	80,758	152,852	21,306	131,546

^{1/} The projected production operating costs per acre, based on a 500-1200 acre project, times the 97 acres planted in the pilot project.

The largest differences in the variable costs of production, between what was projected for a large-scale effort and what was experienced in the pilot project, were in labor and in lime, fertilizer and chemicals.

Labor: Besides the effect of economies of scale, which was mentioned earlier, more hand weeding was required than was originally expected. In addition, because this was a pilot effort, the guidance given to the Farm Manager was to use labor wherever needed to make the effort successful.

Labor cost in any large scale future effort should probably be adjusted upward by about 20% from the earlier projections, to account for the need for hand weeding.

Lime, Fertilizer and Chemicals: The original cost projections for lime, fertilizer and chemicals were based on local or regional procurement. Because this pilot project was financed by USAID, the materials had to be of U.S. source and origin if they were not available in St. Vincent (which was the case, because of insufficient lead time). Fertilizer prices in the U.S. are higher than from some other sources. In addition, the freight from Miami was about 45% of the FOB value of the supplies. Dolomitic lime in Florida was US \$101 per ton, excluding freight. Lime is reported to be available from Dominican Republic for about US \$50 CIF Kingstown. (The quality of the Dominican Republic lime may be lower than that of Florida).

The fact that international oil prices have come down since the project was initiated should cause some reduction in prices of fertilizer and chemicals as well as fuel.

Parts and Repairs: Parts and repairs went somewhat higher than had been earlier projected, largely because the equipment that was obtained from the sugar company (tractors, disc plough, disc harrow and trailer) had frequent breakdowns.

Other Items: In addition to the line items noted in the table above, US \$7,184.00 were laid out for custom hire operations and US \$6,009.00 was spent for rental of equipment which had not been purchased for the project.

Fixed Costs of Production

The main items of fixed cost were for equipment and management. In both cases, 300 to 400 acres of vegetables could have been handled with the specialized equipment that was purchased for the pilot project and with the management team. Therefore, it would be inappropriate to use those costs as an indication of the per-acre cost of equipment and management for a larger-scale project.

Returns

The total yield from the pilot project was \$61,230 pounds of marketable produce (Table 3). Because of the shipping problems noted earlier, less than half of the total (410,620 pounds) was exported. About 28,000 pounds were sold locally and about 78,000 pounds were donated to local institutions such as hospitals, prisons and Salvation Army. An estimated 51,200 pounds, mostly watermelon, were off the field by unauthorized persons, and about 293,000 pounds of eggplant and sweet peppers were left in the field due to lack of shipping.

Table 4 shows sales of the various commodities by month. Due to the time constraint in starting production, only the short-maturing crops (cucumbers and zucchini) were ready for harvest in January and early February. The heaviest marketings (mostly watermelon) were in April.

Table 5 shows sales of commodities by purchaser.

Table 6 summarizes gross sales receipts for the vegetables, which totals US \$51,906.54, excluding a claim for about US \$4,000 for the container that was delayed enroute.

Table 7 is a more detailed analysis of exported commodities, including destinations, shipping dates, prices (for watermelons), gross receipts and a break-down of marketing costs. Total receipts in Table 7 differ from those in Table 6 because the latter excludes receipts for air shipments to London via CATCO.

Table 3. Disposition of marketable produce

Item	Cucumber	Zucchini	Eggplant	Peppers	Watermelon	Total
				<u>pounds</u>		
Exports	94,970	12,350	13,350	28,400	261,550	410,620
Private local sales	500	-0-	630	5,490	16,190	22,810
Sold to S.V. Marketing Corp.	290	250	130	1,380	3,640	5,690
Donations to Hospitals, Prison, Salvation Army, etc.	23,740	1,750	16,130	6,440	29,960	78,020
Total Harvested	119,500	14,350	30,240	41,710	311,340	517,140
Carried-Off ^{1/}	2,000	500	-0-	2,000	46,700	51,200
Left in Field ^{2/}	-0-	-0-	195,480	97,410	-0-	292,890
Total Marketable	121,500	14,850	225,720	141,120	358,040	861,230

^{1/} Estimated.

^{2/} Estimated quantities that could have been harvested and sold, but were left in the field due to lack of market access.

Table 4. Monthly sales of commodities

Month	Cucumber	Zucchini	Eggplant	Pepper	Watermelon	Total
<u>pounds</u>						
January exports	70,680	9,790	-0-	-0-	-0-	80,470
February exports	24,290	2,200	-0-	1,930	51,760	80,180
March exports	-0-	-0-	13,350	20,040	79,270	112,660
Local sales	-0-	-0-	-0-	140	900	1,040
April exports	-0-	360	-0-	6,430	130,520	137,310
Local sales	790	250	760	6,730	18,930	27,460
Total	95,760	12,600	14,110	35,270	281,380	439,120

Table 5. Sales by commodity by purchaser

Item	Cucumber	Zucchini	Eggplant	Pepper	Watermelon	Total
<u>pounds</u>						
Exported						
Puerto Rico	45,400	5,470	-0-	-0-	97,520	
Miami	14,870	2,780	-0-	-0-	-0-	
Philadelphia	24,290	2,200	-0-	1,230	156,060	
Martinique	10,410	1,900	-0-	1,400	5,280	
St. Lucia	-0-	-0-	-0-	4,060	2,690	
London	-0-	-0-	13,350	21,710	-0-	
Sub-total	94,970	12,350	13,350	28,400	261,550	410,620
Local						
Greaves	100	-0-	30	310	1,690	
Grammar School	-0-	-0-	-0-	-0-	14,500	
Marketing Corp.	290	250	130	1,380	3,640	
Sutherland	-0-	-0-	600	4,760	-0-	
Glasgow	400	-0-	-0-	420	-0-	
Subtotal	790	250	760	6,870	19,830	28,500
Total	95,760	12,600	14,110	35,270	281,380	439,120

Table 6. Summary of gross sales receipts of vegetables

Agent/Client	Amount	
	(EC\$)	(US\$)
Island Produce Sales, Inc. (Battaglia)		42,305.15
St. Vincent Marketing Corporation	14,938.12	5,556.92
SIMM (London Sales)	10,872.32	4,044.46
TMT (Claim for delayed delivery of 1 container to Miami)	--	?
Total		51,906.54

LABOR USE AND PRODUCTIVITY

Besides the resident Farm Manager from the United States and the Extension Officer detailed by the Ministry, all of the laborers were hired locally in the Georgetown and Orange Hill/Overland Village Area. Among the first to be hired in early October were a qualified mechanic, who had previously worked with the Sugar Company and who was familiar with their farm equipment; two tractor drivers, one who was formerly a driver for the Sugar Company and one from Orange Hill; a Timekeeper/Labor Manager; and an assistant mechanic/irrigation supervisor. Subsequently, two more tractor drivers, a truck driver, and approximately fifteen other semi-skilled persons were hired.

Aside from the skilled and semi-skilled laborers, daily laborers, both men and women, were hired as needed for field work and for harvesting and packing. In the early production period, these laborers (mostly men, but a few women) were used to assist in land clearing, by removing old banana stands and clumps of grass by hand. Women were used for planting and transplanting, and later for thinning stands and for hand weeding. Mainly women were used in the harvest and packing of vegetables. All of these laborers who were hired as needed were employed at the minimum wage (EC \$13.52 for men and EC \$10.40 for women).

Following is a summary of a representative pay period of two weeks, together with the wages paid:

Table 7. Analysis of exported commodities, U.S. dollars

Date Shipped	Destination Produce	Melon US cents per lb.	Gross Receipts	Shipping Cost	Destination Charges			Net of destination Charges	Pre-shipping		Net for other costs		
					Commiss-ion	Inspec-tions	Un-loading		Inland freight	Cus-toms		Boxes	Commiss-ion
Sea (Watermelons)													
Feb. 25	Philadelphia Watermel.	10.5	2030	1335	244	42	50	200	154	5	776	0	-771
Mar. 4	Philadelphia Watermel.	10.5	1998	1335	240	42	50	200	154	-23	762	0	-785
Mar. 17	Philadelphia Watermel.	19.5	3720	1335	446	0	0	1939	0	1177	762	0	1177
Mar. 21	St. Lucia Watermel.	26.1	271	0	0	0	0	0	0	271	42	0	229
Mar. 25	Philadelphia Watermel.	14.3	5500	2650	660	0	0	0	0	2190	1540	0	650
Apr. 1	Philadelphia Watermel.	17.8	5863	2650	703	0	0	50	0	2460	1260	0	1200
Apr. 1	Puerto Rico Watermel.	15.0	5910	1600	709	0	0	0	0	3601	0	0	3601
Apr. 7	Puerto Rico Watermel.	15.0	6544	1600	785	0	0	0	0	4159	0	0	4159
Apr. 7	Puerto Rico Watermel.	15.0	3225	1250	387	0	0	0	0	1588	0	0	1588
Sub-total			35061	13755	4174	84	100	450	308	16190	5142	0	11048
Sea (Mixed)													
Jan. 14	Martinique Cuke/Zuc.		2143	205	0	0	0	0	0	1938	308	214	1416
Jan. 15	Puerto Rico Cuke/Zuc.		3874	1600	465	0	0	0	0	1809	741	0	1068
Jan. 20	Puerto Rico Cuke/Zuc.		1873	1600	225	68	0	50	0	-70	1096	0	-1166
Feb. 17	Philadelphia Damaged	5.0	1769	2630	212	70	75	200	0	-1438	1386	0	-2874
Feb. 26	Martinique Pep/Wheel.	26.3	934	558	0	0	0	0	0	376	263	0	113
Sub-total			10593	6613	902	138	75	250	0	2615	3794	214	-1393
Air													
Mar. 7	London Pepper/Eggpl.		3553	4359	533	0	202	46	0	-1587	419	297	-2303
Mar. 15	London Pepper/Eggpl.		3321	2778	498	0	208	156	0	-319	442	267	-1028
Mar. 18	London Pepper/Eggpl. 1/		5346	6019	802	0	300	200	0	-1975	0	0	-1975
Mar. 21	London Pepper/Eggpl.		3980	2924	597	0	205	42	0	212	650	334	-772
Apr. 9	Martinique Pep/Zuc.		408	130	0	0	0	0	0	208	70	0	208
Apr. 11	London Peppers		2434	1244	365	0	105	243	0	477	300	183	-6
Apr. 18	London Peppers		1323	620	198	0	54	133	0	318	150	99	69
Sub-total			20365	18074	2993	0	1074	820	0	-2596	2031	1180	-5807
Total			66019	38442	8069	222	1249	1520	308	16209	10967	1394	3648

1/ Some data for this shipment were estimated.

<u>Type of Worker</u>	<u>Daily Rate</u> (EC Dollars)
Time keeper/labor manager	30.00
Mechanic	32.00
Tractor drivers (4)	27.50
Assistant mechanic/irrigation supervisor	25.00
Truck driver	25.00
Semi-skilled workers (15)	15.00 to 22.00
Men laborers (50)	13.52
Women laborers (80)	10.40

The total of wages paid for the six month period of the pilot project was in excess of EC. \$260,000. Monthly payment fo wages is shown in Table 8.

Table 8. Monthly wages paid

<u>Month</u>	<u>Land Clearing</u>	<u>Production</u>	<u>Picking/ Packing</u>	<u>Total</u>
<u>EC Dollars</u>				
October	5,123	569	-0-	5,692
November	13,326	3,331	-0-	16,657
December	9,984	23,296	-0-	33,280
January	5,189	28,043	33,121	66,353
February	675	24,746	34,170	59,591
March	-0-	26,783	26,783	53,567
April	-0-	3,704	22,046	25,750
Total	34,297	110,474	116,120	260,891

Generally, the workers performed quite well, followed instructions, learned quickly, and performed with a minimum of labor problems. The sprit de corps was generally quite good. The workers' attitude was one of wanting to help make the project a success, because they could see the potential longer-term employment. The following points may be worth noting:

- o Workers in the field would work from 7 to 12, but not in the afternoon.
- o Tractor drivers initially resisted working more than 7 hours per day, although when their wages were raised to EC \$27.50 they put in longer hours.
- o Tractor drivers strongly resisted having two drivers so that the tractor could be run two shifts to get more efficient use of the tractor.
- o The supply of available experienced tractor drivers is quite low; an expanded project would require systematic training of tractor drivers.

- o The mechanics would work long hours, weekends and holidays when needed to keep equipment going.
- o Transportation (the farm truck and or tractor and trailer) was required for workers from the area north of Orange Hill.

There was little or no problem in getting sufficient laborers to work in the field and the packing shed. The system was that when additional workers were needed, the timekeeper/labor manager was asked by the Farm Manager or Harvest Specialist to recruit the needed number. This system worked well. The Timekeeper/Labor Manager kept a complete roster of the names of the workers together with their NPF numbers. He filed the relevant data, which was approved by the extension officer, every two weeks with the accounting unit in the Ministry, who processed payment vouchers. Payment was made to the workers at the Treasury office in Georgetown every two weeks.

Although there are no data to quantify the actual production per hour of the labor force, it is felt that in certain areas labor could be more productive and labor costs lower. For instance, packing costs were high and the boxes packed per person-hour were low, for various reasons:

- o The packing equipment was temporary and consisted of two sorting tables and eight small tables for holding the cartons to be packed;
- o The wage structure encouraged workers to work slowly in order to obtain overtime pay which was 1.5 times the minimum wage; and
- o The importance of producing high quality packouts in the pilot project took precedence over rapid production.

If a utility line were used, the need for hand sizing, sorting, waxing would be eliminated. The speed with which product travels through a utility line dictates, to a certain point, the speed with which product is packed. The rate of production measured in boxes per person-hour would increase significantly with a utility line. If production using a utility line were well supervised, it might be beneficial to pro-rate all the activities to a "per box" rate. This keeps all the support activities in an area other than the line (i.e., receiving, dumping on the line, palletizing, etc.) moving fast enough to support the production capabilities of the sorters and packers. This per box payment serves as an incentive when there is an unusually large volume of produce to be packed.

In the field operations, piece work may lower costs of weeding. The work could be parceled out by acres, fractions of acres, or linear measurement of rows. In some countries this system becomes a family operation. The quality of work has to be fairly carefully supervised. Any piece work or incentive payment program must consider that work done rapidly can suffer in quality, especially when workers are still learning the tasks required. The training period should normally be paid by hourly wages; trained workers on an incentive-pay basis must be supervised to ensure quality.

IMPLICATIONS FOR THE FUTURE

Production

Prospective Yields: Prospective yields of eggplant and sweet peppers look very good, assuming the application of technologies and lessons learned from the pilot project. Prospective yields of cucumbers and watermelon look reasonably good and warrant continued production, although possibly at a relatively smaller acreage than for eggplant and sweet peppers. Zucchini squash should not be grown in the future on a commercial basis, unless further small trials indicate that the disease problems can be overcome. Following are the best estimates now on what future yields may be, using what was learned from the pilot project:

<u>Crop</u>	<u>Pounds per Acre</u>
Eggplant	19,800
Sweet peppers	14,000
Cucumbers	13,500
Watermelon (rainfed)	14,000
Watermelon (irrigated)	18,000

Virus Control: Viruses can be expected to be a continuous problem in commercial production of the above crops, unless controlled by the use of stylet oil.

Rainfed Watermelons: It may be concluded from the pilot project that watermelons would do reasonably well given average rainfall, without irrigation, although they would certainly yield better if irrigation were available for critical stages of growth in which rainfall was lacking. It is recommended that watermelon be tried in the southern part of St. Vincent, perhaps around Diamond Estate.

Bees for Pollination: A bee keeper was able to supply sufficient bee hives for pollination of cucumbers and watermelon for the pilot project. In an expanded program, it would be essential to foster the build-up of many more hives of bees, probably by having them brought in from outside St. Vincent.

Varieties: Based on the pilot project, the following varieties are recommended for any future production of these vegetables, until additional trials suggest better varieties:

<u>Crop</u>	<u>Varieties</u>
Eggplant	Hi-Bush, Elite
Sweet peppers	Gator Belle; KR3
Cucumbers	Dahser II; Maximore 101
Watermelon	Royal Jubilee; Charleston Gray #5

Marketing

Shipping: For any project in which extra-regional sales are planned, it is absolutely crucial that firm shipping arrangements be made before production is started.

Pre-cooling: For acreages of vegetables (excluding watermelon) up to about 50 acres, a 40 ft. refrigerated trailer modified to pre-cool can be expected to work reasonably well. For larger acreages, a more permanent facility would be needed.

The U.S. Market: Except for watermelons, the pilot project was unable to test the U.S. market directly, due to lack of short transit time shipping. By inference from the laudatory statements about quality from other markets, and the favorable experience with watermelons, it seems that there should be no problem with acceptance in U.S. market for the commodities grown. However, it will likely be difficult in the longer run for St. Vincent to compete with larger Caribbean and Central American producers of mainline vegetables such as those grown in the pilot project. A better bet in the long run would likely be to seek buyers who are looking for relatively small quantities (in terms of world trade, but large in terms of St. Vincent) of specialty crops which are similar in nature to those grown in the pilot project. Possibilities might include Scotch Bonnet peppers; specialty melons for Europe, the U.S. or Canada; pickling cucumbers; miniature vegetables; or vegetables for ethnic groups from Asian countries in North America.

Watermelons: It is technically possible to ship watermelons for long distances and to retain quality without first having pre-cooled them. Good returns were realized from watermelons in Philadelphia, and excellent returns were realized from those sold in Puerto Rico, Martinique, St. Lucia and Kingstown. It is possible to ship them break-bulk (without boxes). Watermelons shipped this way to Puerto Rico did quite well.

Regional Markets: Martinique, St. Lucia, and probably a few other regional islands offer an opportunity for high returns per unit, although fairly low volume for each island, for a range of vegetables for a longer time period than for the winter market in the U.S., and perhaps year round.

Air Shipments: St. Vincent is disadvantaged without an international airport. The cost per pound of air freight from Kingstown to Barbados is considerably more than the special rates for fresh produce on BWIA from Barbados to London. Even so, it is worth considering London as a potential market for sweet peppers, "Scotch Bonnet" peppers, and perhaps other specialty crops which have a high value per pound. It may be possible to negotiate more favorable rates from St. Vincent to Barbados (or St. Lucia) for a significant and reasonably steady volume.

Air France apparently has highly subsidized rates to Paris from Martinique. This may be worth checking out.

Free Zone Airport: St. Lucia is reported to have indicated that a request from St. Vincent to establish a "free zone" at the Castries International Airport would be considered favorably. Together with either air or overnight sea shipments from St. Vincent to Castries for onward flights to London and elsewhere, this may be worth considering.

Local Box Manufacturing: A prototype packing box for watermelons made by the St. Vincent Container Corporation was of good quality and substantially cheaper than boxes imported from the U.S. Given enough

lead time, this company may also be able to make suitable boxes for packing other vegetables.

Implications for Small Farmers

Technology: With adequate training and technical assistance, smaller-scale farmers should be able to master the techniques of producing the same quality of vegetables that were grown in the pilot project. The most demanding aspects will be in control of diseases and insects. For instance, weekly applications of stylet oil will likely be required, and this calls for a sprayer with capability of generating very high pressures. Back-pack sprayers capable of this are reported to be available. A series of fungicides, insecticides and herbicides will also need to be applied periodically. And training in harvesting and post-harvest handling will be required. This means that only a relatively small group of farmers could be managed initially unless resources were available for a massive training program.

Irrigation: Unless they already have a source of irrigation water, or choose to try production without irrigation, it will likely require grouping several farmers into water-users associations so they can share a common irrigation system. Some guidance will be needed in forming the associations and making arrangements for the shared use of the systems.

Labor Intensive Crops: Smaller farmers, especially those with family labor available, would have an advantage in the production of labor-intensive crops such as trellis cucumbers, pickling cucumbers, and miniature vegetables.

Local and Regional Markets: Even if a large-scale project were not to be started right away, a few enterprising small farmers could probably do well to produce quality vegetables, especially watermelons and sweet peppers, for the local and nearby regional markets. It would be advisable for prior arrangements to have been made with prospective buyers before such production were undertaken.

Implications for the Proposed Mother Farm

Given the required infrastructure (basic irrigation and pre-cooling facilities), sufficient land, firm arrangements for shipping and good management, it appears feasible to initiate a private venture based mainly on sweet peppers, eggplant, and watermelons, but with some cucumbers. As indicated earlier, it would be well to seek markets for specialty crops which would likely give better returns over the longer run.

Interim Possibilities: If it turns out that it is impossible to get all of the required infrastructure in place in time for the 1986-87 season, but firm shipping arrangements and sufficient land are secured, it may still be desirable to initiate a private joint venture based on some combination of the following for harvest during the Winter months:

- o Up to 50 acres, say, of sweet peppers, eggplant, and cucumbers, to be pre-cooled in a modified 40' refrigerated container;
- o 50 to 100 acres of rain-fed watermelons grown at Diamond Estates, Sans Souci, or Langley Park;

- o Several hundred acres of corn grown for Eastern Caribbean Flour Mills; and
- o Black-eye peas grown for the local and possibly regional markets.

These could be followed by corn for the flour mill and some more black-eye peas in the Summer months. By that time, the required infrastructure for a larger vegetable effort could have been put in place.

A pilot effort of about 100 acres in corn and black-eye peas is being initiated in May 1986. This is mainly a private effort, except for the 46 acres of land at Orange Hill that was in vegetables in 1985-86, which is leased to the private interests for a percentage of the profits. This effort should begin to give indications as to feasibility by July and August 1986, and a full analysis should be ready by about September.

Tractor Drivers: Insufficient trained tractor drivers are available in the Georgetown area for a large-scale project. This constraint can be overcome by carrying out a training program. It is suggested that the U.S. financed "Farmer-to-Farmer" program be solicited as a source of volunteer U.S. farmers who would come to St. Vincent for 4 to 6 weeks each to work closely with prospective Vincentian tractor drivers.