PN - ABK-315

FRUIT AND VEGETABLE PROCESSING OPTIONS FOR THE LATIN AMERICAN AND CARIBBEAN REGION

VOLUME I of II

Prepared for USAID/LAC/DR/RD

Contract Number LAC-0654-C-00-0033-00

ATMA International, Inc.

Harold J. Mannion
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I. EXECUTIVE SUMMARY

When the United States Agency for International Development (USAID) first elected to support the development of non-traditional agriculture export (NTAE) products from Latin American and Caribbean (LAC) countries, a decision was made to initially focus on projects to foster the export of fresh produce. These support efforts have been successful, with the past decade seeing the development of a significant fresh produce/export industry in many of the LAC countries. USAID is now ready to move into the second phase, which will provide support for the development of fruit and vegetable agro-processing for export in the region.

The objective of this study has been to identify appropriate opportunities in the target markets (United States, Europe and Japan) for processed (value added) fruit and vegetable products for export from the LAC region - products which would sustain significant levels of production.

This study comes at a time when the world is poised to enter a period of massive change in international trade. Some of the factors affecting this change include the formation of a European Common Market; the potential emergence of Eastern Europe as an agri-business powerhouse; the proposed Mexican-U.S. trade agreement; and the opening of the Japanese market. Agri-business leaders expressed uncertainty as to exactly how these forces will ultimatley play out, but all were in agreement that the changes over the next decade will be profound. The potential impact of these changes on the specific products reviewed were recognized and discussed in the body of this report.

The report was written to address the interests of two audiences, USAID Officers and prospective agro-processors.

For USAID, we identified potential products and markets, making initial evaluations of feasibility and described the circumstances necessary for export success, ie: climatic conditions, land needed for cultivation, infrastructure needs, etc., and described the costs and impact on the community. Specifically we have:

- provided a broad overview of the market structure and demand trends in the target markets,
- identified viable processed export products having significant market potential,
- identified the major competitors (and competitive factors) in these markets, and provided recommendations for assisting LAC producers to compete internationally in these markets,

- identified established U.S. and European marketing concerns that have expressed an interest in additional or alternative sources of supply for these processed products - and are interested in discussing project-specific proposals,

- provided details of the impact of product-specific projects on a target LAC community, in terms of hectares needed to support a processing facility, number of jobs created, etc. and,

- identified competitive factors that must be addressed for LAC processors to succeed and prosper in the international marketplace.

For prospective agro-processors in the region we have provided sufficient information to enable an interested party to decide if a formal feasibility study is warranted for their specific situation; and have compiled an extensive list of contacts (including manufacturers, distributors, importers, etc.) for each product category.

The report is presented in two volumes. Volume I contains the Executive Summary and four chapters:

- an introductory chapter describing project background, methodology, and product selection criteria,
- explanations of market structures in the three target markets,
- product overviews, and
- guidelines for implementation and USAID interventions.

Volume II contains the detailed product profiles including general descriptions of the particular industries; products to be highlighted within the processing categories; major competitors and competitive issues; duties and customs regulations; market access strategies; product-specific implementation tactics and appropriate USAID interventions; transportation and processing cost information; and manufacturing parameters.

The study took a three-part approach:

1. A <u>literature search</u> that included material from the USAID library in Arlington; the UN International Trade Center in Geneva; the US Department of Agriculture; the World Bank Library; the European Community Book Depository; and a wide variety of trade publications in both the U.S. and Europe.

2. <u>LAC country visits</u> to Bolivia, Guatemala, Costa Rica and the Dominican Republic for discussions with development officials and a cross section of private sector agro-businessmen.

3. Telephone and personal interviews with a cross section of industry leaders in the United States and Europe.

The universe of potential processed product options was immense, given the vast diversity of the LAC region. In order to choose from among all the possibilities, candidates for selection were evaluated on six critical criteria:

1. High Volume Market Potential - The most important selection criterion was the existence of (or potential for) a market with strong demand and of sufficient size to make a significant economic impact in the producing and exporting countries. Meaningful volume is also necessary for USAID to economically justify the design and implementation of meaningful product-specific support programs.

2. Favorable Market Dynamics - This criterion addressed the demand dynamics and competitive nature of the target markets. It asked: how feasible will it be for a new shipper to enter this industry in the designated target markets? We maintain very strongly that projects must be demand driven. Desirable market conditions include a sector that is experiencing sales growth; a supply/demand condition which has historically been in balance; and a market with positive pricing characteristics relative to production and distribution costs.

3. Comparative Advantages of LAC Countries - This would include:
   a) Relatively inexpensive labor.
   b) Proximity to the target markets.
   c) The unique nature of some LAC products (ie: tropical products).
   d) Contra-seasonal production (the ability to produce contra-seasonally allows for planning based on known supply and demand conditions in targeted markets, and also reduces costs of carrying inventory).

4. Support of Existing Fresh Industry - Processing in support of an existing fresh industry (using second grade produce, excess supply, etc.) would typically not meet minimum production plant capacity requirements - in terms of volume and/or quality. Relatively few raw materials produced for the fresh export industry lend themselves well to processing activities. Excess supply conditions from fresh operations are often temporary - not the guaranteed production necessary to justify operation of a processing facility or to support an effective marketing program. This criterion (which was identified in the original Scope of Work) was therefore considered valuable where applicable, but products were not necessarily eliminated if they did not offer potential for supporting an existing fresh industry.

5. Substantial In-Country Interest to Produce - Throughout the region, serious interest was exhibited (by farmer groups,

prospective processors and/or USAID Mission Officers) in analyzing potential for certain products. Where this significant interest existed we concluded that a profile should be developed.

6. Good Model for Similar Products and/or Process Types - Much of the material developed in the specific processed product profiles can be used in analyzing other products within the same processing category. Whenever possible products/process types were selected not only on their own merit, but also for their appropriateness as a model for other similar processing options.

Candidate products were not expected to meet every criterion. Product recommendations were ultimately based on the team's judgement as to the extent and degree to which these criteria were met.

Based on the criteria listed above the following processed products were selected for in-depth analysis:

1. Fresh pre-cut fruits and vegetables
2. IQF fruits and vegetables
3. Tropical fruit juices, pulps and concentrates
4. Processed tomatoes
5. Dried tropical fruits
6. Gherkin/cornichon pickles.

Duty free access for CBI beneficiary countries in many cases represented a significant competitive advantage. The outcome of the Andean Initiative proposal could also greatly benefit constituents in the LAC region. In most cost categories, except for transportation, LAC producers would be competitive. Transportation was rarely an advantage, and often a serious disadvantage. However, transportation rates are subject to negotiation and some relief may be obtained once the prospect of substantial volume has been established.

Following is a brief overview of the selected products - their target markets; their chief competitors, and primary competitive factors; and significant requirements for and/or constraints to their success. The team's recommendations for implementation and USAID interventions are based on these aspects of the markets for the selected products.

Fresh Pre-cut Fruits and Vegetables - The study focuses on pre-cut tropical fruits and fruit salads, and broccoli and cauliflower cuts and floretes. Because of the perishable nature of fresh pre-cuts, the only feasible target market is the United States. The primary foreign competitor for LAC countries in this market is Mexico. The major competitive issues are: the ability to guarantee an adequate, high quality supply of raw material; the capability to produce cost efficiently (labor rates are significant

because production of these items is very labor intensive); expertise in quality control through the distribution channels (temperature control is key); the ability to deliver product on a timely basis; and duties. Potential limitations include the lack of an adequate cold chain, and infrequent shipping schedules.

IQF Fruits and Vegetables - The study highlights frozen broccoli and cauliflower, with additional information provided for a broad range of other labor intensive vegetables and fruits. The target markets are the United States and Europe, with limited potential seen for Japan. The major competitor in the U.S. market is Mexico, and the major competitors in the European markets are other European producers (both West and East Europe). Chile is also an important international exporter of frozen foods.

Competitive issues are: the ability to guarantee an adequate, high quality supply of raw material; raw material yields and plant capacity utilization; efficient production (labor rates are significant because production of these items is very labor intensive on both farm and factory levels); transportation costs; and duties. Possible constraints - insuring an adequate level of raw material to supply the plant, and the ability to finance capital expenditures at internationally competitive interest rates.

Tropical Fruit Juices, Pulps and Concentrates - This category has two broad components - processed pineapple products; and "other" processed tropicals which include passion fruit, mango, banana, guava, papaya, and other small volume tropicals. All three target markets offer good potential for these products. The major competitors for pineapple markets are Thailand and the Philippines. Brazil is the major exporter of passion fruit, and also a leading producer of guava and papaya. India is the world leader in mango exports. Many LAC countries are already significantly involved in the international markets for these processed tropical fruits.

Again, the competitive issues are: the ability to guarantee an adequate, high quality supply of raw material; raw material yields and plant capacity utilization; efficient production; transportation costs; and duties. These products are generally bought and sold as commodities and price is a key factor; the difference of a few cents per gallon can be significant. The ability to offer a wide range of products will allow LAC producers to differentiate themselves in international markets.

Processed Tomatoes - This category is also segmented into two product groups - tomato paste, and diced and whole tomatoes. While world demand is high for processed tomatoes, there is a sense in the industry that current capacity can satisfy requirements. There may be limited opportunities for LAC processors of diced and/or whole canned tomatoes packed for industrial and/or institutional

use. Production of the diced and whole canned tomatoes requires relatively low capital investment; is labor intensive; is less sensitive to farm level production yields (than the concentrated paste operations); and there is growing demand for them in international markets.

The target markets in this case are the United States and Japan. Europe, with a subsidized industry is effectively closed and producers there are aggressive exporters. The major competitors in the U.S. market are Mexico, Chile, Italy and Israel. In Japan the contenders are Turkey and Taiwan. Competitive issues include: seasonality; plant labor costs; tomato production costs and yields; plant capacity utilization; product quality (color is very important for canned tomatoes); packaging costs (cans); transportation costs; and duties.

Dried Tropical Fruits - Statistics are scarce for this category, but anecdotal evidence indicates that Europe is the largest market. Demand there is strongest for dried pineapple and banana chips. The U.S. markets offer some potential which could become more significant if dried tropical fruits were added to the line of a major cereal manufacturer. The vast majority of exports are from Thailand and the Philippines. Importers and brokers are reportedly quite satisfied with product quality and with their relationships with current suppliers. This may therefore be a difficult market for LAC producers to penetrate. The key competitive issue is low cost raw material. Technology and capital investment requirements are minimal - but the impact on a producing location would also be minimal.

Pickles - The target markets for pickles are Europe and the United States. Cultivation and harvesting of the very small cucumbers used for pickling is extremely labor intensive. LAC producers would have the ability to produce a bulk in-brine product. Because processing in this manner affects the taste characteristics of the final product, this brine stock is suitable for some types of pickles (sour, acid flavors) - but not for others (sweet flavors). The target markets have very definite taste preferences. Southern European countries (notably France) prefer the sour pickles, while Northern Europeans and Americans prefer the sweet. Market opportunities are available, but in this case the processor and/or exporter must really understand market niche preferences. The major competitors are Mexico, Morocco, Sri Lanka and Turkey.

Market interest was demonstrated for most of the products being evaluated, notably: fresh pre-cut tropical fruits; IQF fruits and vegetables; pineapple and other tropical fruit juices, pulps and concentrates; and gherkin pickles. There was limited interest in fresh pre-cut vegetables and dried tropical fruits. In the case

of tomatoes, there is a sense in the industry that despite the rapidly growing volume, there is enough installed capacity in place to more than cover demand.

Following is a summary of the potential impact of the products reviewed:

Product	Cost of Equipment Required (FOB)	Hectares	Manufacturing Employees
Fresh Pre-cut Tropical Fruits	$200,000	250	20 - 63
IQF Fruits and Vegetables	$1,040,000	600	170
Tropical Fruit Juices, Pulps & Concentrates	$4,000,000	1,200 to 1,400	98
Canned Tomatoes	$1,036,000	200	163
Dried Tropical Fruits	$461,000	10 - 20	12
Pickles	$10,000	80	30

In every case we strongly recommend that no plan go past the feasibility stage without establishing an agreement with an experienced partner in the target market(s). We discovered an encouraging level of interest in potential export ventures on the part of U.S. and European businessmen. The selected products are already traded in international markets - and typically marketers are eager to identify alternative or additional sources of supply. Little interest was found in Japan, but this does not preclude Japan as a potential market for certain products.

In summary, the team concluded that LAC producers could be competitive in each of the product groupings reviewed except for tomatoes. Opportunities for tomatoes will be limited to special situations.

However, with each of the product groupings, LAC producers will find themselves in a difficult, highly competitive environment. Key components to a successful agro-processing export venture will include:

- a high rate of capacity utilization, with profitable products,
- a well trained, informed, aggressive management,
- a political environment in which government policies do not interfere with operations,
- availability of adequate levels of financing at internationally competitive rates,
- adequate infrastructure, with a transportation system at competitive rates, and
- pertinent research support.

There are two categories of possible USAID interventions. The first type support specific product oriented development; and the second type are aimed at creating an environment that allows agri-business to flourish. These are not, in most cases, new ideas. The challenge to achieving success is in executing the basics well.

1. Product Specific Interventions

Project Feasibility

The information we have developed in this report, supplemented with details germane to local conditions, will provide sufficient information to determine feasibility.

Project Facilitation

The team found an encouraging level of interest on the part of U.S. and European businessmen in export possibilities from the LAC region. There is a need though for a facilitation function. A working arrangement between U.S. and/or European marketers and LAC producer/exporters could take many forms, and will need to be negotiated on a situation-by situation basis. Basically, the facilitator's role will be to help reconcile the interests, desires, goals, objectives, etc. of both parties - to build a mutually beneficial long term arrangement. To be effective, the facilitator must therefore understand what the driving forces are that will encourage/motivate the partners on both sides of the equation to enter into the arrangements.

Raw Material Supply

Inadequate and erratic supplies of raw material has been identified as the most fundamental and pervasive constraint to success. An appropriate role for USAID would be to support export oriented processing operations by assisting the growers who will benefit from supplying the plant. This assistance should include:

- helping to organize grower groups,
- providing technical assistance to the growers aimed at increasing yields and quality, and reducing unit costs,
- providing training in the business aspects of farming, so that the farmer can better understand the economic value of his various options.

No project should be established without first determining that supplying raw material to the plant will be an attractive option to local growers.

Training

Farmer training was discussed under raw materials supply above. Training of new workers for start-up operations would be a very effective enticement for luring joint ventures.

Agricultural Production Research

Most LAC countries have agriculture research programs in place. These programs should be harnessed to support any processing project that develops.

Food Processing Research

It would be redundant for Universities or Institutes in LAC to attempt to replicate the excellent food processing research being done in the United States. However, it would be helpful for these Universities and Institutes to work cooperatively with U.S. Universities in helping to solve specific problems that have a substantial impact on the economies of those countries. For example, two problems have been identified in the body of this work, which would lend themselves well to cooperative research:

- methods of extending shelf life and improving sanitary procedures for fresh pre-cut fruits and vegetables, focusing specifically on issues regarding tropical fruit, and

- methods to bulk ship pickled products in a manner that maintains the qualities needed for use in producing the pickles favored in Northern European and most U.S. markets.

Finding solutions to these problems would have an enormous impact (in the hundreds of millions of dollars) on LAC region economies. A participatory role by local Universities should go a long way toward strengthening their overall capabilities. Programs could be supported by a regionally administered grant program.

Product Promotion

It would be very helpful to have an organization to promote the use of processed tropical fruits, and to act as a clearinghouse in the exchange of information between the various producers in the region. This organization should be self supporting but some effort would be needed to establish it. For example, there have been recent attempts at cooperation between producers in Peru, Ecuador, Colombia and Brazil in an attempt to rationalize the passion fruit market.

2. General Improvement of the Export Environment

The second category of USAID interventions are those general support programs aimed at creating an environment that allows agri-business to flourish.

Government Regulations and Policies

The rationalization of government regulations and policies with regard to capital and interest rates, customs procedures, trade, and foreign exchange is critical.

Training

There are three areas of training that would support agro-processing development:

- Food Technology and Plant Operations,
- Management, and
- Farmers and Workers.

Promotion

Nationally based promotional activities can be very useful. Appropriate activities include: assisting shippers at trade shows

by setting up national pavilions; establishing formal quality assurance programs, with attendant promotional labeling; providing frequent publicity regarding quality assurance programs, as well as other upbeat messages about the industry in the country; and a number of other useful promotional activities aimed at industrial buyers. Many buyers and consumers have a very poor image of LAC countries. For the Andean countries this image problem has recently been heightened by the cholera epidemic.

Information Collection and Dissemination

Market and other agricultural export-related information in Latin America has consistently been identified as a central need in the region. USAID has, over the years, addressed this issue by supporting information distribution bureaucracies in many of these countries. This has been expensive, and generally ineffective.

There is need for a weekly Spanish language periodical, in either a newspaper or newsletter format, covering issues of importance to the non-traditional agriculture exporters in the region. Information should cover both fresh and processed products, and provide intelligence on a broad range of subjects of interest to the exporters - from horticulture through transportation, markets, etc. The publication should provide information on markets in North America, Europe, Japan and the Middle East, as well as provide news as to activities in competitor exporting countries.

This would be a straight commercial venture but would require USAID assistance to overcome start-up problems.

General Program to Encourage Small Entrepreneurs in Business

This study has focused on the larger export possibilities. There is also strong potential for small niche-type businesses to develop. What is needed is creating an environment that allows them to flourish - access to adequate capital at internationally competitive rates; access to information; unobtrusive government regulations and procedures; access to an efficient agriculture production sector; a means for finding marketing partners; and promotional support.

It would be useful to supplement this report with two further studies.

The unused installed plant capacity (particularly for processed tropical fruits and frozen vegetables) in the region presents an area of particular interest.

Bolivia, Peru, Ecuador, Panama, Costa Rica, Dominica, Jamaica, and possibly others, all have fruit juice processing plants operating at substantially below capacity. Peru, El Salvador, Guatemala, and the Dominican Republic all have freezer processing plants, many of which are also operating at less than full capacity.

It would be useful to conduct a regional survey of existing facilities to determine the level of unused capacity, the constraints to full utilization, and the social impact of full utilization - to provide an overall USAID strategy aimed at strengthening these operations. This may provide the fastest avenue to satisfy the identified market demands. If the regional approach is not used this should be appraised by the interested Missions.

A second useful supplement to this report would be a summary of the regional sources of investment capital and credit available. This should deal not only with established, development-oriented lenders such as OPIC, the IFC and LAAD, but should also include discussions with other potential commercial sources such as the international banks and investment companies, such as those that have been responsible for organizing investment funds for Brazil and Mexico. This study would define not only what is available and under what circumstances, but also methods to access additional sources of funds.

In the team's opinion, the most effective method to get fast tangible results is through product-specific activities. The next step toward bringing development forward should be to identify specific localities and beneficiary groups suitable for the identified products. In virtually every country within LAC there is sufficient information from previous studies, and in-place promotional organizations to identify likely candidates at a minimum cost in time or money.

Once the geographic areas and beneficiary groups are identified, decisions can be made as to how to proceed with full fledged feasibility studies involving local participants and potential U.S. and European private sector partners.

In summary, this approach would:

1. Identify the targeted area, group and product to be pursued.

2. Utilizing this report, and in most cases, previous in-country studies, integrate local costs, production and logistical information to determine initial feasibility.

3. Based on this information, prepare a "prospectus" covering all salient points of interest to a potential partner.

4. Utilizing the contact list in this report, approach potential joint-venture partners with the proposal. We have found a substantial level of interest among businessmen in the U.S. and Europe.

5. Once one or more potential partners are identified, a preliminary understanding of the terms of their participation should be outlined and a formal feasibility study undertaken, including financing options.

6. Once feasibility has been established, final details of the terms of the agreement between the local group, USAID and the outside participant should be finalized. This should clearly define the roles and responsibilities of each party to the agreement. As discussed earlier, USAID's role would most likely be that of assisting in the training of the growers and workers and in helping to organize and develop the flow of raw material.

II. INTRODUCTION

A. Background

When USAID first elected to support the development of NTAE products from LAC countries, a decision was made to concentrate on developing the export of fresh produce. The reasons for this were numerous. These type of NTAE projects were simpler to start up, required less investment and less infrastructure, required less raw material supply, permitted payment of higher prices to farmers, and had easier market entry. These support efforts have been successful, with the past decade seeing the development of a significant produce/export industry in many of the LAC countries. USAID is now ready to move into the second phase, which will provide support for the development of fruit and vegetable agro-processing for export.

It is important to note that the NTAE produce industry was virtually nonexistent when AID first started its development activities in the region, and despite differences in products, (i.e. shelf life, growing conditions, etc.) the produce industry is structurally similar within itself. These similarities simplified the development of very focused support programs for fresh exports.

With processing, it's a different situation. There is an established processing-for-export industry in place in the region, covering a wide variety of products - with disparate needs. Furthermore, many of the processing plants are currently operating at a fraction of capacity. So, the question will not be how to start something new, but rather how to augment an existing industry, to help it expand and prosper.

The objective of this study is to identify existing value added needs in the target markets (United States, Europe and Japan) which would support significant production of non-traditional agricultural processed products in the LAC region, and provide pre-feasibility information toward their possible development. The investigation focused on fruits and vegetables and limited discussion to six types of products. Critical production factors, market access strategies, demand trends, competition and transportation for export of the identified processed products are examined for the three sub-regions of LAC. Guidelines are provided for appropriate USAID support interventions.

It is recognized that for some LAC countries, notably Bolivia, market opportunities in neighboring countries are a matter of significant interest. However, the investigation of these possibilities was beyond the scope of this study.

B. Methodology

The study had two stages - the first to identify product possibilities, and the second to provide pre-feasibility information toward their possible development. The main strategy of our product reviews was to work with private sector producers, exporters and marketers - to determine their current activities and needs, so as to determine how expanded agro-processing in LAC countries could fit into ongoing activities. What we attempted to avoid were recommendations of theoretically "correct" products that do not have a constituency. That is, we sought the opinions of active businessmen, with marketing clout, who would have an active interest in the product(s).

In order to insure that all significant product possibilities were accounted for the team attended key trade shows allowing us to meet with industry experts and observe the new products and trends in the food trade. To further assure complete product coverage, the review was segmented by process types. Volume levels were determined for items within each process and a conclusion reached as to whether those products would meet the other established selection criteria. Within each category the team concentrated on high-volume products which have the potential for a large enough economic impact to justify product-specific development assistance.

Despite this focus on high volume products, the team wishes to emphasize that great opportunities lie in an explosion of small boutique processors, targeting very narrow, specialized niche markets. These types of operations are, by definition, highly entrepreneurial and do not work well with bureaucratic support systems. This poses a very special set of challenges that must be considered in designing development assistance.

The study took a three-part approach:

1. A literature search that included material from the USAID library in Arlington; the UN International Trade Center in Geneva; the US Department of Agriculture; the World Bank Library; the European Community Book Depository; and a wide variety of trade publications both in the U.S. and Europe. A bibliography is attached (see Appendix VII).

2. LAC country visits to Bolivia, Guatemala, Costa Rica and the Dominican Republic for discussions with development officials and a cross section of private sector agro-businessmen. Please refer to the attached contacts list and interview guides (see Appendix VI).

3. Telephone and personal interviews with a cross section of industry leaders in the United States and Europe. Please refer to the attached contacts list and interview guides (see Appendix VI).

C. Selection Criteria

Product selection was based on numerous considerations. Key determining factors included interviews with industry participants, field visits, and the consultant's marketing expertise. Candidates were evaluated on the following six critical criteria:

- High Volume Market Potential,
- Favorable Market Dynamics,
- Comparative Advantages of LAC Countries,
- Support of Existing Fresh Industry,
- Substantial In-Country Interest to Produce, and
- Good Model for Similar Products and/or Process Types.

Candidate products were not expected to meet every criterion. Product recommendations were based on the team's judgement as to the extent and degree to which these criteria were met.

1. High Volume Market Potential

The target markets were defined in the Scope of Work as Europe, Japan and the United States. With this in mind, the most important selection criterion employed has been the existence of (or potential for) a market with strong demand and of significant size.

This criterion is in order to identify processed product selections that would support a high enough level of production to make a significant economic impact in the producing and exporting countries. Furthermore, meaningful volume is necessary for USAID to economically justify the design and implementation of meaningful product-specific support programs.

2. Favorable Market Dynamics

This criterion addressed the demand dynamics and competitive nature of the target markets. It asked: how feasible will it be for a new shipper to enter this industry in the designated target markets? We believe very strongly that projects must be demand driven. Both the private and public sectors often give lip service to this concept, yet continue to focus on production factors when considering project feasibility.

Desirable conditions include a market that is experiencing sales growth - an expanding market versus a static situation where most demand is satisfied by existing processors. Another measure of a suitable market is a supply/demand condition which has historically been in balance - a market with positive pricing characteristics relative to production and distribution costs. In other words, we would ask ourselves "has this been a good, profitable market in the past?".

In addition, the team recognized that there would be cases of relatively new products that should also be included in this review. While these products typically lack a long track record, they are perceived to have convincing potential based on current literature and/or the endorsement of a significant number of industry experts.

3. Comparative Advantages of LAC Countries

One of the major comparative advantages in most LAC countries is an abundant pool of relatively inexpensive labor. Products and/or process types that require substantial hand labor have therefore been considered prime candidates for production in these areas.

Many LAC countries enjoy geographic locations which are advantageous due to their proximity to the target markets. Benefits would include favorable shipping rates, easier market entry, better communications, and also allow for the importing managers to easily and effectively access the producers. This communications issue has been identified by importers as extremely important.

Also included in this criterion would be products distinctive to the tropics or LAC countries. The unique nature of some products would effectively diminish the number of major international competitors in the target markets.

Many of the products we looked at are now predominately grown seasonally, in northern temperate zones. Several of these products can also be produced contra-seasonally in the LAC countries. This would represent an advantage for processing in the region in that it enables informed planning based on known supply and demand conditions in the target markets, and would reduce inventory associated costs.

4. Support of Existing Fresh Industry

The original Scope of Work placed a strong emphasis on this criterion. However, when considering processing operations one must take into account that a substantial investment is required in

terms of capital, equipment, trained management and labor, as well as support personnel. Significant overhead requirements means the plant must be highly utilized to spread costs and to retain technical expertise. One must also take into account that effective marketing requires long-term commitment - this means dependable supply on a regular basis.

Processing in support of an existing fresh industry (using second grade produce, excess supply, etc.) would typically not meet these minimum requirements - in terms of volume and quality. Relatively few raw materials produced for the fresh export industry lend themselves well to processing activities. In addition, excess supply conditions from fresh operations are often temporary - not the guaranteed production necessary to justify operation of a processing facility or to support an effective marketing program. This criterion has therefore been considered valuable where applicable, but products were not necessarily eliminated if they did not offer potential for supporting an existing fresh produce export industry.

5. Substantial In-Country Interest to Produce

Throughout the region, serious interest was exhibited (by farmer groups, prospective processors and/or USAID Mission Officers) for certain products. Whether based on production capacity or perceived profit potential, where this significant interest existed we concluded that a profile should be considered in order to determine feasibility.

6. Good Model for Similar Products and/or Process Types

Much of the material to be developed in the specific processed product profiles could be used for analyzing other products within the same processed category. Whenever possible products/process types were selected not only on their own merit, but for their appropriateness as a model for similar categories. In other words, their profile would act as a paradigm from which feasibility for analogous products and/or process types could be extrapolated.

In each case, although the establishment of the facility would be justified by high volume products (and the profiles will focus on the higher volume products), we anticipate that there will be supplementary production of a variety of other small-volume products. These products would be processed in the same facilities but could not, in themselves justify them. This situation would provide a broader balance to the plant (by spreading fixed costs and diversifying marketing risks), enhancing its economic viability. Often small investments in special equipment can open possibilities for substantial additional processing options and overall sales.

III. MARKET STRUCTURE

A. United States

There are three basic marketing channels for processed fruits and vegetables in the United States:

- Retail,
- Food Service (Institutional), and
- Industrial.

These marketing channels will be referred to when evaluating market possibilities for the specific products reviewed.

1. Retail

Retail is further divided into three channels:

- Brand Program,
- Co-pack Contract, and
- Private Label Program.

In a **brand program** the manufacturer differentiates his product by packing under a proprietary label. In most cases the products are sold through local brokers servicing the retail community within a given geographic area, although they are occasionally sold directly to retailers. The marketing of branded products requires a significant amount of promotional activity, and sophistication - and would not be practical for new LAC processors to attempt.

Co-packing is a better alternative. Co-packing is characterized by packing the product on a contract basis for an established brand. This is an important avenue for market access and should be pursued. However, most established brands have extremely high standards, and would be reluctant to enter into contracts without assurances that the manufacturer is capable of producing at their prescribed level of quality. In order to insure this quality, the customer normally visits the plant to determine whether the procedures and equipment in place are acceptable, and will often station a company representative there while the product is being run.

Private label is the area in retail which would show the most promise. There are three distinct types of private label:

- store label,
- national buying group, and
- field broker.

Store label - Most large, and some medium sized chains have their own labels. These products are usually custom packed for them by independent canners and freezers. Some buy direct, but most through "city brokers" who charge about a three percent commission. They normally do not contract, but develop an approved supply list of at least three, and usually more, processors. When they need product they negotiate either with the broker or directly with the manufacturer, and then place the order. Lead times are usually no more than one or two weeks. Before approval, and usually annually thereafter, representatives will visit the manufacturer's plant to review the process and sanitary procedures. These chains will have their own in-house product standards to be adhered to, and these are usually different from chain to chain. It is common for chains to have two labels, each with different quality standards.

Sometimes it is possible to have a medium or small chain put the processor's label in as a store label. In that case, it is sold at private label prices and the processor must commit to not putting this label in any other store in the area.

National buying groups - There are probably half a dozen of these groups in all. Virtually all small and medium sized chains will belong to one of these groups. Some chains carry a store brand plus a buying group brand.

The manufacturer must get his product approved by the buying group. However, they are apt to approve a fairly large number of companies. Once approval is received, the manufacturer must then sell to the individual member chains, through his (the manufacturer's) broker network. The buying group will normally take a two to three percent commission, and the private label broker who sells to individual chains, another three percent.

Unlike co-packing, where a specific amount is contracted for, there is generally no firm commitment to take a specific amount of product in these cases. Blanket purchase orders are issued to give guidance to the supplier as to the anticipated amount the chain will purchase under these programs. These amounts are not guaranteed, however, and the actual amount sold is dependent upon both the actual volume that the

supermarket ultimately moves, as well as the manufacturer's competitive position vis-a-vis other approved suppliers.

The product that is bought will be processed under the buying group's label. As with the store label mentioned above, the buying group's standards will be expected to be adhered to, and plant inspections will take place from time to time. However, under both these programs a greater leeway in quality is possible, than under the co-pack and branded programs.

Field Broker - The brokers we have referred to so far sell their products in a limited geographic area for a group of non-competing manufacturers. Field brokers, however, usually have their own labels and fixed customers for them, and they then buy for those labels in the open market. They will charge the manufacturer a commission on the sale. Field brokers have declined as an important factor on the market.

2. Food Service (Institutional)

The food service market consists of restaurants (both "white cloth" and "fast food"), airlines, schools and many other types of installations such as hospitals, government installations, etc. who are often serviced by caterers (see Schedule 2). They can be broken down into three groups for marketing purposes:

- wholesale distributors,
- restaurant chains and contract feeders who buy direct, and
- bid business and government installations.

Schedule 2

FOOD SERVICE FOOD PURCHASES
(Data in Billions of Dollars)

Segment	1989	1990	1991 forecast
Commercial			
Fast Food	56.7	60.1	63.9
Restaurants/Lunch Rooms	22.1	23.9	25.7
Cafeterias	22.8	23.6	24.8
Lodgings	1.7	1.8	1.9
Recreation	3.0	3.1	3.2
Retail Hosts (Convenience Stores, etc.)	2.6	2.8	3.0
Separate Drinking Places	4.0	4.2	4.5
	.6	1.7	.6
Non-Commercial			
In Plant/In Office	8.1	8.7	9.2
Health Establishments	5.4	5.6	5.8
Vending	6.9	7.3	7.8
Schools	7.2	7.5	7.8
Airlines	2.0	2.2	2.3
Military	1.5	1.5	1.6
Other	1.5	1.7	1.9
Total Food Service	89.4	94.7	100.4

(Source: Technomic, Inc., Chicago)

Wholesale Distributors - Each geographic area has a number of wholesale distributors who provide for the food service trade. All but a few of the biggest belong to national buying groups. (see Appendix I). In some cases the national buying groups own and manage the individual wholesalers, and in other cases the wholesalers are independents who are associated with the national group, either in a Voluntary Association or as a Cooperative member.

In any case, the product must first be approved by the national group before any sales can take place. Once approved, the processor becomes one of several approved suppliers.

The national groups who own wholesale operations, tend to buy for them, and charge a brokerage of two to three percent.

The Cooperative and Voluntary Associations will usually charge two percent (sometimes higher) on any sales the processor makes to their members. In most cases the processor must sell each member individually. This is done through the broker the processor has

assigned in that geographic area. Brokerage on these sales will usually run three percent. In any case, the product will be packed in the buying group's label.

In addition, there are a couple of big independent wholesalers who will buy direct, under their own label, through brokers.

Restaurant Chains and Contract Feeders - Most restaurant chains and contract feeders use local wholesalers. A few buy direct. In this case, it is a simple sale, usually through a broker. As usual, a processor must obtain prior approval for its product.

Contract Feeders contract to provide continuous food supplies for airlines, etc., or enter into agreements to operate facilities for feeding in institutions such as schools and hospitals. They buy both through local wholesalers and direct.

Bid Business - Purchases over a certain amount, by all government agencies, usually must be put out for competitive bid. Federal government bids are usually done by the manufacturer himself. There are a couple of brokers who specialize in federal bids, but their contribution usually isn't much more than preparing the rather complicated paperwork, although sometimes they advise on pricing. Their commissions are negotiable.

For state and local jurisdictions, bid houses specialize in this business in their geographic area. Before a bid, they will call several suppliers, secure price guarantees, and usually extended payment terms. If he wins the bid, he will then buy the product at the pre-established price and then resell it to the government agency. Very few manufacturers bid any state and local business directly.

3. Industrial

These are sales, in bulk, to manufacturers for further processing. This is the most likely market for LAC manufacturers. The three industrial uses are primarily:

- as an ingredient,
- for repacking or reconstitution into consumer size packages, and
- as components in assembled products, ie: frozen dinners and blends, dried fruit mixes, etc.

Industrial sales are made direct and through brokers who specialize in industrial sales. Product must meet individual customer's very specific specifications. The customer is often very actively involved - in many cases will visit the plant and in

some cases will station a representative there during the processing.

B. European Community [1]

Modern technology is significantly influencing established eating habits in Europe through the increased usage of modern appliances, particularly the microwave oven. Aging populations, smaller households and real increases in consumer spending power have resulted in a generation of both new products and line extensions specifically targeted at the older, more affluent consumer. This has further stimulated the strong growth of convenience foods. Health concerns have also influenced new product developments with manufacturers responding by the removal of artificial additives and preservatives; and by introducing new products with reduced levels of sugar and salt, and with lower calories. And finally, the growing internationalization of the food industry has made ethnic foods one of the fastest growing sectors in Europe, and the one where the potential for further new products is the greatest.

The trends reviewed above have strongly influenced new product developments.

As would be expected, the most significant factor affecting the European food market is the coming Common Market in 1992. In Europe, the food industry, probably more than any other, has tended to be defined by national boundaries. It was made up of small companies serving national customers. It is interesting to note that of the ten largest food companies operating in Europe, only two are European-based - Nestle and Unilever.

In preparation for 1992, there has been a wave of mergers and acquisitions. There are three reasons for these activities. First, there is a feeling in the industry that size is an essential criterion if they are to compete with American and Japanese multi-nationals. Secondly, mergers and acquisitions immediately provide companies with an established distribution network. And finally, the cost of building brands in foreign markets has, for the most part, become prohibitively expensive - owing to media costs and the generally high risk element involved.

Only 44% of the European Community's 46 largest processing firms operated in a territory other than their country of origin in 1987, and only 10% traded in at least four of the largest Community countries. It is anticipated that more consolidation will occur and the upcoming Common Market should help facilitate exports

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[1] Primary source: EUROMONITOR, P.L.C.

within and to Europe through the use of common standards and customs procedures.

The European market structure is very similar to that of the United States. The three principal distribution channels are retail, food service and industrial.

1. **Retail**

On the retail level, there has been significant change taking place recently, with a rapid expansion of larger retail outlets (hyper-markets and supermarkets) at the expense of small and medium-sized outlets. The concentration process in the major markets has been further intensified by a significant number of mergers and acquisitions. This rationalization in food retailing has resulted in a decline in the actual number of outlets in Europe (see Appendix II). And, these activities have resulted in a significant expansion of private label product sales through European supermarket chains.

In the case of hyper-markets there is an indication that their numbers are reaching saturation. Indeed, there is some evidence that the penetration of the self-service concept has reached its limit in some countries. Few new hyper-markets are being opened, partly because ecological opposition to these new super stores has increased and planning authorities have responded with very restrictive development policies. There are now two major European hyper-market economies, Germany with 950 super stores and France with 640. The United Kingdom has around 450 giant stores, and the rest of Europe about 700 (see Appendix II).

Supermarkets in contrast, have not yet shown signs of saturation. There are around 35,000 such outlets in Europe, and numbers continue to increase virtually everywhere, even if development is slowing in some countries. The increase is due not only to newly built outlets, but also to the expansion of existing stores and the conversion of variety stores and other outlets to the supermarket concept. Recent developments include the addition of fast food counters to many shops; increased fresh foods; revised lay-out formulas; and experiments with the home delivery of orders transmitted by telephone or videotext. This is especially true in France (see Appendix II).

Retail Food Distribution Organizations - The major types of retail food organizations are multiples, affiliations, independents and cooperatives. Private labels are used by virtually all retail food distribution organizations.

By definition, multiples are a chain of more than one store owned by an individual operator or corporation. The limitations of Pan-European comparisons must be kept in mind. In theory, a shop

with just one other branch can be called a "multiple". In practice, the cut-off point varies between 5 and 20 outlets, so that different national statistics deal with very different populations.

Multiples have increased their share of food sales throughout Europe with the notable exception of Sweden, where affiliations have proved more successful. The main developmental strategies have included: the rationalization of smaller food outlets; the upgrading of goods; improvement in design; increasing proportion of own-brands to improve margins; and the growth of convenience stores (see Appendix II).

Affiliations are groups of independent retailers who buy goods from common wholesalers and operate under a common "fascia" (binding relationship). Trading identity is promoted by a central organization which also provides marketing services to the members, and is financed by the wholesalers and affiliated retailers (see Appendix II). Affiliations are particularly strong in areas of low population density.

The bulk of food sales in most European countries are channeled through multiples and affiliations with the former generally gaining market share over other forms of organizations. Multiples are particularly developed in the U.K., Norway and the Netherlands, all of which exhibit a high degree of retail concentration (see Appendix II).

Again, Pan-European comparisons should be viewed with caution since the boundaries between the types of organizations are blurring. The cooperative, AG Germany, for instance has recently acquired several multiple food groups; and Coop-Switzerland also owns several chains. The largest buying groups, apart from offering much more than a group buying to their members have also been investing their money in ever-larger numbers of centrally run shops. The distinction between buying groups and franchise operations is also becoming less clear as the conditions to which members must adhere become more like those of franchise groups. Franchising is, in fact, developing as an offshoot within many multiple chains, (eg. Belgium).

Independent retailers have, in many European countries been hard hit by the growth of the large store and the increasing concentration of outlets in large and acquisitive multiples. Also taking place is a redefining of the independent retailer as a complimentary service rather than a direct competitor against hyper-markets; this can be seen in moves away from packaged groceries and into provisions of higher proportions of fresh foods. Other trends in evidence are attempts to increase own-label sales and the growth of trading over extended hours in the style of convenience stores, and to move toward semi-franchised type relations with other retailers.

The strength of cooperatives varies considerably in Western Europe. Cooperatives in Denmark and Switzerland account for almost 40% of food sales compared to a negligible amount in France, Spain and the Netherlands.

The original cooperative concept has been watered down considerably over the years; membership has ceased to play the important role it once did, and the dividend has been abolished in most countries. As a result, cooperatives are becoming more like multiples - the only difference being in their legal status. Certain cooperatives are taking on the appearance and business methods of public companies. In many cases, financially troubled small cooperative societies have little choice but to seek refuge with the big national wholesale organizations; this explains the growth of CWS in the United Kingdom and the FDB in Denmark.

Private Labels - Private labels have developed rapidly during the 1980's in the European food industry for a number of reasons. This trend is extending down to even the development of new food products. Two of the most successful private label producers in the United Kingdom now employ large teams of food technologists and nutritionists whose expertise has instilled sufficient confidence in consumers, an increasing number of whom regard private label products as superior to some branded label products.

2. Food Service

The reporting on food service sales is not as clear-cut as it is in the United States. There seems to be a difference of definitions from country to country and some confusion as to what should be included. The commonly used term is "catering" and this refers to all non-institutional expenditures on meals away from home. It includes drinks with alcohol and food consumed at the same time, and may also include other incidental costs such as cigarettes.

This food service term, however, is sometimes broadened to include all expenditures away from home, whether or not hot snacks or meals are consumed. Furthermore, there is an overlap between restaurants and hotels. The later often provides food for their guests, but it is often difficult to separate out their catering operations from their lodging operations. This confusion has lent way to the concept of the "horeca" sector. This umbrella term covers all catering expenditures whether in hotels, restaurants, cafes or other establishments - basically representing expenditures on meals, drinks and accommodations away from home.

Differences in definitions thus make comparisons between catering markets in various countries a hazardous procedure. However, even allowing for differences in marketing definitions, it is clear that horeca catering expenditures vary considerably from

country to country in importance in relation to the consumer spending.

Generally, the German and French markets seem to have reached the level of maturity. However, there is great buoyancy in catering sales in the other countries. It is anticipated that throughout the region that there will be substantial growth in fast food and quick service restaurants. Multiples seem likely to gain importance in the catering business, as a clear corporate identity and precisely targeted marketing become as important here as it has been elsewhere. An increasing polarization of the market between small niche concerns and large systematized organizations is expected to occur (see Appendix II).

3. Industrial

These are sales, in bulk, to manufacturers for further processing. This is the most likely market for LAC manufacturers. The three industrial uses are primarily:

- as an ingredient,
- for repacking or reconstitution into consumer size packages, and
- as components in assembled products, ie: frozen dinners and blends, dried fruit mixes, etc.

Industrial sales are made direct and through brokers who specialize in industrial sales. Product must meet individual customer's very specific specifications. The customer is often very actively involved - in many cases will visit the plant and in some cases will station a representative there during the processing.

C. Japan [1]

Appearance is of the highest importance to consumers in Japan, and Japanese food processors invest heavily in packaging. Packages often have several layers of wrapping and the materials tend to be of higher quality than US packaging materials.

Japanese consumers generally prefer small sized packages. Since Japanese value freshness and have limited storage space in their kitchens, they prefer not to have left-over packaged foods.

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[1] Primary sources: FAS Backgrounder Report - Japan: The Market for US Food and Farm Products, and Processed Food Packaging in Japan, Bryson R. Bailey, Washington State Department of Agriculture.

Small sized packages are also preferred because Japanese housewives are more likely to cater to the individual tastes of different members of the family, preparing separate menus for grandparents who like traditional foods and children with a taste for western style fast foods. Finally, package sizes are smaller because portion sizes are usually smaller in Japan.

There are three main segments of the Japanese processed food market that could offer potential to LAC food processors: the food service market, the industrial market, and the mass retail market. On a volume basis food exporters have been most successful marketing their products to food service and industrial users. And this will most reasonably be the main focus for LAC exporters. The food service sector, which accounts for 14% of total Japanese food expenditures, is of great strategic importance for exporters since it sets trends in food consumption which later affect home consumption. Firms in the food service and industrial sector find competitive overseas prices attractive and their purchasing decisions are less influenced by factors such as mass advertising campaigns and package design.

The mass retail market for imported foods is the least developed but offers the greatest long term potential for expanding imported food sales. Because of Japanese import restrictions and domestic price stabilization programs, Japanese food processors must pay very high prices for basic ingredients. Production costs are also high. Consequently, many processed products could be (and are) produced competitively overseas.

The Japanese distribution system is very different from that of the United States and poses many different marketing challenges. Although the distribution system for processed foods is extremely complex, the following simplified overview is designed to illustrate the major implications of that system.

The distribution system in Japan is sometimes described as a deliberately engineered obstacle to the successful entry of overseas producers to the Japanese market.

In 1985 there were 411,000 wholesalers servicing 1,629,000 retail outlets, excluding restaurants, in Japan. Of these retailers 41% handled food and beverages. Small "mom and pop" shops, with one to four employees, made up 82% of the total. With around 38.5 million households, there was a shop of some kind for every 24 households.

Since there is one wholesaler for each four retailers, the resulting competition is fierce, and each wholesaler must provide a unique mix of goods and services in order to survive. This implies that the role of the primary, secondary and in some cases tertiary wholesaler is an important one in providing assistance to

manufacturer and retailer alike, and reflects a feudal organizational structure.

Because retail outlets require frequent, small deliveries, most retailers are served by local wholesalers who are in turn supplied by regional and national wholesalers. Ties between local wholesalers and the larger wholesalers who supply them tend to be just as close as the ties between retailers and their suppliers. Since there is less flexibility in the Japanese distribution system than there is in the US system, it is essential to find good distributors who have access to major retail outlets.

Small retail stores generally have very limited financial resources. For this reason, wholesalers sell to them on credit terms of 120 days or longer. The products of leading food manufacturers are sold at more than 667,000 retail outlets. The risk involved and time required for the manufacturer to check on each retailer regularly to be sure he is still in business and collect bills when due could be prohibitive.

The typical retailer in Japan has little room for inventory storage. For all practical purposes, no one in Japan keeps inventory, including the manufacturer. The entire distribution system relies on the "just-in-time" stockless inventory control concept. In simplest form, the just-in-time approach requires the manufacturer/wholesaler to deliver to the wholesaler/retailer just enough product to fill a limited storage/shelf space. The wholesaler achieves this by providing frequent deliveries either several times daily, or in some cases even hourly, 24-hours per day.

Both because of the small size of the retailer, and because of the established custom of sales on consignment, goods are accepted for sale by the retailer at the risk of the wholesaler or manufacturer. Damaged or unsuccessful products are normally returned to the wholesaler after an agreed-upon interval and, depending on the manufacturer-wholesaler agreement, may also be sent back to the factory. One of the roles of the wholesaler is to absorb part of this risk.

Wholesalers (and to a lesser degree, manufacturers) check periodically on how well goods are displayed in retail shops, whether advertising materials are being used to their best advantage, and make recommendations on how to sell merchandise and on which merchandise is likely to sell best. This function of maintaining close and friendly contact with retailers is called "detailing", and can frequently be very expensive in terms of time spent. This role is sometimes carried out entirely by the wholesaler, but in some industries, particularly where the manufacturer wishes to strengthen his position with respect to the wholesaler, the manufacturer may maintain his own detailing force for certain important outlets.

The wholesaler also plays an important role in providing the manufacturer with information on how well new products are selling, on desired product and packaging improvements and on the appropriateness of pricing. Small retail stores cannot provide many of these functions for themselves and manufacturers also frequently lack sufficient staff to perform these services.

Since wholesalers are so intimately involved in the day-to-day operations of retail outlets, retailers have a strong preference for working with their traditional suppliers who they know to be dependable. Retailers do not readily switch to a new supplier even if the new supplier offers a slightly better product or a better price. Japanese wholesalers, on the other hand, are often less aggressive in trying to open new accounts than their US counterparts since developing new customers requires a major commitment of time and entails some risk because credit must be extended.

Change in this system is likely to be slow in the future as a result of the Retail Store Law. Officially named the Law Concerning the Adjustment of Retail Business Operations in Large-scale Retail Stores, the law requires that large retailers notify the authorities about any plans for building new stores and coordinate the location selection and construction of new facilities with local urban planning efforts. This effectively permits small retailers to cause prolonged delays in the granting of planning permission. It has been estimated that it could take 70 years to open one store in suburban Japan.

However, in some ways, this system is beginning to change. In many cases traditional distributors have been retaining the benefits of the stronger yen at the expense of their customers. As a result, new companies are beginning to enter the market for imported food products, creating opportunities for LAC exporters.

Retailers, particularly supermarkets, are stepping up their import efforts. Some of the larger supermarket chains have fully staffed offices in the US and Europe. There are also at least four groups of smaller supermarket chains that have set up joint buying programs which enable them to consolidate import shipments from overseas. Department stores are also showing increased interest in direct food imports, but these are usually focused on luxury items such as live lobsters and wine. Finally, a few of the larger food service firms are exploring the possibility of more direct purchases from overseas, including investments in farms or factories (see Appendix V).

Attractive profit margins on imported foods are also spurring traditional importers and wholesalers to expand imports. There has been a marked increase in "parallel imports" of products which are either produced in Japan under licenses from overseas manufacturers or imported from overseas by sole agents who have not cut their

prices with the stronger yen. At the current exchange rate even bulky products like canned sodas can be bought in California and sold in Japan at a profit. Traditional importers are also taking on new product lines and entering new segments of the food market. This increased competition in the Japanese market is resulting in lower consumer prices and expanded consumption.

Faced by growing competition from low-priced imported foods, even Japanese food processors are stepping up imports. In some cases they are contracting with food processors overseas to produce products to their specifications. Ten of Japan's top beverage firms, for example, are now importing soft drinks from the west coast of the US. In other cases, Japanese food processors have decided that the most economical way to introduce new products to the Japanese food market is to import products rather than build production facilities locally. A large confectionery manufacturer, for example, has launched a new brand of pet food which is entirely imported from the US and Canada. In a few cases, Japanese manufacturers are even beginning to relocate production of their main product-line overseas. Japan's largest manufacturer of ketchup and tomato sauce, for example, has announced plans to build a factory in California.

Most segments of the Japanese food market are dominated by oligopolies with strong interest in maintaining an "orderly market". Competition among food processors is typically based on quality and uniqueness rather than price. There is great emphasis on new product development, and advertising budgets tend to be large. While supermarkets use loss-leaders to attract customers just as they do in the US, there is generally much less price competition among food processors. Japanese concern for freshness, appearance and quality has a significant impact on the processed food market. (For further information on the Japanese market see Appendix IV).

IV. PRODUCT OVERVIEWS

A. Introduction

In selecting products, the team determined it would be useful to represent different types of processes, thereby providing a broader range of information for subsequent follow-up. In each process category, the most appropriate product was chosen for detailed analysis, using the criteria previously discussed. And, in most cases, additional product possibilities within that framework were also discussed. The following matrix lists the products chosen, and how the selection criteria related to them:

PRODUCT SELECTION SUMMARY

Products	High Volume Market	Favorable Market Dynamics	Comparative Advantages	Support Fresh Industry	Interest to Produce	Good Model
Fresh Pre-cut Vegetables & Tropical Fruits	potential	yes	labor location	no	limited	yes
IQF Frozen Broccoli & Cauliflower	yes	yes	labor contra-season	no	high	yes
Tropical Fruit Juices, Pulps & Concentrates	yes	cyclical	location	yes	high	yes
Canned Diced & Whole Tomatoes	yes	cyclical	labor contra-season	no	high	no
Dried Tropical Fruits	no	no	location	no	high	yes
Midget Gherkin & Cornichon Pickles	potential	limited	labor	no	no	yes

In addition to the above, there were a number of products initially reviewed that were not pursued. This included canned fruits and vegetables, jams and jellies, ethnic products, desiccated coconut, repacked olives and dried vegetables.

In the canned category, the team found pineapple to be the only product with sufficient volume potential to support an export canning operation. Although there are a number of small asparagus canneries in Peru, the export market for asparagus, in itself, is too small and crowded to support a first-class canning operation. Pineapple canning may have good potential for the region. It was not pursued because of time limitations.

Jams and jellies are normally manufactured from concentrates and pulps. This means that higher volume products are better manufactured in the market countries, themselves. The possibilities for LAC countries would be limited to low volume specialties.

Ethnic products aimed at the immigrant communities in North America and Europe provide excellent opportunities for LAC entrepreneurs. However, they are rather narrow, relatively low volume markets and as with the jams and jellies specialties above, would have to be supported in a general way, as a niche business. This will be discussed in more detail in the section on AID implementation options.

Desiccated coconut seemed to provide excellent opportunities. However, the team found little interest, either in the markets or in potential producing countries. The item was dropped from further study.

Repacking olives entails importing European olives bulk and repacking them in glass for trans-shipment to North America. Certain styles of olives require labor-intensive hand packing. Again, this was not pursued due to a lack of interest.

In its initial review, the team was not able to identify any dried vegetables which met a sufficient number of the criteria listed above.

B. Fresh Pre-Cut Fruits and Vegetables

Fresh pre-cut fruits and vegetables have been available to American consumers for just over 20 years, but recently their popularity and importance have been increasing. Several factors are fueling this growing demand.

The foodservice industry is constantly seeking simpler, less costly ways of preparing menu items. Fresh pre-cut produce is

currently the fastest growing segment in this industry as it helps reduce storage space requirements; allows for less waste and better overall produce yields; and provides pre-portioned packaging, taking the guesswork out of prepping produce in the kitchen.

While the foodservice sector was initially the largest market for fresh pre-cuts, the retail sector offers great promise with potential for greater profits. Consumers are increasingly more convenience-minded and pre-cut produce is now a common component of retail grocery produce sections.

Behind the scenes, facilitating this growth are the ever-improving sciences of advanced packaging, storage and shipping. Important strides have been made in "smart", "breathable" membrane films for packaging; sophisticated controlled atmosphere (CA) for storage and shipping; and "superchilling" processes. These and other innovations have extended shelf life to 18 days for fresh pre-cut vegetables and 28 days for fresh pre-cut fruit. Research is enthusiastically on-going and it can be assumed that continued advances will be made.

While the target market is limited to the United States for this category (due to perishability factors), currently attainable shelf lives make it feasible for certain LAC countries to enter into this very lucrative and dynamic market.

Broccoli and cauliflower are the most interesting vegetable candidates for production in LAC due to the extensive hand labor required for cutting and trimming. Tropical fruits and fruit salads, however, present the strongest pre-cut options. The most common fruits used are citrus, pineapple, and melons - but other fruits such as mango, berries, papaya, etc. are also utilized. All these fruits (with the exception of pineapple) also require significant hand labor for cutting.

Mexico will be the primary competitor of LAC producers. Close to 50% of the U.S. production of frozen broccoli has moved off shore over the last few years - 90% to Mexico. The same economic forces that fueled this move will soon begin to impact the fresh pre-cut industry as the business matures. Mexico's geographic proximity to the U.S. markets gives them a freight advantage relative to countries in the LAC region, but these higher transportation costs are offset by a 17.5% duty on Mexican vegetable imports from which the CBI beneficiary countries are exempted.

Several U.S. firms have expressed interest in working with a start-up fresh pre-cut project in the region. The strongest expressions of interest on the part of these firms has been for tropical fruits rather than vegetables.

The central challenge for the LAC producer/shippers will be to maintain the quality and integrity of the fresh product throughout the entire distribution chain. This requires excellent management control (particularly of critical temperature requirements) at each link in the chain.

Processing technology for fresh pre-cut products is relatively unsophisticated, with a typical pre-cutting facility requiring about 20,000 square feet. Equipment costs for a pineapple operation, including a mechanical corer/peeler and cutting equipment, would cost close to $200,000. Without the special pineapple equipment, total cost would be approximately $100,000.

To illustrate impact on the local economy: a viable fruit operation would produce about one truck load a day, requiring about 1 hectare to support each day's production. Beyond the farm, additional employment opportunities would exist at the facility - ranging from 20 to 63 workers, depending upon the product.

An important USAID function would be to identify an interested and capable local group of growers and businessmen, and to facilitate a joint venture agreement. The U.S. firms who have expressed interest are not in the agricultural end of the business - they are processors and marketers. These importers may need to be reassured that the new producing groups can perform. It would be a useful and appropriate role for USAID to support the initiative with a project that would provide comfort by assuring the availability of high quality, pesticide-free raw material.

A USAID project could play an invaluable role in assisting in the organization of the growers and the raw material supply, and assisting the growers to establish cost-effective methods of production that will allow them to make sufficient profits in this competitive environment.

Another very important role for USAID would be in supporting pertinent research. Industry sources have estimated that fresh pre-cuts fruits could grow into a $150 million industry. There is substantial on-going research in shelf life extension, and in sanitary control. It is this research that will provide the basis for further growth of this industry. Considering the importance to the region, it would be useful to have research conducted at a LAC region institution - focused specifically on problems with tropicals. This could be done in a cooperative program with a U.S. institution and would also have the result of strengthening the skills of the LAC region's institutions, providing a base for further development in this science.

C. Individual Quick Frozen (IQF) Fruits and Vegetables

The United States domestic frozen fruit and vegetable pack has grown at an average annual rate of less than 3% since 1985 and actually showed a slight decrease in 1990. Particularly significant during this period of time has been the growth of imports into the U.S. market of the more labor intensive types of frozen vegetables, mostly broccoli and cauliflower. Broccoli imports grew from 77 million pounds in 1985 to 242 million pounds in 1990, and cauliflower imports from 37 million pounds in 1985 to 62 million pounds in 1990. By 1989 imports accounted for 46% and 35%, respectively, of the total (domestic pack and imports combined). Import growth took place almost exclusively from Mexico, with Guatemala being the only other supplier of any significance.

In Europe the situation is somewhat different, with frozen foods representing the most dynamic of all food sectors during the 1980's. From 1984 through 1989 real growth in frozen vegetables was 46% and 35% for frozen fruit. Europe did not experience the phenomenon of movement of production offshore that the United States did. Spain is the leading supplier of labor intensive frozen vegetables to the rest of the Community. Erratic weather patterns have made Spain an unreliable supplier, prompting interest by importers in finding more stable off shore supplies. An unknown factor at this time is the potential of Eastern Europe. There is a sense in the European Community that Eastern Europeans will begin producing huge amounts of frozen fruits and vegetables for export, perhaps as early as this year. East Europeans though have seasonal limitations, and there is also a sense that the production may, in fact, never materialize.

As a result of work done by this and previous consultancies, the following frozen items (which are labor intensive on both the farm and the processing level) have been identified as having good potential for processing and export from LAC countries: broccoli, cauliflower, Brussels sprouts, asparagus spears, diced and sliced red and green peppers, fordhook lima beans, pole green beans, okra, black-eyed peas, melon balls and berries - particularly raspberries.

In addition, opportunities exist for IQF tropical fruits, including pineapple chunks and slices, mango chunks and slices, and banana slices.

Maintaining a reasonably diverse product line is essential and there are any number of production line configurations which would be viable depending on the location of the proposed plant. This study will concentrate on the two high volume items - broccoli and cauliflower.

The key for a LAC exporter will be his ability to compete with Mexico. Although the labor rate is lower in most LAC countries, Mexico has a substantial freight advantage. This advantage is offset by the 17.5% duty that Mexicans must pay on exports to the United States. This obviously raises the question of the effect of the potential U.S.- Mexican trade agreement. Surprisingly, most U.S. frozen food operators in Mexico see this potential agreement as a negative to their operations. They fear it will result in rapidly escalating costs, and competition for labor.

The model plant illustrated in the study has a rated capacity of 3 metric tons of finished broccoli per hour. The through-put capacity of other fruits and vegetables will vary slightly. With a 65% yield of finished product to raw product input, and an effective running rate of 80% of rated capacity; each 8 hour shift will require 65,000 pounds of raw product. Assuming a yield of 25,000 pounds per hectare, this means that each 8 hour shift will require 2.6 hectares to support the processing plant. The total plant through-put for a year will vary by location and type of product being processed. For illustration purposes (using broccoli for calculations), a plant processing 15 million pounds annually would require about 600 hectares.

The equipment for the plant described in the report would cost $1,040,000 (FOB U.S.). The plant would employ about 170 people.

It is recommended that no start-up be attempted without a cooperative agreement with established manufactures and/or distributors in the target markets. The level of volume being contemplated is large enough to be of interest to these companies, while accounting for only a small market share. This targeted market share will depend on the specific products that are chosen but in the case of broccoli and cauliflower would amount to less than 3% of total demand. With the total volume of product that is now moving off shore, this amount of production should be easily absorbed. U.S. producers have expressed varying degrees of interest in cooperating, and there was a high level of interest among Europeans.

Experience has shown that there are three major problems involved in Third World processing:

- insuring an adequate supply of raw material,
- management, and
- interest rates.

There are two distinct groups of potential processors in the LAC region who would benefit from some type of USAID support. The first group are entrepreneurial-type producers who wish to start new plants. The second group are those producers who have existing plants - and, as is generally the case, are operating at under-capacity.

The role for USAID in new operation development would be to provide the technical assistance that would allow feasibility studies to be completed, and to assist the local operators in making initial international contacts.

Existing processors would enjoy some advantage over new start-up operations in that they would have products available for samples, they would have a track-record to allow for planning, and they would have at least some guaranteed raw material supplies.

In either case (new plant start-up, or current processors) it may be beyond the capability of a foreign assisted operator to secure adequate, pesticide-free raw material supplies to the plant. A USAID project could play an invaluable role in the organization of the growers and the supply base - by assisting the growers to establish cost-effective methods of production that will permit them to make sufficient profits in this competitive environment.

And finally, for LAC producers to be internationally competitive, it is extremely important that they be able to borrow money at internationally competitive rates - both for the plant and equipment, and for working capital needs. It is our understanding that this is a policy issue that AID is currently actively addressing.

D. Tropical Fruit Juices, Pulps and Concentrates

According to estimates, world trade in all fruit and vegetable juices (including concentrates and pulps) grew from approximately $1 billion in 1977 to $2 billion in 1981; to about $2.8 billion in 1984; and then to about $4 billion in 1988, the last year for which estimates are available. In 1988 developing country suppliers accounted for slightly over half of this total, or about $2.1 billion.

In 1988 the world's five top importers of fruit juices were the United States ($1,119 million), Germany ($667 million), The United Kingdom ($413 million), The Netherlands ($317 million) and Canada ($249 million). These countries together accounted for about 69% of the world trade.

Brazil is the largest exporter of fruit juices, with a total export value of $1.5 billion in 1988, accounting for over 38% of the market. Most of the exports consist of frozen orange juice. However, Brazil is also among the principal exporters of most other tropical juices.

Internationally, the beverage industry is by far the most important end user of processed tropical fruit products. In the

United States in particular, the rapid rise in consumption for the overall category is being powered by the strong growth in the very large fruit beverage market.

Fruit beverage sales totaled $10 billion in the United States in 1990 after growing at an average annual rate of 7.6% over the preceding ten years. These sales are projected to continue to advance at a 6.4% annual rate, resulting in a $20 billion market at the turn of the century.

Of lesser importance, but still a significant user of imported juices is the dairy industry. Juices in this case are used to produce yogurt, ice cream, deserts, pudding, sauces and so on. The dairy industry is estimated to account for about 10% of the total world trade, but close to 30% of the world trade in tropicals.

Other food industries, producing such items as jam, marmalade, jelly, baby food, bakery products and confectionery are estimated to absorb about 10% of the total world trade in fruit juices, but less than 5% of the processed tropical fruit products.

Tropical fruit juices, pulps and concentrates are usually divided into two categories: pineapple, and all "other tropical" products. The most heavily traded concentrate is pineapple.

International trade in pineapple concentrate was estimated at about 127,000 metric tons in 1990 - up 32% from 1988. Thailand and the Philippines, between them, accounted for exports of 93,000 metric tons, 73% of the total traded. Recent worldwide demand has exceeded supply, and during 1990 prices paid for the product doubled.

The United States imported 41,789 metric tons of pineapple concentrate in 1989. This represents a 28% increase from as recently as 1987.

Sales in the European Community (12 countries) have also been booming. Their total imports of pineapple concentrate in 1989 amounted to 56,389 metric tons. French imports grew from just under 11,000 metric tons in 1988 to close to 15,000 metric tons in 1989. This growth has reportedly continued during 1990. Germany had imports of just under 6,000 metric tons in 1988 and these grew to close to 10,000 metric tons in 1989. In 1990 imports rose to close to 9,000 metric tons for the first nine months alone. In Spain the pineapple juice market reportedly has gone up more than seven-fold since 1984, and now is one of the principal juices being consumed, accounting for more than 40% of the total fruit juice beverage market. The United Kingdom is also an important market, importing close to 15,000 metric tons in 1989.

The Japanese removed quotas on processed pineapple products in April of 1990. Despite high prices and short supplies in the

international market, Japanese imports jumped from 600 metric tons in 1989 to over 5,000 metric tons in 1990.

"Other tropicals" represent a relatively small market and there are no regularly published statistics for them. The largest market for these tropical products (exclusive of pineapple) is Western Europe, which has been estimated to absorb as much as 80% of total exports.

The United States has historically been a relatively small market, for "other" tropicals, but has excellent prospects for substantial growth. Japan also shows a large potential for processed fruit products, but trade sources feel tropicals are likely to take second place to traditional flavors.

Among the "other" tropical juices, passion fruit is the one most favored in Europe and the United States. The main use of passion fruit is in the production of beverages, mainly multi-fruit drinks. Considerable price fluctuations, caused by rapid successions of shortages and over-supplies, have historically disrupted trade patterns in this product. Brazil, Peru, Colombia and Ecuador are the leading exporting countries.

Internationally traded mango volume is impossible to assess accurately - official statistics are either nonexistent or unobtainable. However in 1986, the world trade in mango pulp was believed to have reached a minimum of 21,402 tons - and reportedly there has been a fairly steady increase in demand for mango pulps and juices. India is thought to be the major exporter of mango products worldwide, and South Africa the second major supplier. Drought led to a recent shortfall in supply from India and consequently prices have been moving up since early 1990.

Raw production of banana pulp is estimated at around 70,000 to 80,000 tons annually. The main suppliers are in Central and South America. The banana puree business is dominated by multi-national fruit companies. The principal uses for processed banana have historically been for baby food, ice cream and bakery products. However, it is beginning to be used in fruit juice blends.

Imports of processed banana into the United States, the largest single market, have shown a steady annual increase. From close to 10,000 metric tons in 1985, U.S. imports had increased to over 24,000 metric tons in 1989.

The guava drink market has been actively promoted in Hawaii and North America since about 1980. Dole and several dairies produce a guava nectar. The European market is small, measuring a few hundred tons annually - but their market is showing signs of growth in the field of nectars and mixed fruit drinks.

Papayas are processed in limited quantities only. The size of the papaya pulp market remains unknown as statistics do not record this item separately. According to trade sources, Europe is the biggest importer with Brazil the main supplier. Peru is also involved in exports of the pulp. Inconsequential growth is forecast for the future.

Other minor tropical fruit juices and purees which are becoming available include: acerola, naranjilla, soursop and avocado.

Importers in most of the major markets are interested almost solely in bulk packed fruit juice raw material, in the form of juice concentrate or fruit pulp/puree - depending upon the product in question, and the individual buyer or end user. There is a general lack of interest in imports of consumer packed juices, whether in cans, bottles or cartons.

Del Monte and Dole dominate the pineapple concentrate market. Nevertheless, most sales are still made through independent importers and brokers. These brokers are interested in working with independent suppliers and entry into the market should not pose a problem if the quality is acceptable, and if pricing is correct.

Competitively, there is an important advantage in duty for "other" tropicals into the U.S. market for CBI beneficiaries (and it is anticipated Andean Initiative beneficiaries). Recent legislation has increased the duty to 100% (1991) for "other" tropical fruit products originating from locations other than CBI countries.

The most critical elements in determining ability to compete include: field yields of the raw materials; utilization of plant capacity; energy costs; transportation to market; and consistent, well-planned marketing programs. LAC should be able to compete in each of these areas.

Experience has shown that there are traditionally three major problems involved in Third World processing:

- insuring an adequate supply of raw material,
- management, and
- availability of capital and interest rates.

There are two distinct groups of potential processors in the LAC region who would benefit from some type of USAID support. The first group would be entrepreneurial-type producers who wish to start new plants. The second group would be those producers who have existing plants - and, as is generally the case, are operating at under-capacity.

The role for USAID in new operation development would be to provide the technical assistance that would allow feasibility studies to be completed, and to assist the local operators in making the initial international contacts.

Existing processors would enjoy some advantage over new start-up operations in that they would have products available for samples, they would have a track-record to allow for planning, and they would have at least some guaranteed raw material supplies.

In either case (new plant start-up, or current processors) it may be beyond the capability of a foreign assisted operator to secure adequate, pesticide free raw material supplies to the plant. A USAID project could play an invaluable role in the organization of growers and the supply base - by assisting the growers to establish cost-effective methods of production (ie: technical assistance in terms of variety selection, cultural practices, etc.) that will permit them to make sufficient profits in this competitive environment.

And finally, for LAC producers to be internationally competitive, it is extremely important that they be able to borrow money at internationally competitive rates - both for the plant and equipment, and for working capital needs. It is our understanding that this is a policy issue that AID is currently actively addressing.

Pineapple concentrate has traditionally been produced as a by-product of the pineapple canning operations. Recently, though, the demand for juice has out-stripped the canner's ability to manufacture it strictly as a by-product. All incremental increases in their production have been for processing concentrate from whole pineapples. The model plant in this study contains equipment to produce concentrate from whole pineapples and miscellaneous other tropical fruits and an auxiliary line for processing a variety of other pulps/purees from tropical fruits.

The described concentrate processing line would have a rated capacity of 10 tons (raw material) of pineapple per hour and 12 tons (raw material) of passion fruit per hour. The puree line is designed to run 3 tons of finished product per hour. The equipment for this plant would cost $4,000,000 FOB U.S.

Approximately 20 acres would be needed with the building requiring 20,000 square feet. Labor requirements will vary depending upon the product being processed. For a plant running pineapple and passion fruit concentrate (double shifts) and mango pulp (single shift), 98 employees would be needed. Approximately 1,200 to 1,400 hectares would be required to support this plant.

E. Processed Tomatoes

The processed tomato business is an exceptionally large commodity-type industry, characterized by a number of very efficient operators, cut-throat competition and highly cyclical market pricing.

Sales of processed tomatoes, tomato products and tomato based products have recorded strong growth internationally over the past decade, and industry sources anticipate that this growth will continue through the next decade.

Of the major markets, Europe, with a subsidized industry is effectively closed and producers there are aggressive exporters. The United States is also a major producer and exporter, and although the market is open, it is highly competitive. Japan has recently opened its market to tomato products and has become an important importer. The U.S. and Japan are the best markets to be targeted by LAC producers.

Duty for imports of canned tomatoes from the European Community into the United States amount to 100%. Imports from Israel, CBI recipients, and in the near future the Andean Initiative recipients will be duty free. All other countries pay 13.6% on paste and puree, and 14.7% on canned tomatoes.

Cultivation of tomatoes for processing in the eleven highest producing countries amounted to an estimated 19.5 million tons in 1990, with 9.4 million tons (or just under 50%) produced in the United States. USDA reports planting intentions of over 362,000 acres for 1991, up 1% from 1990. It is forecasted that this will result in a record high production of 10.3 million tons. The European Community, which operates under a quota system with price supports for tomatoes, had an output of processing tomatoes estimated at 7.2 million tons in 1990. This production represented an increase of 34% over 1987, and 4% since 1989.

Tomato paste, and whole and diced tomatoes are the two most important processed items in international trade.

The use of bulk tomato paste has been growing rapidly, making it the single most significant item involved. Over 100,000 metric tons were imported into the U.S. and over 76,000 metric tons into Japan in 1989. Trade sources estimate that the entire increase in tomato production in California from 1989 to 1990 (over 1.7 million tons), went into increased paste production. In addition, the tomato paste supply in major producing foreign countries increased by an estimated 117,000 metric tons, an 8% increase over 1989/90.

This worldwide increase in production was occasioned by the strong pricing for paste that existed for a two year period through

mid-1990, when prices began declining. The production increase had two effects - a reduction in the price of industrially traded paste of over 32%, and a reduction of imports into the United States from 103,600 metric tons in 1989 to 62,274 metric tons in 1990.

Canned tomato imports into the U.S. decreased from 79,938 metric tons in 1988 to 62,274 metric tons 1990, principally because of the imposition of the 100% tariff duty for E.C. products. Pricing remained stable during this period.

In July, 1989, the Japanese began a series of steps toward further opening their markets to the imports of tomatoes and tomato products. Japan imported 76,123 metric tons of paste and puree in 1989, primarily from Turkey and Taiwan; and they imported 18,874 metric tons of tomatoes, two-thirds of the volume from the European Community.

One of the most notable developments in world trade in tomato products over recent years has been the emergence of Chile as a producer and an exporter. Mexico is also a key producer. Between them, Mexico and Chile accounted for 70% of the paste imported into the United States in 1990. With canned tomatoes, Italy was the leading exporter to the U.S. with 16,000 tons in 1990. Italy is followed by Israel with almost 15,000 tons, and Chile with over 12,000 tons. These three countries accounted for close to 70% of the canned tomato imports into the United States in 1990.

The tomato processing industry is seasonal in nature. The uncertainty of raw material supply, the seasonality of finished goods production, and an inelastic demand for products have resulted in unstable prices and profits for growers and processors throughout the industry over the years. LAC areas having micro-climates which would allow for an extended growing period would have a significant competitive cost advantage.

Tomato paste production is capital intensive with a relatively low labor component. Canned tomatoes require significantly less capital and are more labor intensive. A 10 ton per hour canned tomato operation uses about 70 workers per shift for direct labor, and about 25 who would be classified as overhead. Yields of finished product average 9 tons per hour. This means that every $1.00 per hour differential in the wage rate has an impact of $10.50 per ton on canned tomatoes. A representative sales price is $450/ton (FOB east coast). This means that every $1.00 per hour variance in labor costs has an impact of over 2% of sales value.

Tomato production on the farm level is not labor intensive unless the fruit is hand harvested. In the United States and Europe virtually all processing tomatoes are now machine harvested. Machine harvesting is reportedly competitive with hand harvesting even in low wage areas. A worker can hand harvest 3,000 pounds of tomatoes per day.

Yield is the most serious production cost problem. Yields in most LAC countries run 12 to 13 tons per acre. In other major producing areas, on the other hand, yields run 22 to 34 tons per acre.

To understand the impact of yields, assume for illustration purposes, a growing cost similar to that of Monterey, California of $1,160 per acre (exclusive of harvesting costs). And also assume that the lower yields would not reflect lower input costs, which may or may not be true. At 30 tons/acre, cost per ton is $39; at 22 tons/acre, cost per ton is $53; and at 12 tons/acre, cost per ton is $97. For tomato paste this would result in a raw material cost per ton of $260, $360, and $640 respectively. This is compared to a representative sales price of about $800/ton (that could vary $200/ton in either direction). Under this scenario for diced canned tomatoes, raw material costs would be $43, $59, and $108 per ton respectively - against a representative sales price of about $450/ton. The yield:cost impact is greater on the paste as a result of the concentration that takes place.

The three most important quality considerations for paste are mold count, bostwick (consistency), and color. For canned tomatoes, color is the foremost quality concern.

Often in the manufacture of tomato paste a certain amount of mold finds its way into the product, for which the FDA has set tolerance levels. Historically, many developing world processors have performed poorly regarding mold counts. The sense in the industry is that this is a management problem rather than anything inherent in the growing and processing conditions.

The causes for problems with bostwick are less clear. Problems can be partially attributed to management, ie: utilization of over-ripe or green tomatoes, improper processing procedures, or the variety of tomatoes used. It is also possible that problems could be caused by something in the growing conditions themselves.

Color is usually a result of variety selection and growing conditions although it is possible that improper processing procedures (ie: attempting to process green tomatoes) can have some effect. Industry sources have expressed skepticism relative to the ability to grow tomatoes with good color in the tropics. Team members, however, have had experience with processing tomatoes in the Comayagua Valley in Honduras. The color looked very good and samples sent to a leading U.S. laboratory for analysis received the highest possible rating for color.

The capability of producing quality product will have to be addressed on a locality by locality basis.

Of particular interest for LAC producers will be canned diced tomatoes, packed for industrial and institutional use. The markets

for these products have been growing rapidly over the past few years. Dicing is a much smaller-scaled manufacturing process (than paste operations) and is labor intensive.

In terms of transportation and duties, LAC producers would be in a good competitive position in the U.S. canned tomato market vis a vis Italy, Israel and Chile; and versus Chile for tomato paste.

Furthermore, canned tomatoes, with their lower capital investment, greater sensitivity to labor rates, and lower sensitivity to production yields, represent a better option in most instances than the more capital intensive tomato paste.

Key considerations for canned tomatoes are the ability to obtain an excellent product color, and access to reasonably priced welded cans.

Canned tomatoes are, as the name implies, packed in cans. Leaded cans are no longer acceptable for products to be shipped into the United States and this conversion from leaded to welded cans has made the investment in can manufacturing equipment too expensive to be practical for a small canning operation. A can manufacturing facility within reasonable proximity (that charges affordable prices) would be needed by LAC processors.

The number of hectares required by a tomato canning operation would depend upon the length of the season and the yield per hectare. Over a 12 week period, the model plant described in the Manufacturing Parameters section would require between 10,000 and 11,000 tons of raw material annually. At a yield of 55 tons per hectare, this would require about 200 hectares. The ideal situation would be an area with a much longer growing season.

The model plant has two basic lines: one to handle prime product, and the second to handle culls. The prime line would process primarily diced and whole tomatoes for industrial and institutional use. Cull line production will depend on the situation in the country where the processing is taking place. The example given in the following scenario assumes the tomatoes are being manufactured into an export quality sauce. However, any number of products, suitable preferably for the domestic market are possible, with a relatively low investment. Additional products would include various types of tomato-based hot sauces, ketchup, tomato and other vegetable juice blends.

A total of 12,600 square feet would be needed for warehouse, production and supporting space. The total cost of the equipment would be $1,036,000 FOB Baltimore. The plant should be able to run effectively 10 tons of raw material per hour. Direct labor needs to cover one 8 hour shift would amount to 70 persons. Two shifts a day would be run during the peak season. For indirect labor a

total of 23 persons would be required. An estimated 200 hectares would be required to support the plant for a 3 month season.

The most appropriate area for USAID assistance would be in development of an adequate base of raw material (with the necessary color and other characteristics) to support the plant. Especially when dealing with smaller growers, AID could help in improving yields; variety selection; technical assistance for safe and effective pesticide usage; land preparation; planting and harvesting schedules and methods; etc.

There is a sense in the industry that despite the growing markets, there is enough installed capacity currently in place to more than cover demand. There are only a limited number of instances where a tomato operation may be successful in the LAC region. For these reasons, it becomes essential that a very thorough feasibility study be done prior to undertaking any projects.

F. Dried Tropical Fruits

Drying is one of the oldest techniques of food preservation known to man, and sun drying still accounts for the major volume of dried fruits consumed in the world today. Only moderate amounts of fruits are dried mechanically, but quantities are rising rapidly - due in part to the high degree of sophistication attained by dehydration technology over the past 25 years, resulting in a broad range of high quality products that are gaining increased consumer acceptance in retail markets.

During a two month sample period in 1990, sales of all dried fruit through U.S. supermarkets were estimated at $107 million. Dried fruit snacks, a separate category, amounted to an additional $90 million. These two categories were up 6% and 18% respectively from the prior year (the statistical subcategories containing tropicals showed phenomenal growth, expanding 25% and 18% respectively over the previous year - July, August 1990 versus July, August 1989).

In addition, in the United States annual estimated sales of all dried fruit through health food stores are about $60 million, and industrial sales are estimated to be over $600 million.

An average overall rate of growth of 4.6% annually, in real terms, through the year 2000 is forecasted in the United States.

Tropical dried fruits represent a small portion of this market and the following is the only import volume information available.

United States 1989 imports:
- dried pineapple 1,918 metric tons
- dried papaya 621 metric tons
- dried mango 169 metric tons.

Anecdotal evidence and a review of distribution outlets indicates that the largest international market for tropical dried fruit is Europe, where demand is strongest for dried pineapple and banana slices (chips). Dried diced mango and papaya are also used, primarily as a component in tropical fruit mixes.

The only separately recorded imports into the European Community in 1989 were:
- dried banana 1,594 metric tons (includes fried chips)
- dried papaya 757 metric tons.

Dried mango imports into the E.C. have been estimated to be equal to or slightly greater than papaya imports.

In the European Community, Germany and France are the largest consumers of dried tropical fruits, accounting for over 50% of the volume. The Netherlands is the largest importer, but they act primarily as a redistribution point to other European countries.

Currently, the dried fruit market is primarily made up of sweetened and sulfite products. However, there is a movement toward unsweetened, organically grown products without sulfites.

Grouped together under dried tropical fruits classification are two distinct types of fruit: banana chips (and sometimes plantain chips); and all other tropical fruits. The distinction is that the banana chip is fried in coconut oil, and the other fruits are all atmospherically dried.

While industry sources suggest solid and steady growth, the market seems to be currently in balance. Importers and traders have consistently described the quality of the product available today as excellent, and report a high level of satisfaction with present suppliers. Consequently, this may be a difficult market for LAC producers to penetrate.

Thailand, and to a lesser extent the Philippines and Taiwan, are the major exporters of most dried tropical fruits with the exception of bananas. Reportedly, processors in Thailand possess "state of the art" equipment, and quality control is very good.

The disproportionate geographic concentration of production in southeast Asia may provide some competitive opportunities for the LAC region into the United States and Europe, but despite the distances, the freight rates from Thailand and the Philippines are competitive into the northeast United States and Europe.

Duties on dried pineapple from Thailand into the United States are 3.66% - mangos and papaya are duty free. All dried products from CBI countries are duty free.

The model processing plant, as described in the Manufacturing Parameters chapter, would have a total effective capacity of about 300 metric tons annually. The United States market for dried pineapple, papaya and mango amounts to about 2,700 metric tons annually. Similar figures are not available for the European market, but it is considered to be substantially larger. It is safe to assume a total annual market for the U.S. and Europe of at least 6,000 metric tons for all dried tropicals, excluding dried banana chips and desiccated coconut. Consequently, total capacity for the plant would be the equivalent of about 5% of trade for the targeted markets.

Two firms (one U.S. and one European) have expressed interest in working with any new plant that commences production in the LAC region, assuming quality standards can be met.

When dealing with these small volume products, innovative ideas, such as maintaining a broad base of fruit offered would be useful. Special offerings would include multiple fruits, and product with and without sulphur and sugar. Offering mixed containers ("one stop shopping") would also be worthwhile. Maintaining inventories in target markets so that shipments can be made quickly, reducing lead times for customers is another way an export processor can differentiate himself.

Processes should be investigated for eliminating the sulphur preservative. This area is fairly new, and the team had a sense that there is no standard acceptable process yet.

The amount of hectares that would be required to produce the 300 tons would depend upon the product(s) involved. It is difficult to see a need for more than 10 to 20 hectares of production area. A USAID product-specific project would not be warranted under these circumstances. Rather, this type of operation might simply participate in an overall program aimed at promoting small enterprises.

Processing equipment would total $461,000.00 (FOB Baltimore) for the standard cabinet drying method. The plant would require about 1.5 acres of land, and the plant itself an estimated 9,096 square feet. The limiting factor to through-put is the cabinet drier. The drier recommended has a rated capacity of 3,400 pounds of finished product per 16 hour day. The net effective capacity would be about 2,900 pounds per 16 hour day. Approximately 12 workers would be required.

G. Pickles

Pickles are produced by preserving vegetables with acid, salt and sugar. The methods for preparing and fermenting vegetables have been practiced since ancient times. Specific recipes vary the blending of primary vegetable, spices, sugar, salt and vinegar to achieve distinctive flavors, and there are countless names given to the resulting products. Pickles prepared from cucumbers are the most popular pickled consumer item.

The pickled products of particular interest for the LAC countries are the extremely small cucumber pickles known as midgets, gherkins and/or cornichones. Although this is a relatively small market, these pickles are very labor intensive, and are suitable for growth on small plots. The processing is extremely low-tech and the product is not perishable once processed. This sort of enterprise might work in remote areas where there is difficulty in finding appropriate agriculture export products.

The two target markets for LAC producers are Europe and the United States. Japanese imports amounted to only 711 tons in 1989.

The overall market value of pickles and other pickled products totalled over $1 billion in the United States in 1990 and imports amounted to 3,517 metric tons, worth just under $4 million. Cornichon/gherkin pickle volume is not isolated in these statistics, but they are estimated to account for $88 million in grocery sales and about one-half of the total imports.

The European Community is an important market for pickles. Total market value for pickles was not available, but 58,429 metric tons of cucumber pickles and Cornichones were imported in 1989. The major sources of supply were Morocco, Hungary and Turkey, who between them accounted for 73% of the total.

The European market is differentiated by very diverse taste preferences. Generally speaking, the southern European countries prefer a sour, more acid pickle; the mid-European countries favor a sweet-sour flavor (dill); while northern countries fancy sweet tasting pickles. Distinctive and time-honored recipes produce these various flavors - but the sweeter flavors cannot be produced from the brine packed raw material.

There are two approaches to processing. Pickles are either packed initially in consumer packages using fresh raw materials, or first bulk packed in brine and later re-packed in consumer sizes. The two methods result in a product with different flavor characteristics. The pickles packed "fresh" in consumer size are generally more preferred in Northern Europe and the United States. Those re-packed from brine are preferred in France and Southern Europe. Due to the labor intensity of the harvest, packing in

brine in drums for shipment to the U.S. and Europe is a viable enterprise for some developing countries.

Pickle production has been moving off shore. Sri Lanka, the largest exporter to the United States of gherkin/cornichones, began exports of bulk brine pickles only three years ago. And, Vlasic Pickle, the largest U.S. pickle manufacturer, is actively seeking potential sources for non-brine pickles. There are three options for sourcing the non-brine pickles off shore:

- Source fresh raw material to process in the target market. This option requires delivery within 3 days of harvest in order to maintain the integrity of the fresh product,
- Produce a consumer-ready pack off shore. The concerns here are the cost of packaging materials in LAC regions, and the image of the producing country,
- Develop a different process for bulk packing pickles that allows production of the type of pickle preferred in the United States and Northern Europe.

The amount of technology and equipment needed for a bulk pickle packing plant is minimal. A broad line of supplementary products could also be processed in the facility (for example: pickled baby corn, extra fine green beans, and jalepeno peppers). With very little modification to the plant, any combination of these supplemental products could be manufactured. Initial production should be geared to specific customer requirements.

The most appropriate areas for USAID support would be:

- providing for production of an adequate raw material supply to support the plant,
- assistance in forming grower/processor/shipper cooperatives, and
- promote appropriate research which addresses the constraining factors for LAC production, particularly in methods of shipping non-brine pickles.

The model plant would require 80 hectares and would employ 30 workers.

V. IMPLEMENTATION/USAID INTERVENTION OPTIONS

A. Introduction

The following summarizes key components to a successful agro-processing export venture:

- high rate of plant capacity utilization, with profitable products,
- well trained, informed, aggressive management,
- a political environment in which government policies do not interfere with operations,
- availability of adequate levels of financing at internationally competitive rates,
- adequate infrastructure, with a transportation system at competitive rates, and
- pertinent research support.

A high rate of capacity utilization is achieved through good management and planning. It must be achieved with products that make money rather than "cover overhead". It requires consistent raw material supplies - at the proper level (excessive supplies are as damaging as shortages), of good quality, pesticide free, and at competitive prices. This in turn requires an efficient, cost effective farming sector.

Farming for processing invariably involves a trade off of low prices for a guaranteed return. Cost effective, efficient crop production is a critical component of successful growing for processing. To be competitive in exports the prices paid for raw materials are often not attractive to farmers with small parcels - and in many locations prices are substantially less than the grower can get selling in the local market. This leads to the conclusion that processors must operate their own farms, be located in areas where they can draw from larger farms, or be located in areas where the grower has limited marketing options.

The international markets for all of the selected products are highly competitive and the key to success lies in operational execution. The need is for good management with efficient operations. Effective quality and cost controls are needed, as are thoughtful marketing programs - with the flexibility to respond quickly to changing customer needs.

Government regulations, obstructive policies and/or activities can often inhibit agro-processing growth. Impediments include difficult, time consuming customs procedures; restrictive export and import duties; and currency and financial regulations that tend

to distort the economic value of an activity, creating a sense of uncertainty which inhibits investment.

For an export business to thrive it must have access to sufficient financing at a rate that is generally at the same level as one's competition. Subsidized interest is not required.

B. USAID Intervention Options

Following is a discussion of possible USAID interventions that would help to support agro-processing development in the region. There are two categories of possible USAID interventions. The first type support specific product oriented development; and the second type are aimed at creating an environment that allows agri-business to flourish. These are not, in most cases, new ideas. The challenge to achieving success is in executing the basics well.

1. Product Specific Interventions

There are numerous activities that USAID could initiate and/or support in terms of product specific projects. It is important to note that product selection had a marketing orientation. Selected products are demand driven and all activities must be done in support of an overall marketing strategy, down to and including construction of the plant and organization of the business.

Project Feasibility

Product specific development assistance will usually come about in response to a need for assistance in a targeted high priority population or area. The information we have developed, supplemented with details germane to local conditions, will provide sufficient information to determine feasibility.

There must be a strong interest on the part of the beneficiary group to enter into the venture. The beneficiaries will ultimately be liable for the project's success or failure - this group must therefore be involved from the onset of the project through every step of the planning. And, there must be some evidence of real commitment, (such as assumption of risk) on the part of the beneficiaries. It is important that they have a vested and irreversible interest in the long term success of the venture.

The feasibility should determine if, based on the criteria supplied, there is a reasonable chance of success. This doesn't have to be an optimum situation - the human component is the most important. Experience has shown repeatedly that a strong committed group can overcome theoretical competitive disadvantages.

Project Facilitation

The team found an encouraging level of interest on the part of U.S. and European businessmen in export possibilities from the LAC region. There is a need though for a facilitation function. A working arrangement between U.S. and/or European marketers and LAC producer/exporters could take many forms, and will need to be negotiated on a situation-by situation basis. Basically, the facilitator's role will be to help reconcile the interests, desires, goals, objectives, etc. of both parties - to build a mutually beneficial long term arrangement. To be effective, the facilitator must therefore understand what the driving forces are that will encourage/motivate the partners on both sides of the equation to enter into the arrangements.

USAID has supported organizations in most LAC countries to facilitate arrangements in this way. However, the results have been mixed, particularly in agri-business. In many instances, this has been due to a lack of focus, and/or clearly articulated objectives. USAID project oversight often tends to focus on day-to-day activities - but has inadequate procedures for defining objectives and accountability. Frequently it would be more appropriate to place a greater emphasis on accomplishments and accountability, while allowing greater operational flexibility and autonomy in their achievement.

ACDI has recently been awarded a grant by USAID for a model program to act as facilitator between selected processed fruit and vegetable producer/export cooperatives in the LAC region, and U.S. based marketers. This program could provide an excellent model.

Raw Material Supply

Inadequate and erratic supplies of raw material has been identified as the most fundamental and pervasive constraint to success. An appropriate role for USAID would be to support export oriented processing operations by assisting the growers who will benefit from supplying the plant. This assistance should include:

- helping to organize grower groups,
- providing technical assistance to the growers aimed at increasing yields and quality, and reducing unit costs,
- providing training in the business aspects of farming, so that the farmer can better understand the economic value of his various options.

No project should be established without first determining that supplying raw material to the plant will be an attractive option to local growers.

Training

Farmer training was discussed under raw materials supply above. Training of new workers for start-up operations would be a very effective enticement for luring joint ventures.

Agricultural Production Research

Most LAC countries have agriculture research programs in place. These programs should be harnessed to support any processing project that develops.

Food Processing Research

It would be redundant for Universities or Institutes in LAC to attempt to replicate the excellent food processing research being done in the United States. However, it would be helpful for these Universities and Institutes to work cooperatively with U.S. Universities in helping to solve specific problems that have a substantial impact on the economies of those countries. For example, two problems have been identified in the body of this work, which would lend themselves well to cooperative research:

- methods of extending shelf life and improving sanitary procedures for fresh pre-cut fruits and vegetables, focusing specifically on issues regarding tropical fruit, and
- methods to bulk ship pickled products in a manner that maintains the qualities needed for use in producing the pickles favored in Northern European and most U.S. markets.

Finding solutions to these problems would have an enormous impact (in the hundreds of millions of dollars) on LAC region economies. A participatory role by local Universities should go a long way toward strengthening their overall capabilities. Programs could be supported by a regionally administered grant program.

Product Promotion

It would be very helpful to have an organization to promote the use of processed tropical fruits, and to act as a clearinghouse in the exchange of information between the various producers in the region. This organization should be self supporting but some effort would be needed to establish it. For example, there have been recent attempts at cooperation between producers in Peru, Ecuador, Colombia and Brazil in an attempt to rationalize the passion fruit market.

In the Balkanized fashion in which the industry is now operating, it will be difficult for prospective export processors to reach their full potential. It is generally believed in the industry, that tropical fruit products have a bright future if the constraints caused by erratic prices and levels of supply could be solved.

In addition, the recent cholera epidemic has created a serious image problem for food exports from the Andean countries. This is an example of a need for cooperative action to reassure worldwide consumers on the safety of products exported from the region.

2. General Improvement of the Export Environment

The second category of USAID interventions are those general support programs aimed at creating an environment that allows agri-business to flourish.

Government Regulations and Policies

The rationalization of government regulations and policies with regard to capital and interest rates, customs procedures, trade, and foreign exchange has been and is a top priority for USAID. There are already on-going initiatives in place. One program that worked very well in Costa Rica involved the establishment of a council made up of highly placed government officials and business leaders to provide a venue for talking through the problems posed by government actions, to allow a better understanding of the impact of these actions, and to clearly identify critical areas needed for reform.

Training

There are three areas of training that would support agro-processing development:

- Food Technology and Plant Operations,
- Management, and
- Farmers and Workers.

It was beyond the scope of this study to survey the amount and quality of training available at LAC region Universities in food technology and plant operations. The perception is that the availability of this type of training is limited. North American Universities have a number of outstanding departments in this field. Cooperative agreements could be developed between U.S. Universities and selected local or regional schools, to reinforce their capability for teaching.

For those already operating in this field, a series of management seminars to be held at regional Universities or Institutions could be developed in cooperation with U.S. Universities. Seminars would cover subject matter such as Good Manufacturing Practices (GMP) or specifics of the broader based industries, such as tropical fruit processing.

Self-financing national or regional seminars on management techniques would have a useful and stimulating effect, with the USAID project role being organizational assistance. The seminar (or series of seminars) could be developed by a University or by a professional management training group, such as the AMA, and could be held at a number of locations over the course of a year - on a full cost reimbursable basis. Seminars such as these have already been held in a number of countries, and have generally been well attended and successful.

Examples of effective seminars are the series of seminars stimulating the asparagus business in Peru, and the series of annual meetings that were held in Miami in the early days of developing fresh produce exports from the Caribbean. These conferences made a major contribution toward developing these export programs.

Promotion

Nationally based promotional activities can be very useful. Appropriate activities include: assisting shippers at trade shows by setting up national pavilions; establishing formal quality assurance programs, with attendant promotional labeling; providing frequent publicity regarding quality assurance programs, as well as other upbeat messages about the industry in the country; and a number of other useful promotional activities aimed at industrial buyers. Many buyers and consumers have a very poor image of LAC countries. For the Andean countries this image problem has recently been heightened by the cholera epidemic.

Marketing must always remain the province of the manufacturer and/or exporter - the above activities would be in a more generic supportive role. Most LAC countries now have USAID sponsored national promotion programs. Reference is included here to recognize their usefulness - not to necessarily suggest any changes or expansion in existing programs.

Information Collection and Dissemination

Market and other agricultural export-related information in Latin America has consistently been identified as a central need in the region. USAID has, over the years, addressed this issue by

supporting information distribution bureaucracies in many of these countries. This has been expensive, and generally ineffective.

There is need for a weekly Spanish language periodical, in either a newspaper or newsletter format, covering issues of importance to the non-traditional agriculture exporters in the region. Information should cover both fresh and processed products, and provide intelligence on a broad range of subjects of interest to the exporters - from horticulture through transportation, markets, etc. The publication should provide information on markets in North America, Europe, Japan and the Middle East, as well as provide news as to activities in competitor exporting countries.

This would be a straight commercial venture. What has discouraged commercial start-up is that it would require a long period of losses before sufficient circulation and advertising could be developed to break-even.

To assist in start-up, USAID Missions in each country could divert money now used for the largely ineffective in-country systems, to guarantee an appropriate level of circulation in their country for about 2 years. This would provide a guaranteed circulation base, allowing the publisher to approach advertisers. It would also provide a model to allow for expansion into non-AID countries such as Mexico and Chile. From USAID's standpoint this would effectively accomplish the immense and critical information distribution task - at a substantially reduced cost for now - and at no cost in the future. The cost of subscriptions would be relatively minor compared to the current costs of funding the various information distribution organizations currently in operation.

In addition, the print publication should be backed by an electronic version. The information accumulated over the years would become a valuable data base for research purposes.

General Program to Encourage Small Entrepreneurs in Business

This study has focused on the larger export possibilities. There is also strong potential for small niche-type businesses to develop. What is needed is creating an environment that allows them to flourish - access to adequate capital at internationally competitive rates; access to information; unobtrusive government regulations and procedures; access to an efficient agriculture production sector; a means for finding marketing partners; and promotional support.

C. Supplementary Studies

It would be useful to supplement this report with two further studies.

The unused installed plant capacity in the region, particularly for processed tropical fruits and frozen vegetables, presents an area of particular interest. As noted in our report, both these product categories possess strong marketing possibilities.

Bolivia, Peru, Ecuador, Panama, Costa Rica, Dominica, Jamaica, and possibly others, all have fruit juice processing plants operating at substantially below capacity. Peru, El Salvador, Guatemala, and the Dominican Republic all have freezer processing plants, many of which are also operating at less than full capacity.

It would be useful to conduct a regional survey of existing facilities to determine the level of unused capacity, the constraints to full utilization, and the social impact of full utilization - to provide an overall USAID strategy aimed at strengthening these operations. This may provide the fastest avenue to satisfy the identified market demands. If the regional approach is not used this should be appraised by the interested Missions.

A second useful supplement to this report would be a summary of the regional sources of investment capital and credit available. This should deal not only with established, development-oriented lenders such as OPIC, the IFC and LAAD, but should also include discussions with other potential commercial sources such as the international banks and investment companies, such as those that have been responsible for organizing investments of funds in Brazil and Mexico. This study would define not only what is available and under what circumstances, but also methods to access additional sources of funds.

D. Summary

In the team's opinion, the most effective method to achieve fast tangible results is through product-specific activities. The next step toward bringing development forward should be to identify specific localities and beneficiary groups suitable for the identified products. In virtually every country within LAC there is sufficient information from previous studies, and in-place promotional organizations to identify likely candidates at a minimum cost in time or money.

Once the geographic areas and beneficiary groups are identified, decisions can be made as to how to proceed with full fledged feasibility studies involving local participants and potential U.S. and European private sector partners.

In summary, this approach would:

1. Identify the targeted area, group and product to be pursued.

2. Utilizing this report, and in most cases, previous in-country studies, integrate local costs, production and logistical information to determine initial feasibility.

3. Based on this information, prepare a "prospectus" covering all salient points of interest to a potential partner.

4. Utilizing the contact list in this report, approach potential joint-venture partners with the proposal. We have found a substantial level of interest among businessmen in the U.S. and Europe.

5. Once one or more potential partners are identified, a preliminary understanding of the terms of their participation should be outlined and a formal feasibility study undertaken, including financing options.

6. Once feasibility has been established, final details of the terms of the agreement between the local group, USAID and the outside participant should be finalized. This should clearly define the roles and responsibilities of each party to the agreement. As discussed earlier, USAID's role would most likely be that of assisting in the training of the growers and workers and in helping to organize and develop the flow of raw material.

APPENDICES

I. U.S. Food Distributors and Buying Groups

II. Analysis of European Market

III. Transportation Analysis

IV. Supplemental Japanese Market Description

V. Japanese Supermarkets and Buying Groups With Offices Abroad

VI. Individuals Contacted and Interview Guides

VII. Bibliography

APPENDIX I

Major Foodservice Buying Groups

(Source: Institutional Distribution, February)

Group:	Member Companies	Warehouse Locations	Member Sales 1990 (Millions)	% Chge. 1989
ComSource Independent Foodservice Companies, Inc.[1] Atlanta, GA	150	244	$8,101	+ 6.1
EMCO Foodservice Systems[2] Pittsburgh, PA	162	242	5,430	+ 12.7
Nugget Distributors, Inc. Stockton, CA	185	193	3,500	+ 16.7
Federated Foods, Inc. Arlington Heights, IL	118	148	3,408	+ 29.8
F.A.B., Inc. Norcross, GA	78	86	3,320	+ 6.3
Pocahontas Foods USA Richmond, VA	114	125	2,207	+ 9.3
All Kitchens, Inc. Boise, ID	116	135	2,051	+ 11.0
Gelbon Boise, ID	62	69	1,500	+ 25.0
Allied Buying Corporation Chicago, IL	58	106	965	NC
Plee-Zing/Lil Brave Glenview, IL	162	170	965	+ 1.0
SLFA/Supply & Equipment Foodservice Alliance, Inc. Des Plaines, IL	55	72	870	+ 6.1

[1] ComSource data includes $369 million, 16 members, and 35 warehouse locations from Canadian associate, Federated Foods, Ltd.
[2] Formerly CODE, Inc. Data includes $2.5 billion, 36 members and 107 warehouse locations from Canadian associate, AFD.

Top 25 Broadline Distributors

1990 Rank	Company	Estimated Foodservice Sales (Millions)	% Chge. 1989	No. of Locations
1	Sysco Corporation, Houston, TX	$7,720.0	+10.4	105
2	Kraft Foodservice Group, Deerfield, IL	3,300.0	+6.5	46
3	Rykoff-Sexton, Inc., Los Angeles, CA	1,509.0	+8.6	31
4	PYA/Monarch, Inc., Greenville, SC	1,423.5	+9.5	15
5	JP Foodservice, Inc., Hanover, MD	1,019.0	+12.4	9
6	White Swan, Inc., Fort Worth, TX	754.0	+9.0	8
7	Food Services of America, Kent, WA	740.0	+12.1	19
8	Gordon Food Service, Grand Rapids, MI	725.0	+13.3	2
9	Unifax, Inc., Wilkes-Barre, PA	712.0	+14.1	5
10	Shamrock Foods Co., Phoenix, AZ	418.0	+8.1	3
11	Consolidated Foodservice Companies, Virginia Beach, VA	400.0	+14.9	5
12	Clark Foodservice, Elk Grove Village, IL	375.0	+15.4	12
13	CONCO Food Service, New Orleans, LA	300.0	N.C.	3
14	Woodhaven Foods, Philadelphia, PA	264.7	+11.2	5
15	Reinhart Institutional Foods, Inc., LaCrosse, WI	234.4	+12.3	6
16	Ben E. Keith Foods, Fort Worth, TX	211.0	+18.5	9
17	Maines Paper & Food Service, Conklin, NY	202.0	+21.0	2
18	Scrivner, Inc., Oklahoma City, OK	195.0	-17.0	6
19	Ritter Food Corp., Elizabeth, NJ	162.5	+2.3	1
20	Institution Food House, Hickory, NC	161.6	+6.7	2
21	IJ Companies, Knoxville, TN	150.5	-4.1	4
22	Alpha Distributors, Madison, WI	150.0	+20.0	1
23	McLane Foodservice, Temple, TX	148.1	+13.4	2
24	Tartan Foods, Philadelphia, PA	138.0	+9.5	1
25	Henry Lee Company, Miami, FL	130.0	+5.7	1

APPENDIX II

Analysis of European Market

- Number of Food Outlets by Type 1987
- Growth Rates in European Consumption: Frozen & Canned Foods 1984 - 1989
- Market Share Held by Hypermarkets in the Food Sector in Europe 1982 - 1988
- Market Share Held by Supermarkets in the Food Sector in Europe 1982 - 1988
- Food Distribution by Organization 1988
- Market Shares Held by Multiples in the Food Sector in Europe 1982 - 1988
- Market Share Held by Affiliations in the Food Sector in Europe 1982 - 1988
- Market Shares Held by Co-Operatives in the Food Sector in Europe 1988
- Number of Catering Establishments in Europe
- Growth in Consumer Catering Sales at Constant 1980 Prices 1984 - 1988
- Forecast Index of Real Growth in Consumer Catering Sales 1988 - 1995
- Summary of Growth Prospects in Consumer Catering 1989 - 1995

Table 1 NUMBER OF FOOD OUTLETS BY TYPE 1987

Number	All	Non-spec	Self-serve	Super-markets	Hyper-markets
Austria[1]		11,895	8,510	937	67
Belgium		15,200	4,592	1,314	88
Denmark	14,900	6,050	4,800	912	44
Finland	8,454	7,514	5,894	888	34
France			12,231	6,128	639
Italy	316,060		6,890	2,876	51
Netherlands[1]		10,150	7,335	1,953	35
Norway		7,280	6,671	1,023	15
Spain		92,484	17,893	5,292	99
Sweden		8,850	8,850	1,585	185
Switzerland	18,150	9,457	8,450	782	94
UK	95,000	43,130		1,966	457
West Germany	159,903	65,900	58 482	7,987	953

Source: ISSO
Notes: [1] 1986
Non-spec: non-specialised (grocery)

Table 8 GROWTH RATES IN EUROPEAN CONSUMPTION: FROZEN AND CANNED FOODS 1984-1989

% change in volume	
Frozen food	41.5
- vegetables	46.0
- potato products	65.5
- fish, shellfish	35.2
- meat	55.6
- bakery products	25.1
- poultry	12.7
- fruit	35.1
Canned foods	
- meat	2.8
- vegetables	7.2
- fruit	-7.1
- fish	9.1

Source: Euromonitor

Table 2 MARKET SHARE HELD BY HYPERMARKETS IN THE FOOD SECTOR IN EUROPE 1982-1988

% value

	1982	1988
Austria	11	11
Denmark	13	15
Finland	4	5
France	16	22
Italy	-	1
Netherlands	3	4
Norway	-	2
Spain	14	17
Sweden	4	6
Switzerland	12	15

Source: Euromonitor

Table 3 MARKET SHARE HELD BY SUPERMARKETS IN THE FOOD SECTOR IN EUROPE 1982-1988

% value

	1982	1988
Austria	25-30	28
Denmark	44	47
Finland	27	35
France	19	23
Italy	8	12
Netherlands	29	35
Norway	40	45
Spain	19	29
Sweden	36	38
Switzerland	20	28
West Germany	23	25

Source: Euromonitor

Table 4 FOOD DISTRIBUTION BY ORGANISATION 1988

%	Co-op	Mult	Affi	Inde/other[4]	Total
Austria	15	44	36	5	100
Belgium	*	12	20	68	100
Denmark	39	21	36	4	100
Finland	30	3	66	1	100
France	3	20 [1]	20 [2]	57	100
Netherlands	*	50	30	20	100
Norway	23	23 [3]	30	24	100
Spain	2	10	6	82	100
Sweden	21	8	44	27	100
Switzerland	38	12	12	6	100
United Kingdom	12	55	7	26	100
West Germany	14	23	57	6	100

Source: Euromonitor
*Notes: * Negligible*
[1] Including hypermarket operators
[2] Including the 'groups of independents'
[3] Including franchises
[4] Including department and variety stores, specialists
Key: Co-op = Co-operatives
Mult = Multiples, including hypermarket chains
Affi = Voluntary chains and buying groups
Inde = Non-affiliated, independent retailers and other

Again readers are reminded of the limitations of pan-European comparisons. In theory a shop with just one other branch could be a multiple In practice the cut-off point varies between five and 20 outlets so that different nations statistics deal with very different populations

Table 5 MARKET SHARES HELD BY MULTIPLES IN THE FOOD SECTOR IN EUROPE 1982-1988

% value	1982	1988
Austria	36	44
Belgium	12	12
Denmark	20	21
Finland	2	3
France	18	20
Italy	9	9
Netherlands	40	50
Norway	16	23
Sweden	12	8
Switzerland	11	12
West Germany	20	23

Source: Euromonitor

Table 6 MARKET SHARE HELD BY AFFILIATIONS IN THE FOOD SECTOR IN EUROPE 1982-1988

% value	1982	1988
Austria	36	36
Denmark	37	36
Finland	58	66
Italy	19	21
Netherlands	54	30
Norway	25	25
Sweden	40	44
Switzerland	13	12
West Germany	58	57

Source: Euromonitor

Table 7 MARKET SHARES HELD BY CO-OPERATIVES IN THE FOOD SECTOR IN EUROPE 1988

% value	
Denmark	39
Switzerland	38
Finland	30
Norway	23
Sweden	21
Austria	15
West Germany	14
Italy	13
United Kingdom	12
France	3
Spain	2
Netherlands	1

Source: Euromonitor

II Number of Catering Establishments in Europe

Information on the numbers of catering establishments in operation is notoriously incomparable.

At best we can only summarise the reported figures for the different countries. In order to gauge the significance of hotels, a breakdown exclusive of hotels is provided where possible (b).

Table 13 NUMBER OF CATERING ESTABLISHMENTS 1983/4-1988

		1983/4	1988 or latest	Notes
Austria	(a)	42,157	43,857	Includes public houses with accommodation
	(b)	25,707	28,819	Excluding accommodation
Belgium	(a)	55,756	54,828	Horeca outlets
	(b)	53,048	53,343	Restaurants, cafés only
Denmark	(a)	na	16,000	Licensed restaurants and hotels
	(b)	na	14,500	Excluding lodging units
Finland	(a)	9,180	10,860	Catering and accommodation units
	(b)	8,312	9,829	Excluding lodging units
France	(a)	154,905	204,800	Includes hotels with restaurants
	(b)	135,139	171,400	Excludes hotels
Italy	(a)	228,200	181,021	All catering establishments (1987)
	(b)	195,500	167,079	Excludes hotels (1987)
Luxembourg	(a)	2,239	2,040	• All catering
	(b)	1,906	1,750	• Excludes hotels
Netherlands	(a)	na	35,145	All catering
	(b)	36,241	33,364	Excludes hotels
Spain	(a)	na	203,000	All catering
	(b)	42,713	50,000	Restaurants, cafés only
Sweden		7,219	8,000	Excludes hotels
Switzerland	(a)	26,663	25,123	Hotels and catering establishments (1985)
	(b)	na	19,593	Excludes hotels
UK	(a)	117,715	121,930	Catering and allied trades - businesses in operation
	(b)	100,041	na	Excludes hotels and holiday camps
West Germany	(a)	151,586	200,000	Hotels, restaurants, cafés, bars
	(b)	121,659	160,000	Excludes hotels and places of accommodation

Sources: National Statistical Offices/Trade Associations
Note: e = estimate

Table 6 GROWTH IN CONSUMER CATERING SALES AT CONSTANT 1980 PRICES 1984-1988

1980 = 100

	1984	1985	1986	1987	1988	% change 1984/88
Belgium	105.0	108.0	110.0	115.0	120.0	14.3
Denmark	110.1	116.9	123.6	129.2	123.6	12.3
Finland	106.2	112.5	116.7	122.9	131.2	23.5
France	104.0	106.0	107.0	108.0	108.0	3.8
Italy	116.0	119.0	121.0	123.0	125.0	7.7
Netherlands	96.0	96.0	97.0	99.0	99.0	3.1
Norway	102.0	111.0	114.0	118.0	114.0	11.8
Spain	110.0	112.0	115.0	118.0	120.0	9.1
Sweden	111.0	112.1	113.0	115.0	117.0	5.4
Switzerland	98.0	99.0	101.2	102.4	105.2	7.3
United Kingdom	107.8	110.2	115.1	122.8	129.0	19.7
West Germany	97.0	97.0	100.0	103.0	105.0	8.2

Table 19 FORECAST INDEX OF REAL GROWTH IN CONSUMER CATERING SALES 1988-1995

	1988	1992	1995
Belgium	123.0	131.9	144.7
Denmark	123.6	134.0	139.1
Finland	131.2	153.1	170.6
France	108.0	115.9	125.7
Italy	125.0	138.7	147.1
Netherlands	99.0	101.3	103.5
Norway	114.0	120.7	134.1
Spain	120.0	126.8	132.3
Sweden	105.2	109.0	111.6
United Kingdom	129.0	147.4	159.2
West Germany	105.0	110.4	114.4

Table 16 SUMMARY OF GROWTH PROSPECTS IN CONSUMER CATERING 1989-1995

	Growth outlook	Forecast of real growth (% per annum)
Austria	Slow	+1.0
Belgium	Slow	+1.0
France	Moderate	+1.5
Italy	High	+2.0
Netherlands	Nil or negative	0-0.5
Scandinavia	High	
Spain	Slow	+1.0
Switzerland	Very slow	+0.5
UK	High	+3.0
West Germany	Slow	+1.0

Source: Euromonitor

APPENDIX III

Transportation Analysis

AGROPROCESSING STUDY:

TRANSPORTATION OVERVIEW

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April 1991

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I. Introduction and Background

Transportation rate information for a select group of commodities in specific trade lanes was provided by Chemonics International under the study done by ATMA. The rate quotations are included in a series of spreadsheets organized by transport mode, e.g., domestic or foreign trucking, commercial cargo or air charter costs, and ocean shipping costs (refer to tables 1 through 4).

Rate quotations were obtained through direct contact with carrier representatives. A target list was identified of carriers that currently provide service in the trade lanes defined in the scope of work (refer to annex A). The data shown in the tables resulting from the survey of carriers are based on the assumption that the scope of work did not include an exhaustive analysis of every carrier's rates serving a particular trade lane, but rather it would be representative of one or more carriers with the current capability of carrying the freight at the rate provided. Other assumptions were made concerning the loadability (weight per container) as well as the commodities. More specifics on the data and their interpretation are included in the following sections of the report.

II. Commodities

The commodities included in the study were as follows:

- IQF - Individual quick-freeze products, especially frozen broccoli or frozen cauliflower.
- Pre-cut fruits and vegetables - Either a fruit salad of pieces of cut fruits (e.g., citrus, pineapple, papaya or mango) packaged in five-gallon pails, or fresh broccoli, or cauliflower florets.
- Dried fruit - Dried whole fruits or pieces of mango, pineapple, or papaya or a combination of these.
- Canned tomatoes - Processed tomatoes, packed in cans.
- Pickles in brine - Processed pickles, packed in brine in barrels.
- Frozen juice concentrate - Frozen juice concentrate (e.g., pineapple) packed in pails or drums.

III. Interpretation and Use of Data

As described above, the information in the spreadsheets is intended to be representative of current rate structures and serves as a good starting point for an exporter of these commodities. If a specific rate did not exist for the commodity, the carrier's published

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rate for the broader product description under which the commodity could be shipped is indicated. If neither a specific rate nor a general category rate were available, the comments section notes "no established rate." This indicator would suggest that the commodity is not presently moving in the trade lane.

Trucking and ocean rates have been rounded to the nearest dollar. Air cargo and charter rates were quoted on a weight basis or per chartered aircraft. Ocean rates were calculated using assumed loadabilities per 40-foot refrigerated or dry container. Many quotations represent conference rates (multiple carriers offering the same rate from a common tariff). Specifics on the ocean freight and additional charges are detailed in the rate quotation sheets in annex C. Where necessary, currency conversions to U.S. dollars were done, based on prevailing exchange rates.

Rates in general, as well as those provided in the study, are subject to change and to negotiation. The three factors that influence rate levels are the regulatory environment, operational costs, and competition. These factors may be reflected in the base commodity rate or, alternatively, may be shown in additional charges (e.g., terminal charges, port dues, bunker). Surcharges related to fuel (or bunker) were subject to tremendous volatility during the war in the Middle East. A general rate increase of about $200 per container is planned for May 1, 1991 for eastbound cargo originating in some of the Pacific Basin countries. Other charges (e.g., currency adjustment factors or security surcharges) may apply to one trade lane and not to another. These additional charges can represent upwards of 30 percent of the total transport cost.

Because these charges and base rates are both changeable <u>and</u> costly, it is suggested that exporters update the information provided by the study when planning to export. Special attention should be devoted to ocean shipping rates that average in the thousands of dollars per trailer, and to completing other transport costs (e.g., inland trucking from origin point to the port). Because these inland costs often run to hundreds of dollars (perhaps signifying the difference in an exporter's profit margin), caution is urged in comparing only the port-to-port costs. Depending on his terms of sale, an exporter should include the costs from his loading point to the release of the cargo to his receiver or consignee.

Negotiation is also an important factor in price structures. The study assumes hypotheticals (i.e., if one had the product to transport today, these are rates under which the freight <u>could</u> move). Under these circumstances, the study does not reflect the lowest rate, or any effort to "shop around" for a carrier willing to quote a lower rate than that which is currently established by his company or provided by the competition. With real cargo (and volume), however, an exporter has the opportunity to negotiate directly with a carrier to achieve a rate level that is commensurate with his cargo needs and the carrier's interest in generating revenue.

It is suggested therefore that prior to shipment of these commodities, an exporter should proceed as described below:

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- Identify potential competitor countries currently supplying or exporting the same product.

- Isolate, where possible, target markets, volumes, and inland origin points for principal suppliers.

- Identify current providers of transportation services in the designated trade lanes, as well as their frequency of service.

- Obtain rate quotations for the specified commodity from all carriers that have a capability of carrying the cargo (make note of published rates vs. quotations, specific vs. broad commodity descriptions).

- Contact a targetted group of carriers with the intention of sharing export plans (i.e., timing, volumes, details about the commodity, etc.) Review currently published rates and calculate freight costs using the appropriate volumes, loadabilities, and equipment types. Include domestic and foreign inland transportation costs as well.

- Analyze results of the rate calculations and their effect on the product's competitiveness together with other costs of producing and placing the product in the marketplace.

- Make proposals as appropriate to carriers for rate adjustments per findings of rate analysis.

- Perform trial shipments under existing or temporary rates with multiple carriers to establish a track record and identify problems/opportunities.

- Negotiate rates as appropriate with carriers that have demonstrated acceptable or superior service performance.

- Apprise carriers of changes in export volumes or other particulars surrounding cargo movement.

- Monitor rates and service performance; communicate with carriers on a regular basis.

IV. Domestic Trucking

Rate quotations for the domestic routings (refer to table 1) were obtained from a medium-sized California trucking firm: Freymiller, headquartered in Bakersfield, California. The company also has interline agreements with some Mexican trucking companies, allowing

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Rate quotations for the domestic routings (refer to table 1) were obtained from a medium-sized California trucking firm: Freymiller, headquartered in Bakersfield, California. The company also has interline agreements with some Mexican trucking companies, allowing for carriage of product from Mexico to U.S. destinations using a combination of Mexican and U.S. carriers.

The assumed loadability per trailer for the commodities reviewed in the study was 42,000 pounds. This will vary in practice, however, depending on the product and the equipment. The trend in the U.S. trucking industry is toward larger trailers. Most are between 42 and 45 feet in length. Over-the-road maximum weights are regulated by state governments, and may vary.

The deregulation of certain aspects of the U.S. trucking industry a few years ago has produced downward pressure on freight rates, leading to some cases of bankruptcy. Despite the general competition for freight among domestic carriers, not all carriers are equipped or willing to carry refrigerated cargos. These products require investments in more expensive equipment, as well as in staff, drivers, insurance, etc.

Rates for processed products (e.g., canned tomatoes) are regulated by the Interstate Commerce Commission (ICC), as are frozen vegetable rates. Rates must be filed with the ICC. The rates for fresh produce and dried fruit moved via truck or rail are not regulated.

Rates on file with the ICC are organized in tariff books according to carriers. Because the tariffs are not referenced by product, (and not all products are regulated), they are not a particularly useful information tool for shippers in terms of identifying trucking companies that operate in a particular routing or carry certain products. Some good information sources include: "The Florida Shipper's Truck and Rail Guide"; the Trucking Section in the United Fresh Fruit and Vegetable Association's "Outlook" magazine; the American Trucking Association; and The Redbook (refer to annex A).

Domestically, the greatest demand for refrigerated trucking occurs between April and May. As a result, rates may fluctuate during the year for certain routings, depending on backhauls, competition, and product risk. The U.S. Department of Agriculture publishes a weekly report on trucking costs for certain fresh commodities in specific routings. This information is compiled as well in an annual report entitled "Fruit and Vegetable Truck Rate and Cost Summary." The 1989 and 1990 reports, as well as the figures for the first quarter of 1991, are in annex B.

V. Foreign Trucking

Rate quotations found in table 2 were received from two companies: Transfryos and Fletes Mexicanos Chihuahua (refer to contact information in annex A). Quotations are based on 45-foot trailers. The routing and cost information from the Mexican border to U.S. inland points (i.e., Salinas and New York) was added to the rates from Mexican origin points

U.S.-Mexico free trade agreement, more open, through movement of Mexican and U.S. trucks will likely occur.

VI. Commercial Cargo and Air Charters

Commercial cargo rates shown in table 3 were obtained from carriers currently providing regular service for the commodities and routings specified under the study. These included Challenge Air Cargo, Arrow Air, and APA International (refer to contact information in annex A). Quotations were received on a per pound or per kilogram basis. The table also reflects the type of aircraft and its capacity, as well as schedule information.

Quotations for charter aircraft are also included. These figures were based on one-way carriage that would require positioning an empty aircraft in the country of export. In making a financial commitment of this size, exporters should exercise careful planning.

The aircraft types shown in table 3 provide palletized space in the belly of the plane or jet. The lack of temperature control, as would be the case for air containers, should be taken into consideration when making export plans. Of particular interest to exporters in addition to carrying costs are such factors as the carrier's reputation for on-time arrivals and departures, flight duration, frequency of departures, and available space. Shippers should also be aware of a carrier's procedures for handling perishable cargoes when received as well as at the the airport of destination.

VII. Ocean Shipping

Commercial ocean cargo rates for the commodities described under the study are shown in table 4. Many of the quotations included are conference rates offered by multiple carriers that are members of the same rate agreement. In some circumstances, the rates may include an intermodal movement using a combination of ocean, truck and rail movement. These rates may not always reflect the lowest rate in the specific trade lane (i.e., conference rates are usually higher than those offered by independent carriers). However, these figures serve to indicate prevailing rate levels of carriers and or conferences that offer departures at least once per week.

The rate quotations are shown in detail on rate quotation sheets in annex C, organized by country of origin. These sheets reflect the specific charges, loadabilities, commodity description, rate basis and cost calculations, and source of information (i.e., carrier's name). Carrier contact information is provided in annex A. The total costs, based on 42,000 pounds per 40-foot container, are shown in the rate column in table 4. Exceptions (e.g., quotations on 20-foot equipment) are noted.

In most cases, the rate quotations were based on existing ocean tariff rates. In some circumstances, the carriers provided a rate quotation subject to booking the cargo. The absence of either an existing tariff rate or a rate specific to the commodity are indications

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that the commodity is not currently moving. Typically, rates for refrigerated cargoes are higher than those for dry cargoes due to the risks and operational costs which are inherent in the carriage of perishable products. It should be noted that particularly "high" rates for either dry or perishable cargoes may indicate that there is not cargo to support the movement, and the established rate may have been subjected to periodic general rate increases. In any case, shippers should consider that all rates are negotiable within international regulations.

The port pairs shown in table 4 are typical loading and discharge ports for the carriers and commodities shown. They are not intended to reflect a shippers' options, but rather to demonstrate normal cargo movements. Origin and destination port charges will vary. When calculating alternate ports, exporters should request the associated port charges (refer to annex C).

It is suggested that exporters update the ocean rate quotations when planning to export, using the rate quotation sheets in annex C. At this time, additional information can be added (e.g., inland origin points, inland trucking costs, destination trucking costs). Ocean freight costs for the commodities covered by the study are usually quoted on a weight basis (e.g., per ton) or per container. The loadabilities for the specific commodity should be adjusted to calculate the total cost.

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TABLE 1: U.S. DOMESTIC TRUCKING RATES*

ROUTE	SOURCE	DATE	CONTAINER	COMMODITY CATEGORY	COMMODITY	TIME FRAME	AVERAGE	RANGE
Miami – NYC	Freymiller	3/26/91	Chilled	Pre–cut Fruits & Veg	Fruit salad	Oct/April	1591	1591
Miami – NYC	Freymiller	3/26/91	Chilled	Pre–cut Fruits & Veg	Broccoli florets	Oct/April	1591	1591
Miami – NYC	Freymiller	3/26/91	Frozen	IQF Fruits and Veget	Frozen Broccoli	year–round	1629	1629
McAllen – NYC	Freymiller	3/26/91	Chilled	Pre–cut Fruits & Veg	Fruit salad	Oct/April	2428	2428
McAllen – NYC	Freymiller	3/26/91	Chilled	Pre–cut Fruits & Veg	Broccoli florets	Oct/April	2428	2428
Salinas – NYC	Freymiller	3/26/91	Chilled	Pre–cut Vegetables	Broccoli florets	Oct/April	3301	3301
Salinas – NYC	Freymiller	3/26/91	Frozen	IQF Fruits and Veget	Frozen Broccoli	year–round	3391	3391
Imperial Valley,CA–NYC	Freymiller	3/26/91	Chilled	Pre–cut Vegetables	Broccoli florets	Oct/April	2910	2910
San Joaquin Valley,CA–NE	Freymiller	3/26/91	Dry	Canned Tomatoes	Canned Tomatoes	Aug/Jan	3012	3012

* See also annexed annual USDA truck report summaries: 1988, 1989, select origins 1990.

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Updated: April 5, 1991

TABLE 2: FOREIGN TRUCKING RATES*

ROUTE	SOURCE	DATE	CONTAINER	COMMODITY CATEGORY	COMMODITY	TIME FRAME	AVERAGE	RANGE
Guatemala – McAllen, TX	Transfryos	3/21/91	Chilled	Pre–cut Fruits & Veg	Pre–cut Fruits & Veg	Oct/April	3200	3200
Guatemala – McAllen, TX	Transfryos	3/21/91	Frozen	IQF Fruits and Veget	Frozen Broccoli	Oct/April	3200	3200
Guatemala – El Paso, TX	Transfryos	3/21/91	Chilled	Pre–cut Fruits & Veg	Pre–cut Fruits & Veg	Oct/April	4200	4200
Guatemala – El Paso, TX	Transfryos	3/21/91	Frozen	IQF Fruits and Veget	Frozen Broccoli	Oct/April	4200	4200
Guatemala – Nogales, AZ	Transfryos	3/21/91	Chilled	Pre–cut Fruits & Veg	Pre–cut Fruits & Veg	Oct/April	4885	4885
Guatemala – Nogales, AZ	Transfryos	3/21/91	Frozen	IQF Fruits and Veget	Frozen Broccoli	Oct/April	4885	4885
Mex Cty–Reynosa/McAllen,TX	Fletes Mex	4/3/91	Frozen	IQF Fruits and Veget	Frozen Broccoli	Oct/April	1200	1200
Mexico City – Nogales, AZ	Fletes Mex	4/3/91	Frozen	IQF Fruits and Veget	Frozen Broccoli	Oct/April	2100	2100
Mexico City – El Paso, TX	Fletes Mex	4/3/91	Frozen	IQF Fruits and Veget	Frozen Broccoli	Oct/April	1650	1650
Mexico – Laredo, TX	Fletes Mex	4/2/91	Frozen	IQF Fruits and Veget	Frozen Broccoli	Oct/April	1180	1180
Mex Cty–El Paso–Salinas,CA	Fletes Mex	4/3/91	Frozen	IQF Fruits and Veget	Frozen Broccoli	Oct/April	2094	2094
Mex Cty–McAllen–NYC	Fletes Mex	4/3/91	Frozen	IQF Fruits and Veget	Frozen Broccoli	Oct/April	3628	3628
Mex Cty–Laredo–NYC	Fletes Mex	4/3/91	Frozen	IQF Fruits and Veget	Frozen Broccoli	Oct/April	3566	3566
Mex Cty–El Paso–NYC	Fletes Mex	4/3/91	Frozen	IQF Fruits and Veget	Frozen Broccoli	Oct/April	4309	4309

* Equipment (45'). Weight 42,000 lbs. Door–to–door rate.

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TABLE 3: COMMERCIAL AND CHARTER AIR COSTS

ROUTE	SOURCE	DATE	COMMODITY CATEGORY	COMMERCIAL RATE	CHARTER	AIRCRAFT	CAPACITY	DEPARTURES	COMMENTS
Lima, Peru–Miami, FL	Challenge	3/25/91	Pre–cut Fruits & Veg	$.90/kilo, min. 500 kilos	N/A	757	82,000 lbs.	Wed., Fri., Sun	Regular commercial service
Lima, Peru–Miami, FL	Challenge	3/26/91	Pre–cut Fruits & Veg	N/A	$51,359	707	38,000 kilos		7,348 cubic feet; 13 pallets
Lima, Peru–Miami, FL	Challenge	3/25/91	Pre–cut Fruits & Veg	N/A	$53,347	757	42,000 kilos		8430 cubic feet; 16 pallets
Lima, Peru–Miami, FL	Arrow Air	3/26/91	Pre–cut Fruits & Veg	N/A	$55,100	DC–862	85,000 lbs		Based on positioning empty
Lima, Peru–Miami, FL	Arrow Air	3/26/91	Pre–cut Fruits & Veg	N/A	$62,500	DC–863	97,000–100,000 lbs.		Based on positioning empty
San Jose, CR–Miami, FL	Challenge	3/26/91	Pre–cut Fruits & Veg	$.56/kilo, min. 500 kilos	N/A	757	82,000 lbs.	Daily	Regular commercial service
San Jose, CR–Miami, FL	Challenge	3/26/91	Pre–cut Fruits & Veg	N/A	$26,740	707	40–41,000 kilos		
San Jose, CR–Miami, FL	Challenge	3/26/91	Pre–cut Fruits & Veg	N/A	$27,963	757	42,500 kilos		
San Jose, CR–Miami, FL	Arrow Air	3/26/91	Pre–cut Fruits & Veg	$.56/kilo, min. 500 kilos	N/A	DC–862	85,000 lbs.	Thurs, Sun	Thursday flight is usually full; Sunday better.
San Jose, CR–Miami, FL	Arrow Air	3/26/91	Pre–cut Fruits & Veg	N/A	$24,000	DC–862	85,000 lbs.		Based on positioning empty
San Jose, CR–Miami, FL	Arrow Air	3/25/91	Pre–cut Fruits & Veg	N/A	$28,000	DC–863	97000–100,000 lbs.		Based on positioning empty
Sto Domingo, DR–Miami, FL	APA Int'l	3/26/91	Pre–cut Fruits & Veg	$.185/lb., min.$45/1100 lbs.	N/A	DC–6	30,000 lbs.	Daily except Sun Sun ex Pto Plata	Includes base rate, fuel surcharge, airport duties
Sto Domingo, DR–Miami, FL	APA Int'l	3/26/91	Pre–cut Fruits & Veg	N/A	$12,000	DC–6	30,000 lbs.		No backhaul. Same rate for Pto Plata origin.
Sto Domingo, DR–Miami, FL	Arrow Air	3/26/91	Pre–cut Fruits & Veg	N/A	$20,000	DC–862	85,000 lbs.		Based on positioning empty
Sto Domingo, DR–Miami, FL	Arrow Air	3/26/91	Pre–cut Fruits & Veg	N/A	$24,000	DC–863	97,000–100,000 lbs.		Based on positioning empty
Sto Domingo, DR–Miami, FL	Challenge	3/26/91	Pre–cut Fruits & Veg	N/A	$23,000	707	41,000 kilos		

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Unless otherwise noted, rates calculated on basis of 42,000 lbs. loadability per 40-foot trailer
Updated: April 8, 1991

TABLE 4: OCEAN SHIPPING COSTS

ROUTING	LOADING PORT	DISCHARGE PORT	COMMODITY CATEGORY	TARIFF COMMODITY DESCRIPTION/COMMENTS	RATE
Chile – NE, USA	Valparaiso	New York, NY	Canned tomatoes	Canned fruits and vegetables, NOS	2545
Chile – Europe	Valparaiso	Le Havre, France	Canned tomatoes	Foodstuffs, NOS Quote only	7200
Chile – Europe	Valparaiso	Rotterdam, Holland	Canned tomatoes	Foodstuffs, NOS Quote only	7200
Chile – Japan	Valparaiso	Yokohama, Japan	Canned tomatoes	Foodstuffs, NOS Quote only	10750
Costa Rica – South Florida, USA	Puerto Limon	Port Everglades, FL	Canned tomatoes	Foodstuffs, bottled, canned, pkged, preserved, bagged No specific rate for canned tomatoes	2780
Costa Rica – South Florida, USA	Puerto Limon	Port Everglades, FL	Pickles, in brine	Foodstuffs, bottled, canned, pkged, preserved, bagged No specific rate for pickles in brine	2780
Costa Rica – South Florida, USA	Puerto Limon	Port Everglades, FL	Dried fruit	Foodstuffs, bottled, canned, pkged, preserved, bagged No specific rate for dried fruit	2780
Costa Rica – South Florida, USA	Puerto Limon	Port Everglades, FL	IQF frozen vegetables	Frozen broccoli	4429
Costa Rica – South Florida, USA	Puerto Limon	Port Everglades, FL	Pre-cut vegetables	Broccoli, refrigerated	4408
Costa Rica – Northeast, USA	Puerto Limon	New York, NY	Pre-cut vegetables	Broccoli, refrigerated	6791
Costa Rica – South Florida, USA	Puerto Limon	Port Everglades, FL	Pre-cut fruit	Salad, fruit, including pieces packed	3352
Costa Rica – Northeast, USA	Puerto Limon	Northeast, USA	Pre-cut fruit	Salad, fruit, including pieces packed	5185
Costa Rica – South Florida, USA	Puerto Limon	Port Everglades, FL	Frozen juice concentrate	Concentrates or juices, NOS	2899
Costa Rica – Europe	Puerto Limon	Rotterdam, Holland	IQF frozen vegetables	Fruits and vegetables, frozen Rate is 4271 to Le Havre.	4460
Costa Rica – Europe	Puerto Limon	Rotterdam, Holland	Frozen juice concentrate	Fruit puree, pulp concentrate, NOS	4165

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Unless otherwise noted, rates calculated on basis of 42,000 lbs. loadability per 40-foot trailer
Updated: April 8, 1991

TABLE 4: OCEAN SHIPPING COSTS

ROUTING	LOADING PORT	DISCHARGE PORT	COMMODITY CATEGORY	TARIFF COMMODITY DESCRIPTION/COMMENTS	RATE
Costa Rica – Europe	Puerto Limon	Marseilles, France	Canned tomatoes	Foodstuffs, canned, bottled, NOS No specific rate for canned tomatoes.	20-ft 2370
Costa Rica – Europe	Puerto Limon	Rotterdam, Holland	Pickles, in brine	Foodstuffs, canned, bottled, NOS No specific rate for pickles in brine.	20-ft 2370
Costa Rica – Europe	Puerto Limon	Rotterdam, Holland	Dried fruit	Foodstuffs, canned, bottled, NOS No specific rate for dried fruit.	20-ft 2370
Costa Rica – Japan	Puerto Limon	Kobi, Japan	IQF frozen vegetables	No rate established	
Costa Rica – Japan	Puerto Limon	Kobi, Japan	Pre-cut fruits and veg	No rate established	
Costa Rica – Japan	Puerto Limon	Kobi, Japan	Frozen juice concentrate	Fruit puree and fruit juice, refrigerated	8248
Costa Rica – Japan	Puerto Limon	Kobi, Japan	Canned tomatoes	No rate established	
Costa Rica – Japan	Puerto Limon	Kobi, Japan	Pickles, in brine	No rate established	
Costa Rica – Japan	Puerto Limon	Kobi, Japan	Dried fruit	No rate established	
Dominican Republic – South Florida, USA	Haina	Port Everglades, FL	Canned tomatoes	Canned and bottled foodstuffs, non-refrigerated No specific rate for canned tomatoes	1144
Dominican Republic – South Florida, USA	Haina	Port Everglades, FL	Pickles, in brine	Canned and bottled foodstuffs, non-refrigerated No specific rate for pickles in brine	1144
Dominican Republic – South Florida, USA	Haina	Port Everglades, FL	Dried fruit	Canned and bottled foodstuffs, non-refrigerated No specific rate for dried fruit	1144
Dominican Republic – South Florida, USA	Haina	Port Everglades, FL	IQF frozen vegetables	Fruits and Veget, refrig, straight or mixed loads No specific rate for frozen vegetables	3971
Dominican Republic – South Florida, USA	Haina	Port Everglades, FL	Pre-cut fruits and veg	Fruits and Veget, refrig, straight or mixed loads No specific rate for pre-cut fruits or vegetables	3971
Dominican Republic – South Florida, USA	Haina	Port Everglades, FL	Frozen juice concentrate	Juice or juice concentrate, frozen	4314

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Unless otherwise noted, rates calculated on basis of 42,000 lbs. loadability per 40-foot trailer
Updated: April 8, 1991

TABLE 4: OCEAN SHIPPING COSTS

ROUTING	LOADING PORT	DISCHARGE PORT	COMMODITY CATEGORY	TARIFF COMMODITY DESCRIPTION/COMMENTS	RATE
Dominican Republic – Northeast, USA	Haina	Elizabeth, NJ	IQF frozen vegetables	Fruits and Veget, refrig, straight or mixed loads No specific rate for frozen vegetables	4173
Dominican Republic – Northeast, USA	Haina	Elizabeth, NJ	Pre-cut fruits and veg	Fruits and Veget, refrig, straight or mixed loads No specific rate for pre-cut fruits or vegetables	4173
Dominican Republic – Northeast, USA	Haina	Elizabeth, NJ	Frozen juice concentrate	Juice or juice concentrate, frozen	4426
Dominican Republic – Northeast, USA	Haina	Elizabeth, NJ	Canned tomatoes	Canned and bottled foodstuffs, non-refrigerated No specific rate for canned tomatoes	3185
Dominican Republic – Northeast, USA	Haina	Elizabeth, NJ	Pickles, in brine	Canned and bottled foodstuffs, non-refrigerated No specific rate for pickles in brine	3185
Dominican Republic – Northeast, USA	Haina	Elizabeth, NJ	Dried fruit	Canned and bottled foodstuffs, non-refrigerated No specific rate for dried fruit	3185
Dominican Republic – Europe	Haina	Rotterdam, Holland	IQF frozen vegetables	Frozen vegetables	4657
Dominican Republic – Europe	Haina	Rotterdam, Holland	Pre-cut fruits and veg	Fruits and vegetables, refrigerated	4050
Dominican Republic – Europe	Haina	Rotterdam, Holland	Frozen juice concentrate	Frozen juice concentrate	4657
Dominican Republic – Europe	Haina	Rotterdam, Holland	Canned tomatoes	Canned vegetables	3120
Dominican Republic – Europe	Haina	Rotterdam, Holland	Pickles, in brine	Pickles in brine	3120
Dominican Republic – Europe	Haina	Rotterdam, Holland	Dried fruit	Dried fruit	4050
Dominican Republic – Japan	Haina	Kobi, Japan	IQF frozen vegetables	No rate established (S/L, NYK, Zim)	
Dominican Republic – Japan	Haina	Kobi, Japan	Pre-cut fruits and veg	No rate established (S/L, NYK, Zim)	
Dominican Republic – Japan	Haina	Kobi, Japan	Frozen juice concentrate	No rate established (S/L, NYK, Zim)	
Dominican Republic – Japan	Haina	Kobi, Japan	Canned tomatoes	Crushed tomatoes, canned	2607

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Unless otherwise noted, rates calculated on basis of 42,000 lbs. loadability per 40-foot trailer
Updated: April 8, 1991

TABLE 4: OCEAN SHIPPING COSTS

ROUTING	LOADING PORT	DISCHARGE PORT	COMMODITY CATEGORY	TARIFF COMMODITY DESCRIPTION/COMMENTS	RATE
Dominican Republic – Japan	Haina	Kobi, Japan	Pickles, in brine	Foodstuffs, non-refrigerated No specific rate for pickles in brine	2607
Dominican Republic – Japan	Haina	Kobi, Japan	Dried fruit	Foodstuffs, non-refrigerated No specific rate for dried fruit	2607
India – Europe	Bombay	Rotterdam	Frozen juice concentrate	Frozen juice concentrate Quote, not a published rate	7180
India – Northeast, USA	Bombay	Elizabeth, NJ	Frozen juice concentrate	Frozen juice concentrate Quote, not a published rate	6750
India – Japan	Bombay	Kobi, Japan	Frozen juice concentrate	Frozen juice concentrate Quote, not a published rate	5530
India – California, USA	Bombay	Long Beach/Oakland	Frozen juice concentrate	Frozen juice concentrate Quote, not a published rate	5730
Israel – Northeast, USA	Haifa	New York, NY	Dried fruit	Fruits, Mixed containerloads of preserves No specific rate for dried fruit.	3475
Israel – Northeast, USA	Haifa	New York, NY	Canned tomatoes	Tomato products	2950
Israel – Japan	Haifa	Kobi, Japan	Dried fruit	Dried fruit Quote, not a published rate	4028
Israel – Japan	Haifa	Kobi, Japan	Canned tomatoes	Canned tomatoes Quote, not a published rate	4649
Peru – Europe	Callao	Rotterdam	IQF frozen vegetables	Refrigerated cargo, NOS Quote, not a published rate	6800
Peru – Europe	Callao	Rotterdam	Frozen juice concentrate	Refrigerated cargo, NOS Quote, not a published rate	6800

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Unless otherwise noted, rates calculated on basis of 42,000 lbs. loadability per 40-foot trailer
Updated: April 8, 1991

TABLE 4: OCEAN SHIPPING COSTS

ROUTING	LOADING PORT	DISCHARGE PORT	COMMODITY CATEGORY	TARIFF COMMODITY DESCRIPTION/COMMENTS	RATE
Peru – Europe	Callao	Rotterdam	Pickles, in brine	Foodstuffs, NOS Quote, not a published rate	6200
Peru – Europe	Callao	Rotterdam	Canned tomatoes	Foodstuffs, NOS Quote, not a published rate	6200
Peru – Europe	Callao	Rotterdam	Dried fruit	Foodstuffs, NOS Quote, not a published rate	6200
Peru – South Florida, USA	Callao	Miami, FL	IQF frozen vegetables	Frozen vegetables	6264
Peru – South Florida, USA	Callao	Miami, FL	Frozen juice concentrate	Juice Concentrate	6313
Peru – South Florida, USA	Callao	Miami, FL	Pickles, in brine	No rate established.	
Peru – South Florida, USA	Callao	Miami, FL	Canned tomatoes	Canned fruits or vegetables NOS No specific rate for canned tomatoes.	2649
Peru – South Florida, USA	Callao	Miami, FL	Dried fruit	Dried Fruit	4517
Peru – Northeast, USA	Callao	New York, NY	IQF frozen vegetables	No rate established.	
Peru – Northeast, USA	Callao	New York, NY	Frozen juice concentrate	No rate established.	
Peru – Northeast, USA	Callao	New York, NY	Pickles, in brine	No rate established.	
Peru – Northeast, USA	Callao	New York, NY	Canned tomatoes	Canned fruits or vegetables, NOS No specific rate for canned tomatoes	2477
Peru – Northeast, USA	Callao	New York, NY	Dried fruit	Dried fruit	4488
Peru – California, USA	Callao	Long Beach, CA	IQF frozen vegetables	Fruits and vegetables, all kinds, refrigerated No specific rate for frozen vegetables	6110
Peru – California, USA	Callao	Long Beach, CA	Frozen juice concentrate	Fruit juice, concentrate, refrigerated	2300
Peru – California, USA	Callao	Long Beach, CA	Pickles, in brine	No rate established.	

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Unless otherwise noted, rates calculated on basis of 42,000 lbs. loadability per 40-foot trailer
Updated: April 8, 1991

TABLE 4: OCEAN SHIPPING COSTS

ROUTING	LOADING PORT	DISCHARGE PORT	COMMODITY CATEGORY	TARIFF COMMODITY DESCRIPTION/COMMENTS	RATE
Peru – California, USA	Callao	Long Beach, CA	Canned tomatoes	No rate established.	
Peru – California, USA	Callao	Long Beach, CA	Dried fruit	Dried fruit in bags or cases	4310
Peru – Japan	Callao	Yokohama	IQF frozen vegetables	Refrigerated cargo, NOS Quote only, no rate established	10750
Peru – Japan	Callao	Yokohama	Frozen juice concentrate	Refrigerated cargo, NOS Quote only, no rate established	10750
Peru – Japan	Callao	Yokohama	Pickles, in brine	Foodstuffs, NOS Quote only, no rate established	9750
Peru – Japan	Callao	Yokohama	Canned tomatoes	Foodstuffs, NOS Quote only, no rate established	9750
Peru – Japan	Callao	Yokohama	Dried fruit	Foodstuffs, NOS Quote only, no rate established	9750
Philippines – Europe	Manila	Rotterdam	Dried fruit	Dried fruit Quote, not a published rate	3166
Philippines – Europe	Manila	Rotterdam	Frozen juice concentrate	Frozen juice concentrate Quote, not a published rate	4789
Philippines – Northeast, USA	Manila	New York, NY	Dried fruit	Foodstuffs and beverages, non-refrigerated NOS No specific rate for dried fruit	3315
Philippines – Northeast, USA	Manila	Elizabeth, NJ	Frozen juice concentrate	Refrigerated fruit or concentrate	5620
Philippines – California, USA	Manila	Long Beach, CA	Dried fruit	Foodstuffs and beverages, non-refrigerated NOS No specific rate for dried fruit	2110
Philippines – California, USA	Manila	Long Beach, CA	Frozen juice concentrate	Juice, concentrated, refrigerated	4434

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Unless otherwise noted, rates calculated on basis of 42,000 lbs. loadability per 40-foot trailer
Updated: April 5, 1991

TABLE 4: OCEAN SHIPPING COSTS

ROUTING	LOADING PORT	DISCHARGE PORT	COMMODITY CATEGORY	TARIFF COMMODITY DESCRIPTION/COMMENTS	RATE
Philippines – Japan	Manila	Kobi, Japan	Dried fruit	Dried fruit Quote, not a published rate	880
Philippines – Japan	Manila	Kobi, Japan	Frozen juice concentrate	Frozen juice	3080
Sri Lanka – Europe	Colombo	Rotterdam	Pickles, in brine	Pickles in brine Quote, not a published rate	3073
Sri Lanka – Northeast, USA	Colombo	Elizabeth, NJ	Pickles, in brine	Gherkins, in brine, in drums	20-ft 2105
Sri Lanka – Japan	Colombo	Kobi, Japan	Pickles, in brine	Pickles in brine Quote, not a published rate	1720
Sri Lanka – California, USA	Colombo	Long Beach, CA	Pickles, in brine	Gherkins, in brine, in drums	20-ft 1685
Thailand – Europe	Bangkok	Rotterdam	Dried fruit	Dried fruit Quote, not a published rate	3266
Thailand – Europe	Bangkok	Rotterdam	Pickles, in brine	Pickles, in brine	3266
Thailand – Europe	Bangkok	Rotterdam	Frozen juice concentrate	Refrigerated cargo No specific rate for juice concentrate	4683
Thailand – Northeast, USA	Bangkok	Elizabeth, NJ	Frozen juice concentrate	Refrigerated fruit juice concentrate	4954
Thailand – Japan	Bangkok	Kobi, Japan	Frozen juice concentrate	No rate established.	
Thailand – California, USA	Bangkok	Long Beach, CA	Frozen juice concentrate	Refrigerated juice concentrate	3735

INFORMATION SOURCES

Alcantar & Brown
Customs Brokerage/Freight Forwarding
El Paso, TX
tel: (915)858-1022
contact: Joe Alcantar, Jr.

American Trucking Association
Alexandria, VA
tel: (703) 838-1793
contact: Russ Kapelle, Emery Williams

APA International
Miami, FL
tel: (305) 526-3304
contact: Jorge Rodriguez

Arrow Air
Miami, FL
tel: (305) 526-0900
contacts: Jon Batchelor, Pam Holt, Dan Stevens

Chilean Line
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Crowley Caribbean Transport
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contact: Mario Lopez

Challenge Air Cargo
Miami, FL
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contacts: Ivy Guerrero, Sam Robbin

Danny Herman Trucking
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Empresa Naviera Santa
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Flota Mercante Grancolombiana
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Hapag-Lloyd
Miami, FL
tel: (305) 591-8410
contact: Carson Ausgebeauer

Fletes Mexicanos Chihuahua
Juarez, Mexico
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contact: Gustavo Gomez

Florida Shipper Magazine
Miami, FL
tel: (305) 576-6766

Freymiller Trucking
Bakersfield, CA
tel: (805) 397-4151
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Interstate Commerce Commission (ICC)
Washington, D.C.
tel: (202) 275-7260
contacts: Bill Chamberlain, Andrew Lee, Larry Herzig

Journal of Commerce
New York, NY
tel: (212) 837-7000

Lykes Lines
Miami, FL
tel: (305) 374-6400

Red Book
Shawnee Mission, KS
tel: (913) 451-6605

Refrigerated Transport
Dallas, TX
tel: (214) 565-0296

Sea-Land Service
Elizabeth, NJ
tel: (800) SEA-LAND

Transfryos
Guatemala City, Guatemala
tel: (502) 2 25541, 536308
contacts: Sr. Bianchi, Jim Marsh

United Fresh Fruit and Vegetable Association
Alexandria, VA
tel: (703) 836-3410

USDA/Agricultural Marketing Service
Washington, D.C.
tel: (202) 447-2175
contacts: Jim Gwynn, Bill Crocker

USDA/Office of Transportation
Washington, D.C.
tel: (202) 245-5328
contact: Freeman Buckston

Zim Container Service
New York, NY
tel: (800) 444-2000
contact: Gilbert Lugo

APPENDIX IV

The Japanese Market

APPENDIX IV

Supplemental Japanese Market Description

The strengthening yen over the last few years has created many new opportunities for high value food exporters to Japan. Over the past three years alone, the stronger Japanese yen has cut the yen cost of a dollar's worth of imported food in half, stimulating increased interest in imported food among wholesalers, supermarket chains, department stores and food service chains, as well as traditional importers. Japanese food processors are also showing greater interest in producing foods abroad for the Japanese market.

Japanese per capita expenditures for food are now among the highest in the world. Average per capita disposable income is now higher in Japan than it is in the United States, but the average Japanese spends 25% of disposable income for food compared to 14% in the US. Japanese consumers demand top quality products and are willing to pay premium prices to insure that they get them.

Eighty percent of Japan's population lives outside of the Tokyo metropolitan area but relatively few imported food products have nation-wide distribution. Sales of imported foods are hampered by the complexity of the Japanese distribution system and the high cost of making trade calls to small firms outside of Tokyo.

Changing lifestyles and dietary patterns are creating opportunities for expanding sales of imported food products. An increase in the number of working women and single adults living alone is resulting in and expanding demand for convenience foods. Younger people are learning to enjoy a more Western-style diet, generally due to the increasing affluence within Japan, but also in part because of the rapid expansion of fast food outlets.

Processed foods are attractive to working women, who now account for 40% of all Japanese women. The proliferation of full-sized refrigerators and microwave ovens is encouraging interest in microwavable frozen foods.

The demand for convenience, the lack of refrigerator and freezer space in the distribution chain are driving forces in the proliferation of dual ovenable, retortable and shelf-stable packages. Hot filled packed pouches and aseptic packages are in evidence everywhere. Self-heating containers for beverages and convenience foods are proliferating. This is a serious restraint to the expansion of frozen foods in Japan. More frozen and chilled foods will enter the consumption stream as refrigerated distribution and storage increase.

There is a perception that "what is new" and "what is good" comes from abroad. However, the slightest hint of shoddiness, even if it might be excused in a Japanese product is taboo in an

imported product.

Competition in Japan is fierce. Competition will continue to be fierce at distributor and retail levels alike, with imports adding to the mass of products available. Whereas in the US there are approximately 9,000 new products introduced annually, Japan experiences nearly 30,000 new product introductions.

Japan is a huge, wealthy and rapidly growing market. It is one of the world's most challenging and competitive markets. It is also sophisticated, technologically advanced, and one of the toughest markets in the world to penetrate. Customers are very loyal to their suppliers and are much more demanding in terms of quality, service and delivery schedules than are customers in the rest of the world. Packaging plays a particularly important role in the competitive battle in food processing.

Even though the Japanese market is very demanding, it can also be extremely rewarding to those who succeed in mastering it's special needs. While Japan has a total land area slightly smaller than California, it is the second largest consumer market in the world, with a population of about half of that of the United States (121.7 million in 1896). In 1986, Japan's total food imports amounted to $ 20.8 billion. By 1988 total Japanese food imports had topped 30 billion.

Incomes have risen rapidly in Japan over the past two decades. In 1987, annual average disposable income was $19,642, slightly above the average in the United States.

Principal sources:

1. Processed Food Packaging in Japan. Bryson R. Bailey, Jr. Washington State Department of Agriculture, Olympia, Washington; and Sam Payne & Associates, Bellvue, Washington.

2. Foreign Agriculture Service, USDA
Backgrounder Report - Japan: The Market for US Food and Farm Products.

3. Japan External Trade Organization (JETRO).

4. Personal interviews.

APPENDIX V. JAPANESE SUPERMARKETS & BUYING GROUPS WITH OFFICES ABROAD

APPENDIX V

SELECTED JAPANESE MAJOR SUPERMARKETS WHO OWN OFFICES IN THE US

COMPANY	ADDRESS	CITY	COUNTRY	CONTACT
The Daiei Inc.	Shuwa Shiba Park Bldg., 2-4-1, Shiba Koen	Minato-ku, Tokyo	Japan 105	Mr. Kenji Fujiwara
The Seiyu Lyd.	Sunshine 60 Bldg., 3-1-1, Higashi-Ikebukuro	Toshima-ku, Tokyo	Japan 107	Mr. Kunio Ueno
Ito Yokado Co. Ltd.	4-1-4, Shiba Koen 4-Chome	Minato-ku, Tokyo	Japan 105	Mr. Fumio Kobayashi

SELECTED JAPANESE RETAILERS/JOINT PURCHASING ORGANIZATIONS

COMPANY	ADDRESS	CITY	COUNTRY	CONTACT
AIC Inc.	2-8, Kanda Jimbo-cho 3-chome	Chiyoda-ku, Tokyo	Japan 101	Mr. Kaoru Nakamura
Nihon Ryutsu Sangyo	3-1-15, Honmachi, Chuo-ku	Osaka	Japan 541	Mr. Iwao Saji
C.G.C. Japan	2-1-1, Okubo, Shinjuku-ku	Tokyo	Japan 169	Mr. Shouzo Ueda
Century Trading	Hakuho Bldg., 5-17-11, Shinjuku	Shinjuku-ku, Tokyo	Japan 160	Mr. Keiji Ono

APPENDIX VI

INDIVIDUALS CONTACTED AND INTERVIEW GUIDES

INDIVIDUALS CONTACTED AND INTERVIEW GUIDES

CONTACT	TITLE	ORGANIZATION	CITY	STATE COUNTRY
Abreu Nunez, Augustin	Technical Director	Coscos	Santo Domingo	Dominican Rep.
Adriazola, Jorge R.	Gerente General	CANEB	La Paz	Bolivia
Aldrich, Edward	Sales Engineer	Key Technologies	Wala Wala	WA
Aliica, Jesus	President	Chuito Farms	Guayama	Puerto Rico
Aliendre Lafuente, Eddy	Gerente Produccion	SEASA	Cochabamba	Bolivia
Alvarez, Ricardo	President	Club Chef	Cincinnati	OH
Ampuero Ramos, Luis	Agricultural Economist		La Paz	Bolivia
Arana Quintanilla, Enrique	Consultor en Manufacturea	INPEX	La Paz	Bolivia
Araujo Galindo, Daniel	Evaluador de Proyectos	U.C.F.	Cochabamba	Bolivia
Arias Castro, Juan M.	Gerente General	CruZex	Santa Cruz	Bolivia
Arnold, Gus	Director of Marketing	San Francisco Food Bank	San Francisco	CA
Arroyo, Juan L.	Sales Mgr., Foreign Ports	Govt. of Puerto Rico	San Juan	Puerto Rico
Arteaga Cospedes, Jose Luis	Gerente	Arteaga S.R.L.	Santa Cruz	Bolivia
Arteaga, Marlene	Sub-Gerente General	Camara Dept. de Industria	Cochabamba	Bolivia
Bahomonde Gonzalez, Ana	CPA	Manzano-Bahamonde Cert. Pub. Accts.	Bayamon	Puerto Rico
Barbee, William	Advisor	CINDE/CAAP	San Jose	Costa Rica
Bareno, Harry	Mgr. for LA & Caribbean Reg.	Aruba Foreign Investment Agency	Oranjestad	Aruba
Barillas, Maria Regina	Coordinator	Gremial de Exportadoras	Guatamala City	Guatamala
Barnard, Steve	President	Mission Produce	Oxnard	CA
Baucomb, William	Agriculture Dev. Officer	USAID		Costa Rica
Bennet, Louis	Gulf South Reg. Manager	Vie de France Culinary Corporation	Denner	LA
Biggs, Dee	Director of Logistics	Welch Grape Juice Co.	Westfield	NY
Borchers, Diane	Director of Marketing	Dalgety Produce, Inc.	Salinas	AZ
Borgman, Mike	Bird's Eye, Reg. Sales Mgr.	The All American Gourmet Co.	Newport Beach	CA
Bowman, Dick	VP, Agriculture	Vlassic Pickles	Farmington Hills	MI
Breuers, Nico	President	Nico Breuers BV	Venlo	Netherlands
Brodski, Arnold	Chief Engineer	AK Robbins & Co., Inc.	Baltimore	MD
Brooks, Pat	President	J.R. Brooks & Son, Inc.	Homestead	FL
Brown, Douglas	Private Sector Relations	US Dept. of Ag.-Office of Int'l Coop. & Dev.	Washington	DC
Bryce, Adolf		Dole	Salinas	CA
Bubnis. Tom		Network Associates	Salinas	CA
Buddi, Bjorn	President	Unimark	Argyle	TX
Byers, Don	Operations Manager	Simplot	Boise	ID
Calixte, George	Executive Director	Caribbean Ag. Research & Dev. Inst.	Castries	St. Lucia
Campos. Julio	Managing Director	Verdufrex	San Lucas	Guatamala

INDIVIDUALS CONTACTED AND INTERVIEW GUIDES

CONTACT	TITLE	ORGANIZATION	CITY	STATE COUNTRY
Cespedes, Jorge		ACDI	San Jose	Costa Rica
Chatt, Joe	President	Caribe Express	Aguadilla	Puerto Rico
Cornick, Tully	Agricultural Dev. Officer	U.S. Agency for International Dev.	Guatamala City	Guatamala
Crossin, Bill		The All American Gourmet Co.	Newport Beach	CA
Davis, Bill	Ag Attache Officer	USDA/FAS	Mexico City	Mexico
Delporte, Mark		Frost Impex	Aaiveke	Belgium
Diederich, William	Food Resource Consultant	Second Harvest (Nat'l. Food Bank Network)	Orange	CA
Dilone, Silvia	Director of Production	Producots doe Valle, S.A.	Santo Domingo	Dominican Rep.
Domont, Jacques		Agro 10	Paris	France
Donohue, Dennis	VP Food Svc. Mkt. & Proc. Veg	Dole Fresh Vegetables	Salinas	CA
Drever, Mark		Fresh Co.	Salinas	CA
Duidencio, Marcelo	Gerente	U.C.F.	Cochabamba	Bolivia
Eames, Donald		Gilbert Foods	Hanover	MD
El Ehwany, Nazmy	Consultant		Oxford	MD
Elias, Jandira	Mgr., Commerce Promotion	Gremial de Exportadoras	Guatamala City	Guatamala
Espinal, Juan Jose	Economist	Joint Ag. Coordinating Committee	Santo Domingo	Dominican Rep.
Estrada Palomo, Ricardo	Commercial Info & Mkt. Analyst	Gremial de Exportadoras	Guatamala City	Guatamala
Estrada, Alvaro	Sector Manager	CINDE/CAAP	San Jose	Costa Rica
Exbicki, Edward	Eastern Zone Sales Mgr.	Pkg. Corp. of America - Tenneco	Powell	OH
Farfan Mealla, Oscar	Director Ejecutivo	INPEX	La Paz	Bolivia
Fernando de la Rosa, Juan	Planning	Banco de Guatamala	Guatamala City	Guatamala
Figueroe, Alvaro	Owner	Fresas Del Llano	Cartago	Costa Rica
Flick, Robert	Chief of Party	Agriculture Cooperative Dev. Int'l.	Colombo	Sri Lanka
Fonseca, Gerardo	Promotional Official	Islania de Alementos	San Juan	Puerto Rico
Frommander, Richard	Marketing Advisor	PROEXAG	Guatamala City	Guatamala
Garcia, Tulio Rene	Executive Director	Cooperativa Agricola Integral	Santiago	Guatamala
Garry, Jim	Partner	Garry Packing Inc.	Del Rey	CA
Gaskill, Mark		Chestnut Hill Farms	Miami	FL
Gifford, Gerry	VP, Marketing	Cisco	Houston	TX
Gilomen, Tom	Vice President, Sales	AIM Plastics	Sandy	UT
Gonzales Zuniga, Alberto	Promocion de Exports	Carana Corporation	Cochabamba	Bolivia
Graulich, Les	Chief Exec. Officer	Alpac Foods	Santa Maria	CA
Guercio, Randy	Vice President, Produce	Cuercio Company	New Orleans	LA
Gunderman, Randy		The Red Bock	Lincolnshire	IL
Haley, Kevin	Ag. Attache Officer	USDA/FAS	Mexico City	Mexico

INDIVIDUALS CONTACTED AND INTERVIEW GUIDES

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Hash, Charles T.	Funcionario Supervisor	USAID	La Paz	Bolivia
Hodgson, Aurora	Processing Specialist	Univ. of Hawaii, Manoa	Honolulu	HI
Huber, Rick		Dole Fresh Vegetable Co.	Salinas	CA
Huff, Peter	Manager of Purchasing	Campbells	Camden	NJ
Hutson, Billy		American Food Service	Dallas	TX
Idol, Ronald	Dir. of Technology	Multiform Desiccants, Inc.	Buffalo	NY
Kanan, Dr. Sidney	Technical Expert	Camerican	Teaneck	NJ
Karr, Miriam		Chase Manhattan Bank	New York	NY
Kirk, Cynthia		Mann Packing	Salinas	CA
Kjaersgaard Eriksen, Erik	M. Sc. Econ.	Oficial de Programas Especiales Onudi	La Paz	Bolivia
Klocke, Ray	VP Fresh Sales	Chiquita Brands Co.	Cincinnati	OH
Klonsky, Karen		UC David Ag. Econ. Dept.	Davis	CA
Korrison, John		Top Frost International	Surrey	England
Kortbech-Olesen, Rudy	Sr. Market Advisor	Int'l. Trade Centre - UNCTAD/GATT	Geneva	Switzerland
Kraidy, Michael		Sunripe Co.	Miami	FL
Kuehn, Stanley	Chief of Party	National Cooperative Bus. Assoc.	San Salvador	El Salvador
Lamb, John	Chief of Party	PROEXAG	Guatamala City	Guatamala
Lamba, Vijay	Export Sales Manager	Frigoscandia Food Proc. Systems, Inc.	Bellevue	WA
Lara, Luis	Agriculture Loans	Banco Interamerican de Desarrollo	Guatamala City	Guatamala
LaSister, Coy	Director of Markets	Wholesale Food Mkt. Dev. Prog.	New York	NY
Layton, Steve	VP Marketing	Ready Pac	Pasadena	CA
Levan, Nanette		The All American Gourmet Co.	Newport Beach	CA
Levy, Eric		Great American Farms, Inc.	Pompano Beach	FL
Leyton, Gerardo	President	Camara Dept. de Industria	Cochabamba	Bolivia
Long, Phil		Dennis Sales, Ltd.	Salisbury	MD
Lonsdale, Tommy	Planeamiento y Coordinacion	Vascal S.A.	La Paz	Bolivia
Menacho Espejo, Carlos	Assesor	CADEX	Santa Cruz	Bolivia
Miron, Danilo	President	Multirel, Food Div. of Mercantil Ciusa	Guatamala City	Guatamala
Moreno, Jaime A.	General Manager	Helados Bon	Santo Domingo	Dominican Rep.
Morriss, Bob	VP Sales, Pacific Rim	Morriss and Associates	Diamond Bar	CA
Moulton, Kirby		Univ. of CA, Extension	Berkeley	CA
Murtaugh, Tom	Technical Director	Club Chef	Cincinatti	OH
Nazarowski, Jim	VP Sales	Orval Kent	Wheeling	IL
Nieto, Rafael		Hidrocultivas del Caribe S.E.	Juana Diaz	Puerto Rico

INDIVIDUALS CONTACTED AND INTERVIEW GUIDES

CONTACT	TITLE	ORGANIZATION	CITY	STATE COUNTRY
Noriega, Diane		Valley Foreign Trading	McAllen	TX
Nucci, Don	Partner	Mann Packing	Salinas	CA
Ogg, Kelly	Customs Broker	Zerweck	Long Beach	CA
Orozco, Julio	Investment Unit	Gremial de Exportadoras	Guatamala City	Guatamala
Pagan, Jose	Coordinator-Marketing Prog.	P.R. Department of Agriculture	Santurce	Puerto Rico
Palenque, Luis	Vice President Ejecutivo	VASCAL	La Paz	Bolivia
Pena, Roberto	Gerente General	Dillman	Cochabamba	Bolivia
Perez, Manny	VP Operations & Dev.	Del Monte	Miami	FL
Posner, Howard	Business Dev. Manager	Harborside Refrigerated Services, Inc.	Tampa	FL
Prahm, Niels		Inpex Lapaz Angorasport	La Paz	Bolivia
Preska, Robert		Lamex Foods, Inc.	Bloomington	MN
Preston, Patti	Chief of Party	Diversified Ag. Research Project	Peradeniya	Sri Lanka
Quiroga Salamanca, Fernando	Gerente Regional	SEASA	Cochabamba	Bolivia
Rapuzzi, Peter	Vice President	Chase Manhattan Bank	New York	NY
Rawal, Kanti	President	California Hybrids	San Leandro	CA
Reed, Ray	Purchasing Manager	Ore-Ids Foods, Inc.	Boise	ID
Reish, Tom	Broker	John Stanley Horne Co.	San Francisco	CA
Richey, Bob	Ag Attache Officer	USDA/FAS	Mexico City	Mexico
Rielly, John		Rielly Food Brokerage	Orange	CA
Rios Ore, Hugo	Sector Specialist	Banco Interamerican de Desarrollo	Guatamala City	Guatamala
Rivera Masis, Carlos	General Manager	Coo-Agros	Tierra Blanca	Costa Rica
Roca Leigue, Carlos	Gerente General	IBCE	Santa Cruz	Bolivia
Roebuvk, William	Executive Director	Dep. of Econ. Dev. & Ag. Govt. - Vir. Islands	St. Croix	U.S. Virgin Isl.
Rojas, Fernando	Technical Director	Tico-Palma	San Jose	Costa Rica
Rood, Alex	President	Plantaciones Tropicales, S.A.	Santo Domingo	Dominican Rep.
Runsten, David		Univ. of CA, Extension Service	Berkeley	CA
Salazar Franco, Jorge Luis	Plant Manager	Industria Exportadora de Alimentos	Santo Tomas	Guatamala
Salomon, Rene	Gerente General	Sohfrut	Santa Cruz	Bolivia
Samayoa, Rudolfo	Manager, Agricultural Products	Gremial de Exportadoras	Guatamala City	Guatamala
Sattler, Roger	Intl. Bus. Dev., Fresh Fruits/Vegs.	NTG Gargiulo, Inc.	Naples	FL
Saulsbury, Orrell	President	Saulsbury Bros.	Ridgely	MD
Schwarz, Bob	Director of Int'l Ops.	Green Giant	Minneapolis	MN
Semens, Homer	Production Manager	Saulsbury Brothers	Ridgley	MD
Sencker, Joel	Project Eng. Int'l Projects	FMC International AG	Madera	CA
Shoemaker, Kent		Red's Fischer Group	Orlando	FL

INDIVIDUALS CONTACTED AND INTERVIEW GUIDES

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Sittenfeld, Curtis	Director Ejecutivo	Carana Corporation	La Paz	Bolivia
Sosnoski, Donald	Managing Dir. of Export Sales	Patterson Frozen Foods, Inc.	Patterson	CA
Spink, Dennis		AgriPac	Salem	OR
Starke, Judy		Frozen Herbs Ltd.	Suffolk	England
Stashun, Somner	Food Processing Analyst	Food Plant Engineering, Inc.	Yakima	WA
Stillman, Andrew		American Importing Co.	Minneapolis	MN
Sulit, Danny	Industrial Operations Mgr.	Camerican	Teaneck	NJ
Thomas, Dana	Dir. of International Ops.	Calavo	Tustin	CA
Thomas, Dennis	Bus Planning Mgr., West Coast Div.	CONAGRA Frozen Foods	Scottsdale	AZ
Trundle, Doug	Vice President	Choppin' Block Produce Co.	Dallas	TX
Tuggle, Tom	National Sales Manager	California Prune Packing Co.	Live Oak	CA
Turnbull, Richard		Mister T Int'l Frozen Foods	Surrey	England
Unanue, Frank	President	Goya Foods	Bayamon	Puerto Rico
Unrein, John	President	The Packer	Lincolnshire	IL
Valletta, Mike		Valletta & Co.	Pompano Beach	FL
Van Sevenant, Piet		Frost Impex	Aaiveke	Belgium
Vasquez, Eduardo	Gerente General A.I.	Del Valle	Cochabamba	Bolivia
Velazquez, Mario	President	Latin Trading and Inversiones	Santo Domingo	Dominican Rep.
Velez, Julian	General Manager	Agro-Negocios	Lima	Peru
Wahl, Daniel	Director of Imports	Heartland Prod. Marketing, Inc.	Miami	FL
Walker, Ray	Chief Executive Officer	Nor-Cal Crosetti Foods	Salinas	CA
Ward, Steve	Partner	Sea Wind Trading	Carlsbad	CA
Weiss, Kenneth		LAC-Tech Chemonics	Washington	DC
Willison, Judith	Quality Assurance Mgr.	Cisco	Santa Clara	CA
Wirt, Thomas	SW Regional Vice Pres.	Glico Harmony	Walnut	CA
Zaelani, Koko		PT. Univ. Indomatra/Asia Permai Group	Jakarta	Indonesia

INTERVIEW GUIDE

The following guideline has been used when interviewing producers, exporters and marketers during the field visits.

1. Name

2. Company Name

3. Title/Responsibilities

4. Products
   - history (number of seasons)
   - decision to produce

5. Process Type
   - number of plants
   - location(s)
   - number of employees

6. Volume
   - domestic (%)
   - export (%)

7. Shipping/Logistics
   - sea, air, surface (%)
   - frequency
   - rates

8. Constraints

9. Advantages

10. Why Success?

11. Why not Success?

12. Plans for the Future

13. Production Base
    - size
    - characteristics
      - many small growers?
    - terms of trade with growers

14. Production costs

15. Margins

16. Cultural acceptance

17. Interest in Joint Ventures

APPENDIX VII

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PN-ABK-315

FRUIT AND VEGETABLE PROCESSING OPTIONS FOR THE LATIN AMERICAN AND CARIBBEAN REGION

VOLUME II of II

Prepared for USAID/LAC/DR/RD

Contract Number LAC-0654-C-00-0033-00

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May 31, 1991

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I. Fresh Pre-Cut Fruits and Vegetables

Major Competitor for Fresh Pre-cut Fruits and Vegetables

I. FRESH PRE-CUT VEGETABLES AND TROPICAL FRUITS

Executive Summary

Fresh pre-cut fruits and vegetables have been available to American consumers for just over 20 years, but recently their popularity and importance have been increasing. Several factors are fueling this growing demand.

The foodservice industry is constantly seeking simpler, less costly ways of preparing menu items. Fresh pre-cut produce is currently the fastest growing segment in this industry as it helps reduce storage space requirements; allows for less waste and better overall produce yields; and provides pre-portioned packaging, taking the guesswork out of prepping produce in the kitchen.

While the foodservice sector was initially the largest market for fresh pre-cuts, the retail sector offers great promise with potential for greater profits. Consumers are increasingly more convenience-minded and pre-cut produce is now a common component of retail grocery produce sections.

Behind the scenes, facilitating this growth are the ever-improving sciences of advanced packaging, storage and shipping. Important strides have been made in "smart", "breathable" membrane films for packaging; sophisticated controlled atmosphere (CA) for storage and shipping; and "superchilling" processes. These and other innovations have extended shelf life to 18 days for fresh pre-cut vegetables and 28 days for fresh pre-cut fruit. Research is enthusiastically on-going and it can be assumed that continued advances will be made.

While the target market is limited to the United States for this category (due to perishability factors), currently attainable shelf lives make it feasible for certain LAC countries to enter into this very lucrative and dynamic market.

Broccoli and cauliflower are the most interesting vegetable candidates for production in LAC due to the extensive hand labor required for cutting and trimming. Tropical fruits and fruit salads, however, present the strongest pre-cut options. The most common fruits used are citrus, pineapple, and melons - but other fruits such as mango, berries, papaya, etc. are also utilized. All these fruits (with the exception of pineapple) also require significant hand labor for cutting.

Mexico will be the primary competitor of LAC producers. Close to 50% of the U.S. production of frozen broccoli has moved off shore over the last few years - 90% to Mexico. The same economic forces that fueled this move will soon begin to impact the fresh

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pre-cut industry as the business matures. Mexico's geographic proximity to the U.S. markets gives them a freight advantage relative to countries in the LAC region, but these higher transportation costs are offset by a 17.5% duty on Mexican vegetable imports from which the CBI beneficiary countries are exempted.

Several U.S. firms have expressed interest in working with a start-up fresh pre-cut project in the region. The strongest expressions of interest on the part of these firms has been for tropical fruits rather than vegetables.

The central challenge for the LAC producer/shippers will be to maintain the quality and integrity of the fresh product throughout the entire distribution chain. This requires excellent management control (particularly of critical temperature requirements) at each link in the chain.

Processing technology for fresh pre-cut products is relatively unsophisticated, with a typical pre-cutting facility requiring about 20,000 square feet. Equipment costs for a pineapple operation, including a mechanical corer/peeler and cutting equipment, would cost close to $200,000. Without the special pineapple equipment, total cost would be approximately $100,000.

To illustrate impact on the local economy: a viable fruit operation would produce about one truck load a day, requiring about 1 hectare to support each day's production. Beyond the farm, additional employment opportunities would exist at the facility - ranging from 20 to 63 workers, depending upon the product.

An important USAID function would be to identify an interested and capable local group of growers and businessmen, and to facilitate a joint venture agreement. The U.S. firms who have expressed interest are not in the agricultural end of the business - they are processors and marketers. These importers may need to be reassured that the new producing groups can perform. It would be a useful and appropriate role for USAID to support the initiative with a project that would provide comfort by assuring the availability of high quality, pesticide-free raw material.

A USAID project could play an invaluable role in assisting in the organization of the growers and the raw material supply, and assisting the growers to establish cost-effective methods of production that will allow them to make sufficient profits in this competitive environment.

Another very important role for USAID would be in supporting pertinent research. Industry sources have estimated that fresh pre-cuts fruits could grow into a $150 million industry. There is substantial on-going research in shelf life extension, and in sanitary control. It is this research that will provide the basis

for further growth of this industry. Considering the importance to the region, it would be useful to have research conducted at a LAC region institution - focused specifically on problems with tropicals. This could be done in a cooperative program with a U.S. institution and would also have the result of strengthening the skills of the LAC region's institutions, providing a base for further development in this science.

A. General Description of the Industry

In what is emerging as a decade preoccupied with time, convenience and waste reduction, fresh pre-cut produce is becoming a symbol of the times. Pre-cut has been on the scene for some two decades, but only recently has it begun to hit stride. The number of processors is mushrooming, the variety of products is growing and advancing technology promises to improve quality. The enormous strides that have been made in the packaging and storage sectors are the driving forces which make the high volume fresh pre-cut industry viable. Packaging innovations will be discussed in detail later in this section.

In the context of this study, the target market for fresh pre-cut products is limited to the United States and production is best suited to the Central American and Caribbean regions because these fresh products have narrow shelf life time limits. Statistics are virtually non-existent for this category since it is so new, but industry participants report recent yearly growth as high as 60-70% and say that demand continues to grow as consumers become aware of product availability (Don Nucci, Mann Packing). A boon to continued growth is the emphasis and support our government gives to health conscious diets - with fresh produce representing an important component.

According to trade estimates, pre-cut produce sales currently approximate $80 million. But as the foodservice sector continues to seek greater efficiencies and retail consumers demand more convenience-oriented food products, pre-cut seems well positioned to skyrocket in coming years and some in the industry estimate a $4 to $8 billion market in 10 years.

In fact, pre-cut produce is the fastest growing segment of the foodservice industry as restaurateurs and institutional feeders look for simpler, less costly ways of preparing menu items. A recent survey by Restaurant Business magazine and the Produce Marketing Association found that one-third of restaurants surveyed used at least some pre-cut produce, with an additional 15% expressing interest in adding pre-cuts. The rising minimum wage, combined with foodservice employer liability and insurance concerns for employees handling sharp knives combine to make the future of off-site pre-cut processing more attractive. Distributors tapping

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this trend point to these additional advantages for foodservice operators:

- Significantly reduced storage space requirements, both in the warehouse and in the operator's cooler.

- Less waste and better yield. Pre-cut produce arrives in 100 percent usable condition. All of the product goes on the plate or in the salad bar, eliminating the waste associated with bulk produce.

- Pre-portioned packaging that takes the guesswork out of prepping bulk produce for a given meal period.

While the foodservice sector has historically been considered a safer and more promising market, innovative pre-cut marketers are now looking to the retail sector where payoffs may be greater. Retailers typically target two types of consumers, with distinct product requirements and attributes:

- Up-scale customers who are attracted to pre-cuts for high quality, freshness and year-round availability. These customers will pay top dollar, but will expect very high quality and freshness will be key. For this reason, it is likely that the products will be processed within the retail facility. Many up-scale retail stores have introduced "islands" positioned within the produce section where workers prepare the products in full view of the customers. These facilities are expensive (initial investment in space and equipment can range from $1 - $1.5 million or more) and trained labor is costly, but they enhance the client's perception of freshness and quality.

- Convenience seeking customers who are attracted to pre-cuts for other reasons characterized by time-savings and waste reduction. For these buyers the challenge will be to design innovative packaging such as single servings and microwave-ready trays, some of which are wrapped with sauce packs. These products would most likely be produced away from the store in regional centers and delivered on a timely basis.

There are now three types of pre-cut operations - national, regional, and in-store. National operators such as Mann and Bud (California), centralize their processing operations in the producing area, and distribute the finished product nationally. Regional operators market in a geographic area in close proximity to the processing facility, and source their raw material nationally. In-store operators engage in pre-cut activities on location where the product is being sold at retail. There is no consensus as to which approach is apt to prove most successful in

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the long run. Pre-cut is a very new industry and it is undergoing significant change and improvement as it grows.

B. Selected Products

Major fresh pre-cut vegetable items include lettuce, cabbage, mixed greens, carrots, broccoli and cauliflower. Most high-volume processing (cutting) is done mechanically. However, in the pre-cut vegetable category broccoli and cauliflower have costly hand labor requirements, making them interesting products for production in LAC countries. With proper packaging and handling, shelf life for pre-cut vegetables can be as high as eighteen days.

Pre-cut fruits and fruit salads are dynamic new products. The most common pre-cut fruits (packed as single ingredients) are citrus and pineapple - along with a small volume of melons and other minor fruits such as mango. Principal combinations in fruit salads include pineapple, melons, and citrus - with occasional additions of berries, papaya, mango, etc. All these fruits (with the exception of pineapple) require significant hand labor for cutting. Restaurants ranging from white tablecloth to fast-food are finding uses for the fruit. Supermarket delis are also selling the product. The fruit, packed in a light syrup - with the addition of trace preservatives - can achieve a shelf life of twenty-eight days if kept below 35 degrees F.

The current market for acidic pre-cut fruit salads (with preservatives) is estimated at $40-50 million/year and Chiquita is projecting a market of $150 million/year for products with no preservatives over the next few years (Ricardo Alvarez, Club Chef).

C. Competition

The labor intensive pre-cut vegetables, broccoli and cauliflower are now processed both centrally in California and in regional pre-cut operations around the country. A key challenge for LAC producers will be to compete with the freshness that local processors can offer customers. Regional processors claim that one in ten shipments from national processors now arrive in poor condition. Shipments are transported using refrigerated trucks, shipments by air are expensive and used only in emergency situations. A few U.S. processors export to Japan and Europe using surface (sea) and air transports, respectively (Don Nucci, Mann Packing); this is extremely expensive and not a viable option for new LAC producers.

Close to 50% of the U.S. production of frozen broccoli has moved off shore over the last few years - 90% to Mexico. The same economic forces that fueled this move will soon begin to impact the fresh pre-cut industry as the business matures. The most likely

off shore areas for these pre-cut facilities to re-locate are apt to be in the broccoli and cauliflower growing regions of Mexico. There are no significant pre-cut vegetable operations in Mexico at this time.

Mexico, like the LAC region has an abundant, inexpensive labor pool which permits cheaper raw material production as well as labor savings for processing activities. For example, production costs for sample farms in 1986 were $1,222/acre in the U.S. compared to $297/acre in Mexico - with similar yields (United States International Trade Commission).

Mexico's geographic proximity to the U.S. markets gives them a freight advantage relative to countries in the LAC region. The following is a cross-section of transportation rates drawn from the transportation analysis in Appendix III, Vol.I:

To McAllen, Texas		Dollar Rate
(Overland)		
From:	Guatemala	$ 3,200
	Bajio, Mexico	1,200
To south Florida		
From:	Costa Rica (vegetables)	4,408
	Costa Rica (fruits)	3,352
	Dominican Republic	3,971
To New York City		
From:	Costa Rica (vegetables)	6,791
	Costa Rica (fruits)	5,195
	Dominican Republic	4,173
	Bajio, Mexico	3,628

These higher transportation costs are offset by a 17.5% duty on Mexican vegetable imports from which the CBI beneficiary countries are exempted. On higher value fresh pre-cuts, this will more than offset freight costs. The impact of the proposed free trade agreement between the United States and Mexico remains an unknown. Many operators in Mexico believe it may have a negative effect on their operations in that it will create greater competition for labor.

Tropical fruits and fruit salads present a strong pre-cut option for LAC producers. The operations of Orval Kent and Unimark in Mexico, and Able Sales in the Dominican Republic were the only fresh pre-cut fruit transplants identified. Orval Kent, the largest U.S. pre-cut salad manufacturer/distributor, recently opened a plant in Monterrey to prepare the very labor intensive

fruit salads. Their products contain a trace of preservatives and have a shelf life of 28 days. Able Sales has a plant in the Dominican Republic producing citrus segments and pineapple chunks for use in fruit salads. Unimark imports fresh chilled fruit segments.

Duties on these products can be confusing. Prepared mixed fruit salads imported from Mexico are charged a 17% duty, while individual fruit segments (pineapple, mango, melons, etc.) come in duty free. Citrus segments are charged a 2 cent/pound duty.

Del Monte attempted a no-additive operation in Costa Rica, but abandoned it after reportedly having difficulty managing the blending and the very critical refrigeration requirements. The varying shelf lives and other characteristics of the individual fruits makes blending a difficult art.

Del Monte now ships fresh pineapple chunks from Hawaii and is promoting this product heavily. A spokesperson for the company stated that they have no interest in attempting to replicate the Hawaii operation in the LAC region owing to their negative experience in Costa Rica. They cited the human resource and infrastructure weaknesses as the constraints.

The remainder of the pre-cut tropical fruit market is prepared at regional centers within the U.S. from purchased whole fruit.

Pineapple is the tropical fruit with the heaviest pre-cut demand. The finished product yield is approximately 35% to 38%. It obviously doesn't make sense to ship 62% to 65% of the pineapple through an expensive transportation system, only to have it thrown out at the end of its journey.

The central challenge for the LAC shipper will be to maintain the quality and integrity of the fresh product throughout the entire distribution chain. This requires excellent management control (particularly of critical temperature requirements) at each link in the chain. In addition, improved technology is needed to increase shelf life. This is an infant industry, and a significant amount of research continues to go into developing improved methods to extend shelf life. We should see significant progress continue to be made over the near future.

D. Market Access Strategies

Two major considerations will influence the ability of LAC pre-cut processors to enter and effectively compete in markets in the United States: innovative packaging and proper handling procedures to increase shelf-life; and concentration on management, safety and environmental concerns. LAC region processing would

need to be at the cutting edge of technology in a tightly managed environment.

The growth of the fresh produce export industry over the past several years has spawned a new breed of young, competent managers in many LAC countries, often with U.S. training. These managers should provide an excellent base to build upon. By its nature, any attempts to enter this business must be done in cooperation with experienced U.S. firms. Partners with established distribution networks will be required to handle these perishable products.

The strongest expressions of interest on the part of United States processors and distributors has been with fruits rather than vegetables. Interested parties included:

- Jim Nazarowski, Vice President, Orval Kent. Orval Kent is the largest U.S. fruit salad manufacturer.

- Ricardo Alvarez, President, Club Chef, (the pre-cut subsidiary of Chiquita). Mr. Alvarez has since left the firm and the current contact is Tom Murtaugh, Director of Technical Services. Mr. Murtaugh has re-affirmed Club Chef's interest in pursuing off shore cut fruit possibilities.

- Bob Morris, Able Sales Associate. Able Sales markets pre-cut fruit segments and salads throughout the Eastern U.S. and Canada.

- Bjorn Buddi, President, Unimark Corp. Unimark now imports chilled fruit segments from Mexico.

Dole and Del Monte are not currently interested, but further efforts to solicit their association should be pursued.

Additional selected firms in the fresh pre-cut industry are listed in the Directory, (Appendix I-2).

E. Implementation/USAID Intervention Options

A viable operation would produce about one truck load a day. This is reasonable from a marketing standpoint for pineapple and other fruits and fruit salads. There would be some question as to the volume of vegetables that could be exported.

For purposes of illustration (of the order of magnitude only), a 100% pineapple operation - with a 38% yield/packout and a 45 metric ton/hectare production yield - would require about 1 hectare to support each day's production.

An important USAID function would be to identify an interested and capable local group of growers and businessmen, and help facilitate a joint venture agreement. The firms expressing interest in this are not in the agricultural end of the business - they are processors and marketers. It would be a useful and appropriate role for USAID to support the initiative with a project that would supply some comfort and assurances as to the continued availability of high quality, pesticide-free raw material. Importers may need to be reassured that the new producing groups can perform.

Assistance could take the form of not only assisting the growers, but help in training the local workers.

Another very important role for USAID would be in supporting research. As stated earlier, industry sources have estimated that this could grow into a $150 million industry. There is substantial on-going research in shelf life extension, and in sanitary control of the pre-cut products now going on in the U.S. It is this research that will provide the basis for the growth of this industry. Considering the importance to the region, it would be useful to have research conducted at a LAC region institution and focused specifically on problems with tropicals. This could be done in a cooperative program with a U.S. institution and would also have the result of strengthening the skills of the LAC region's institutions, providing a base for further development in this science.

F. Manufacturing Parameters

1. Introduction

Once packaged and stored for a long period of time, cut produce may provide a breeding ground for harmful bacteria. Microbiological contamination is emerging as the number one food safety issue for pre-cuts in the 1990's according to Joseph Hotchkiss of Cornell University's Institute of Food Science.

Although this may not be the most important public or legislative food safety issue, it will be an important issue from a scientific standpoint. It will be the most difficult and expensive issue to address for several reasons, one of which is that many of the products involved have low acid levels. Low acid means a larger prevalence of pathogenic bacteria.

The industry must be very skilled and expert in control of microbiological contamination, the safety of chemicals like chlorine and other disinfectants, refrigeration, and waste management, etc.

The American public is very much concerned with waste management, use of recyclable products, etc. Despite the environmental backlash against packaged goods, produce in controlled and modified atmosphere packages actually could curb overall waste. The weight ratio - possibly 1 pound of plastic packaging per 300 pounds of vegetables saves upward of 100 pounds of vegetable trim (which is not nearly as biodegradable as some non-biochemists might lead the media to believe). It will be key for pre-cut manufacturers to educate the public that the amount of produce that would go to waste without CA and MA wraps outweighs the packaging threat.

The trend to use more fresh pre-cut produce in foodservice and retail sectors can be attributed in large measure to improvements in packaging. Each product has its own peculiarities and characteristics, so each requires a different package. Additionally, cut item's differing respiration rates makes many combinations difficult.

The industry has seen recent introductions of innovative packaging such as vacuum packs, "breathable" membranes and clear plastic-type trays that use a packet of table salt to regulate the environment and absorb moisture. The breathable polypropylene film regulates how quickly oxygen and carbon dioxide enter and exit the package.

One of the most innovative new packaging technologies is a system called FreshHold developed by Hercules, Wilmington, Del., and sold earlier this year to Fresh Western Marketing, a Salinas, Calif.-based produce grower. FreshHold uses a specially engineered membrane to maintain the mix of gases optimum for a particular produce variety based on respiration rate. This typically extends shelf-life two or three times. The system has great potential because it does not require the use of preservatives, a plus in today's additive-conscious environment. Industry experts say the company's greatest challenge will be getting volume up so the cost can come down. Costs have recently been lowered somewhat by switching from rigid packages to plastic bags.

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Another innovation known as "superchilling" which has been pioneered by Club-Chef, Inc., a Cincinnati fresh processor, can extend shelf-life for many pre-cut fresh fruits and fruit salads to 30 days, without the use of preservatives. The process involves cooling the product to 28-32 degrees - then wrapping it in a modified-atmosphere (MA) package. The atmosphere in the MA packing encompasses modified mixtures of oxygen, carbon dioxide and nitrogen within a semipermeable bag. Large, commercial-size shipments of the product could prove to be a hurdle, however. Broad distribution systems will have to be developed to handle the superchilled products. Also, shipping and handling prices could be high. Only a team effort by the grower, processor, distributor and merchandiser will make these products a reality.

Researchers are talking with particular enthusiasm about entire controlled-atmosphere (CA) and modified-atmosphere systems within containers. The systems hold promise especially for ocean-going containers, curbing product decay and the need for chemical fumigation. Although available for years, the CA and MA technology now - thanks in part to computerization - is more efficient and economically feasible for containers. These systems, still in experimental stages, have application for broccoli, citrus, mangoes, melons, avocados, strawberries, papaya and kiwifruit.

But the biggest obstacle to growth of packaged pre-cut at both retail and foodservice levels is handling in the distribution chain and by the receivers. Product must be kept at a uniformly proper temperature from the time it is packed until it reaches the consumer.

Currently, processors say proper handling is the exception rather than the rule. Temperature control is the weakest link - and maintaining proper temperature throughout the entire distribution chain is critical. To combat these problems with distribution, it is likely the trend toward regional processing will continue and modified-atmosphere packaging will become more important for shipping point processors who must transport their products long distances.

2. Processing

Processing technology for fresh pre-cut products is relatively unsophisticated. The primary processing function for virtually all products (with the exception of pineapple) is hand labor for peeling, sectioning, cutting, etc. There is very little mechanization in the process. The pineapple process, on the other hand, is highly mechanized utilizing corers, peelers and mechanical cutters. Raw material quality will greatly affect the efficiency of the process as well as the yield.

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3. Equipment Requirements - Floor Space - Cost

A typical pre-cutting facility would require about 20,000 square feet. The plant would consist of a precooler or flume cooling system (quickly removing field heat will greatly increase potential shelf life), an air conditioned cutting area (trim conveyors would have stations for the cutters and three belts: raw material line, waste line and finished product line), and a 40 degree cooler to hold finished inventory waiting for shipment.

A pineapple operation including a mechanical corer/peeler, and cutting equipment would cost close to $200,000. Without the special pineapple equipment, total cost would be approximately $100,000. Estimates are based on quotations from A.K. Robins & Company, Baltimore, Maryland, 3/31/91.

4. Raw Materials/Yields

Production parameters were based on one truckload/day, or 40,000 pounds of finished, packaged product.

<u>Yield/Packout Range</u>

Pineapple	- 38.3%	Cantaloupe	- 46.4%
Oranges	- 46.3%	Honeydew	- 63.9%
Grapefruit	- 46.2%	Strawberries	- 60.0%
Papaya	- 50.4%	Grapes	- 90.0%

Broccoli

floretes	- 40%
3/4 inch spears	- 60%
6 inch spears	- 75%

A commonly used variety for the pineapple is the Smooth Cayenne. For broccoli "bunch" types are used which include Green Belt, Premier and Marathon.

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5. Direct Labor Costs

Labor requirements will vary greatly relative to raw material quality and maturity. The productivity reported for broccoli varied from 400 pounds per cutter per 8 hour shift to 2,000 pounds per 8 hour shift. Following are representative requirements:

Cutters	20-40	
Material Handlers	1-2	(tub handling, etc.)
Mixing	2-3	
Packers	3-5	
Lid Application	1-2	
Boxing	2	
Palletization	1	
Support	5-8	(deliver raw materials, maintenance, etc.)
Total	32-63	

The more mechanized pineapple process will take about 20 people. Other fruit would vary, but be in the range of broccoli.

6. Overhead Requirements

Well trained management is integral to successful operations. Each shift should have at least one supervisor and one quality control person. In addition, there would be a plant manager, possibly one or two assistants, and 2-3 office/inventory personnel required.

7. Packaging and Product Standards

Package sizes and configurations is an area of the pre-cut picture likely to get attention in coming years. Although 5- and 10-pound units are common in foodservice, processors say there is more demand for smaller sizes, down to a pound or less. For the retail market some customers like the 8-ounce package and some like the 1-pound package (The Packer). Following are some representative packaging standards examples for the major products:

Broccoli florettes - Ideal for salad bars, dips, relish trays, garnish, soups. Bite size and ready to dip. 100% usable product. No waste. Four (4) three (3) pound bags/carton. Total net product 12 pounds. Sixty-five (65) or more buds per pound. Three pack offered at 9 pounds net. Six pack also offered at 18 pounds net. Packed in salt-free ice.

Broccoli spears - 3-4 inches (gourmet spear) - Ready to cook. Excellent for plate, salad or prep for dip or soups. 100% usable product. Creates 60 gourmet four-ounce portions. No

waste to a 15 pound net product carton. Packed in salt-free ice.

Broccoli spears - 6 inch - 100% usable product. Will make 84 four-ounce servings. A convenient way to serve fresh broccoli. No waste. 21 pounds net product to carton. Also offered at 15 pounds net product to carton. Packed in salt-free ice.

(from Mann Packing, Salinas, CA. See Appendix I-1)

Fruit salads, Melon chunks, Citrus segments - Offered in 2- 8 pound containers, gross case weight of 17.3 pounds; or 4- 4 pound containers, gross case weight of 17.8 pounds. Packed in plastic safety sealed jars with trace quantities of sodium mg. Items offered include fruit salad (with and without sugar), cantaloupe chunks, honeydew chunks, orange segments (with and without sugar), pineapple chunks, grapefruit segments (with and without sugar), and citrus salad with pineapple.

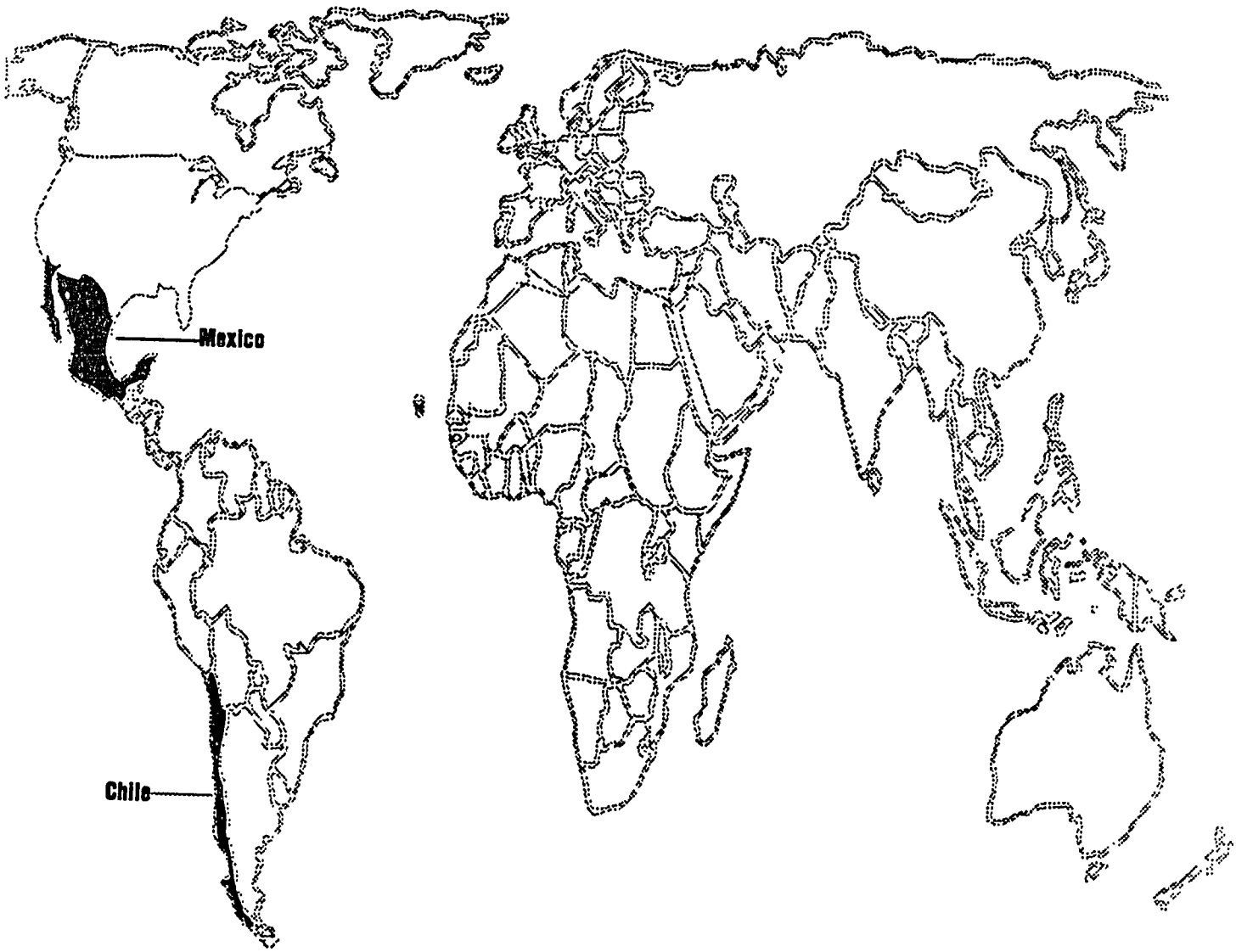
(from Orval Kent, East Rutherford, NJ)

8. Energy Requirements

This process will require minimal utility usage.

II. IQF Fruits and Vegetables

Major Competitors for IQF Fruits and Vegetables



II. IQF FROZEN FRUITS AND VEGETABLES

Executive Summary

The United States domestic frozen fruit and vegetable pack has grown at an average annual rate of less than 3% since 1985 and actually showed a slight decrease in 1990. Particularly significant during this period of time has been the growth of imports into the U.S. market of the more labor intensive types of frozen vegetables, mostly broccoli and cauliflower. Broccoli imports grew from 77 million pounds in 1985 to 242 million pounds in 1990, and cauliflower imports from 37 million pounds in 1985 to 62 million pounds in 1990. By 1989 imports accounted for 46% and 35%, respectively, of the total (domestic pack and imports combined). Import growth took place almost exclusively from Mexico, with Guatemala being the only other supplier of any significance.

In Europe the situation is somewhat different, with frozen foods representing the most dynamic of all food sectors during the 1980's. From 1984 through 1989 real growth in frozen vegetables was 46% and 35% for frozen fruit. Europe did not experience the phenomenon of movement of production offshore that the United States did. Spain is the leading supplier of labor intensive frozen vegetables to the rest of the Community. Erratic weather patterns have made Spain an unreliable supplier, prompting interest by importers in finding more stable off shore supplies. An unknown factor at this time is the potential of Eastern Europe. There is a sense in the European Community that Eastern Europeans will begin producing huge amounts of frozen fruits and vegetables for export, perhaps as early as this year. East Europeans though have seasonal limitations, and there is also a sense that the production may, in fact, never materialize.

As a result of work done by this and previous consultancies, the following frozen items (which are labor intensive on both the farm and the processing level) have been identified as having good potential for processing and export from LAC countries: broccoli, cauliflower, Brussels sprouts, asparagus spears, diced and sliced red and green peppers, fordhook lima beans, pole green beans, okra, black-eyed peas, melon balls and berries - particularly raspberries.

In addition, opportunities exist for IQF tropical fruits, including pineapple chunks and slices, mango chunks and slices, and banana slices.

Maintaining a reasonably diverse product line is essential and there are any number of production line configurations which would be viable depending on the location of the proposed plant. This

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study will concentrate on the two high volume items - broccoli and cauliflower.

The key for a LAC exporter will be his ability to compete with Mexico. Although the labor rate is lower in most LAC countries, Mexico has a substantial freight advantage. This advantage is offset by the 17.5% duty that Mexicans must pay on exports to the United States. This obviously raises the question of the effect of the potential U.S.- Mexican trade agreement. Surprisingly, most U.S. frozen food operators in Mexico see this potential agreement as a negative to their operations. They fear it will result in rapidly escalating costs, and competition for labor.

The model plant illustrated in the study has a rated capacity of 3 metric tons of finished broccoli per hour. The through-put capacity of other fruits and vegetables will vary slightly. With a 65% yield of finished product to raw product input, and an effective running rate of 80% of rated capacity; each 8 hour shift will require 65,000 pounds of raw product. Assuming a yield of 25,000 pounds per hectare, this means that each 8 hour shift will require 2.6 hectares to support the processing plant. The total plant through-put for a year will vary by location and type of product being processed. For illustration purposes (using broccoli for calculations), a plant processing 15 million pounds annually would require about 600 hectares.

The equipment for the plant described in the report would cost $1,040,000 (FOB U.S.). The plant would employ about 170 people.

It is recommended that no start-up be attempted without a cooperative agreement with established manufactures and/or distributors in the target markets. The level of volume being contemplated is large enough to be of interest to these companies, while accounting for only a small market share. This targeted market share will depend on the specific products that are chosen but in the case of broccoli and cauliflower would amount to less than 3% of total demand. With the total volume of product that is now moving off shore, this amount of production should be easily absorbed. U.S. producers have expressed varying degrees of interest in cooperating, and there was a high level of interest among Europeans.

Experience has shown that there are three major problems involved in Third World processing:

- insuring an adequate supply of raw material,
- management, and
- interest rates.

There are two distinct groups of potential processors in the LAC region who would benefit from some type of USAID support. The first group are entrepreneurial-type producers who wish to start

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new plants. The second group are those producers who have existing plants - and, as is generally the case, are operating at under-capacity.

The role for USAID in new operation development would be to provide the technical assistance that would allow feasibility studies to be completed, and to assist the local operators in making initial international contacts.

Existing processors would enjoy some advantage over new start-up operations in that they would have products available for samples, they would have a track-record to allow for planning, and they would have at least some guaranteed raw material supplies.

In either case (new plant start-up, or current processors) it may be beyond the capability of a foreign assisted operator to secure adequate, pesticide-free raw material supplies to the plant. A USAID project could play an invaluable role in the organization of the growers and the supply base - by assisting the growers to establish cost-effective methods of production that will permit them to make sufficient profits in this competitive environment.

And finally, for LAC producers to be internationally competitive, it is extremely important that they be able to borrow money at internationally competitive rates - both for the plant and equipment, and for working capital needs. It is our understanding that this is a policy issue that AID is currently actively addressing.

A. GENERAL DESCRIPTION OF THE FROZEN FRUIT AND VEGETABLE INDUSTRY

In the United States, Europe and Japan consumer demand for frozen fruits and vegetables has changed over the past few years. Food processors and distributors find themselves in a new marketplace - a marketplace offering a wider variety of products, including a multitude of new value added items. Fueling this change has been the presence of more and more women in the work force and the increased availability and use of the microwave oven.

1. United States

In the United States the frozen vegetable pack, other than potatoes, increased from 3.1 billion pounds in 1985 to 3.5 billion pounds in 1989, a 12% increase (see Schedule B-1). Imports during this same period of time more than doubled, to over 300 million pounds (see Schedule B-2). Sales have been characterized as flat since 1989.

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Schedule B-1
TOTAL UNITED STATES FROZEN VEGETABLE PACK
(Data in Thousands of Pounds)

Product	1985	1986	1987	1988	1989
Artichokes	1,202	1,417	1,415	1,052	1,542
Asparagus *	**19,990**	**18,008**	**16,725**	**18,055**	**19,741**
Beans, Baby Lima	84,567	71,644	75,399	82,347	103,648
Beans, Green Reg Cut	179,349	170,694	159,027	145,187	237,853
Beans, Green French Cut	82,544	63,892	67,297	65,138	73,682
Beans, Green Whole *	**19,576**	**22,230**	**26,426**	**25,661**	**31,641**
Beans, Fordhook Lima *	**32,490**	**29,211**	**26,951**	**20,911**	**17,086**
Beans, Speckled Butter	6,671	7,040	5,713	6,373	7,389
Beans, Green Italian	24,511	25,430	24,819	20,519	29,712
Beans, Wax	10,034	5,386	4,379	5,465	7,665
Broccoli, Cut Chop Sprs*	**356,806**	**324,519**	**312,460**	**289,446**	**290,566**
Brussels Sprouts *	**44,735**	**37,990**	**45,660**	**49,787**	**46,557**
Carrots, Chips & Diced	99,940	138,445	120,845	100,847	134,033
Carrots, Sliced & Crinkle	84,604	72,036	78,558	96,430	122,249
Carrots, Other	70,042	59,882	95,193	97,396	102,566
Cauliflower *	**94,617**	**89,120**	**77,758**	**78,762**	**109,822**
Celery	15,839	18,729	21,640	24,817	31,029
Collards	15,708	19,454	17,930	15,204	17,855
Corn-on-Cob	423,326	391,954	406,859	345,869	436,301
Corn, Cut	360,297	364,891	433,158	423,339	502,980
Kale	5,167	4,175	4,792	2,862	4,208
Mushrooms	28,669	32,410	37,372	32,713	35,084
Mustard Greens	11,222	11,768	11,556	9,226	12,239
Okra *	**51,815**	**73,160**	**70,472**	**65,708**	**60,005**
Onions	142,008	185,458	188,021	198,916	208,762
Peas, Black-Eyed *	**31,675**	**22,586**	**29,003**	**30,158**	**33,500**
Peas, Green	485,985	373,605	400,231	358,779	469,404
Pepper, Bell (Grn/Rd) *	**20,922**	**22,958**	**23,043**	**29,673**	**30,735**
Pumpkin & Cooked Squash	20,734	22,319	30,393	23,870	21,538
Rhubarb	6,647	6,106	6,211	8,082	8,730
Spinach	174,802	157,119	171,208	172,849	159,891
Squash, Summer& Zucchini	67,458	75,994	70,999	69,961	74,716
Sweet Potatoes & Yams	18,677	13,683	11,871	20,044	26,380
Turnip Greens	14,446	14,371	17,205	17,003	17,024
Turnips, Others	20,639	19,417	16,513	21,919	24,563
Misc. Vegetables	3,144	6,399	8,291	12,608	11,399
Total Vegetables	3,130,858	2,973,400	3,115,429	2,987,016	3,522,185
Total Potato Products	5,118,102	5149,148	5,287634	5,763,671	5,746,038
Grand Total	8,248,960	8,122,548	8,403,063	8,750,687	9,268,223

*** Potential LAC Export Products**

Source: The American Frozen Food Institute.

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Schedule B-2
UNITED STATES IMPORTS OF FROZEN FOODS
(Pounds = 1,000 Value = $1,000[1])

PRODUCTS	1985	1986	1987	1988	1989	1990
Blueberries						
Pounds	10,216	10,113	16,192	11,219	12,509	n/a
Value	5,876	5,647	11,243	9,951	10,523	n/a
Boysenberries						
Pounds	3,009	4,998	3,059	1,327	862	n/a
Value	1,606	2,692	1,867	610	360	n/a
Raspberries						
Pounds	4,391	14,135	6,256	2,775	7,875	n/a
Value	2,517	7,913	4,657	2,750	5,196	n/a
Strawberries (up to 40 oz)						
Pounds	2,326	2,003	2,121	3,250	n/a	n/a
Value	687	794	813	1,001	n/a	n/a
Strawberries (over 40 oz)						
Pounds	57,364	48,745	72,801	61,349	n/a	n/a
Value	15,686	16,255	25,255	16,181	n/a	n/a
Asparagus						
Pounds	917	2,584	4,774	5,499	3,353	n/a
Value	521	1,341	3,402	5,770	3,029	n/a
Broccoli						
Pounds	77,147	117,150	194,818	178,152	244,991	242,042
Value	25,666	34,495	49,701	47,993	69,325	73,109
Brussels Sprouts						
Pounds	n/a	n/a	n/a	n/a	8,368	9,069
Value	n/a	n/a	n/a	n/a	2,731	2,854
Cauliflower						
Pounds	36,824	37,843	58,513	50,260	60,009	62,042
Value	11,518	10,753	15,039	14,057	18,611	21,153
Okra						
Pounds	19,423	14,760	18,332	11,147	9,094	10,096
Value	5,275	4,093	4,877	2,966	2,215	2,394
Peas						
Pounds	16,374	17,547	23,384	37,783	56,107[2]	n/a
Value	6,729	9,088	11,150	17,099	25,915	n/a

Sources: National Food Processors Association, Division of International Trade, and US Department of Commerce.

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[1] Value represents declared value for Customs purposes, and does not necessarily reflect actual market prices.

[2] Includes an estimated 9,774 of snow peas.

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Frozen potatoes increased 12% during this period from 5.1 to 5.7 billion pounds. Frozen fruits remained relatively flat, with the berry sector (which accounts for one-half of frozen fruit production) growing from 350 million pounds in 1986 to 376 million pounds in 1989, and increase of 7% (see Schedule B-3). During the same period, the import of frozen berries had decreased 1.4%, with decreases in all categories except raspberries.

Schedule B-3

UNITED STATES BERRY PACK
(Data in Thousands of Pounds)

Type of Berry	1986	1987	1988	1989
Blackberries	12,955	21,027	21,437	13,765
Blueberries	77,754	69,153	82,382	89,274
Boysenberries	5,493	5,234	6,706	4,936
Loganberries	1,133	1,016	1,461	720
Raspberries (black)	1,687	2,001	2,518	1,984
Raspberries (red)	13,645	24,470	23,991	27,300
Strawberries (whole)	101,189	145,151	132,224	117,088
Strawberries (sliced)	136,415	189,255	142,386	121,064
Total	350,262	457,307	413,105	376,131

Source: Frozen Food Age, June, 1990.

Furthermore, specific demand changed in the frozen vegetable market during this growth phase. Suppliers of these products saw a shift in consumer preference for certain vegetable products (such as value added "frozen like fresh" and IQF vegetables) over more traditional products (including boil-in-bag and bulk food service items).

Industry experts had anticipated that an accelerating growth in the frozen food industry would be fueled by increasing demand for high value microwavable specialties. Despite industry growth in the late 1980's, Food Age forecasted that 1990 would show a 1/2 percent decline in frozen fruit and vegetable retail tonnage as these microwavable items, the epitome of convenience that were launched with great fanfare by most major processors in 1987 and 1988, began to falter. Industry analysts attributed consumer resistance to high prices.

Nevertheless, a survey of retailers in 1990 indicated that close to 90% of them plan to increase the size of their frozen food departments over the next two years (see Schedule B-4).

Schedule B-4

SURVEY
HOW RETAILERS SEE FROZEN FOOD DEPARTMENT SIZE CHANGING IN NEW STORES OVER THE NEXT TWO YEARS

Expected Substantial Increase	5.3%
Expect Some Increase	89.5%
Total	94.8%
Remain the Same Size	5.2%
Expect to Downsize	0

Source: Frozen Food Age - survey conducted in 1990.

In 1989 the retail sector accounted for 34% of the frozen pack, food service 26% and the industrial sector 36%. Both the retail and food service sectors were flat from 1987 to 1989 (see Schedule B-5). Technomics estimated a 1.1% real growth in food service food purchases in 1990, and has forecasted a 1.3% increase for 1991.

Schedule B-5

FROZEN VEGETABLE PACKS - BY OUTLETS
(Data in Millions of Pounds)

Outlet	1989	1988	1987
Food Service	904	942	823
Retail	1,182	1,127	1,188
Bulk	891	447	614
Other Uses *	363	314	334
Not Available	181	156	152
Total	3,522	2,987	3,113
(Data as Percentage of Total)			
Food Service	25.7	31.6	26.5
Retail	33.6	37.8	38.2
Bulk	25.3	15.0	19.7
Other Uses *	10.3	10.5	10.7
Not Available	5.1	5.2	4.9

* Initially frozen weight going into combination (mixed) vegetables, canned and prepared food.

Source: Frozen Food Age. June, 1990.

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Brand competition and product differentiation, which are key in the retail sector, are not as important in the food service trade (restaurants, hospitals, etc.) because the ultimate consumer rarely knows the origin or brand of the vegetable. Competition is therefore based more on price -- as opposed to advertising and/or brand promotion. As a result, import products (which are not usually differentiated) have easier market penetration in the food service and industrial sectors than in the retail trade.

The strongest growth in the overall U.S. frozen food market has been in the industrial sector which increased 32% from 1987 through 1989. Industrial trade is characterized by bulk sales, generally to manufacturers for further processing. The three major industrial uses of frozen product are: as an ingredient; for repacking into consumer size packages; and as components in assembled frozen products, ie: frozen dinners. It becomes obvious that the industrial sector will ultimately be impacted by the slow-down in growth in the retail and food service markets.

The point should be made here that while growth in the freezing industry as a whole has leveled off, the logistics and economies of production favor movement of operations to offshore locations. This offers potential for prospective processors in the LAC countries, particularly for labor intensive products.

Industrial sales represent the most practical way for start-up LAC manufacturers to enter the US market, and this will be discussed in more detail in the market strategy section.

2. Europe

In Europe, frozen foods were the most dynamic of all the food sectors during the 1980's. Growth was attributed to increased household penetration of freezers and microwaves, coupled with new product development. From 1984 through 1989 real growth in frozen vegetables was 46%, and 35% for fruit. Among the various product sectors, "ready meals" showed phenomenal growth, epitomizing the strong demand for convenience foods (see Appendix II-5 summarizing the EEC imports of frozen vegetables in 1989, as well as production in the Community's major producing countries).

1990 saw the European Community frozen fruit and vegetable industry devastated by a severe drought. This was the second consecutive drought year for Europe. Despite the drought and resulting higher prices, demand has remained strong everywhere except the United Kingdom.

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3. Japan

In Japan, lifestyles and dietary patterns have expanded the sales of frozen food products. An increase in the number of working women and single adults living alone is resulting in a growing demand for convenience foods. Younger people are learning to enjoy a more Western-style diet, generally due to the increasing affluence within Japan, but also in part because of the rapid expansion of fast food outlets. Processed foods are becoming more attractive to working women, who now account for 40% of all Japanese women. In the past the lack of home freezers, and the small size of Japanese refrigerators inhibited the sales of frozen foods. However, recently there has been a proliferation of full-sized refrigerators and microwave ovens which has encouraged strong interest in microwavable frozen foods.

A summary of Japanese imports and production of frozen vegetables is contained in Appendix II-5. The Japan Frozen Food Association reported the growth in production of frozen vegetables in Japan averaging 5.1% over the past 5 years, while frozen vegetable imports rose by an average of 12.6%. Most of the vegetable import growth took place during the 1987 through 1988 period. The increase from 1988 to 1989 was only 0.9%, and has reportedly remained static in 1990.

With 64% of all Japanese households now owning a microwave oven, the evidence suggests though that frozen food is likely to follow the boon that has taken place in other developed markets such as North America and Europe. Japan now has 830 factories producing frozen foods, compared to 735 in 1985. Consumption appears to be on course for even further expansion.

B. SELECTED PRODUCTS

As a result of work done by this and previous consultancies, the following frozen items (which are labor intensive on both the farm and processing level) have been identified as having potential for processing and export from LAC countries: broccoli, cauliflower, Brussels sprouts, asparagus spears, diced and sliced red and green peppers, fordhook lima beans, whole green beans, okra, black-eyed peas, melon balls and IQF berries.

In addition, opportunities exist for frozen tropical fruit products, including pineapple chunks and slices, mango chunks and slices, and banana slices.

The following analysis will concentrate on the products with the largest markets; broccoli and cauliflower, providing more limited information on the broader range of crops. It should be noted that the percentage of plant capacity utilization is a

critical cost factor. It is recommended that any freezer going into production in the LAC countries should handle not just one product, but as wide a range of product as is feasible.

Product diversification is necessary for three basic reasons. First, to extend the production season in order to spread overhead costs over as much of the year as possible. Second, to help mitigate the impact of price fluctuations of any one product. And finally, having multiple-product capability in place (in terms of equipment, processing knowledge, cultural practices, etc.) will allow the processors to maximize profits by adjusting production, in a contra-seasonal manner, in response to supply and demand conditions in the temperate zone. Much of the information developed for broccoli and cauliflower should be usable in developing the feasibility of some of the other products.

1. Broccoli and Cauliflower

Broccoli is the edible head (including green buds and thick fleshy flower stalks) of the broccoli plant, a biannual plant grown as an annual. Broccoli is considered a cool season crop, cultivated primarily in higher altitudes, or during the cooler winter months in warmer climates, and during the late spring and early fall months in other production areas. Both broccoli and cauliflower are members of the same genus and species of the cabbage family of crops. Although generally resembling cauliflower in growth and appearance, broccoli has less exacting climatic requirements than cauliflower. Broccoli heads are looser than those of cauliflower, green in color, and have longer flower stalks.

Approximately one-third of the broccoli grown in the U.S. is frozen. Imported broccoli, grown from the same varieties as those grown in the U.S., are similar in flavor and appearance to domestically grown product.

Cauliflower, a biannual plant of the cabbage family is cultivated as an annual for its white, firm but tender head of flower stalks. It is grown in much the same way as broccoli, but is somewhat less tolerant of adverse conditions. For profitable production, cauliflower must have a fertile soil, cool temperatures during the growing season, freedom from frost when the plants are young, adequate soil moisture, and a high atmospheric humidity. Frozen cauliflower is marketed as "pieces" or "floretes".

Frozen food processors attempting to expand their product lines have used frozen broccoli and cauliflower in a wide variety of new products, including product packed in boil-in-bag pouches with butter or cheese sauce, packed in mixtures (for example, broccoli/cauliflower or broccoli/cauliflower/carrots), packed with

pasta, battered and breaded for sale as hors d'oeuvres, and as ingredients in frozen prepared meals (see Appendix II-2).

There are approximately 40 freezers in the United States and Canada that handle broccoli and cauliflower either as primary freezers or repackers (see Appendix II-8, Directory). A few large multi-national firms account for a significant share of the U.S. market.

Primary processors of frozen broccoli and cauliflower are concentrated in California and in recent years California producers accounted for about 90% of the total U.S. production of frozen broccoli and 70% of the frozen cauliflower.

Although broccoli and cauliflower may account for the largest share of the freezer's processed production, most freezers are also diversified into a number of other products. This enables growers and freezers to expand the number of months they are in operation and spread costs over a longer period of time.

U.S. growers are continuously faced with rising costs. California producers particularly are encountering serious challenges: increasing water costs; a dwindling labor pool, despite escalating wage rates; pressure from non-agricultural users for existing land and production sites; and tighter restrictions on pesticide usage.

The result has been an explosion in imports over the past few years, particularly for the more labor intensive types of cuts. In the years 1985 through 1990 frozen broccoli imports increased from 77 million pounds to 244 million pounds, and frozen cauliflower from 37 million pounds to 62 million pounds (see Schedules B-6 and B-7). Mexico was the dominant source, accounting for 82% of the broccoli imports in 1985, increasing to 92% in 1990. Mexico's market share for cauliflower went from 89% to 92% over the same period of time. Guatemala is the only other source of any significance.

Schedule B-6

FROZEN BROCCOLI
UNITED STATES IMPORTS BY PRINCIPAL SOURCES

(Data in Thousands of Pounds)

	1985	1986	1987	1988	1989	1990
Mexico	63,376	96,837	164,414	153,080	229,086	223,49
Guatemala	12,666	18,124	27,844	22,148	14,256	17,62
El Salvador [1]	181	1,437	1,289	2,330	788	70
Canada	44	250	563	- [2]	227	4
Peru	-	-	-	-	-	2
Costa Rica	-	-	-	-	-	3
Argentina	-	-	-	-	-	9
All Other	881	502	597	708	166	20
Totals	77,147	117,150	194,818	178,156	244,479[3]	244,215
Total US Production and Imports (1,000 lbs)	430,000	438,000	502,000	467,602	534,781	n/a
Percentage of Imports to Total	18%	27%	39%	38%	46%	n/a

Source: Department of Commerce.

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1 Raw material was grown in Guatemala.

2 Included in "Other".

3 Discrepancy from Schedule B-2 due to different sources. Discrepancy was not deemed to be significant so no attempt was made at reconciliation.

Schedule B-7

FROZEN CAULIFLOWER
UNITED STATES IMPORTS BY PRINCIPAL SOURCES
(Data in Thousands of Pounds)

	1985	1986	1987	1988	1989	1990
Mexico	32,869	34,347	55,877	47,937	56,071	57,871
Guatemala	2,835	2,159	1,614	1,532	2,279	3,258
Spain	486	832	558	- [1]	631	428
United Kingdom	380	56	173	- [2]	79	-
Canada	74	220	106	- [3]	549	101
Belgium/Luxembourg	124	91	51			
Israel	26	23	35			
Columbia	0	0	42			
All Others	28	115	0	794	275	384
Totals	36,823	37,843	58,513	50,263	59,884 [4]	62,042
Total US Production and Imports (1,000 lbs)	130,000	126,000	135,000	129,025	169,766	n/a
Percentage of Imports to Total	28%	30%	43%	39%	35%	n/a

Source: Department of Commerce.

In the case of Europe, adequate statistics are not available. From interviews with European brokers, it appears that the principal frozen vegetables (in rough order of importance) are: peas, cut green beans, cauliflower, carrots, brussels sprouts, broccoli, and mixed vegetables. Other frozen products of importance include: red and green peppers, onions (used extensively in the industrial sector), white asparagus, zucchini, and leeks. Cauliflower (in contrast with broccoli) is the more important crop there, with prominent production areas in Belgium, France, Spain and England (see Appendix II-5).

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[1] Included in "Others".

[2] Included in "Others".

[3] Included in "Others".

[4] Discrepancy from Schedule B-2 due to different sources. Discrepancy was not deemed to be significant so no attempt was made at reconciliation.

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Over the Community as a whole, broccoli is a decidedly minor crop, although it is growing in popularity. Spain, Italy, and France are the major producers. Minor quantities of broccoli are sourced in South Africa, Mexico, Guatemala and Chile as well. Reportedly, East European suppliers (Yugoslavia and Hungary) will enter the market this year with significant volumes of frozen broccoli and it is predicted that their presence will bring prices down. Turkey, Hungary and Yugoslavia offer other frozen products to the E.C. as well (peppers, etc.).

Imports from outside the Community now play a relatively minor role. Total imports of frozen vegetables into the European Community in 1988 amounted to 121 million pounds. Appendix II-5 summarizes total EEC imports from all sources in 1989, including intra-EEC trade.

Growers in Europe are faced with many of the same cost pressures as in California, as well as the consequences of consecutive drought years. Spain, the largest supplier of broccoli to the E.C. has a reputation for unreliable volume on a year to year basis because of their dramatic variations in climatic conditions. As a result of these situations there appears to be opportunity for producers in LAC to enter the European market, particularly with the more labor intensive products. As is the case in the U.S. markets, it would be most feasible for LAC producers to initially concentrate efforts in the food service and industrial markets.

The team was not able to determine the acceptability of broccoli and cauliflower in the Japanese market. However, trade sources indicated that the Japanese frozen food importers preferred to source product in nearby Asian countries (see Appendix II-5 for Japanese production and import statistics).

See Appendix II-1 for U.S. pricing history. Please note these are list prices, actual sales prices are routinely discounted from this base depending on supply and demand conditions. One trade source estimates discounts could average about 10%, although there is no hard data to determine this discount level. Broccoli was selling on March 15, 1991 in the United Kingdom at UK 0.46 per pound for a 4 portion 2 pound bag, FOB UK. Very good demand was also reported for cauliflower throughout Europe, notably in Germany. As of March 15, prices had firmed to around BFR 28-30/kg compared with BFR 22-24/kg, FOB, quoted previously. (In 1990/91 the U.K. pound ranged from .57 to .61 per US$, and the BFR was about 35 per US$.)

2. Secondary Frozen Products

Berries - It should be noted that berry freezing operations should be capable of packing both IQF and block frozen industrial products in order to satisfy diverse customer requirements.

The current berry situation is somewhat obscure. U.S. buyers indicated small, but good markets for IQF strawberries and particularly raspberries. Increased demand and lower production resulted in excellent block frozen industrial markets over the few years preceding 1989. 1990 showed a substantial increase in production, but inventories as of the end of the year (while 15% above the end of 1989) were still only 1% higher than the previous 5 year average for that date. Although prices were somewhat lower in 1990, strong demand (particularly seen in burgeoning sales to Japan) have kept prices profitable.

The Food Institute Market Report of March 16, 1991 quoted 30 pound pails of bulk frozen Northwest strawberries at 72 cents per pound; IQF whole strawberries at 78 cents per pound; and bulk frozen sliced 6-6.5 pounds were 75 cents per pound (all FOB plant). Meanwhile, sliced or whole bulk frozen 30 pound pails of Mexican strawberries were selling at 58 cents per pound (FOB Texas). It should be noted that these are list prices and there is generally discounting off these prices in the marketplace, particularly on the Mexican strawberries.

On January 5, 1991, 28 pound containers of bulk frozen red raspberries from the Northwest were being quoted at 60 to 65 cents per pound (FOB plant), with sluggish trading. Chilean IQF red raspberries were quoted at $1,350 per metric ton, and $850 per metric ton for whole and broken fruit (FOB U.S.).

In Europe, prices have been extremely volatile over the past 12 to 18 months, resulting from confusion about available supplies. While no current pricing was available, the strawberry market was characterized as being two tiered - with firm pricing for IQF strawberries and high grade industrial packs; and a very depressed market for the lower grade industrial packs. The latest European reports for raspberries (March 1991) indicated a soft market with heavy supplies of Yugoslavian IQF raspberries remaining unsold, as well as heavy supplies of industrial product.

A smaller volume product, blackberries, is currently in a low-stock situation in both the U.S. and Europe, with resulting strengthening prices.

All of these berries are cyclical in nature and the market situation can be expected to continue to change from season to season.

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Asparagus - In the United States there has been particular interest in green asparagus spears. Food Institute Marketing Report list prices for March 16, 1991 quoted Jumbo spears at $2.14 per pound and Medium spears at $2.12 per pound (FOB West coast). Imports into the U.S. are overwhelmingly from Mexico.

In Europe there have been offerings of low priced Chinese asparagus. The quality has reputedly been very poor, and as a result Chilean asparagus continues to sell well at higher prices. The recent cholera epidemic has dried up demand for Peruvian product. Information dated November 2, 1990 on asparagus pricing indicated a very wide range of pricing being quoted, in an "unstable" market.

Peppers - In the United States green and red peppers are a relatively small market, but according to industry sources they have tended to command consistently good pricing.

In Europe, peppers are a somewhat larger volume product, and one that (according to the trade) is consistently in short supply. On March 15, 1991 prices were quoted for sliced red blanched peppers at U.K. 0.36 per pound (delivered U.K.) and BFR 50/kg (FOB plant).

Melon Balls - Melon balls are a relatively small volume item, and there are no published statistics involving them. However, Chile reported exporting 74 metric tons in 1989. Agro International who packs them in Central America has indicated that the current market appears to be saturated.

Bananas - Although still very much a specialty item, the rapid increase in demand for frozen bananas has been one of the most interesting developments in Europe's frozen tropical fruit trade in recent years. The experience of one major U.K. supplier of IQF banana slices is just one example of the sales prospects for this product. Starting from scratch in 1988, and following sampling inside the industry, the company was handling 13 containers annually by 1990.

Industry sources say that while most frozen bananas are used in yogurt and cake manufacturing, recent developments aimed at preventing discolorization have extended the uses to include pie decoration. Frozen bananas are sold in a range of sizes and are diced as well as sliced. The tendency for smaller sizes to break up into small pieces has seen the 1 centimeter cut emerge as the standard size, packed in 30 pound cartons.

Reports suggest that the United Kingdom, France and Germany account for the bulk of trade in IQF banana, while most raw material is now coming from Honduras and Guatemala. Prices of around UK 1,000 - 1,100 per metric ton (delivered U.K., duty paid) are said to be representative of the market. Traders say the

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business has been plagued by quality control problems, and stricter supervision of production is necessary. In addition to bananas traders have also pointed to a strong and growing market for frozen slices and chunks of pineapple and mango.

C. Competition

The primary markets for exports for frozen fruits and vegetables from the LAC region will be the United States, followed by the European Community. In the case of the U.S. market this means the region's ability to compete against Mexico. In the case of the European Community it will be their ability to compete with other European (Western and Eastern) producers. There will also be possibilities in the Japanese market, but long term plans of Japanese buyers are to develop sources of supply closer at hand in Asia.

A freezing plant as outlined in the Manufacturing Parameters section would be anticipated to run between 10 and 20 million pounds annually. This would represent less than 10% of the 1990 imports of broccoli and cauliflower into the United States alone (exclusive of Europe), and 5% of the total U.S. production and imports for these products. When the European market is added into the equation, and realizing that the entire production will not be made up of cauliflower and broccoli, the marketing goals do not seem unrealistic.

Mexican exports of frozen vegetables to the United States are anticipated to continue to grow at about 10% per year, according to industry sources. The Agriculture Attache in Mexico City reports that numerous U.S. firms have invested in the Mexican frozen food industry. They have contracted with Mexican vegetable farmers, and/or invested in "in bond" vegetable freezing and packing plants, and/or transport facilities to expedite servicing U.S. frozen vegetable demand. The Attache reports that several U.S. based vegetable producers are interested in diversifying sources of vegetables and view Mexico as both an alternative supplier and as a region with a predictable production climate. The team, in interviews with U.S. investors in the Mexican industry, found a generally high level of satisfaction with their operations there.

Broccoli and cauliflower now dominate the Mexican exports. However, many Mexican producers and processors now plan to diversify the type and harvest schedule of vegetables offered for export. Should this occur, some believe that Mexico could become a major supplier of a wide variety of frozen vegetables to the U.S. in the next five to seven years.

This expansion can be attributed, in part, to Mexican government interventions which have caused distortions in the agricultural economy over the past several years, particularly in

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the grain sector. The interventions resulted in low prices for basic grains, but allowed the costs of inputs to rise, making grain farming unattractive. However, recent government policies have endeavored to reverse this situation - allowing for better pricing of grains for the farmers, while attempting to keep input costs under control. The frozen food industry in Mexico is centered in a predominately grain growing area.

The key factors to take into consideration when evaluating LAC's competitiveness with Mexico include:

1. For the U.S. we are dealing with a rapidly growing "market" - ten percent a year (as estimated above) on a 280 million pound base. The opportunity in this case, is not just represented by the growth in the U.S. market (which has, in fact, slowed recently) but rather the continued rationalization of the U.S. industry, as it continues to move its labor intensive production offshore. Potential LAC producers are presented with a dynamically expanding situation - one which allows opportunities and easier entry for new players.

2. Mexican industry expansion has been focused in Central Mexico, in the Bajio region with some production about 100 kilometers north of there. A third production area is in the Monterrey region near the U.S. border. Industry sources have reported an excellent situation in the Bajio region, with adequate labor and water. However, the plants situated in the Monterrey region have reportedly been experiencing both labor and water problems.

3. Moulton and Runsten, in their 1986 study indicated poor growing conditions for the crop that would be harvested between May to January in the Bajio region due to weather conditions. They reported higher risks in growing, lower farm yields and poor raw material quality which resulted in lower processing yields, and increased labor costs in processing. They also suggested that the processing period could be extended by movement further north. The move north has been accomplished, and the Mexican industry now shows elevated production from January through May and lower production, as little as one-half, in the months from June to December. The movement north apparently allowed the Mexicans to pick up a month of production at both ends of the prime growing season as described by Moulton and Runsten in 1986 (see Schedule B-8).

Schedule B-8

EXPORT OF FROZEN MEXICAN BROCCOLI BY MONTH
CROP YEARS 1986/87 vs. 1990
(Data in Metric Tons)

	1986/87	1990
October	456	5,652
November	1,847	4,324
December	1,800	5,418
January	1,076	10,008
February	3,665	11,494
March	5,274	11,221
April	2,084	14,358
May	1,487	10,053
June	1,273	6,909
July	1,181	8,499
August	1,278	7,714
September	705	6,140
Total	22,126	100,790

Sources: The Frozen Vegetable Industry of Mexico, Kirby Moulton and David Runsten, University of California Cooperative Extension, Dec. 9, 1986, and US Commerce Department.

Despite the statistical variations in production, industry operators in Mexico stated that there are no seasonal problems. This remains an open question. This seasonality, if it is in fact a problem, has a serious impact on costs associated with processing plant utilization.

4. The Mexican economy is beginning to strengthen and the government is in the process of reversing its policies affecting basic grains production (as discussed above), which may make grain once again a more attractive crop. Much of the land in the principal growing area is held by absentee land owners. For management purposes alone, grain is a much more interesting crop for these people. Vegetables, on the other hand, are a management-intensive business and it is difficult for absentee owners to maintain necessary controls. These factors may very well result in a greater focus on the domestic market, and a lessening of the drive to export. It is interesting to note that despite projected increases of 10% per year, actual volume in 1990 versus 1989 was flat, and preliminary figures indicate that export shipments in 1991 will also be flat. This may reflect the increased attraction of the local grain market.

5. Transportation is another key issue. A 42,000 pound load of frozen product would cost $1,200 to deliver from the Mexican

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growing area to McAllen, and an additional $2,400 to New York City. From Guatemala it would cost $3,200 overland to Mc Allen. From Costa Rica it would cost $4,429 by water to south Florida. And from Lima, Peru it would cost $6,264 to South Florida. These figures do not include inland transportation which will vary depending on the location of the plant. The LAC shipping rate can probably be reduced, but at best would remain substantially higher than Mexican costs.

6. Labor costs are relatively high in Mexico as compared with LAC countries. Unskilled labor now makes about $5.50 per day, supervisors earn about $15.00 per day, and managers about $40.00 per day. The biggest labor component for broccoli and cauliflower is trimming. Moulton and Runsten reported trimming through-put at 7 plants surveyed varying anywhere from 200 to 700 pounds per 8 hour shift per trimmer, depending on the condition of the raw material, the complexity of the cut and the productivity of the laborer. They found a reasonable average for Mexico of about 500 to 600 pounds per eight hour day. A prominent packing facility in California, reports capacity of 2,000 pounds per worker per 8 hour shift. A second major packer reported 1,200 pounds per worker per shift for floret trimming and 1,000 pounds per worker per shift for spears.

7. Duty on broccoli and cauliflower is 17.5% of declared value. There is no import duty into the U.S. on CBI (and it is anticipated on Andean country) exports. Surprisingly, the U.S. operators with whom the team spoke foresaw the possible Free Trade Agreement between the United States and Mexico as a negative factor for their operations in Mexico. The general consensus was that the Free Trade Agreement could potentially make their labor situation very difficult.

8. The Mexican government now has policies which will discontinue subsidies for agriculture inputs (such as electricity rates, irrigation water, and fertilizer), allowing costs to gradually rise to world price levels. Attached in Appendix II-4 is a detailed analysis of Mexican agricultural costs prepared by BANAMEX in January of 1991.

9. Yields and quality of Mexican product are similar to that of California. The growing of both broccoli and cauliflower are labor intensive. Please see Appendix II-3 for the California Imperial Valley growing costs.

10. Plant capacity utilization in Mexico is estimated to be approximately only 60% currently.

For the European Community, current cauliflower and broccoli production is centered in Western Europe. This production is seasonal, concentrated during the months of December through February for cauliflower, and from October through March for

broccoli. Frozen product is available year-round from storage. The ability to produce in a contra-seasonal manner would be an advantage for LAC producers, as there is no African country playing the strong role that Mexico does vis-a-vis the U.S., with low cost/off season production.

The European duty on all frozen vegetables is 18% for countries outside the E.C. (E.C. country's production is duty free). Mexican producers have expressed an interest in expanding exports to Europe, but are deterred by poor port infrastructure and a lack of refrigeration equipment and capacity; at the vegetable packing plants, within the rail/truck/barge transport chain, and finally at Mexico's ports of export. The infrequency of refrigerated ships servicing Mexico forces processors interested in exporting to third country markets to ship through transfer ports. For these reasons, Mexico frozen vegetable exports to Europe are expected to continue at about the same level over the next several years.

A secondary, but still significant competitor to the LAC countries in the production of frozen fruits and vegetables is Chile. In 1989 Chile exported almost 3,000 tons of frozen vegetables and over 8,500 tons of frozen fruits, predominantly berries (see Appendix II-5 for details). Asparagus, at volumes of 1,478 metric tons in the vegetable category; and raspberries, with a volume of 3,284 metric tons in the fruit category were the two principal product exports in 1989.

Chile's asparagus pack is expected to drop in half, from 2,000 tons exported in 1989, to about 1,000 tons in the 1990-1991 season. The 2,000 tons in 1989/90 represented a three-fold increase over the 1988/89 season. Trade sources reported that the lower crop expected this year is due mainly to a cut-back in plantings - the repercussion of a glut of supplies in the 1988/89 season which saw an influx of new suppliers entering the market, contributing to an immense expansion in product offered worldwide. Weak prices which followed this glut and the prohibitive costs of keeping stocks in cold storage persuaded producers to cut back. Also, there has been increased domestic consumption, particularly of fresh asparagus, and an increase in demand for fresh produce overseas.

Japan had been Chile's primary outlet, with sales of about 1,500 tons in 1989. However, with growing competition from China and Peru, Chilean sales to Japan are expected to fall to around 500 tons in the 1990/91 season. The balance will virtually all go to Europe, while the United States is forecasted to take a very insignificant amount. The new season offerings of Chilean asparagus were expected to open at $3,000 per metric ton, delivered Japan; and about $2,600 per metric ton, delivered Europe.

There are three major factors influencing Chile's competitiveness. The newly elected civilian government gave

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temporary farm workers the right to strike farms and packing houses. Further increase in the industry's transport costs was another factor. And, there has been about a 20% rise in wage rates, also introduced by the new government. These extra costs, however, have been more than offset by the much lower value of the U.S. dollar which has made Chilean products extremely attractive to European buyers. Prices calculated in European currencies are reported to be about 20% lower than last season.

Contrary to the above, raspberry production in Chile is forecasted to increase in the 1991 season to 10,760 tons from a planted area of 2,010 hectares. Although production has increased dramatically since the 1987/88 season growth is expected to slow primarily because of the lower export prices.

Over 80% of Chile's raspberry production is exported either as fresh or frozen. Exports of frozen berries in the 1990/91 season are forecasted to reach 9,280 tons, up 18% from the previous season and up 734% from 1987/88.

Strawberry production in Chile has not varied significantly over the last 5 years. Production in 1989/90 was estimated to total over 6,000 tons from 770 hectares, down 16% in volume from the earlier season. Reportedly, phytosanitary problems are affecting yields. About 70% of Chilean strawberries are produced in the Santiago and Rancagua regions. Over 70% of Chile's strawberries go to Europe. These figures refer to both fresh and frozen.

D. MARKET ACCESS STRATEGIES

Despite the dominant position of Mexico as a low cost supplier of labor intensive types of frozen fruits and vegetables, the team has concluded that there are opportunities for exports from the LAC region to both the European Community and the United States. As indicated in the Competition section the lower labor costs and lack of duty should be sufficient to off-set the transportation advantage enjoyed by Mexico. Any LAC country able to improve on Mexico's 60% plant utilization rate would be very cost competitive. And, as discussed above, there are forces at work in the Mexican economy which may make the Mexican domestic market more attractive, lessening the pressure to increase exports.

In the United States the movement of the labor intensive types of products from the U.S. to overseas seems irreversible. For the European Community there is no strong African country playing the significant role that Mexico does vis-a-vis the United States, with low costs and off-season production. And Spain, Europe's largest exporter of labor intensive frozen products, experiences erratic weather conditions which cause unpredictable market conditions. Spain is also expected to experience pressure on wage rates with

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the coming Common Market. European industry experts are forecasting heavy production and exports of frozen vegetables from the Eastern European countries in coming years. However, this production will be highly seasonal and it is unclear at this time the degree to which this will actually happen, or what its impact will be. LAC producers therefore have the opportunity to take advantage of the expanding trend to source offshore over the next few years.

Unfortunately, the growing season in Central America corresponds to the Mexican season fairly closely, LAC will therefore have to compete with Mexico each year. However, Central America possesses a number of different micro-climates in close proximity which might allow for a greater level of plant utilization. This issue of plant utilization is extremely serious in terms of overall costs, and any area in the LAC region which has micro-climates allowing for fuller plant utilization (either by extending the season, or by processing multiple products) would have a decided cost advantage.

If regions in South America can be identified which have diverse climates with more moderate seasonal fluctuations, they will benefit in three important ways: 1) the ability to produce contra-seasonal to Mexico, 2) a better ability to maintain a high level of plant utilization, and 3) guarantee a more predictable volume on a year-to-year basis. Passage of the Andean Initiative, which will allow duty-free access to the U.S., may increase LAC competitiveness despite the substantially lower Mexican freight rates.

Once the production feasibility (in terms of raw material supply and plant location) of a given region is established, joint venture or contractual marketing arrangements with established firms must be made before any further investment is undertaken. This need not be for the entire plant capacity, but certainly for its initial production levels. As production capacity grows marketing horizons can be expanded accordingly.

Establishing relationships with contracting "partners" will be essential to success. And, by working closely with the marketing partners from the beginning (on grading standards, specialty cuts, etc.), finished product can be guaranteed to meet the final customer's requirements, thus avoiding costly errors.

During the course of this study the team has found expressed interest (in joint ventures and/or contractual marketing agreements) on the part of Green Giant, Simplot and Campbell's in the United States; Mister T Limited, Top Frost International and FrostImpex in Europe; and John Stanley Horne Company a broker who operates in both the United States and Europe. However, this is not meant to indicate that interest is limited to these firms.

Appendix II-8 lists firms in the United States, Europe and Japan that handle the type of products that have been discussed.

It is impossible at this point to state exactly what form these joint ventures and/or contractual marketing arrangements should take. Arrangements could range anywhere from direct investments by the companies in setting up their own operations in country - to a marketing agreement covering all or a portion of a plant's output. Individual negotiations will be necessary based upon the marketing company's requirements, and the situation in the processor's environment. A key will be to match appropriate producers and marketers especially in terms of volume.

In the case of Green Giant, discussions were held by the team with Bob Schwarz, Director of International Operations. According to Mr. Schwarz, Green Giant has recently decided to aggressively pursue sourcing opportunities in the Third World. They are particularly interested in asparagus at this point in time. Green Giant's approach would be to either operate their own plant, or establish a very close working relationship with the plant operators, taking all of the plant's production. If the plant were owned and run by an independent group, Green Giant would have their own representative on site to assure quality controls.

Campbell's, meantime, would not be interested in this complete an arrangement. They would have no interest in investing in their own plant, but would enter into annual contracts for a portion of the production. Campbell's would also maintain their own personnel on site for quality control. Campbell's has a long standing company policy to the effect that they will not contract for more than one year's production. This could obviously be a dangerous situation for the processors. However historically, Campbell's has earned the reputation for acting in an ethical manner, and where the quality of product has been acceptable to Campbell's they have continued to renegotiate the annual contracts. And again, while no commitments would be forthcoming, Campbell's has traditionally been very helpful in providing technical assistance to their suppliers.

Simplot is very happy with their Mexican operations, but are willing to consider other possibilities that may develop.

Mister T Limited and Top Frost International, the two European distributors, as well as FrostImpex all indicated an extreme interest in potential projects. The wide swings in Spain's broccoli production cause great difficulty for these marketers and they conveyed a strong desire to find additional and/or alternative sources of supply. FrostImpex has a reputation of working closely with their suppliers, providing seeds, technical assistance, quality control procedures, etc.

It would be anticipated that initial production would focus on industrial product, with possibly some institutional packs. The

industrial output would be shipped to the United States and/or Europe for reprocessing. Again it should be emphasized that quality standards and packaging specifications must be determined in agreement with the marketing firm.

It may be necessary for manufacturers in the LAC region, attempting a marketing program independent of any US joint-venture partners, to maintain inventory stocks at public warehouses in key marketing areas in the United States and/or Europe. However, it must be pointed out that some local market presence is absolutely essential, if not as a joint-venture partner - at least a firm arrangement with an importer. Quality Foods in El Salvador has set up their own office in Miami that performs the function of an importer. They have stated that this has worked very well. However, the team would hesitate to recommend this for any start-up operation in Latin America. It is critical that they work directly with companies already established in the industry, be they importers or other market based manufacturers.

E. Implementation/USAID Intervention Options

The impact of the freezing plant on growers in the region can be illustrated with the example of broccoli (see Manufacturing section). The broccoli processing line will require 32 short tons of raw material per 8 hour shift. Overall production yield will depend on growing conditions in the area. For illustration purposes, a plant that ran 250 8 hour shifts each year would require 8,000 short tons - or 1,600 acres (640 hectares), with production yields of 5 tons per acre. This will vary somewhat for products other than broccoli, but not significantly.

Growth in the freezing industry in Mexico has shown that integrated farming/freezing operations seem to be the most successful, even when these integrated operations did nothing but subcontract work for multinational firms. Historically, independent processors contracting with growers frequently have experienced substantial conflict with the growers on issues of grower returns leading to sourcing problems. The success of the integrated freezers in Mexico involving cooperative ventures of many small growers is encouraging for the possibility of replication in Latin America.

There are two distinct groups of potential processors in the LAC region who would benefit from some type of USAID support. The first group would be entrepreneurial-type producers who wish to start new plants. The second group would be those producers who have existing plants - and, as is generally the case, are operating at under-capacity. In all cases it must be kept in mind that freezer processing mark-ups tend to be very low, and that the international marketplace is very competitive. Efficient operations will be crucial for success to be achieved.

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Experience has shown that there are three major problems involved in Third World processing. These issues must be dealt with by both of the potential producer groups:

- Insuring an adequate supply of raw material. This issue cannot be overemphasized. Varieties, maturity, post harvest handling, etc. greatly affect efficiencies at the processing level. It is imperative that adequate volume be guaranteed for full plant utilization.

- Management. This area covers a wide range of issues - from insuring proper pesticide usage (an extremely critical factor); adequate training at all phases of the operation; quality control; proper, efficient managing of the operation as a cost-effective entity; and the implementation of thoughtful, effective marketing programs.

- Interest rates. Traditionally, interest rates are well above world market rates in developing countries. The cost of financing for capital expenditures as well as growing costs can preclude any hope of competing on an international level with rivals who have a significantly lower debt service component in their overall operating situation.

1. New Plant Start-Up

The first step would be to determine which of the identified products could be most cost-effectively grown in the target location. Next would be to conduct a detailed feasibility study to determine production capabilities, as well as financial feasibility. And then, armed with feasibility study, potential joint venture partners or potential contractual market agreement associates would be approached to seek participation.

One arrangement that has promising potential, looking back at Mexico's success with totally integrated operations, is the creation of cooperatively owned processing plants. The cooperative enters into a management agreement with foreign based (American, European or Japanese) marketers and/or processors - to run the operations for a specified and finite period of time (five years would be an appropriate period). At the end of the agreement period, either the local people would be trained well enough to take over themselves, or they could opt to renegotiate and extend the contract with the foreign partner.

The role the team sees for AID to play in new operation development would be to provide the technical assistance that would allow feasibility studies to be completed, and to assist the local operators in making the initial international contacts. The major challenge here will be to find appropriate "matches" between

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producers and marketers - in terms of volume, type of product, ability to expand, cultural compatibility, etc.

Once agreements have been reached, the management of the plant and the various quality and cost problems inherent in operating the plant should best be left to the private sector operators. However, a very important issue which may be beyond the capability of the foreign assisted operator in the early stages, would be the assurance of adequate, pesticide-free supplies to the plant. A USAID project could play an invaluable role in assisting in the organization of the growers and the supply, and assisting the growers to establish cost-effective methods of production that will allow them to make sufficient profits in this competitive environment.

2. Existing Processors

Existing processors would enjoy some advantage over new start-up operations in that they would have products available for samples, they would have a track-record to allow for planning, and they would have at least some guaranteed raw material supplies.

In this case, assuming that existing operations are operating at under-capacity, the role of USAID would most appropriately be to help define the reasons for the under utilization. If the problem was with inadequate raw material supplies, technical assistance in terms of variety selection, cultural practices, etc. could be provided for the grower population which serves the plant. If the problem was with engineering or plant lay-out deficiencies, technical support could be provided to ameliorate these situations, on a full cost recovery basis.

And finally, for LAC producers to be internationally competitive, it is extremely important that they be able to borrow money at internationally competitive rates - both for the plant and equipment, and for working capital needs. It is our understanding that this is a policy issue that AID is currently actively addressing.

F. MANUFACTURING PARAMETERS

1. Introduction

Freezing can preserve many foods in a form as acceptable to the consumer as the fresh product. Fundamentally, freezing inhibits the agents responsible for spoilage at ordinary temperatures, without causing major alterations in appearance or in flavor. Freezing, however, cannot completely preserve quality; some deterioration will inevitable take place even in freezer storage. At -18 degrees centigrade, the recommended storage

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temperature for frozen vegetables, products maintain an acceptable commercial life of from eight to twenty-four months, depending upon the products.

Vegetables were first successfully frozen commercially about 1936, with green peas and spinach as leaders. The key to holding the fresh flavor was not freezing per se, but inactivation of the flavor deteriorating enzymes by blanching before freezing. Once this problem was solved, the list of commercially frozen vegetables grew to more than 25 by 1944, and by 1950 included most heat-tolerant vegetables.

Only vegetables of the highest quality should be frozen. The less choice cultivars, over-mature or off-type grades of the best cultivars should be used fresh or preserved by a less expensive method.

Fresh vegetables have a specific time during which they are in prime condition for freezing and deteriorate very rapidly, whether harvested or not, after that time. Since deterioration is so rapid after harvesting, all vegetables harvested on a particular day should be processed on that day, and on occasions when that is not possible they should be immediately refrigerated. It is for this reason that during the peak of the processing season a high percentage of the crop is processed at night.

2. Process

Vegetables to be processed are normally harvested at their optimum maturity corresponding to that required for immediate fresh consumption. Harvesting and storage must be controlled to provide a uniform flow of products during an extended harvesting period. A freezing plant should not be supplied with more material than it can handle promptly, as delays before freezing adversely affect the quality of the frozen product. In-plant cold storage facilities are used to keep the harvested product in good condition prior to processing.

Before they are frozen, vegetables undergo a series of treatments - cleaning, washing, sorting, grading, peeling, blanching, cooling, and sometimes packaging. All of the processes are usually mechanized and organized in such a way that they succeed each other rapidly, and that each occupies the shortest possible time.

Mechanical injuries, improper temperatures during preparation, exposure to light, and contamination with copper and iron should be avoided as these factors can cause changes in the color, texture and flavor of the frozen products.

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The movement of large quantities of vegetables, both before and after processing, from one part of the plant to another is done in a variety of ways - belts, conveyors, flumes and tote bins. All of these have their advantages or disadvantages in terms of cost, convenience, space and sanitation. Moving vegetables by water in a flume or by pumping has special attractions to the freezer because it simultaneously moves, cools and washes.

With blanching the objective is to achieve maximum destruction of enzymes with minimum alteration in raw product properties. This can be accomplished in hot water at 100 degrees Centigrade, or with steam at atmospheric pressure. Recommended blanching times vary from product to product, and for similar products of different size.

Rapid cooling is required immediately after blanching in order to avoid over-cooking and to prevent the growth of micro-organisms, which is possible in a slow cooling process. Cooling can be done by water flume, forced air, water spray, or a combination of water spray and forced air.

Freezing may be accomplished in various ways. Common methods include belt and fluidized bed freezing for IQF products, and plate (wet pack) freezing for solid pack.

In a plate freezer, individual cartons are sandwiched between refrigerated plates and frozen in 30 to 90 minutes, depending on the type and size of the product being frozen. Several design variations have been developed that offer batch or continuous flow operation.

The choice of processing technology (wet pack versus IQF) and the resulting finished product will depend on the end user's requirements. Wet pack product is generally used for the food service and retail sectors, and wet pack buyers prefer to purchase mixed container loads. For this reason, the processor would need to offer more than one product. If, however, the vegetable must retain its appearance and/or a "free flowing" aspect, then IQF is the preferred processing method. With IQF freezing, each floret for example, remains intact. This characteristic is necessary if the product will be reprocessed (into a blend, used as an individual item in a frozen dinner, for soups. etc.).

Frozen food packages must protect the contents from oxygen and light, loss of moisture, flavor contamination and entry of micro-organisms.

The procedures involved in the movement of frozen vegetables from manufacturing plant to the freezing storage warehouse, and then to distribution and merchandizing channels must be carefully planned and supervised. Every effort should be made to avoid or at least minimize non-refrigerated conditions.

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Broccoli

Several cultivars of broccoli have proven satisfactory for freezing in California. These include Atlantic, Coastal, Topper 43, and Medium Length. In Mexico, the primary varieties include Green Valiant, Green Belt and Shogun.

Broccoli is harvested by hand and transported to freezer plants in large bins. Samples of broccoli are taken where received at the plant and growers may be docked for any of a variety of defects.

The broccoli is dumped from a bin onto a conveyor belt and taken to a sorting line where damaged, blossomed or insect-infested heads and oversized leaves are removed. Side chutes are removed and used for chopped broccoli. Frozen broccoli is marketed as "spears" (florets with attached stalk), "cuts" (one-inch pieces), and "chopped" (pieces smaller than one inch). USDA specifications are generally used, but many firms have private specifications, which they consider proprietary particularly for cuts (see Appendix II-6 for specifications). All cutting and trimming of spears and cuts is done by hand. They are then washed in a tank of highly agitated water, followed by a final spray rinse. The broccoli is blanched in water at 96 to 99 degrees centigrade for 2 to 3 minutes or in steam for 3 to 4 minutes.

Broccoli requires a rapid freezing rate to avoid texture deterioration. The usual method of freezing in the past has been the "wet-pack" method in which the blanched vegetable pieces are placed in a container that is sealed and then frozen. Increasingly, more of the vegetables are now individually quick frozen (IQF) and then the frozen vegetables are packaged. Plastic poly bags of various sizes are commonly used to pack IQF broccoli and cauliflower.

Cauliflower

The cultivars used in California are Early Snowball, Snowball, Super Snowball, Snowdrift, St. Valentines and Early and Late March strains. By the judicious choice of cultivars it is possible to grow cauliflower over a 9 month season in California.

After hand cutting in the field, cauliflower is loaded into bulk trailers and hauled to the freezing plant. Rapid handling from the field to freezers is essential because discoloration resulting from the inevitable bruising during loading will show up after a fairly short holding period. If it is necessary to hold cauliflower for more than a few hours it should be kept under refrigeration at -1 degree centigrade and 85% relative humidity.

Cauliflower floretes are hand trimmed. The floretes then are thoroughly cleaned by vigorous agitation and high pressure cold water sprays.

The washed material is blanched for 4 to 5 minutes with steam, cleared in water in a flume, and then placed on a conveyor with cold air blowing to cause rapid evaporative cooling. The cooled, blanched florettes are de-watered, sorted and either individually quick frozen or mechanically packed into cartons to be frozen with plate freezing or blast freezing.

Green Beans

The Blue Lake green bean cultivar, which is a pole-type bean is considered highly desirable for freezing. However, the labor cost for growing and harvesting of Blue Lake green beans is comparatively high and in recent years, because of the development of mechanically harvested bush beans, many packers in the U.S. have switched to the bush bean.

Green beans are harvested, hauled to the plant and dumped onto a belt and shaker screen with blowers to remove field dirt and extraneous material. After machine separation of the pod clusters, the beans are conveyed to a washer and then to size graders. Size grading is an elaborate operation, requiring much machinery and space. Beans for freezing have been classified into six commercial sizes according to thickness. Smaller sizes are frequently packed as whole beans and the larger sizes are used to make French-style beans.

The size graded beans are fed into snippers, which remove the stems and most blossom ends from the pods. Some processors prefer to snip beans prior to size grading. The product is then blanched, quickly cooled, sorted, packed and frozen "wet pack" or individually quick frozen on belts.

Brussels Sprouts

Principal cultivars are Jade Cross, Sandra and Long Island. Brussels sprouts are harvested weekly for maximum yield and this results in high labor costs. An acre will yield 7 to 8 tons of sprouts when hand harvested. Yields with once-over machine harvesting are lower than those with hand harvesting, which permits several pickings.

Of the total quantity of Brussels sprouts grown in the United States, approximately 25% are used fresh and 75% frozen. Sprouts are designated by size as #1 (1.97 to 2.54 centimeters); #2 (2.54 to 3.18 centimeters); #3 (3.18 to 3.81 centimeters); and #4 (3.81 or larger). The size limitations are a minimum of 31 and a maximum of 57 sprouts per kilogram as received at the processing plant.

Brussels sprouts are run through a pre-grader in which extraneous material and small buds are removed. The sprouts are trimmed by water driven mechanical cutters to remove the butt end and outer leaves. Trimmed sprouts are size graded into small, medium and large sizes. Such size grading is important, not only from the standpoint of uniform pack, but also to permit an optimum

blanch for each size sprout. Careful control of blanching time is especially important because an over-blanch results in a poorly colored, soft product - while an under-blanch results in a pink center. For an average sized sprout a 4 minute blanch in water, or a 5 minute blanch in steam is appropriate. After cooling and sorting, the sprouts are mechanically filled into cartons for freezing or individually quick frozen and bulk stored for later packaging or for use in boil-in-bag products.

Bell Peppers

Bell peppers freeze very well. Large peppers with thick walls and small placentas are desired as raw material for freezing. Yolo Wonder, is a cultivar resistent to tobacco mosaic virus and is widely used by processors in California. California Wonder is similar in appearance to Yolo Wonder, but it is not resistant to tobacco mosaic virus and hence is less popular now. Frozen peppers are sold both as red or green.

Bell peppers are harvested by hand and brought into the plant in bins in bulk trailers. They are washed, inspected and graded for color and size. Peppers are often fed by hand into an automatic coring machine, which removes and ejects the stem, pithy placenta, and seeds. At the same time, they are cut into halves. The halves are washed under strong water sprays to remove any remaining seeds or pithy material. Some operators slice the tip off the stem end and mechanically squeeze out the placenta and the seeds. Other operators pass the whole pepper through rollers to crush the pepper, and then remove the placenta and seeds by hand or by screening.

The bell peppers are processed as whole green peppers (usually unblanched), cored and halved (unblanched or blanched), or diced (unblanched or blanched). Both green and red bell peppers freeze well unblanched, but they tend to develop objectionable flavors after about six months in storage. When blanching, it is common to blanch the peppers in water or steam for about 2 minutes. Belt freezers are advantageously used with diced peppers because slow freezing of the item causes bleeding and adverse texture changes. Most of the frozen bell pepper pack, perhaps more than 90%, is destined for food service or re-manufacturing use.

Berries

Frozen berries are largely used for re-manufacturing into ice cream, jams, preserves and bakery products. They are packed in 30 pound cartons, 30 pound tins and 50 pound barrels.

Fresh strawberries to be frozen should have a deep color, firm texture and rich flavor. They should be picked when fully colored and firm ripe. For packing in barrels, the berries should be pre-cooled for 24 hours in shallow pans or trays at about 32 degrees F. Some strawberries are packed without sugar but they are less preferred than the sugar-packed fruit. The net contents of a 50

gallon barrel of berries in sugar vary from 400 to 450 pounds for the 4 plus 1 pack.

The freezing plant should not be too far away from the fields. Freezing and storage of the product should be carried out at 0 degrees F. or lower. Efficient methods of freezing whole berries include the IQF process.

Strawberries are picked several times a week so that the fruits do not become overripe. The berries are picked without stems or caps; thus they are ready for sorting and processing upon arrival at the plant. Shallow trays or crates holding about 14 pounds of berries are used. The alternative is to keep the harvested berries at 32 degrees for processing the next morning.

Although operations of strawberry freezing plants vary considerably, the following outline is fairly representative. Trays of berries are dumped gently into a small tank of water and conveyed to a vibrating, sloping screen, on which they are washed with sprays of cold water and delivered to sorting belts which slope upward. Grade A and B berries are separated and the culls and green berries are removed. In foggy weather a considerable number of ripest berries are apt to be moldy and must be discarded.

The berries are then conveyed to size grader consisting of diverging stainless steel rods or stainless steel sheets with circular openings to two or more different diameters. Usually, three sizes are made by the grader. Most of the large and medium berries go to the slicer, while the small berries to the bulk line. The slicer consists of a number of circular disk knives rotated by a common shaft. The slices are about 1/4 inch in thickness.

The sliced berries are next mixed with dry sugar in one of several types of mixing devices. A common arrangement consists of a stainless steel trowel in which is a slowly turning augur. Sliced berries are filled into the trowel to predetermined levels where they contact a vertically placed rod. This activates a sugar measuring or weigh mechanism operated by electric eye that adds the required weight or volume of dried sugar. The slowly turning augur mixes the berries and the sugar and conveys them to the filling hopper at the end of the mixer. Considerable juice or syrup is formed by osmosis in the mechanical handling of the mix. A batch mixer, resembling a concrete mixer in general appearance and operation, has also been used. Weighed amounts of fruit and sugar are mixed and delivered to the filling machine - a slowly revolving stainless steel cylinder has also been used for mixing.

From the filling hopper the mixed berries and sugar drop by gravity into an Elgin, FMC or other filling machine that measures the product by volume and places it in the final package.

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Grade B sliced berries are usually mixed with sugar, as described above, and delivered to a hopper from which they are filled by hand operated valves into 30 pound tins for preserver's use. Others are packed (especially in the Pacific Northwest) into 50 gallon barrels. The Grade A strawberries are either IQF frozen or put into retail sized packages which are then frozen in plate freezers, or in an air blast freezing tunnels at about -30 to -40 degrees F. Storage is at 0 or 5 degrees F. in most warehouses.

IQF Berries

IQF berries are now in strong demand. However, in processing them problems have arisen because washed berries tend to stick together in large chunks or masses when put into the freezing tunnels. To break up these clusters they are run through rubber roller "busters" where many of the berries break with a consequent lessening of the quality of the frozen product. Nakagawa eliminated the objectionable freezing together of the berries by providing a special tray that maintains berries in spaced relation to each other while they are being frozen. At the same time, better drainage from the berries and improved circulation of the freezing medium past the berries are obtained.

The special tray is a flat rectangular-based plate made of flexible plastic material such as polyethylene. Risers or nipples project upward from the base evenly in parallel rows to extend over the entire area. They leave straight and continuous intersecting aisles between all the different rows. The nipples prevent any berry seated at adjacent spaces from contact with each other.

The berries to be processed are graded and washed after draining and are distributed into trays. The loaded trays are conveyed by truck to the usual freezing tunnel. Any water that remains on the berries when they are placed on the tray ends tends to drain and collect on the base instead of forming a bond between the adjacent berries when they are frozen. When the berries are frozen, the trays are removed from the tunnel in rack, inverted and bent downward so that the base becomes curved in a convex downward direction. The nipples are spread apart, allowing the frozen and separated berries to drop cleanly. There is no fracturing of the berries or other damage to their appearance.

3. Equipment Needed - Floor Space Cost - Cost

The freezing line can be divided into three phases: 1) preparation; 2) common blanching, cooling and freezing lines, and 3) packing and storage. The FOB, Baltimore price for the necessary preparatory equipment quoted by A.K. Robins on March 13, 1991 was as follows: (note - Transportation cost must be added to the site, plus installation costs. A rule of thumb on installation costs is 15% of purchase price.)

Broccoli and Cauliflower Preparation Line

Flood Washer	$ 50,000.00
Trimming and Inspection Tables	40,000.00
Magnuson CC Hydrouts (4)	10,000.00
Slicer/Dicer	30,000.00
Even-Flo Regulator-type Elevator	12,000.00
Total	$ 112,000.00

With only modest additional equipment costs, this same preparatory line could be used for bell peppers, artichokes, okra, etc. For some other products, such as green beans, Fordhook Limas, etc. an entire new preparatory line would have to be set up. An example of an additional green bean line follows:

Green Bean Preparation Line

Even-Flo Regulator-type Elevator	$ 11,000.00
EMK Bean Cleaner	26,000.00
Hydro-flow Washer	35,000.00
Inspection Table	8,000.00
Even-Flo Regulator-type Elevator	15,000.00
Graders (2)	40,000.00
Cross Conveyors (2)	14,000.00
Bean Cutters (2)	40,000.00
Even-Flo Regulator-type Elevator	12,000.00
Total	$ 201,000.00

These preparatory lines would feed into a common blancher system with the following equipment:

Style F Rotary Hot Water Blancher	$ 42,000
Junior Rod Reel Washer	9,000
Inspection Table	8,000
Even-Flo Regulator-type Elevator	12,000
De-waterer	6,000
Total	$ 77,000

The above equipment was quoted by A.K. Robins, Baltimore, Maryland. Frigi-Scandia, Bellevue, Washington estimated the freezing and cold storage portions as follows:

Freezers	$ 275,000
Attendant Equipment	275,000
Refrigeration Equipment (for 4 900 cu. meter storage areas)	100,000

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This freezing equipment would allow for both IQF fluidized bed and plate freezing. In summary, the FOB U.S. cost of equipment with 2 vegetable preparation lines, as illustrated above - and with the facility to do both IQF and plate freezing, would amount to $1,040,000.

An operation of this size requires a building of approximately 4,500 square meters on a site of approximately 15,000 meters of land (see Appendix II-7 for the lay-out of a standard broccoli line).

4. Raw Materials/Yields

This line would have a rated capacity of about 3 metric tons of broccoli (finished product) an hour, and slightly less for cauliflower. According to a chart published by Jorgensen Food Engineering, broccoli would yield 65% good finished product overall. This would depend on the product. Floretes yield 40%, small spears 60% and large spears 75%. Other yield figures are:

Cauliflower	70%
Green Beans	70%
Bell Peppers	60%
Strawberries	90%
Okra	75%

At 80% efficiency, this means that each 8 hour shift would require approximately 32 short tons of broccoli. With a production yield of 5 tons per acre, this would require slightly more than 6 acres to support each 8 hour shift.

5. Direct Labor Costs

According to the 1986 study of Moulton and Runsten, in Mexico, broccoli trimmers at 7 processing plants were reported to average 400 to 500 pounds per person per 8 hour shift, working on a piece-cut basis. There are a number of specialized cuts, and this can substantially impact the complexity and difficulty of the cutting involved. A major processor in California has reported trimming through-put of 2,000 pounds per person per shift. A second California processor reports through-put of 1,000 to 1,200 pounds per worker per shift. Using a middle ground of about 1,000 pounds of finished product per shift, would indicate a need for about 50 trimmers per 8 hour shift.

Direct labor requirements per shift:

Trimmers	50
Grading/Counting	2
Unloading	2
Support	15
Shift foreman	1
Shift clerk	1
Quality control	1
Maintenance	2
Total	74

6. Overhead Requirements, Labor and Other

General manager	1
Accountant	1
Assistant accountant	1
Sales manager	1
Sales clerk	1
Watchmen	3
Clean-up	3
Fieldmen	3
Fork lift operator	1
Warehouse	1
Maintenance/electrical	2
Boilerman	1
Total	19

7. Packaging and Product Standards

Product for the food service sector is commonly packed in 2 to 2 1/2 pound containers (12 to the carton), although some customers prefer 20 to 55 pound bulk containers. Product destined for reprocessing (industrial sector) is frequently packaged in 900 to

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1,400 pound totes. Different products have different densities or "bulk" which determines the tote weight (for example, a tote of peas will weigh much more than a tote of broccoli). The totes have poly liners (required by USDA for food safety) and are encased in a fiber container. Wet pack product is packaged in folding waxed boxes, while IQF product is packaged in poly bags. It should be noted that while these are packaging "standards", individual customer requirements will always determine how product is packaged.

See Appendix II-6 for samples of commercial product specifications.

8. Energy Consumption

Consumption of utilities will depend on many factors such as capacity, pressure, room temperature, product temperature, etc. The following are from Jorgenson Food Engineering Company. Preparation will consume 20 Kwh, blanching and cooling another 44 kWh, and packaging 3 kWh, for a total of 69 kWh of electricity.

The availability and quality of water is still extremely important. Over 20 meters per hour will be consumed. The consumption of steam will be 1,000 kg/h.

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III. Tropical Fruit Juices, Pulps and Concentrates

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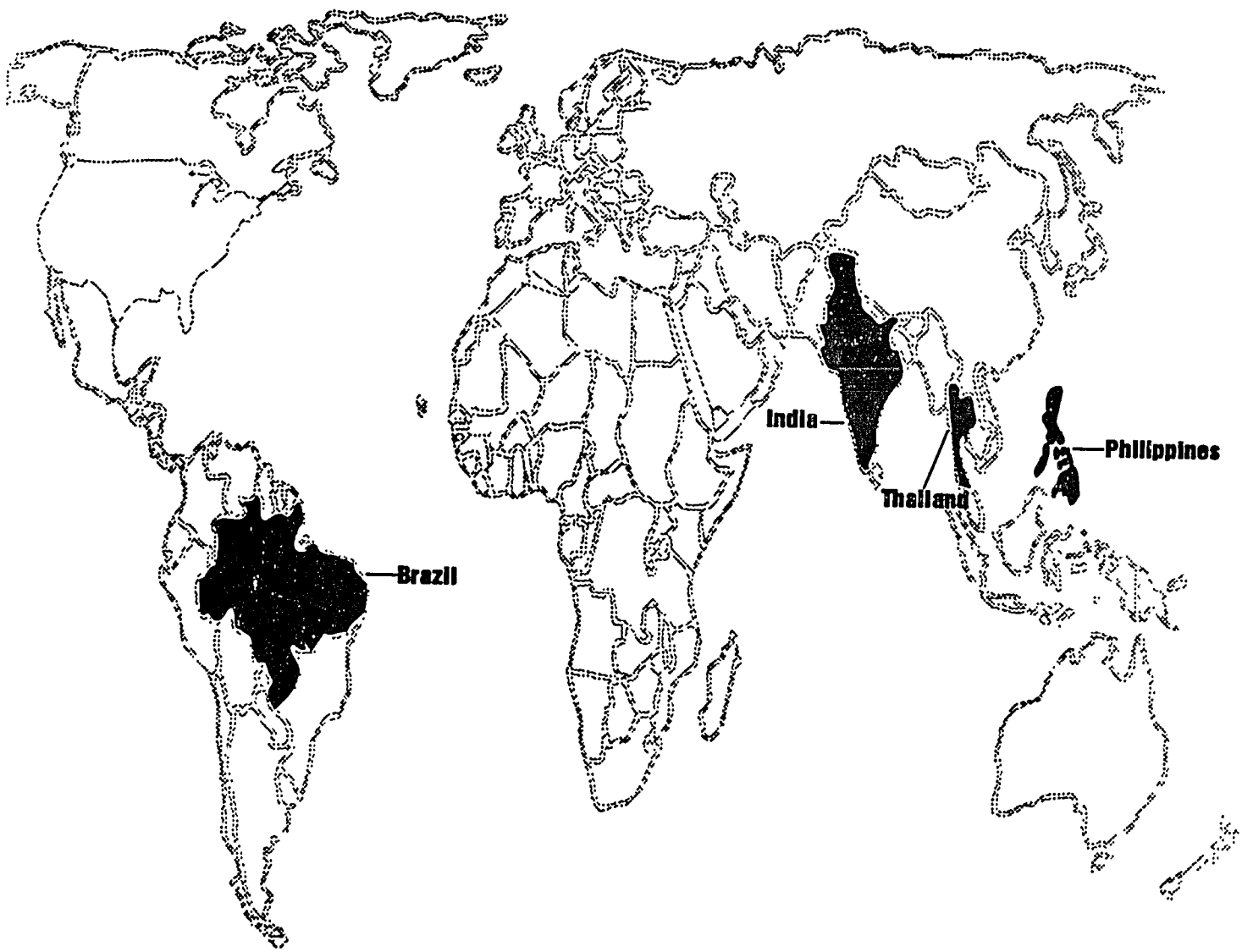
Major Competitors for Tropical Fruit Juices, Pulps & Concentrates



III. TROPICAL FRUIT JUICES, PULPS AND CONCENTRATES

Executive Summary

According to estimates, world trade in all fruit and vegetable juices (including concentrates and pulps) grew from approximately $1 billion in 1977 to $2 billion in 1981; to about $2.8 billion in 1984; and then to about $4 billion in 1988, the last year for which estimates are available. In 1988 developing country suppliers accounted for slightly over half of this total, or about $2.1 billion.

In 1988 the world's five top importers of fruit juices were the United States ($1,119 million), Germany ($667 million), The United Kingdom ($413 million), The Netherlands ($317 million) and Canada ($249 million). These countries together accounted for about 69% of the world trade.

Brazil is the largest exporter of fruit juices, with a total export value of $1.5 billion in 1988, accounting for over 38% of the market. Most of the exports consist of frozen orange juice. However, Brazil is also among the principal exporters of most other tropical juices.

Internationally, the beverage industry is by far the most important end user of processed tropical fruit products. In the United States in particular, the rapid rise in consumption for the overall category is being powered by the strong growth in the very large fruit beverage market.

Fruit beverage sales totaled $10 billion in the United States in 1990 after growing at an average annual rate of 7.6% over the preceding ten years. These sales are projected to continue to advance at a 6.4% annual rate, resulting in a $20 billion market at the turn of the century.

Of lesser importance, but still a significant user of imported juices is the dairy industry. Juices in this case are used to produce yogurt, ice cream, deserts, pudding, sauces and so on. The dairy industry is estimated to account for about 10% of the total world trade, but close to 30% of the world trade in tropicals.

Other food industries, producing such items as jam, marmalade, jelly, baby food, bakery products and confectionery are estimated to absorb about 10% of the total world trade in fruit juices, but less than 5% of the processed tropical fruit products.

Tropical fruit juices, pulps and concentrates are usually divided into two categories: pineapple, and all "other tropical" products. The most heavily traded concentrate is pineapple.

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International trade in pineapple concentrate was estimated at about 127,000 metric tons in 1990 - up 32% from 1988. Thailand and the Philippines, between them, accounted for exports of 93,000 metric tons, 73% of the total traded. Recent worldwide demand has exceeded supply, and during 1990 prices paid for the product doubled.

The United States imported 41,789 metric tons of pineapple concentrate in 1989. This represents a 28% increase from as recently as 1987.

Sales in the European Community (12 countries) have also been booming. Their total imports of pineapple concentrate in 1989 amounted to 56,389 metric tons. French imports grew from just under 11,000 metric tons in 1988 to close to 15,000 metric tons in 1989. This growth has reportedly continued during 1990. Germany had imports of just under 6,000 metric tons in 1988 and these grew to close to 10,000 metric tons in 1989. In 1990 imports rose to close to 9,000 metric tons for the first nine months alone. In Spain the pineapple juice market reportedly has gone up more than seven-fold since 1984, and now is one of the principal juices being consumed, accounting for more than 40% of the total fruit juice beverage market. The United Kingdom is also an important market, importing close to 15,000 metric tons in 1989.

The Japanese removed quotas on processed pineapple products in April of 1990. Despite high prices and short supplies in the international market, Japanese imports jumped from 600 metric tons in 1989 to over 5,000 metric tons in 1990.

"Other tropicals" represent a relatively small market and there are no regularly published statistics for them. The largest market for these tropical products (exclusive of pineapple) is Western Europe, which has been estimated to absorb as much as 80% of total exports.

The United States has historically been a relatively small market, for "other" tropicals, but has excellent prospects for substantial growth. Japan also shows a large potential for processed fruit products, but trade sources feel tropicals are likely to take second place to traditional flavors.

Among the "other" tropical juices, passion fruit is the one most favored in Europe and the United States. The main use of passion fruit is in the production of beverages, mainly multi-fruit drinks. Considerable price fluctuations, caused by rapid successions of shortages and over-supplies, have historically disrupted trade patterns in this product. Brazil, Peru, Colombia and Ecuador are the leading exporting countries.

Internationally traded mango volume is impossible to assess accurately - official statistics are either nonexistent or

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unobtainable. However in 1986, the world trade in mango pulp was believed to have reached a minimum of 21,402 tons - and reportedly there has been a fairly steady increase in demand for mango pulps and juices. India is thought to be the major exporter of mango products worldwide, and South Africa the second major supplier. Drought led to a recent shortfall in supply from India and consequently prices have been moving up since early 1990.

Raw production of banana pulp is estimated at around 70,000 to 80,000 tons annually. The main suppliers are in Central and South America. The banana puree business is dominated by multi-national fruit companies. The principal uses for processed banana have historically been for baby food, ice cream and bakery products. However, it is beginning to be used in fruit juice blends.

Imports of processed banana into the United States, the largest single market, have shown a steady annual increase. From close to 10,000 metric tons in 1985, U.S. imports had increased to over 24,000 metric tons in 1989.

The guava drink market has been actively promoted in Hawaii and North America since about 1980. Dole and several dairies produce a guava nectar. The European market is small, measuring a few hundred tons annually - but their market is showing signs of growth in the field of nectars and mixed fruit drinks.

Papayas are processed in limited quantities only. The size of the papaya pulp market remains unknown as statistics do not record this item separately. According to trade sources, Europe is the biggest importer with Brazil the main supplier. Peru is also involved in exports of the pulp. Inconsequential growth is forecast for the future.

Other minor tropical fruit juices and purees which are becoming available include: acerola, naranjilla, soursop and avocado.

Importers in most of the major markets are interested almost solely in bulk packed fruit juice raw material, in the form of juice concentrate or fruit pulp/puree - depending upon the product in question, and the individual buyer or end user. There is a general lack of interest in imports of consumer packed juices, whether in cans, bottles or cartons.

Del Monte and Dole dominate the pineapple concentrate market. Nevertheless, most sales are still made through independent importers and brokers. These brokers are interested in working with independent suppliers and entry into the market should not pose a problem if the quality is acceptable, and if pricing is correct.

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Competitively, there is an important advantage in duty for "other" tropicals into the U.S. market for CBI beneficiaries (and it is anticipated Andean Initiative beneficiaries). Recent legislation has increased the duty to 100% (1991) for "other" tropical fruit products originating from locations other than CBI countries.

The most critical elements in determining ability to compete include: field yields of the raw materials; utilization of plant capacity; energy costs; transportation to market; and consistent, well-planned marketing programs. LAC should be able to compete in each of these areas.

Experience has shown that there are traditionally three major problems involved in Third World processing:

- insuring an adequate supply of raw material,
- management, and
- availability of capital and interest rates.

There are two distinct groups of potential processors in the LAC region who would benefit from some type of USAID support. The first group would be entrepreneurial-type producers who wish to start new plants. The second group would be those producers who have existing plants - and, as is generally the case, are operating at under-capacity.

The role for USAID in new operation development would be to provide the technical assistance that would allow feasibility studies to be completed, and to assist the local operators in making the initial international contacts.

Existing processors would enjoy some advantage over new start-up operations in that they would have products available for samples, they would have a track-record to allow for planning, and they would have at least some guaranteed raw material supplies.

In either case (new plant start-up, or current processors) it may be beyond the capability of a foreign assisted operator to secure adequate, pesticide free raw material supplies to the plant. A USAID project could play an invaluable role in the organization of growers and the supply base - by assisting the growers to establish cost-effective methods of production (ie: technical assistance in terms of variety selection, cultural practices, etc.) that will permit them to make sufficient profits in this competitive environment.

And finally, for LAC producers to be internationally competitive, it is extremely important that they be able to borrow money at internationally competitive rates - both for the plant and equipment, and for working capital needs. It is our understanding

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that this is a policy issue that AID is currently actively addressing.

Pineapple concentrate has traditionally been produced as a by-product of the pineapple canning operations. Recently, though, the demand for juice has out-stripped the canner's ability to manufacture it strictly as a by-product. All incremental increases in their production have been for processing concentrate from whole pineapples. The model plant in this study contains equipment to produce concentrate from whole pineapples and miscellaneous other tropical fruits and an auxiliary line for processing a variety of other pulps/purees from tropical fruits.

The described concentrate processing line would have a rated capacity of 10 tons (raw material) of pineapple per hour and 12 tons (raw material) of passion fruit per hour. The puree line is designed to run 3 tons of finished product per hour. The equipment for this plant would cost $4,000,000 FOB U.S.

Approximately 20 acres would be needed with the building requiring 20,000 square feet. Labor requirements will vary depending upon the product being processed. For a plant running pineapple and passion fruit concentrate (double shifts) and mango pulp (single shift), 98 employees would be needed. Approximately 1,200 to 1,400 hectares would be required to support this plant.

A. General Description of the Tropical Fruit Juice, Concentrate and Pulp Industry[1]

"Single-strength juice" is that liquid which is extracted from a fruit, as is, without any deletions of water or any other substance, or additions of sugar or any other substance. "Fruit concentrates" are single-strength juices with a portion of the water mechanically evaporated. The degree of concentration refers to the extent of water elimination. "Pulps/purees" refers to the fruit after it has been peeled, de-pitted, macerated and processed through a screen. "Brix" refers to the soluble solids (sugar) content of the fruit product. The more water that is removed from the juice through evaporation, the higher the concentration of soluble solids, and therefore the higher the Brix rating. The different tropical fruit products have unique characteristics and market niches, as will be discussed in detail throughout this section.

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[1] Principal sources: International Trade Center, UNCTAD/GATT, Geneva, Switzerland, and Business Trend Analysts, Inc., New York, New York.

According to estimates of the International Trade Center in Geneva, world trade in all fruit and vegetable juices (including concentrates and pulps) grew from approximately $1 billion in 1977 to $2 billion in 1981, to about $2.8 billion in 1984 and then to about $4 billion in 1988, the last year for which estimates are available. In 1988 developing country suppliers accounted for slightly over half of this total, or about $2.1 billion.

It is believed that international trade in this product group will continue to expand in the future, though at a slightly slower rate, and that developing countries should be able to increase their share in this trade.

Of the various juices, orange continued to dominate in 1988 with about 59% of the trade ($2.3 billion). This was down from a 64% share in 1984. Imports of pineapple juice in 1988 amounted to approximately $149 million or 3.8% of the total, up from 3.5% in 1984. There are no reliable statistics on world trade in what is classified as "other" tropical fruit juices, concentrates and pulps. The three most important tropical fruits in this classification are banana, passion fruit and mango, which together it is thought account for three-quarters of trade in the category.

In 1988 the five top importers of fruit juices were the United States ($1,119 million), Germany ($667 million), The United Kingdom ($413 million), The Netherlands ($317 million) and Canada ($249 million). These countries together accounted for about 69% of the world trade (see Appendix III-1).

Brazil is by far the largest exporter of fruit juices, with a total export value of $1.5 billion in 1988, accounting for over 38% of the market. Most of the exports have consisted of frozen orange juice. However, Brazil is also among the principal exporters of most other tropical juices (see Appendix III-2).

A few types of end users - including the beverage industry, the dairy industry, and manufacturers of jams, jellies, etc. - are common to most markets. Of these, the beverage industry is by far the most important end user.

In the United States in particular, the rapid rise in consumption in the overall category of fruit juices, pulps and concentrates is being powered by the strong growth in the very large fruit beverage market. This market is divided into two major segments:

- fruit juices containing 100% juice, and
- fruit "drinks" which are combinations of fruit juice and other ingredients such as water and corn syrup.

Combined sales of these products totaled $10 billion in the United States in 1990 after growing at an average annual rate of

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7.6% over the preceding ten years. These sales are projected to advance at a 6.4% annual rate, resulting in a $20 billion market at the turn of the century. Powering these sales gains is a long-term per capita increase in U.S. consumption. On a per capita basis, consumption is up from 12.7 gallons in 1980 to 14.2 gallons in 1990. Consumption is anticipated to reach 4.4 billion gallons by the year 2000 from the current level of 3.5 billion.

The individual growth of these two categories (100% juice versus the juice drinks) will have significantly different impacts on overall consumption/demand for tropical fruit juices, pulps and concentrates. Pure juice products utilize significantly more raw material, and growth in this segment will have a greater impact than growth in the juice drinks sector where there is normally only a 10% to 30% juice content.

Pure Juice Products

This processed juice segment has nearly doubled since 1982, from $2.8 billion to $5 billion in 1990. It is forecasted to reach $8.9 billion by the year 2000. Orange juice has remained dominant, with about 62% of total sales; and the orange juice market share is expected to remain constant through the year 2000.

Juices in this segment are packaged frozen, bottled/canned, and chilled. The big story in sales has been the skyrocketing popularity of chilled juices. The average annual growth rate for chilled juices has been 9% over the past decade. Furthermore, chilled juices are expected to continue with the highest growth rate of all three packaging forms during the upcoming decade.

Schedule C-1 analyses the U.S. market for processed fruit juices, by type. The "Other Fruit Juices in Blends" category with U.S. sales of $450 million in 1990, contains most of the usages of the various tropical fruits as well as additional usage of pineapple. This category is expected to nearly double by the year 2000.

Schedule C-1

THE U.S. MARKET FOR PROCESSED FRUIT JUICES BY TYPE (Data in Millions of Dollars)

Product	1982	1987	1990	2000
Orange Juice	1,049	1,448	1,714	2,861
Other Proc Orange Juice	520	1,197	1,460	2,642
Frozen Grape Juice	65	62	65	111
Other Proc Grape Juice	114	136	145	2[illegible]4
Frozen Grapefruit Juice	56	120	145	242
Other Proc Grapefruit Juice	176	225	250	451
Apple Juice	317	355	435	787
Pineapple Juice	74	82	85	155
Nectars	13	10	12	22
Prune Juice	23	25	25	47
Other Frozen Fruit Juices	207	255	302	502
Other Fruit Juices in Blends	173	315	450	813
Total	2,787	4,230	5,080	8,897

Source: The Market for Juices, Ades and Non-Carbonated Drinks. Published by Business Trend Analysts.

Business Trends Analysts, Inc. recently published a list of 37 new product introductions involving fruit juices. Eleven included tropical juices, primarily pineapple. This analysis was through 1989, and the trend toward increased utilization of tropical juices is believed to have accelerated since that time, particularly among the chilled juices (see Appendix III-3 Selected Recent New Product Introductions: Fruit Juices).

Fruit Juice Drinks

The other beverage segment - the market for fruit drinks, cocktails and ades - has expanded at an annual average clip of 9.8% over the past 10 years. In 1990 sales reached $3.7 billion and are expected by the year 2000 to reach $7.6 billion. Many of these products contain pineapple and other tropical fruit juices. The fruit juice content of these drinks normally ranges anywhere from 10 to 30 percent. Traditionally, only a small percentage of this would be made up of a tropical fruit used in a blend. Recent market introductions of 30 new products had nine that included a blend of tropical juices. As with the pure juices, the trend to utilize tropical ingredients in these blends is reportedly accelerating (see Appendix III-4 Selected Recent New Product Introductions: Fruit Drinks).

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[1] Projected.

Dairy Industry

Of lesser importance, but still a significant user of imported juices is the dairy industry. Juices in this case are used to produce yogurt, ice cream, deserts, pudding, sauces and so on. The dairy industry is estimated to account for about 10% of the total world trade, but close to 30% of the world trade in tropicals.

Yogurt is the most important item in this context. Fruit yogurts usually have a 10-20% fruit content prepared from juice concentrate or pulp These are usually sold to the dairy companies in the form of a "base" which is manufactured and supplied to the dairies by highly specialized companies in this field. Flavor preferences vary considerably from market to market, but in most cases traditional fruits and berries are in the highest demand. However, with the growing interest in yogurt, consumers are also looking for new flavors and tropical fruits are increasingly used. Ice cream is another important end use for banana, passion fruit, mango, papaya and pineapple.

Other Uses

Other food industries, producing such items as jam, marmalade, jelly, baby food, bakery products and confectionery are estimated to absorb about 10% of the total world trade in fruit juices, but less than 5% of the processed tropical fruit products. These industries use very large amounts of imported frozen and otherwise preserved fruits and berries.

Citrus, pineapple and other juices imported in large quantities are partly obtained through agents or importers, but a much larger share is purchased either direct by bottlers and other end users or through compound houses. Tropical fruit juices and other juices sold in small quantities, on the other hand, are generally obtained through specialized agents or importers, some of which have blending facilities. A few end users in need of larger quantities may buy some of their requirements direct from the source.

The brokers act as importers, in most cases buying the product at a fixed price and re-selling it to their customers. They will usually take possession of the product after it clears customs and phytosanitary inspection in the receiving country. In most instances, they maintain long term relationships with their suppliers and in some cases they will provide technical assistance and/or install quality control personnel at the plant while processing is under way. In addition to technical assistance, some of the larger brokerage houses may also provide financial assistance. Contracts with the suppliers can either be on a fixed-price basis for the entire season, or a variable price related to some published price index. In some cases the importer will act as an agent for the shipper, not taking possession of the product but being responsible for the sale, and being compensated on a commission rate.

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The producers of compounds, essences and flavors in the main markets play an important role in supplying raw materials (for example, yogurt bases to the dairy industry and other bases or blends to the beverage industry). Compound Houses import at least part of their requirements direct, but they also buy through agents and/or importers.

In the European Community, there is a considerable amount of foreign trade in processed tropical fruit products. Most major importers and compound houses/blenders of this product group are based in Germany, The Netherlands and Switzerland and to a lesser extent in The United Kingdom, France and Belgium. They import and resell tropical fruit juice as raw material to customers (bottlers, the dairy industry, etc.) in their own country and also in other European countries.

In the Middle East, importers handle fruit juices as well as other food products. In recent years, a number of companies have invested in modern warehouses, including cold storage and transport facilities. Some importers are owners of supermarkets and other retail outlets. Several bottling plants have also been set up in the Middle East in recent years.

Japan is the market currently uppermost in fruit juice exporter's minds. Foreign supplies of fruit juice concentrates have started to flood into Japan. With no quantitative restrictions, other than on orange, imports last year surged to over 106 million liters, almost double the 1989 level, and three times the volume taken two years earlier (see Appendix III-11). In Japan, most of the imports are handled by well-known trading companies, although some large end users import directly.

B. Selected Products

Tropical fruit juices, pulps and concentrates are usually divided into two categories: pineapple, and all "other tropical" products. The following is a brief description of the individual products involved. Please refer to Appendix III-6 for a summary of the major suppliers, market requirements and import price ranges for these products.

1. Pineapple

Pineapples are cultivated most successfully in those parts of the tropics which enjoy a mild climate. The principal variety used for juice production is the Smooth Cayenne, which is also grown widely for the canning industry. Another variety is the Abacaxi, also known as the Pemambuco or Perola, grown widely in Brazil.

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Total world pineapple production for all uses reported by USDA/FAS was 4.7 billion metric tons in 1990, unchanged from 1989. Two-thirds of this production was in Thailand and the Philippines.

The pineapple processing industry is dominated by the canneries. Pineapple juice has traditionally been a by-product of this industry, utilizing waste (bits and pieces, and skins) from the canning operation. In 1979, encouraged by quality conscious European juice packers, there was a move in Brazil to start producing juice from the whole fruit which allegedly yielded a product with better flavor, body and stability than what was previously available. Since that time the demand for pineapple juice has become so pronounced that it has outstripped the industry's ability to process merely from waste products, and more and more product is being processed from whole pineapples each year.

While some publications, and some brokers allude to the better quality of juice processed from the whole pineapple; most importers say that there is no commercial difference between the two products. The products are not differentiated in the market, and there is no price premium for one or the other. Pineapple concentrate price is determined by adherence to conventional specifications based on Brix, acidity, color, flavor/taste, micro-biological standards and pulp content.

Both pineapple concentrate and single-strength juice are traded extensively in world markets. But by far, the most important is pineapple concentrate, with international trade estimated for 1990 at about 127,000 metric tons, up 32% from 1988. Thailand and the Philippines, between them, accounted for exports of 93,000 metric tons, 73% of the total traded (see Schedule C-2). A serious drought in Thailand resulted in an estimated 10% drop in production from 1989 levels. This reduction came at a time of rapidly expanding consumption, resulting in a doubling of prices paid for the product during 1990. This will be discussed further below. Brazil, Kenya and South Africa are also significant producers.

SCHEDULE C-2

SELECTED COUNTRIES: PRODUCTION AND EXPORT OF PINEAPPLE CONCENTRATE
(Data in Metric Tons)

Country	Production			Exports		
	1988	1989	1990	1988	1989	1990
Philippines	35,264	35,760	n/a	29,099	32,513	40,946
Thailand	44,403	49,450	n/a	40,167	58,635	52,000
Kenya	9,420	9,730	9,450	8,811	11,793	8,893
Mexico	1,500	2,500	3,900	1,012	1,500	2,600
Cote d'Ivoire	3	24	25	1	22	23
Subtotal	90,590	97,464	-	79,090	104,463	104,462
Brazil	n/a	n/a	n/a	11,264	11,776	12,700
South Africa	n/a	n/a	n/a	5,618	7,429	9,793
Total				95,972	123,668	126,955

Source: USDA/FAS, Horticultural Products Review and Foodnews, England.

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In 1989 the United States imported 41,789 metric tons of pineapple concentrate, 33.6% of world trade, (see Schedule C-3). This represents a 28% increase from as recently as 1987. Product from the Philippines and Thailand dominate the U.S. imports, accounting for 38,000 metric tons, 93% of the total.

In 1990, U.S. imports of concentrate increased to 74,412 (1,000 gallons), 17% over 1989 and 50% over 1987. Costa Rica became a significant exporter to the U.S. (2,000 MT) during 1990.

SCHEDULE C-3

PINEAPPLE JUICE: U.S. IMPORTS

Source	Quantity (1,000 gallons)			Value ($1,000)		
	1987	1988	1989	1987	1988	1989
Concentrate[1]						
Philippines	21,868	24,073	29,591	15,828	15,090	20,019
Thailand	17,545	21,992	29,004	10,944	13,765	18,338
Honduras	2,827	1,008	961	1,948	720	570
Brazil	2,720	1,789	1,086	2,401	1,364	783
Others	4,517	3,320	2,867	3,045	2,386	2,079
Total	49,477	52,182	63,509	34,166	34,325	41,789
Single-Strength						
Philippines	6,881	6,664	7,981	7,657	7,426	8,885
Japan	-	853	1,241	-	1,947	2,386
Others	186	340	1,246	259	523	1,745
Total	7,067	7,857	10,468	7,916	9,896	13,016

Source: USDA/FAS.

Sales in the E.C. have been booming. The European Community's (12 countries) total imports of pineapple concentrate in 1989 amounted to 56,389 metric tons, 45% of world trade (see Schedule C-4). French imports grew from just under 11,000 metric tons in 1988 to close to 15,000 metric tons in 1989. This growth has reportedly continued during 1990. Germany had imports of just under 6,000 metric tons in 1988 and these grew to close to 10,000 metric tons in 1989. In 1990 imports rose to close to 9,000 metric tons for

[1] Expressed in single-strength equivalents. Conversion from gallons to tons is 204.6 gallons/ton of single-strength = 258 gallons/ton of concentrate.

the first nine months alone (see Appendix III-8). In Spain the pineapple juice market reportedly has gone up more than seven-fold since 1984, and now is one of the principal juices being consumed, accounting for more than 40% of the total fruit juice beverage market. The United Kingdom is also an important market, importing close to 15,000 metric tons in 1989.

SCHEDULE C-4

1989 PINEAPPLE JUICE IMPORTS INTO THE EUROPEAN COMMUNITY (Data in Metric Tons)

Country	Metric Tons
Thailand	17,353
Brazil	10,037
South Africa	8,562
Kenya	7,278
Philippines	5,621
Israel	3,071
Martinique	1,530
Ivory Coast	1,321
Other	1,616
Total	56,389

Source: EUROSTAT.

The Japanese removed quotas on pineapple juice in April of 1990. Despite high prices and short supplies in the international market, Japanese imports jumped from 600 metric tons in 1989 to over 5,000 metric tons in 1990 (see Appendix III-8).

The Japanese still maintain high tariffs on the products (27% to 35%, depending on classification), but tariffs are scheduled for reduction in the coming years. The trade anticipates a substantial increase in Japanese imports due to reduced tariffs. The major suppliers to Japan are the Philippines and Thailand (see Schedule C-5).

SCHEDULE C-5
JAPANESE IMPORTS OF PINEAPPLE PRODUCTS - 1989

	Quantity	Value (1,000 yen)[1]
Pineapple Juice[2]		
Thailand	9,384 (liter)	1,842
Philippines	326,777	32,683
United States	25,841	3,658
Total	362,002	38,183
Pineapple Juice[3]		
Thailand	117,730 (liter)	19,930
Philippines	64,983	15,809
France	1,200	255
United States	10,477	1,277
Brazil	66,890	15,594
Total	261,280	52,865
Pineapples[4]		
China	19,048 (kg)	1,829
Taiwan	1,686,900	264,999
Thailand	9,550,714	1,207,720
Malaysia	4,232,068	586,057
Philippines	7,070,351	1,162,225
Indonesia	510,313	63,255
United States	625,107	110,598
South Africa	230,617	23,175
Australia	90,545	11,090
Total	24,015,663	34,309,948
Pineapples[5]		
Thailand	129,085 (kg)	16,961
Philippines	782,898	105,957
Indonesia	9,185	1,001
United States	4,572	1,223
Total	925,740	125,142

Source: Japan External Trade Organization (JETRO).

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1 Conversion rate: 137 yen = U.S. $1.00.

2 Containing added sugar, not more than 10% by weighted sucrose.

3 Not containing added sugar.

4 Prepared or preserved, in airtight containers not more than 10kg each including container, containing added sugar.

5 Prepared or preserved, not containing added sugar.

The trade in pineapple juice concentrate is generally between 60 and 65 degrees Brix. It is usually frozen but there is also some trade in aseptic pack. The frozen product is perceived as more desirable than that of the aseptic pack by many in the trade, with better color, flavor and aroma characteristics; however this is not a universal opinion (see Appendix III-12 for product specifications)

Current pricing for 65 Brix pineapple concentrate is $10.00 per gallon for aseptic pack (delivered, East Coast) and $10.50 per gallon for frozen concentrate (delivered, East Coast). These prices are based on full 20 foot container loads. A 20 foot container holds approximately seventy 53 gallon drums.

Single strength juice exported in 1990 was estimated at 42,770 metric tons, 35,000 (or 81%) of which was from the Philippines (see Schedule C-6). Of the Philippine production, 93% was exported to the United States and Canada. This means that U.S. imports of single strength juice accounted for about 75% of the world trade. All of this product was under the control of either Dole or Del Monte.

SCHEDULE C-6

SELECTED COUNTRIES: PRODUCTION AND EXPORT OF PINEAPPLE JUICE - Single Strength [1]
(Data in Metric Tons)

Country	Production			Exports		
	1988	1989	1990 [2]	1988	1989	1990
Philippines	44,080	44,700	46,500	28,348	34,226	35,000
Mexico	4,500	4,500	4,000	2,000	-	-
South Africa	1,422	1,025	950	1,135	891	800
Taiwan	2,700	2,160	1,500	124	17	10
Malaysia	1,200	1,290	1,325	470	536	700
Kenya	420	960	20	200	360	110
Cote d'Ivoire	2,300	2,750	2,850	1,200	1,600	1,650
Australia	27,600	34,798	36,000	2,576	3,568	4,500
Total	84,222	91,683	91,145	34,053	41,198	42,770

Source: USDA/FAS, Horticultural Products Review.

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[1] One ton of single-strength juice is equivalent to approximately 253 gallons.

[2] 1990 statistics are estimated.

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2. Other Tropicals

"Other tropicals" represent a relatively small market and there are no regularly published statistics for them.

Certain characteristics of the individual fruits effect their prospects for further market growth. For tropicals such as passion fruit and guavas, acidity levels impose a limit to consumption in juices. Tropical juices generally tend not to be suitable for drinking on their own and are usually found either in nectars or juice-based drinks, or as an ingredient in the mixed fruit drinks which have become more common in recent years. Usage in dairy products - mostly in yogurt - is thought to be restricted due to the stiff price competition in this sector.

The largest market for these tropical products (exclusive of pineapple) is Western Europe, which has been estimated to absorb as much as 80% of total exports. Consumption is concentrated in the Netherlands, West Germany, the U.K., France and Switzerland - and remains particularly low in the southern European countries of Spain, Portugal, and Italy. Saudi Arabia is the next largest market, followed by the United States.

The United States has historically been a relatively small market, but has excellent prospects for substantial growth. Japan also shows a large potential for processed fruit products, but trade sources feel tropicals are likely to take second place to traditional flavors.

Passion Fruit

There are two varieties of passion fruit. The yellow is cultivated in the lower and medium elevations in tropical climates, while the purple variety prefers subtropical climates and it is grown at higher elevations in the tropics. Latin America is the largest producing region for passion fruit.

There are more than 400 species of passion fruit, and more than 50 of these species are edible. However, only the purple passion fruit, passiflora edulis Simms; and the yellow passion fruit, p. edulis Simms f. flavicarpa degener, are grown commercially. The yellow passion fruit is the one most commonly used commercially due to its higher yields (20 - 40 tons/hectare) and greater resistance to disease. The purple type has a much finer quality of fruit, but the yield is less than half that of the yellow. The purple variety is grown in an increasing number of countries in East Africa (Kenya, Zimbabwe and Zambia), and is suitable for marketing both as fresh and in processed forms.

Work is being done to produce hybrids and cultivars which combine the best characteristics of both types.

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Yellow passion fruit is known by many colloquial names in different parts of the world. It is interesting to note that the name "passion fruit" resulted from religious emblems identified in the plant by Spanish friars, rather than for any interesting or unusual qualities of the fruit.

The fruit is small - about 5 to 8 centimeters in diameter and slightly ovoid in shape. A thin, leathery skin which is either yellow or purple encloses soft edible seeds, each surrounded by a sac which also contains the yellow, slightly fleshy juice. It grows on a vine which is supported on wires and trellises.

Among the "other" tropical juices, passion fruit is the one most widely used in Europe and the United States. The main use of passion fruit is in the production of beverages, mainly multi-fruit drinks. It's flavor blends well with other fruit juices, and is prized for use in beverages for its exceptional, pleasing aroma. This use was pioneered by English and Swiss manufacturers in the late 1950's and early 1960's. As a result, Europe became (and continues to be) the leading consumer of passion fruit juice. Passion fruit juice is also increasingly used in dairy products.

Commercially, passion fruit is sold either single-strength (12 to 15 degrees Brix) frozen, as a concentrate of 24 to 30 Brix frozen, or a concentrate at 50 Brix frozen. It is generally packaged in 55 gallon drums. The concentrate of 24 to 30 Brix was once the most commonly used, but the industry is beginning to favor 50 Brix concentrate.

Statistics on passion fruit production are not universally reported, and are difficult to obtain. D. Hicks in The Production and Packaging of Non-Carbonated Fruit Juices and Beverages, estimated production in 1987/88 at 15,500 metric tons, of 50 Brix concentrate equivalent (see Schedule C-7). Exports of all strengths of concentrates from the three principal South American exporters (Brazil, Peru and Colombia) totalled 12,438 metric tons in 1989 (see Appendix III-11).

Schedule C-7

Estimated Production of Passion Fruit Juice
50 Brix Concentrate Equivalent - 1987/88

Countries	Tons
Brazil	8,500
Peru	3,200
Colombia	1,600
Ecuador	850
Kenya	350
Sri Lanka	350
Fiji	250
South Africa	250
Australia	150

Source: D. Hicks, The Production and Packaging of Non-Carbonated Fruit Juices and Beverages.

Considerable price fluctuations, caused by rapid successions of shortages and over-supplies, have historically disrupted trade patterns in this product. Stable pricing, which has not been achieved yet, will be necessary for the market to expand significantly in the longer run.

For example, going back over the last nine years, the price range for 50 brix concentrate has fluctuated sharply from around U.S. $10,000/ton in 1980; down to $2,000/ton, climbing back to $6,000/ton by late 1987; only to start another downward spiral in mid-1988 resulting in an ultimate low of $1,500/ton in 1989. Prices began to firm in early 1990 and are currently undergoing a rapid ascent. On April 12, 1991 Brazilian concentrate was offered at $6,000/metric ton (FOB Brazil).

Major producers from Brazil, Peru, Colombia and Ecuador, the leading exporting countries, have been meeting to work out solutions to the price volatility problem. In a recent press release, they stated that they identify this volatility as being the greatest constraint to the expansion of passion fruit sales.

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They are attempting to develop a program that will help stabilize the industry and set a framework for its growth.

Mangoes

The mango is to the tropics what the apple is to temperate climates. It is eaten all over the world and its many varieties are grown in a large number of tropical and subtropical countries. The mango tree is large, evergreen, deep-rooted and long-lived. Growth is rapid and both grafted and seedling trees can be allowed to bear fruit 5 to 6 years after planting with a peak harvest at 15 years. Production life is about 50 years for grafted cultivars and 100 years for seedling cultivars. Generally, the harvest season in the northern hemisphere (Mexico, India, Pakistan) corresponds to the U.S. spring and summer. Production in the southern hemisphere (Brazil, Peru and South Africa) corresponds to the U.S. winter.

The most recent statistics for mango production are from 1988 (see Schedule C-8). It is significant to note that the production of mango remained relatively constant over the five years ending in 1988, with over 60% of the world's supply being produced in India.

Schedule C-8

WORLD MANGO PRODUCTION
(Data in 1,000 tons)

	1983	1984	1985	1986	1987	1988
India	8,874	9,154	9,888	9,416	9,400	9,450
Mexico	685	851	1,109	902	843	955
Pakistan	683	673	692	713	737	713
Indonesia	344	633	385	500	400	400 e
Brazil	413	421	422	420	422	390
China	353	315	322	330	370	385
Haiti	340	354	363	350	352	355
Philippines	361	367	381	301	346	340
Thailand	388	344	336	373	387	387 e
Taiwan	29	95	82	75	134	128
Florida	7	9	8	8	10	10 e
Others	1,291	1,367	1,532	1,685	1,448	2,265

Note: Data marked "e" represents estimate.

Source: Tropical Fruits, Fresh/Processed - A Survey of World Trends in Mangos, Guavas, Papayas, and Passion Fruits. Written and researched by Karine Yourassowski. Published by F.N. Research and Marketing, Ltd., England.

Mango has usually been exported as a frozen pulp (puree), but is now also traded in single-strength (Brix around 14) and double-strength concentrate (25 to 30 degrees Brix), both also frozen. Aseptic packs are becoming more frequent but are considered to be of poorer quality than the frozen by many in the trade (see Appendix III-12 for commercial specifications).

Mango products are processed in most of the main growing areas as virtually a cottage industry. Much of the production would not meet quality standards required in Europe or the United States and it is mostly used for production of domestically consumed drinks in countries where it grows.

The quality of puree varies dramatically depending upon the variety of fruit used to produce it. Premium prices are obtained for Indian pulp made from the Alphonso variety. The Totapuri variety is also used in India. Brazil reportedly exports some high quality product, and Peru is also an important exporter. The Peruvians process the Hayden and Chato de Ica varieties which have found very good acceptance among buyers in Europe. Most end users only require the normal commercial quality, which is available from many suppliers.

Internationally traded mango volume is impossible to assess accurately - official statistics are either nonexistent or unobtainable. However in 1986, the world trade in mango pulp was believed to reach a minimum of 21,402 tons. This figure emerged from Indian export data plus supplies to the U.S. from other sources. Current estimates for world production of single-strength juice (14 Brix) are around 50,000 tons, and approximately 20,000 tons for 28 Brix concentrate.

India is thought to be the major overall exporter of mango products worldwide. South Africa is thought to be the second major supplier. A number of other countries including Thailand, Brazil, the Philippines, the Dominican Republic, Peru, Pakistan, Egypt and Cuba also play an important role in world trade. Taiwan, at one time the second major supplier, has gradually disappeared from the picture. African countries are starting to develop an export pack but in general progress has been hindered by a lack of technology improvements and poor infrastructure.

There has been a fairly steady increase in demand for mango pulps and juices. Drought led to a recent shortfall in supply from India and consequently prices have been moving up since early 1990. Current pricing for 15 Brix puree is 63 cents per pound (X-warehouse, anywhere in the U.S.). Product is shipped in 20 foot containers holding 80 to 90 drums with each drum having a net weight of 440 pounds.

Countries in the Middle East are the principal markets for mango products, especially Saudi Arabia and Yemen. For the European Community, the Netherlands and the United Kingdom are the major importers. The Philippines, India and the Dominican Republic are the key suppliers of mango pulp to the U.S. market, with the Philippines increasing their share (see Schedule C-9).

Schedule C-9

MANGO PASTE AND PULP IMPORTED INTO THE U.S.
(Data in Tons and Thousands of Dollars)

Source	1985 tons dollars	1986 tons dollars	1987 tons dollars	1988 tons dollars
Dominican Republic	221 $105	328 $239	- -	212 $100
India	318 $532	470 $772	431 $660	419 $704
Philippines	342 $409	344 $332	452 $455	887 $796
Total	1,834 $1,468	1,573 $1,704	1,398 $1,503	1,650 $1,742

Source: Tropical Fruits, Fresh/Processed - A Survey of World Trends in Mangos, Guavas, Papayas, and Passion Fruits. Written and researched by Karine Yourassowski. Published by F.N. Research and Marketing, Ltd., England.

Banana

Banana is a very widely cultivated tropical fruit and processed banana products are extensively used by food industries throughout the world. Processed banana has generally been packed in frozen form (22 to 25 Brix). Aseptically packed product is reportedly preferred in the market, but few processors have the more complicated technology required to manufacture aseptic packs.

Raw production of banana pulp is estimated at around 70,000 to 80,000 tons annually. The main suppliers are in Central and South America, with the principal export industries in Panama, Brazil, Honduras, Costa Rica and Ecuador. The banana puree business is dominated by multi-national fruit companies.

The principal uses for processed banana have historically been for baby food, ice cream and bakery products. However, it is beginning to be used in fruit juice blends. Its flavor blends well

with other juices, and it has a tendency to lighten the color and to improve the texture.

Most processed banana exports go to markets in North America and Western Europe. Imports into the United States, the largest single market, have shown a steady annual increase. From close to 10,000 metric tons in 1985, U.S. imports had increased to over 24,000 metric tons in 1989 (see Appendix III-9).

Guavas

The guava is grown throughout most tropical and subtropical regions, where the plant is well adapted to a wide range of different conditions. Guavas grow on a small tree which in humid tropical climates produces fruit continuously. The harvesting season in subtropical areas is from four to five months.

The two main varieties are commonly distinguished by their color - the white and pink guavas. The later is grown mainly in South Africa. The most common commercial variety is a high acid type, Beaumont, which is used extensively in Hawaii.

Estimated world production of guava puree for 1987/88 is shown in Schedule C-10. Both the Brazilian and Australian production, together with smaller amounts produced in Fiji and New Zealand, are mostly consumed domestically in the producing countries. On the other hand, Hawaii's production (which grew from about 150 tons in 1970 to over 8,000 tons in 1987) is consumed both locally and in the "mainland" United States.

Schedule C-10

Estimated World Production of Guava Puree
1987/88

Countries	Tons
United States (Hawaii)	5,500 - 6,000
Brazil	4,000
South Africa	800 - 1,000
Australia	600 - 1,000
India	1,500
Pakistan	100 - 200
Taiwan	100 - 200
Others	400 - 600

Source: D. Hicks, The Production and Packaging of Non-Carbonated Fruit Juices and Beverages.

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The guava drink market has been actively promoted in Hawaii and North America since about 1980. Dole and several dairies produce a guava nectar. Some of the first to introduce guava nectar were Libby's, Kern Foods and Hansen Foods. There is also a large market in the Middle East, supplied by India, and another growing market in Japan where supplies are obtained from Taiwan, India and Pakistan, as well as the Philippines. The European market is supplied mainly by South Africa, and to a lesser extent the Philippines and Brazil. The European market is small, measuring a few hundred tons - but showing signs of growth in the field of nectars and mixed fruit drinks. Currently the main use of guava in Europe is in dairy products.

Guava is sold as a single-strength frozen puree, hot packed and frozen. Some concentrated juice is also available. Brix strength runs from 8% to 14% (see Appendix III-12 for commercial specifications).

Papayas

Papayas are grown throughout the tropical and subtropical regions, and its juice is used primarily for juice blends and as a dairy ingredient.

The short period from planting to harvesting papaya, nine months, leads to tremendous variations in supply. Another important feature of papayas that should be noted is the high sensitivity of the crop to sanitary conditions.

Papayas are processed in limited quantities only. The most common form is as a pulp, hot packed and frozen. Frozen concentrate (20 to 25 degree Brix) has recently been introduced on world markets. Higher concentrations affect the flavor. The single-strength Brix of papaya can range from 9 to 13 degrees.

Although the taste and flavor of the processed papaya do not normally appeal to consumers in the major markets, it has grown in importance in recent years. It is mainly used with other fruits, for instance in multi-fruit drinks. It is also used in yogurt and baby food, because of its papain content.

The size of the papaya pulp market remains unknown as statistics do not record this item separately. According to trade sources, Europe is the biggest importer with Brazil the main supplier. Peru is also involved in exports of the pulp. As mentioned above, the quantities traded are relatively small and only limited growth is forecast for the future.

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Miscellaneous Other Tropical Products

In addition to the products discussed above, there are a few other tropical fruit juices and purees which are becoming available because of their applications in other food industries, because they are consumed locally or because some enterprising producers believe it worthwhile trying to develop a market.

a. Acerola

Acerola is also known as the Acerola cherry or West Indian cherry. It is now cultivated in Puerto Rico and other parts of the West Indies and Central America. The fruit grows on small bushy trees which can reach a height of about 3 meters. The trees have small dark green oval leaves and dense thorns which make hand picking unattractive to local labor. The acerolas are similar to cherries in appearance, about 2 centimeters in diameter, and can be converted into a palatable juice by crushing and screening.

The chief interest in acerola centers around its exceptionally high ascorbic acid content. As a result, the main market for this product is in the health food area where it appeals to those who perceive advantages in natural over synthetic vitamin C. With the current interest in new types of juices it may gain popularity. However, its rather bland taste assures that it most likely will be confined to mixtures with other juices.

b. Naranjilla

Naranjilla, also known as lulo is believed to have originated in Ecuador and grows in the Amazonian districts of that country as well as Colombia and Peru. The fruit grows on thorny perennial shrubs which reach a height of 1 to 3 meters and has very large leaves. It is a round, yellowish-green fruit about 5 centimeters in diameter and has a leathery skin covered with short prickly hairs. The flesh is greenish and has a jelly-like consistency divided into compartments filled with a large number of seeds.

Naranjilla is processed into a yellow juice which has a Brix of 8 to 9 degrees and is quite acid. Currently it is only available as a single-strength juice packed either frozen or aseptically. The flavor is sharp and aromatic and it is used as and ingredient in mixed fruit drinks.

c. Soursop

Soursop, also known as guanabana is a native of Central America and the West Indies. It is grown commercially in many tropical regions where it is consumed as a fresh fruit. The fruit is soft and very easily damaged. Since the flavor deteriorates quickly after picking and refrigeration can cause discoloration, it is relatively unknown in Europe and the United States.

The tree is an evergreen and grows 5 to 8 meters high. The fruit, which like pineapple is a composite with a rather fibrous flesh, has black seeds and is enclosed by a soft green skin. It is

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usually about 1/2 kilogram in weight and has a refreshing sweet-sour flavor with a distinctive aroma reminiscent of strawberries and pineapple.

After hand-peeling, the fruit is pulped and screened to yield a puree with Brix of around 16 degrees. It is not usually available in concentrated form. At present the main commercial source of the puree is the Philippines, where it is available frozen in 5 kilogram cans.

So far, soursop puree has remained relatively unexploited by the United States and European fruit juice industries, probably for cost reasons, although it is used in mixed fruit drinks in Italy. It is popular in Central America where it is used in jellies and it also mixes well with milk and ice cream. Generally, it is felt there is an interesting potential for soursop based drinks.

d. Avocado

The rapid growth in recent years in the popularity of Mexican food, including the rapid expansion of Mexican restaurants, has resulted in a strong demand for the avocado based guacamole. Although most restaurants pulp fresh avocados to make their guacamole, the frozen puree is gaining widespread acceptance. Calavo now dominates this market in the United States. A joint venture of the J.R. Simplot Company and Mission Produce (a major avocado supplier in California) will open a new state of the art plant in Morelia, Mexico built specifically to produce frozen avocado products.

Guacamole is typically made from 100% avocado pulp with no fillers or extenders. With the rapid growth of the avocado pulp market, and with the recurring fresh avocado production shortfalls that have been plaguing the industry, an opportunity seems to exist for new processors of this product.

Although smaller, the European market, particularly France also offers excellent potential. In Japan the product is virtually unheard of, other than in some of the U.S. franchised Mexican restaurants operating there.

C. Competition

Importers in most of the major markets are interested almost solely in bulk packed raw material, in the form of single-strength juice, juice concentrate or fruit pulp/puree - depending upon the product in question, and the individual buyer or end user. There is also a growing demand for pieces/slices of some tropical fruits.

There are in effect two levels of customers: the very large brokers and importers who buy in straight container loads; and smaller operators who would find it extremely useful to be able to buy in mixed container loads. These smaller players frequently incur storage and inventory carrying costs when forced to buy the lower volume products in full container loads because their customers generally require smaller quantities. A worthwhile strategy for LAC producers entering this market would be to produce as broad a line of tropicals as is possible. Producing and offering multiple products would provide for "one stop shopping" and the importers interviewed indicated that the ability to buy "mixed" container loads would be very appealing to them. Since this is normally not possible now, a new producer offering this service would have a marketing advantage. Producing multiple products would also mitigate the market risks associated with handling only one product.

Another strategy, perhaps also in response to this problem, has been the trend for producers to warehouse products in their major markets, engage brokers in the market and sell directly from these warehouses, rather than from the plant. In this case, the producer is offering another service - "just-in-time" delivery to the customer. Clients requiring this convenience will generally pay a higher price for the product. Key here is <u>service</u> orientation; the ability to adapt to customer requests and/or requirements - to make it as easy and convenient as possible to buy. A flexible production line makes this possible.

There is a general lack of interest in consumer packed juices, whether in cans, bottles or cartons. This apathy is due to the high freight costs of such packs (essentially for transporting water) and the frequently higher packaging costs in developing countries. In addition, food laws and regulations, and labelling and packaging requirements often pose considerable difficulties to exporters of consumer packs. In general, only very small quantities of consumer pack fruit juices, destined mainly for delicatessen specialty shops, are imported into the major markets.

1. Pineapple Concentrate

Pineapple concentrate has traditionally been produced as a by-product of the pineapple canning operations. Recently, though, the demand for juice has out-stripped the canner's ability to manufacture it strictly as a by-product. All incremental increases in its production has been from whole pineapples. In fact, juice has become more profitable and product is being diverted from canning.

Del Monte and Dole dominate the pineapple concentrate market, however, most sales are still made through independent importers

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and brokers. These brokers are very interested in working with independent suppliers. Entry into the market should not pose a problem if the quality is acceptable, and if pricing is correct. Trading in pineapple concentrate is a large volume business, and competitiveness in pricing can be determined by a few cents per gallon.

The principal producers and exporters of pineapple concentrate are Thailand and the Philippines.

Thailand

The major exporter of pineapple concentrate is Thailand. 1990 exports were estimated at 52,000 metric tons, 42% of the total world trade. This volume was down from close to 59,000 metric tons in 1989, the result of a serious drought. This drought has continued into 1991. The unfavorable weather conditions caused a sharp reduction in 1990 yields to 21 tons per hectare. Normal yield is 45 tons per hectare. Continued dry conditions are expected to result in even lower yields in 1991. However, total production is expected to be about the same as last year, as increased plantings should offset the drought-affected lower yields.

Thai growers normally work with a "plant crop" and two "ratoon" crops. The "plant crop" (the original planting) reaches maturity in 14 to 18 months while the ratoon (the crop grown on the same plant after the harvest of the "plant crop") can be harvested after 12 months. After the second ratoon in harvested, farmers normally grow a new plant crop. The peak harvest season is April to May, with a second peak from November to January. An increased number of farmers are using a "forcing" technique in order to harvest more off-season crop, and therefore receive higher prices. Thailand's pineapple production fluctuated from 1.4 to 1.9 million tons per year in the 1980's.

In Thailand, pineapple growers normally alternate their fields between sugar cane and pineapple, depending on market prices. Growers in the Eastern provinces also plant pineapple in rubber fields to maximize the utilization of their plantations. Due to soaring prices in recent months, several farmers began to switch from sugar cane to pineapple. Also, some farmers are beginning to substitute pineapple for plantation crops that were wiped out by the 1989 typhoon. While this new production acreage is coming on, some is going out, as tourism competes for land use. More and more farmers in the Eastern provinces are selling their pineapple land to developers of golf courses and development parks.

According to official figures, variable costs for 1990 were $1,201 per hectare, compared with $1,195 the previous year. About 38% of this cost was labor, with another 50% for seed, fertilizer and chemicals. Fixed costs averaged $100 per hectare.

Last year's farm gate prices increased 31% to $62.00 per ton due to the lower supplies of fresh fruit and the strong world demand for processed pineapple products. The continued dry conditions led to further rises in farm gate prices in early 1991. In addition, lucrative world market prices for concentrated juice led to the emergence of new canneries which bid up the competition for raw materials. Current farm gate prices are $118 to $126 per ton - reportedly the highest prices in decades.

Product entering the United States from Thailand is subject to a 1.3 cent per liter duty. CBI beneficiary countries can now enter the U.S. market duty-free, and Andean countries are expected to win this privilege in the near future.

As to other costs, all chemicals and fertilizers are imported, and are not subsidized by the government of Thailand. Minimum wage rates in Thailand were reportedly increased by 14% in 1990. However, the growing and processing of pineapple is not necessarily labor intensive. Comparative freight costs will be discussed later in this chapter.

The Philippines

The second largest exporter of pineapple concentrate is the Philippines. In 1990 the Philippines exported an estimated 40,000 metric tons, 29% of the total world trade. This entire production is accounted for by two U.S. based multinationals, Del Monte and Dole. A third group, made up of local Filipino, Japanese and American investors, is scheduled to come on stream during 1991. Philippine production is centered on the island of Mindanao. With freight and duties, the same competitive situation applies here as was discussed for Thailand.

Del Monte and Dole Philippine pineapple plantations recorded their best yields ever in 1990. In 1991, additional new areas are planned in Mindanao under a new concept of nucleus estate farming, as part of the agrarian reform program with Dole.

Average yields in small holdings reportedly average 15 to 25 metric tons per hectare. This is with a single-plant crop and a relatively low planting density of about 28,000 to 40,000 plants per hectare. On the large plantations, average yields are about 165 to 180 metric tons per hectare during a three year crop cycle, or about 55 to 60 metric tons per hectare per year. There are expectations for yield improvements beginning in 1992 on the large plantations resulting from the planting of newly developed hybrid varieties in 1990.

Producer costs for pineapple are expected to remain relatively high in the Philippines due to the following factors:

- at least a 100% increase in land lease payments by Del Monte and Dole to its agrarian reform beneficiaries. These leased lands presently account for more than 65% of the plantation's effective areas cultivated to pineapple,

- high cost of farm and factory labor considered as one of the highest in the domestic agro-industrial processing sector, and

- high cost of energy and fuel, despite a general decline in world fuel prices, due to the Philippine government's replenishment of its oil price stabilization fund.

There have been improvements in productivity, however. Harvesting operations now take 12.3 man hours per ton of fruit, compared with 16.65 man hours per ton in 1989. The percentage of fruit rejects has dropped from 12.96% in 1989 to 8.8% in 1990. The overall average cannery recovery rate in 1990 was estimated at about 61%.

The land lease rate mentioned above is $100 per hectare per year, with an allowance of 7% per year increase. In addition, the company pays all property taxes, and a production bonus of about 20 to 30 cents per ton of fruit.

In 1991 Dole and some of its agrarian reform beneficiaries (numbering close to 300) are reportedly planning to set up a pineapple nucleus estate on a 1,400 hectare site. Under the nucleus estate scheme (a modified contract growing arrangement), the farmers will contribute the land and labor to the venture - while Dole will establish a processing plant and handle marketing and exports of the venture's entire fruit production, as well as provide management and extension services. The project was filed with the Board of Investments in mid-1990 and commercial operation is expected by 1992. Most of the scheme's participants are farmer's cooperatives.

During 1990 prices of major agricultural inputs such as urea fertilizer and gasoline doubled. Fertilizer input prices are not subsidized, and tend to reflect world prices. Production credit interest rates are no less than 18%, and often as high as 35% to 40%. There are additional problems with rising labor costs and militant labor unions in the Philippines.

Theoretically, there should be a substantial savings in freight from LAC countries (versus Asian exporters) to the U.S. markets, and a lesser savings into the European markets. In reality there is an inconsistency in the rates charged as they relate to distance travelled.

It is difficult to make firm comparisons of freight rates, for reasons outlined in the Transportation Analysis in Appendix III, Vol. I, but the following, drawn from this alysis should provide useful guidance. This analysis used a standard unit of measurement, which was a 40 foot container carrying 42,000 pounds. These rates are from port to port, and do not include inland freight which can add significantly to overall transportation costs.

To northeast United States		Dollar Rate
From:	Dominican Republic	4,426
	Peru	no established rate
	Philippines	5,620
	Thailand	4,954
To south Florida		
From:	Costa Rica	2,899
	Dominican Republic	4,314
	Peru	6,313
To California		
From:	Peru	2,300
	Philippines	4,434
	Thailand	3,735
To Rotterdam		
From:	Costa Rica	4,165
	Dominican Republic	4,657
	Peru	6,800
	Philippines	4,789
	Thailand	4,683
To Japan		
From:	Costa Rica	8,248
	Dominican Republic	no established rate
	Peru	10,500
	Philippines	3,080

It should be noted that these rates are subject to negotiation. In particular, the expansion of the fresh produce export business in the LAC region has created an imbalance in the supply/demand situation for refrigerated containers, with extremely heavy demand over a relatively short season, and then virtually no demand the rest of the year. This allows a framework for

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negotiating extremely favorable off-season contracts with the shipping companies.

2. Other Tropicals

Passion Fruit

Passion fruit is currently exported primarily from Latin America, particularly Brazil, with some exports from Sri Lanka. The historical problem here has been erratic supplies. Most processing plants are having difficulty keeping land under contract. This has been true in Ecuador, Peru and Sri Lanka. Any supplier with stability of supply, consistent quality and a stable pricing mechanism in place will be able to dominate the market.

The passion fruit market is now characterized by many small processors. Competitively there is an important advantage in duty into the U.S. market for CBI beneficiaries, and it is anticipated Andean Initiative beneficiaries. According to a U.S. Commerce Department representative, recent legislation has increased the duty to 100% (1991) for products originating from other locations.

Plant utilization is another very important cost issue here.

Mango

Mango exports have been dominated by India for years, but recent reduction in exports from India (the result of a severe drought there) have created supply shortages and higher worldwide prices. At this particular moment in time, new suppliers could easily gain a share of market. Mango can be marketed as a package together with the pineapple and other tropical fruits, as discussed earlier, and the opportunity for buyers to purchase these products as a part of a mixed container load will further enhance an exporter's ability to gain market share.

Unlike pineapple, the mango is labor intensive. Since mango would essentially be a secondary product for the processing plant, and a supplement to fresh market production for the farmer's fruit; the real competitive issues become the quality of the finished product, transportation costs, and duty into the U.S. market. Transportation costs favor LAC (over India) into both North America, and into Europe (see Appendix III Vol. I). And, as stated above, new legislation has put import duties into the U.S. at 100% in 1991. CBI beneficiaries, and it is anticipated Andean Initiative beneficiaries, will be able to enter the U.S. duty free.

Banana

Latin America is now the major supplier to the world of banana pulp. However, the number of producers in Latin America is limited due to the difficulty of the technology for processing.

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Guavas

The major use of processed guava is as an ingredient in mixed juices, where it is prized for its distinctive pink color. For this reason, correct variety selection, cultural practices and proper processing procedures which do not jeopardize this delicate element of the fruit are very important. Hawaii is currently the principal supplier. Although the demand is modest, there should be opportunities for LAC producers to build business as the fruit, owing to its distinguishing pink hue, is ideal for the increasingly popular mixed juice drinks.

Papayas

The papaya pulp market is small and stagnant. Some small amounts of papaya pulp should probably be processed in order to fulfill the goal of offering a broad line of products.

Other Minor Tropical Fruits

Again, with these tropical fruits, the major problems are: 1) inconsistent levels of supply resulting in highly volatile and unstable pricing, and 2) the small qualities required by end users, while purchasers (agents, brokers, importers, etc.) must buy full container loads. This results in added storage costs, affecting competitiveness. If these more minor crops can be put together as part of a package, allowing importers to buy mixed containers, it would significantly enhance the ability to sell the product and would allow for some marginally premium prices. Quality control cannot be overemphasized if this scenario is to succeed.

A special note on avocados - Processing of fresh avocados requires fairly sophisticated and expensive technology, and diligent management of operations. Yield efficiency is predicated on the oil content of the fruit. Optimal harvesting practices as well as post harvest management of the raw material are therefore critical. The raw material is not usable if bruised or over-ripe and great losses can be experienced if the fruit is mishandled.

The equipment required for processing is unique and current possessors of the technology regard it to be highly proprietary. The markets are sophisticated (food service primarily) requiring knowledgeable brokers to sell this niche-type product. For these reasons, it would be difficult to enter this market without a partner who has past experience in it.

Summary

In summary, the most critical elements in determining ability to compete include: field yields of the pineapples; utilization of plant capacity; energy costs; transportation to market; and consistent, well-planned marketing programs. LAC should be able to

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be cost competitive in each of these areas. Service, or marketing orientation cannot be overemphasized. It is extremely important for producers to remain flexible and to maintain the ability to adapt rapidly to customer requirements and requests.

D. Market Access Strategies

Decisions regarding specific products, as well as the type of pack, should be determined in consultation with potential customers. In fact, the project should not proceed until these potential customers are lined up.

It is anticipated, however, that the plant would be producing bulk frozen product for industrial use. The frozen product has much better market acceptance at this time than the aseptic. This should be reviewed at the time of moving forward with the project and particularly in light of specific customer's needs.

It is recommended that the plant manufacture a broad range of tropical concentrates and pulps, led by pineapple concentrate as the high volume lead product. As discussed earlier in the Competition section, offering this range of product will provide an important marketing tool for the processor.

An illustrative product configuration for the plant described in the Manufacturing section would be about 2,900 metric tons annually of pineapple concentrate, 500 metric tons of passion fruit juice concentrate, and the balance in 500 metric tons of miscellaneous other concentrates. This volume represents less than 3% of the world market. In addition, the plant would produce roughly 4,400 metric tons of puree. The market share would depend upon the fruits processed, but would be well under 10% of the overall tropical puree market.

The market for the lead product, pineapple concentrate, is a commodity-type market and the primary competitive issue is cost competitiveness (assuming that product quality is equal to or better than the competitor's). When purchases of multiple container loads are in question, a variance of even a few cents per gallon can be pivotal.

Market penetration would be assured if joint ventures could be arranged with Del Monte and/or Dole the firms that dominate the pineapple concentrate business. Unfortunately, they both have established sources of supply and have expressed no interest in working toward development of new sources at this time.

However, a number of importers did express interest in finding additional or alternative sources of supply. Among these are two very large importers, Camerican in the United States, and

FrostImpex in Europe. In addition, Welch, a major juice manufacturer in the United States, stated that as they expand their "Orchard" line of blended juices they are utilizing more and more tropicals. Welch indicated that they too would consider a joint venture or contractual marketing arrangement with LAC producers if quality standards and quantity requirements could be met. Strong interest was also expressed by importers such as Morris and Associates (California), Able Sales (Puerto Rico), and John Stanley Horne Company (San Francisco). Horne sells both in the United States and Europe, and Morris in the U.S. and Japan. A directory of other selected manufacturers, importers and distributors of tropical fruit juices, pulps and concentrates in the U.S., Europe and Japan is attached (see Appendix III-14).

It should be noted that all potential market partners communicated the importance of quality control and most indicated that they would wish to work very closely with any start-up operation in order to install their standards in processing. It is common for firms in this situation to provide technical assistance and/or financial support to insure a finished product that satisfies their requirements.

A portion of the plant's production would normally be produced under contract for a fixed quantity at a fixed price, or with a price indexing procedure. The balance would be for sale on the open market. The contracted percentage would be a matter of judgement best left to the business managers, and could change from year to year, with possibly higher percentages of fixed contracts in the early years of the business.

E. Implementation/USAID Intervention Options

In terms of cost competitiveness, one of the key factors to be taken into consideration, if not the key factor, is capital cost. To set up processing lines, particularly evaporation equipment, involves a substantial investment. This investment is ultimately reflected in the unit costs of the products manufactured. This means that for a successful operation a relatively high (75-85%) level of capacity utilization must be maintained, and there should be a reasonable balance between total capital investment required and rated through-put capability. This will be discussed further in the manufacturing parameters section.

Because of the low volume of the "other" tropical products sector, the team sees the most effective approach to be the development of a modern, efficient, multi-product operation. Though the main burden of volume would be carried by pineapple concentrate, the operation would have the ability to do a wide range of other concentrates and purees. Although most of the tropicals have their own unique equipment requirements,

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particularly for raw product preparation, essentially the great bulk of the equipment is common to all of them. The incremental investment in the additional processing equipment can usually be economically justified.

In any event, passion fruit should be considered as a second crop, as well guava and the other more minor crops discussed earlier. If the plant were situated near a fresh mango production and exporting operation of some volume, this would be extremely helpful. This diversification should help protect, in at least a small measure, against some of the vagaries of market fluctuations.

Plant operation, with a product line configuration as outlined in the manufacturing section would require 17,600 tons of pineapple annually. Assuming a 45 ton/hectare average yield, 600 hectares under cultivation would be required to supply the plant. The passion fruit component would require about another 400 hectares; and the miscellaneous other fruit, depending on the crop could employ another 200 to 400 hectares.

The pulp line, would require about 10,000 tons over a 44 week year. Again, the impact will depend upon which crops are being pulped. Mango and banana are the highest volume items, with guava and papaya also offering some market potential. An estimate of the pulp line requirements is an additional 200 hectares under cultivation.

So, to maintain reasonable capacity utilization levels would require about 1,400 to 1,600 hectares under cultivation.

There are two distinct groups of potential processors in the IAC region who would benefit from some type of USAID support. The first group would be entrepreneurial-type producers or cooperatives wishing to start new plants. The second group would be those producers who have existing plants - and are probably operating at under-capacity. In all cases it must be kept in mind that processing mark-ups tend to be very low, and that the international marketplace is very competitive. Efficient farming and processing operations will be crucial for success to be achieved.

Experience has shown that there are traditionally three major problems involved in Developing World processing. These issues must be dealt with by the producer groups:

- Insuring an adequate supply of good quality raw material. This issue cannot be overemphasized. Varieties, maturity, post harvest handling, etc. greatly affect efficiencies at the processing level. It is imperative that adequate volume be guaranteed for full plant utilization.

- Management. This area covers a wide range of issues - from insuring proper pesticide usage (an extremely critical

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factor); adequate training at all phases of the operation; insuring quality control; proper, efficient managing of the operation as a cost-effective entity; and providing effective thoughtful marketing programs.

- Interest rates. Traditionally, interest rates are well above world market rates in developing countries. An excessive cost of financing for capital expenditures as well as growing costs can preclude any hope of competing on an international level with rivals who have a significantly lower debt service component in their overall operating situation.

1. New Plant Start-Up

In developing a new plant, the first step would be to determine which of the identified products could be most cost-effectively grown in the target location. A detailed feasibility study should be conducted to determine production capabilities, and financial feasibility. Then, armed with the feasibility study, potential joint venture partners or potential contractual market agreement associates would be approached to seek participation.

One model that may be of interest, would be Dole's activities in the Philippines. Sixty-five percent of Dole's pineapple production land there is leased from agrarian reform beneficiaries. These beneficiaries also provide labor for production and processing. This arrangement has worked successfully, and in 1991 Dole is coming on stream with a nucleus estate of an additional 1,400 hectares, working with 300 agrarian reform beneficiaries.

It should be noted that pineapple production seems to thrive in large intensely managed units. For example, the yields on Dole's nuclear estates are 55 to 60 metric tons/hectare, compared to 15 to 25 metric tons/hectare achieved by small landholders. Similar disparities between small and large landholders has been reported in the Ivory Coast and Thailand.

An appropriate role for USAID in new operation development would be to provide the technical assistance for feasibility studies to be completed, and to assist the local operators in making the initial international contacts. The major challenge will be to find appropriate "matches" between producers and marketers - in terms of volume, type of product, ability to expand, cultural compatibility, etc.

Once agreements have been reached, the management of the plant and the various quality and cost problems inherent in operating the plant should best be left to the private sector operators. However, a very important issue which may be beyond the capability or willingness of the foreign assisted operator in the early stages, would be the assurance of adequate, pesticide-free supplies

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to the plant. A USAID project could play an invaluable role in assisting in the organization of the growers and the supply, and assisting the growers in establishing cost-effective methods of production that will allow them to make sufficient profits in this competitive environment.

Cooperatively owned, fully integrated plants in areas where growers have limited other options, could be in a position to provide adequate returns to its members.

2. Existing Processors

The only pineapple concentrate processing of significance in the LAC region is in Costa Rica. However, there are a number of processors of other tropical fruit juices, pulps and concentrates. In the development of these manufacturing plants, there seems to be little apparent thought given to the organization and development of raw material supplies. For example, there are at least three modern, well-equipped fruit processing plants now in operation in Ecuador, plus two plants currently under construction. In addition, there are reportedly smaller poorly-equipped plants manufacturing small quantities of the products primarily for the domestic market, with some for export. These plants are reportedly operating at a fraction of capacity.

Existing processors would enjoy some advantage over new start-up operations in that they would have products available for samples, they would have a track-record to allow for planning, and they would have at least some guaranteed raw material supplies.

In the case, where current operations are at substantial under-capacity, the role of USAID would most appropriately be to help define the reasons for the under utilization. If the problem was with adequate raw material supplies, technical assistance in terms of variety selection, cultural practices, etc. could be provided for the grower population which serves the plant.

There are generic programs that would be beneficial in the development of operations for both new plant start ups and existing processors:

Credit for LAC producers - To be competitive in international markets, it is extremely important that processors have the ability to borrow money at internationally competitive rates - both for the plant and equipment, and for working capital needs. It is our understanding that this is a policy issue that AID is currently actively addressing.

Product promotion - For years tropical fruit products (other than pineapple) have been regarded as having great unfulfilled

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potential. Many plants now operating are at very low levels of capacity utilization. There is no point in any promotional activities until this raw material supply situation is resolved. Prospective buyers have tended to shy away from these due to the uncertainty of supply and the wild price swings. Two approaches may help in stabilizing this industry:

- an international association of producers would be useful to assist in the exchange of information between producers, and to assist in general promotion of the products in the targeted world markets. This should be self sustained, but assistance in the original organization may be required.

- a stabilization fund may be useful in any given growing area where moneys are paid into a fund during times of high prices, and drawn from the fund to assist the growers during low prices. This will help provide the stability of supply necessary to set a base for expansion.

F. Manufacturing Parameters

1. Introduction

Fruit juices can be preserved by a number of methods. These include heat processing after canning; aseptic packing using high temperature, short term sterilization in sterilized containers; concentration of juices to 70% solids or higher without further processing; and freezing. Of all these methods, freezing is regarded as best for retaining the delicate flavors and characteristic colors of fruit juices or pulp. In the case of pineapple and other tropical fruit juices, the most widely traded commercial products are concentrates and purees, either frozen or aseptically packed in 55 gallon drums.

Whether the customer needs a frozen or aseptically packed product depends on its end use. Some importers state that the quality of the frozen product is substantially better, and is the most widely traded. Aseptic packaging is much easier to handle and store since it requires no refrigeration.

From the processors standpoint, freezing represents a lower initial capital investment, but entails much higher operating and subsequent storage and transportation costs. Aseptic packaging, in the mean time, involves a substantially higher capital investment, but entails much lower operating and transportation costs.

What will be reviewed in the following is a fruit juice concentration, and puree manufacturing plant packing bulk frozen product.

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To be equipped to process concentrates requires a large capital investment. The degree of labor intensiveness in this will vary from product to product, primarily due to the extent of hand preparation required at the front end of the process. Pineapple, for example, has a low labor intensity overall; passion fruit is labor intensive in the production of the product, but not in the processing; and mango is labor intensive in processing with extensive hand preparation of the fruit.

2. Process

The fruit juice concentrate process is made up of: 1) fruit preparation; 2) juice extraction and concentration; and 3) packing/freezing. Fruit pulp, or puree processing is a much simpler and less capital intensive process. It involves: 1) fruit preparation; 2) pulp extraction and pureeing; 3) sterilization; and 4) filling/freezing.

Fruit juices may be classified as: 1) clear juices, such as those prepared from cherries and apples; 2) cloudy juices containing a quantity of insoluble solids, such as pineapple juice; and 3) pulps containing fibrous and other insoluble matter, such as those obtained from mangos. Some highly fibrous products (such as mangos) can be processed as either a juice or a pulp, while others (such as bananas) do not lend themselves to juicing at all.

The preparation of juices, pulps and purees consists primarily of removing all, or part of the insoluble solids from the whole fruit. To accomplish this, ingenious equipment of many kinds is available. The equipment and process used varies from fruit to fruit, and will be discussed for selected fruits later in this chapter.

Pineapple Processing

The principal variety used for juice production is the Smooth Cayenne, which is grown widely for the canning industry. In addition, the Perola variety has very successfully been used for juice production in Brazil.

Single-strength pineapple juice has a soluble solids content averaging around 12 to 15 brix. However, this can be higher when utilizing whole fruit, particularly for the Perola variety.

As mentioned earlier, most pineapple concentrate is a by-product from the canning operations - where the trimmings, cores, etc. are pressed; centrifuged to remove excess pulp; de-aerated; pasteurized and concentrated. In 1979 there was a move to start producing juice from whole fruit which resulted in a product with better flavor, more body and stability than previously available. This process involves crushing the whole fruit rather than using

just those parts rejected during the canning process. As this became successful, special-purpose extractors were developed, such as the Indelicato "polypine" which cuts the fruit in half against the screen. The juice is then passed through a normal finisher before de-aeration and concentration.

The juice is concentrated in multiple effect vacuum pans to a concentration of 60 to 65 degrees Brix. Essence is recovered and is added and mixed back with the pineapple concentrate, which is then "slush" frozen and packed into a 55 gallon drum. Freezing is completed by holding at -10 degrees F.

Passion Fruit Processing

Upon ripening the passion fruit falls from the vine and is harvested from the ground at least once a week, preferably more often in wet weather. The fruit is transported from the field normally in 18 kilogram lug boxes, and if it is not processed immediately, it is placed in cold storage. Recommended storage temperature is 6.5 degrees Centigrade, with a relative humidity of 85 to 90%. Under these conditions, the fruit can be stored for 4 to 5 weeks.

The fruit is then fed into an inspection belt where culls and immature fruit are removed. It is desirable to trim off any adhering stock ends if centrifugal extraction of the juice is to follow. This may be done by running the fruit over rollers running in opposite directions as in a strawberry de-stemmer. The fruit is then spray washed with the optional addition of detergent in the first stage, followed by a final rinse in clean water.

There are several methods for extracting passion fruit pulp. The most efficient for volume production and high yields is a centrifugal extractor developed by the University of Hawaii, currently being used successfully in commercial practice. The fruit is sliced by means of a gang of rotating knives, and the slices (5/8 inch) drop directly into a perforated centrifuge bowl. The bowl has sloping sides and four baffles at right angles to the side. When it is rotated, at centrifugal force of 175g, the pulp and seeds from the slices are thrown out through the holes in the basket while the residual skins climb up the walls of the basket and are thrown out over the edge. The pulp and skins are then collected from separate chutes.

Another passion fruit extractor, which resembles a citrus juice extractor, has been developed in Italy by S.A. Bertuzzi. Called the Passy Press, the extractor works on a principal of compression. The passion fruits are compressed between two rollers, one rubber-covered and the other with stainless steel teeth. A diaphragm with vertical motion insures that the fruit is caught between the rollers and that the skins are fractured. The

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tooth roller then presses the broken fruit against the screen so that the pulp flows through.

The use of pectinolytic enzymes has been reported to increase juice extraction yields by 35% without any deleterious effects on juice flavor or color.

After de-aeration and pasteurization, the juice is concentrated to about 50 Brix, and the essence returned to it. Passion fruit is then filled into 55 gallon drums and frozen. It should be stored at -18 Centigrade.

Mango Processing

Mango is most commonly marketed as a single-strength puree, but juice concentrate is becoming increasingly popular.

Mangos that are fully ripe and free from rot are usually selected for processing into puree. They not only provide a more flavorful and highly colored product, but they also provide higher yields. The Alphonse is the premium variety, however, almost all other varieties are also traded. Other varieties specifically identified in trade are the Totapuri (from India); and the Hayden, and the Chato de Ica varieties out of Peru.

When they arrive in the plant, mangoes are thoroughly washed - preferably in a soaker-washer fitted with brushes using a detergent and a chlorine wash at 20 to 60 ppm of active chlorine, followed by a rinse in a rotary washer. Fruit is then steamed for a few minutes to loosen the skin. The next stage is generally to pass the fruit through a stirring and cutting vessel where knives break the fruit up into a mixture of pulp and skin without breaking the seeds or stones which remain intact. Then, after it passes through a sieve to remove the stone and skins, fruit moves on to a final pulp-er or centrifuge to yield a smooth puree. Frequently the peeling is done by hand, rather than mechanically.

Mango pulp is generally macerated and mechanically screened through devices termed "pulpers", which convert the pulp into a finer and smoother puree. Puree that is to be frozen requires a heat treatment for the inactivation of the enzymes. A plate heat exchanger can be used to raise the puree temperature to 195 to 200 degrees F., hold them for two minutes and then rapidly cool to 85 to 100 degrees F. The product is then packed and frozen in 5 gallon pails and 55 gallon drums.

Recently concentrated mango has become more popular. Concentrating mango is extremely difficult to accomplish. One method that has been employed with some success is to centrifuge the puree to separate the pulp from the syrup. The latter can then be concentrated to about 45 to 50 Brix, and when the pulp is returned the result is a concentrate of about 40 Brix, equivalent

to a 3-4 concentration which has much of the aroma and quality of the original puree.

Banana Processing

Bananas are peeled and emersed for three minutes in a 2.0 solution of sodium bisulfite. They are drained several minutes, then milled through a one-inch screen to give a coarse puree. The puree is pumped to a plate heat exchanger where it is heated very rapidly to 190 degrees F. and after about one minute is cooled rapidly to 85 degrees F. It then goes to a finisher with a .033 screen which removes seeds and some of the fibrous material. Citric acid is stirred in to bring the pH to 4.2. The average Brix of the finished product is 22 degrees.

Guava Processing

The most desirable fruit for processing are those cultivars with a thick outer flesh and a small seed cavity since they will yield more puree per unit weight than thin fleshed types. The more acid fruits (Ph 3.3 to 3.5) are better for processing than the sweeter fruits. Good color and flavor and high vitamin C contents are also important factors in selecting fruit types for processing.

Guavas picked at peak maturity do not keep well and there should be no delay in getting them the plant for quick processing or refrigerated storage. It would be desirable to ship only fruits that are firm and slightly under-ripe, and to finish off the ripening under controlled conditions at the processing plant. Fully ripe guavas should be processed without delay, but if necessary, can be held for about a week at 36 to 45 degrees F.

When the guavas are ready for processing they are fed into an inspection belt, where spoiled fruits are removed and green fruit set aside for ripening. Those fruits that have only minor defects may be trimmed to make them acceptable for processing. A flow sheet for guava processing is shown in Appendix III-13.

From and inspection belt the sound fruits drop into a washing tank or onto a washing belt, mechanical or manual agitation and the addition of a detergent to remove dirt, debris and dried on flower parts. An elevator belt removes the fruits from the washing bath and a clear water spray washes off the detergent. After washing, the whole fruit can be fed directly into a paddle pulper for maceration into a puree; if the fruits are rather firm it may be necessary to attach a chopper or slicer to the hopper that feeds it into the machine. To remove seeds and fibrous pieces of skin tissue, a perforated screen should be used on the pulper. Chopping of all fruit before feeding into the pulper may be desirable since it allows for a more uniform feed rate.

The outer flesh of some guava fruit has a considerable number of hard stone or grit cells. Removing most of these stone cells improves the texture of the final product. One method of getting rid of these unwanted cells is to pass the puree through a paddle finisher equipped with .02 plural screens. This machine is a pulper in which the steel paddles are replaced by neoprene rubber strips held in place with stainless steel or hardwood cleats. The rubber paddles are adjusted so that they almost touch the screen and the angles decrease from that at which the paddles are set for at the pulping operation. For this operation, the speed of the machine is reduced while the puree is fed into the hopper at a uniform rate. Adjustment of the paddle's pitch speed and waste gate should be continued until the waste is slightly moist.

Another of finishing is to run the puree through a mustard mill so that the stone cells are pulverized. This operation reduces the grittiness but does not improve the color. Both methods are used by processors.

After pulping and finishing to remove the seeds and stone cells, the puree is put through a de-aerator. The removal of oxygen lessens deterioration in storage because oxidation is the chief cause for the loss in color, vitamins and flavor. The removal there makes for a more uniform and smoother looking product, with improved color. Also, the prevention of foaming caused by air allows correct and uniform filling of containers.

After removing stone cells a flush freezer chills the product before it is filled into containers. The advantage of pre-chilling is that the puree will freeze more rapidly, maintaining high quality and allow labeling and casing to take place sooner. Because of the high acidity of this product, the containers should be enameled or protected with plastic lining.

Total soluble solids for guava tend to be on the low side, averaging around 9 Brix. The major difficulty in processing is caused by the seeds or seed particles. These are very sharp, and if present in the puree can give an unpleasant, gritty texture. In addition, they cause excessive wear and tear on machinery, particularly the rubber parts on some filling equipment. This is another reason that some processors pass the puree through a mill, so that any seed particles that have not been trapped in the screens are eliminated. This means the introduction of equipment that would not be necessary in a plant processing other types of tropical fruits.

Guava puree does not concentrate easily because of its high pulp content, and is normally available only as a frozen single-strength puree. The market for guava concentrate is beginning to strengthen somewhat.

Papaya Processing

Papaya puree is a liquid form product, which is prepared by the maceration of fresh papaya flesh into a fluid-like product. Nearly all of the unit operations in its manufacture can be mechanized. However, processing papayas into puree can be difficult. Special care is necessary to prevent two major problems: gelation and "off flavor" development. Gelation can be prevented through heat inactivation of the enzymes, a process that also improves the flavor stability of the puree.

There are additional factors which contribute to "off flavors" or "off odors". The peel and seeds are sources of bitterness; these must be separated from the puree completely - and as early in the processing line as possible. Latex in the skin contributes to bitterness if it finds its way into the puree. And, if the sarcotesta and seed are ruptured during processing, an unpleasant, pungent flavor and odor can be released into the puree.

The process is as follows:

Fresh papayas are inspected and sorted to remove any damaged and/or undesirable ones. The fruits are immersed in water at 120 degrees F. for 20 minutes. The warm water treatment is used to prevent undue spoilage losses during ripening. The fruits are ripened at room temperature for 5 to 6 days. The papayas are then exposed to flowing steam for 2 minutes. This steaming coagulates the latex in the peel, thereby preventing its entry into the puree. Steaming increases puree yield by softening the outer portion of the fruit, and the heat treatment inactivates enzymes in the peel.

Water sprays cool the fruit, which is then sliced by rotary blades. The slices drop into a crusher/scraper that loosens the pulp and seeds from the peel, without breaking the seeds. The slicer and crusher eliminate hand labor previously required for cutting the fruit and scooping out the flesh. However, hand labor is still frequently used.

The maceration of skins, pulp and seeds is then fed into a centrifugal separator which separates the skins from the pulp and seeds. Any seeds not removed from the pulp by the centrifugal separator are further removed by means of a paddle pulper fitted with rubber paddles and a .033 inch screen.

Citric acid in 50% solution, is metered into the puree to lower the Ph level to 3.4 to 3.6. Acidification at this early stage is critical for the inhibition of gelation. The acidified puree is then passed through a paddle finisher fitted with a .020 inch screen to remove fiber and seed specks.

The pulp is then pumped through a heat exchanger in which it is held at 205 degrees F. for 2 minutes, and then cooled quickly to 85 degrees F. This heating inactivates enzymes in the puree to stabilize it against quality deterioration during frozen storage.

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The cooled puree is then packed into containers for freezing at -10 degrees F. or below.

Papaya purees prepared by this method were judged to be superior to those prepared by other commercial methods (Jagtiani, et al., 1988). The resulting puree has a Brix of about 9 degrees. As with mango, frozen concentrates are beginning to be available with Brix up to about 22 degrees.

Avocado Processing

The avocados are selected on the basis of maturity and size; they should be just on the immature side of the condition referred to as "eating ripe". At this stage of maturity, the fruit is free of brown spots.

The avocado is cut in half, along its longitudinal axis and the seed is removed. The opened half is inspected for spots or areas of discoloration, or for any soft or rotten places.

An avocado peeling machine has been developed consisting of two drums, both rotating downward toward the nip. One has a solid outside surface. Pitted avocado halves are placed one at a time, with the seed cavity toward the perforated drum. As the drum rotates, the solid drum presses the meat of the avocado through 1/4 inch holes in the perforated drum. A doctor blade, mounted inside the drum cuts the meat from the peel and a doctor blade on the outside of the perforated drum removes the peel.

Avocado must be treated with an anti-oxidant such as 0.5 ascorbic acid, one-half strength lemon juice, or a solution of citric acid.

Soursop Processing

Soursop is hand peeled, then pulped and screened to yield a puree with a Brix around 16 degrees. It is not usually available in concentrated form.

3. Equipment Needed - Floor Space - Cost

To accomplish the diversification discussed earlier we have outlined a plant that has two separate production lines; one for concentrate, and one for puree. Processing is part science and part art, and there are many variations to the system we will outline. The concentrate line will be predominately for pineapple but will have the flexibility to handle other concentrates such as passion fruit, mango, guava and papaya. The proposed line would have a rated capacity of 10 tons (raw material) of pineapple per hour, and 12 tons (raw material) of passion fruit per hour.

Pineapple and passion fruit will require two separate lines for fruit preparation and juice extraction. From that point on the juice would be fed into the evaporator which would be common to both products, as will all the following steps of drum filling and freezing. The main item of expense for the equipment, about one-third of the equipment cost, is the evaporator. The incremental costs for additional fruit preparation and juice extraction would run about $200,000 per line - a relatively minor part of the estimated $4 million cost of equipment when weighed against the flexibility it adds to the plant.

Most of the minor crops under consideration for concentrating, would also be processed as puree, and much of the equipment used in the puree operation for fruit preparation can be also utilized when the product is being run for concentrate. The equipment needs for a puree processing line are relatively simple. By itself, the equipment cost will be less than $1 million. This puree line is designed to run 3 tons (finished product) per hour. Line drawings of guava and papaya processing are attached (see Appendix III-13).

FMC Corporation, Madera, California, estimated a total equipment cost, including the refrigeration system for cold storage of $4 million (FOB U.S.).

Approximately 20 acres would be needed, including a waste disposal area. The building would require about 20,000 square feet, which includes refrigerated warehouse space of about 5,000 square feet.

4. Raw Materials/Yields

Pineapple

At a 4:1 concentration, it takes 75 pounds of pineapple to make one gallon of 61 Brix pineapple concentrate. The net weight per gallon is 10.8 pounds.

For single-strength pineapple, 15 pounds of farm weight yields about 8.8 pounds of juice, single-strength - reported yields have ranged from 56% to 61%.

Mango

Yields can vary substantially from variety to variety. The Alphonse, the most popular variety for use in processing in India, yields about 50% in pulp. This is also a good average for other varieties.

Passion Fruit

The juice yields of passion fruit is 33%.

Guava

Guava averages a 12% seed waste, 5.5% stone cell waste, with an estimated effective yield of useful pulp of 80%.

5. Labor Costs

Labor requirements can vary depending upon the product. The following labor estimate is for a plant running pineapple and passion fruit concentrate, and mango pulp. It is estimated that the plant will need the following personnel for double concentrating shifts and a single puree shift:

- General Manager
- 1 sales manager
- 6 accountants, secretaries and other office help
- 5 field men
- 1 plant manager
- 1 receiving supervisor
- 3 weighing and recording
- 9 receiving labor
- 2 concentrating line foreman
- 20 skilled operators, concentrating line
- 1 puree line foreman
- 24 puree line labor
- 7 maintenance, mechanics and electrician
- 3 quality control technicians
- 1 warehouse foreman
- 3 warehouse labor
- 10 plant clean-up

Total = 98

6. Overhead Requirements

Indirect costs that would have to be taken into consideration include: pallets, vehicle operations for field men, yard vehicles, telephone and FAX, auditing and legal, insurance, licenses, printing and postage, repairs and maintenance (estimate repairs and maintenance at 1% of the total cost of the equipment).

7. Packaging and Product Standards

See Appendix III-12.
A drum with liner is estimated to cost about $60 per ton.

8. Energy Consumption

Concentration Line

water	10/20 degree C.	112.45
fuel energy	MJ/H	12.000
steam	KG/H 10 bar	3.220
electric power	kWh	500

Source: Alberto Bertuzzi SpA, Burgherio, Italy

Puree Line

water	M/H20 degree C.	1.6
	2 degree C.	0.3
steam	KG/H 7 bar	470
compressor air	M3/H 7 bar	20
electric power	kWh	120

Source: APV Crepaco Inc., Chicago, Illinois

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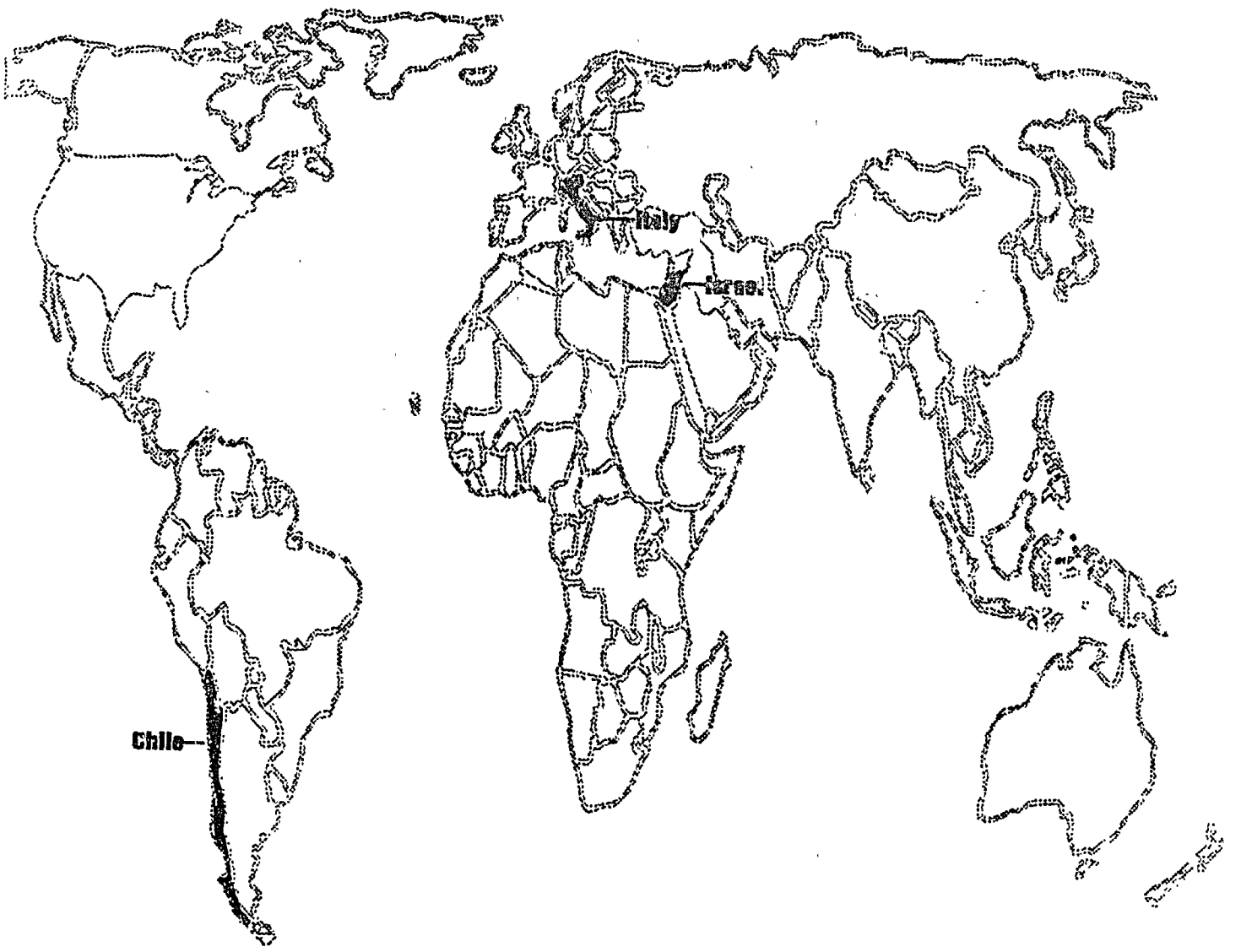
IV. Processed Tomatoes

Major Competitors for Canned Tomatoes



IV. PROCESSED TOMATOES

Executive Summary

The processed tomato business is an exceptionally large commodity-type industry, characterized by a number of very efficient operators, cut-throat competition and highly cyclical market pricing.

Sales of processed tomatoes, tomato products and tomato based products have recorded strong growth internationally over the past decade, and industry sources anticipate that this growth will continue through the next decade.

Of the major markets, Europe, with a subsidized industry is effectively closed and producers there are aggressive exporters. The United States is also a major producer and exporter, and although the market is open, it is highly competitive. Japan has recently opened its market to tomato products and has become an important importer. The U.S. and Japan are the best markets to be targeted by LAC producers.

Duty for imports of canned tomatoes from the European Community into the United States amount to 100%. Imports from Israel, CBI recipients, and in the near future the Andean Initiative recipients will be duty free. All other countries pay 13.6% on paste and puree, and 14.7% on canned tomatoes.

Cultivation of tomatoes for processing in the eleven highest producing countries amounted to an estimated 19.5 million tons in 1990, with 9.4 million tons (or just under 50%) produced in the United States. USDA reports planting intentions of over 362,000 acres for 1991, up 1% from 1990. It is forecasted that this will result in a record high production of 10.3 million tons. The European Community, which operates under a quota system with price supports for tomatoes, had an output of processing tomatoes estimated at 7.2 million tons in 1990. This production represented an increase of 34% over 1987, and 4% since 1989.

Tomato paste, and whole and diced tomatoes are the two most important processed items in international trade.

The use of bulk tomato paste has been growing rapidly, making it the single most significant item involved. Over 100,000 metric tons were imported into the U.S. and over 76,000 metric tons into Japan in 1989. Trade sources estimate that the entire increase in tomato production in California from 1989 to 1990 (over 1.7 million tons), went into increased paste production. In addition, the tomato paste supply in major producing foreign countries increased by an estimated 117,000 metric tons, an 8% increase over 1989/90.

This worldwide increase in production was occasioned by the strong pricing for paste that existed for a two year period through mid-1990, when prices began declining. The production increase had two effects - a reduction in the price of industrially traded paste of over 32%, and a reduction of imports into the United States from 103,600 metric tons in 1989 to 62,274 metric tons in 1990.

Canned tomato imports into the U.S. decreased from 79,938 metric tons in 1988 to 62,274 metric tons 1990, principally because of the imposition of the 100% tariff duty for E.C. products. Pricing remained stable during this period.

In July, 1989, the Japanese began a series of steps toward further opening their markets to the imports of tomatoes and tomato products. Japan imported 76,123 metric tons of paste and puree in 1989, primarily from Turkey and Taiwan; and they imported 18,874 metric tons of tomatoes, two-thirds of the volume from the European Community.

One of the most notable developments in world trade in tomato products over recent years has been the emergence of Chile as a producer and an exporter. Mexico is also a key producer. Between them, Mexico and Chile accounted for 70% of the paste imported into the United States in 1990. With canned tomatoes, Italy was the leading exporter to the U.S. with 16,000 tons in 1990. Italy is followed by Israel with almost 15,000 tons, and Chile with over 12,000 tons. These three countries accounted for close to 70% of the canned tomato imports into the United States in 1990.

The tomato processing industry is seasonal in nature. The uncertainty of raw material supply, the seasonality of finished goods production, and an inelastic demand for products have resulted in unstable prices and profits for growers and processors throughout the industry over the years. LAC areas having micro-climates which would allow for an extended growing period would have a significant competitive cost advantage.

Tomato paste production is capital intensive with a relatively low labor component. Canned tomatoes require significantly less capital and are more labor intensive. A 10 ton per hour canned tomato operation uses about 70 workers per shift for direct labor, and about 25 who would be classified as overhead. Yields of finished product average 9 tons per hour. This means that every $1.00 per hour differential in the wage rate has an impact of $10.50 per ton on canned tomatoes. A representative sales price is $450/ton (FOB east coast). This means that every $1.00 per hour variance in labor costs has an impact of over 2% of sales value.

Tomato production on the farm level is not labor intensive unless the fruit is hand harvested. In the United States and Europe virtually all processing tomatoes are now machine harvested. Machine harvesting is reportedly competitive with hand harvesting

even in low wage areas. A worker can hand harvest 3,000 pounds of tomatoes per day.

Yield is the most serious production cost problem. Yields in most LAC countries run 12 to 13 tons per acre. In other major producing areas, on the other hand, yields run 22 to 34 tons per acre.

To understand the impact of yields, assume for illustration purposes, a growing cost similar to that of Monterey, California of $1,160 per acre (exclusive of harvesting costs). And also assume that the lower yields would not reflect lower input costs, which may or may not be true. At 30 tons/acre, cost per ton is $39; at 22 tons/acre, cost per ton is $53; and at 12 tons/acre, cost per ton is $97. For tomato paste this would result in a raw material cost per ton of $260, $360, and $640 respectively. This is compared to a representative sales price of about $800/ton (that could vary $200/ton in either direction). Under this scenario for diced canned tomatoes, raw material costs would be $43, $59, and $108 per ton respectively - against a representative sales price of about $450/ton. The yield:cost impact is greater on the paste as a result of the concentration that takes place.

The three most important quality considerations for paste are mold count, bostwick (consistency), and color. For canned tomatoes, color is the foremost quality concern.

Often in the manufacture of tomato paste a certain amount of mold finds its way into the product, for which the FDA has set tolerance levels. Historically, many developing world processors have performed poorly regarding mold counts. The sense in the industry is that this is a management problem rather than anything inherent in the growing and processing conditions.

The causes for problems with bostwick are less clear. Problems can be partially attributed to management, ie: utilization of over-ripe or green tomatoes, improper processing procedures, or the variety of tomatoes used. It is also possible that problems could be caused by something in the growing conditions themselves.

Color is usually a result of variety selection and growing conditions although it is possible that improper processing procedures (ie: attempting to process green tomatoes) can have some effect. Industry sources have expressed skepticism relative to the ability to grow tomatoes with good color in the tropics. Team members, however, have had experience with processing tomatoes in the Comayagua Valley in Honduras. The color looked very good and samples sent to a leading U.S. laboratory for analysis received the highest possible rating for color.

The capability of producing quality product will have to be addressed on a locality by locality basis.

Of particular interest for LAC producers will be canned diced tomatoes, packed for industrial and institutional use. The markets for these products have been growing rapidly over the past few years. Dicing is a much smaller-scaled manufacturing process (than paste operations) and is labor intensive.

In terms of transportation and duties, LAC producers would be in a good competitive position in the U.S. canned tomato market vis a vis Italy, Israel and Chile; and versus Chile for tomato paste.

Furthermore, canned tomatoes, with their lower capital investment, greater sensitivity to labor rates, and lower sensitivity to production yields, represent a better option in most instances than the more capital intensive tomato paste.

Key considerations for canned tomatoes are the ability to obtain an excellent product color, and access to reasonably priced welded cans.

Canned tomatoes are, as the name implies, packed in cans. Leaded cans are no longer acceptable for products to be shipped into the United States and this conversion from leaded to welded cans has made the investment in can manufacturing equipment too expensive to be practical for a small canning operation. A can manufacturing facility within reasonable proximity (that charges affordable prices) would be needed by LAC processors.

The number of hectares required by a tomato canning operation would depend upon the length of the season and the yield per hectare. Over a 12 week period, the model plant described in the Manufacturing Parameters section would require between 10,000 and 11,000 tons of raw material annually. At a yield of 55 tons per hectare, this would require about 200 hectares. The ideal situation would be an area with a much longer growing season.

The model plant has two basic lines: one to handle prime product, and the second to handle culls. The prime line would process primarily diced and whole tomatoes for industrial and institutional use. Cull line production will depend on the situation in the country where the processing is taking place. The example given in the following scenario assumes the tomatoes are being manufactured into an export quality sauce. However, any number of products, suitable preferably for the domestic market are possible, with a relatively low investment. Additional products would include various types of tomato-based hot sauces, ketchup, tomato and other vegetable juice blends.

A total of 12,600 square feet would be needed for warehouse, production and supporting space. The total cost of the equipment would be $1,036,000 FOB Baltimore. The plant should be able to run effectively 10 tons of raw material per hour. Direct labor needs to cover one 8 hour shift would amount to 70 persons. Two shifts

a day would be run during the peak season. For indirect labor a total of 23 persons would be required. An estimated 200 hectares would be required to support the plant for a 3 month season.

The most appropriate area for USAID assistance would be in development of an adequate base of raw material (with the necessary color and other characteristics) to support the plant. Especially when dealing with smaller growers, AID could help in improving yields; variety selection; technical assistance for safe and effective pesticide usage; land preparation; planting and harvesting schedules and methods; etc.

There is a sense in the industry that despite the growing markets, there is enough installed capacity currently in place to more than cover demand. There are only a limited number of instances where a tomato operation may be successful in the LAC region. For these reasons, it becomes essential that a very thorough feasibility study be done prior to undertaking any projects.

A. General Description of the Processed Tomato Industry

In processing terms, "tomatoes" refers to whole canned and diced tomatoes - any product where parts of the tomato can be seen. "Tomato products" usually refers to tomato paste and sauces - products where the tomato has been processed to an extent, but nothing has been added. Once ingredients are added to the product, ie: "spaghetti sauce", etc., it is referred to as a "tomato-based" product.

The processed tomato business is an exceptionally large commodity-type industry, characterized by a number of very efficient operators, cut-throat competition and highly cyclical market pricing.

Sales of processed tomatoes, tomato products and tomato based products have recorded strong growth internationally over the past decade, and industry sources anticipate that this growth will continue through the next decade.

Of the major markets, Europe has a subsidized industry and is effectively closed. Producers there are aggressive exporters. The United States is a major producer and exporter and as a result, although the market is open, it is highly competitive. Japan has recently opened its market to tomato products and has become an important importer. The Japanese government works under a duty-free allotment. Exports that exceed this duty-free allotment have a 20% tariff imposed on them.

In the United States, Business Trend Analysts, Inc. estimate an annual growth rate of close to 6% for grocery sales overall of tomatos, tomato products and tomato based products through the year 2000. In addition, there is an equally strong institutional market, particularly for pizza-type sauces. This strong growth in the retail and institutional sectors has resulted in a flourishing industrial market in processed tomatoes and tomato paste for use in the manufacture of these products.

Output of tomatoes for processing in the eleven major producing countries amounted to an estimated 19.5 million tons in 1990, with 9.4 million tons (or just under 50%) produced in the United States. The European Community, which operates under a quota system with price supports for tomatoes, had an output of processing tomatoes estimated at 7.2 million tons in 1990. This production represented an increase of 34% over 1987, and 4% since 1989 (see Schedule D-1).

Schedule D-1

PRODUCTION OF TOMATOES FOR PROCESSING IN SELECTED COUNTRIES
(Data in 1,000 metric tons)

Country	1987	1988	1989	1990 [1]
United States	6,896	6,722	8,604	9,387
Canada	478	519	539	580
Mexico	271	282	317	365
Italy	3,100	3,160	3,800	3,800
France	236	276	323	340
Greece	865	1,005	1,400	1,150
Spain	743	746	976	1,134
Portugal	427	450	611	760
Turkey	900	1,200	1,700	1,500
Israel	178	136	317	300
Taiwan	278	207	220	182
Total	14,372	14,703	18,807	19,498

Source: FAS Production Estimates and Crop Assessment Division, August, 1990.

[1] Preliminary.

U.S. production is concentrated in California (85%), with a secondary center in Ohio and Indiana (10%). Imports fluctuate with the size of the California crop, with the market outlets for imports concentrated along the east coast (see Schedule D-2). USDA reports planting intentions of over 362,000 acres for 1991, up 1% from 1990. It is forecasted that this will result in a record high production of 10.3 million tons. Duties on tomatoes and tomato products amount to 13.6% on paste and puree and 14.7% on canned tomatoes.

Schedule D-2

UNITED STATES TOMATO STATISTICS

	1985	1986	1987	1988	1989
HARVESTED ACREAGE	**(Data in 1,000 Acres)**				
Total U.S.	265.5	252.2	257.1	274.9	320.8
California	217.0	210.4	214.0	226.1	276.5
Midwest	29.3	26.6	27.7	30.4	30.7
YIELD PER ACRE	**(Data in Tons)**				
Total U.S.	27.0	29.3	29.6	27.0	29.6
California	28.1	30.8	31.3	29.0	31.0
Indiana	20.6	21.6	23.4	20.8	20.2
PRODUCTION	**(Data in 1,000 Tons)**				
Total U.S.	7,177	7,393	7,602	7,410	9,485
California	6,102	6,480	6,703	6,548	8,585
Midwest	711	656	643	628	682
VALUE PER TON					
U.S. Average	$66.30	$63.90	$59.10	$60.70	$67.50
California	64.80	64.10	62.20	57.20	66.30
Indiana	79.20	80.10	75.30	80.90	79.00

Source: The Almanac.

B. Selected Products

There is a wide range of tomato and tomato-based products. This discussion will focus on tomato paste, and whole and diced tomatoes, the two most important items in international trade.

1. Tomato Paste

The use of bulk tomato paste has been growing rapidly, making it the most important item involved in the international trade of tomato products. Over 100,000 metric tons were imported into the U.S. and over 76,000 metric tons into Japan in 1989.

Tomato paste production in the United States is concentrated in California, where it is represented by high volume and highly mechanized operations from harvesting through packing. Yields in California average 30 tons/acre (see Schedule D-2), substantially above reported yields in most other parts of the country or world. California no longer releases pack statistics on tomato paste production, but significant new tomato paste capacity reportedly came on stream in 1990.

Trade sources estimate that the entire increase in tomato production in California from 1989 to 1990 (over 1.7 million tons), went into increased paste production. This had two effects, a reduction in the price of industrially traded paste of over 20%, and a reduction of imports into the United States from 103,600 metric tons in 1989 to 62,274 metric tons in 1990. All of this reduction took place in the last five months of the year (See Appendix IV-1).

Meanwhile, the tomato paste supply in major producing foreign countries increased by an estimated 117,000 metric tons, an 8% increase over 1989/90 (see Schedule D-3).

Schedule D-3

TOMATO PASTE SUPPLY IN SELECTED FOREIGN COUNTRIES
(Data in Metric Tons)

Countries	1990/91[1]	1989/90[2]	% Change
France	90,626	88,226	+ 3
Greece	221,273	257,273	- 14
Italy	430,000	378,650	+ 14
Portugal	144,374	110,625	+ 31
Spain	127,000	89,000	+ 43
Israel	28,000	29,300	- 4
Mexico	58,000	53,607	+ 8
Taiwan	22,088	22,678	- 3
Turkey	390,000	365,000	+ 7
Total	1,511,361	1,394,359	+ 8

Source: USDA Foreign Agriculture Service.

This worldwide increase in production was occasioned by the strong pricing for paste that existed for a two year period through mid-1990. At that time prices began declining - and as of April 15, 1991, prices were 33% lower than at the same date the previous year (see Appendix IV-1).

Since 1988 there has been a shift in the share of paste imports into the United States away from the European Community in favor of South American countries. U.S. imports of paste from Argentina, for example, jumped from 859 tons in 1988 to 15,000 tons in 1989. A drop-off, down to 1,700 tons in 1990, was a result of serious cost problems facing Argentine producers. Similarly, increased imports from Chile, which averaged roughly 2,000 tons per year from 1985 through 1988, increased to over 19,000 tons per year in both 1989 and 1990, challenging Mexico those years as the single largest foreign supplier of tomato paste to the United States.

Japan imported 76,123 metric tons of paste and puree in 1989 from a wide variety of sources.

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[1] Estimated.

[2] Preliminary.

2. Canned Whole and Diced Tomatoes

Meanwhile, principally because of the imposition of the 100% tariff duty for E.C. products, U.S. canned tomato imports decreased from 79,938 metric tons in 1988 to 62,274 metric tons 1990 (see Schedule D-5). Pricing remained stable during this period, but by the end of February, 1991 had begun to decline (from: Food Institute and the U.S. Census Department). Through 1990 there were no reports of new tomato processing capability expansion in the United States, but there has been unsubstantiated rumor that some additional capacity will be coming on stream in 1991.

Schedule D-4

CANNED TOMATOES
INCLUDING WHOLE PEELED, WEDGED, DICED, CRUSHED
AND OTHER NON-CONCENTRATED PRODUCTS

Pack Years	87/88	88/89	89/90 [1]	90/91 [2]
European Community				
Production	1,202,491	1,155,569	1,375,465	1,219,900
Imports	47,694	60,640	64,800	59,400
Exports	556,538	636,186	662,500	666,500
Israel				
Production	14,700	11,800	33,000	26,000
Imports	-	-	-	-
Exports	8,700	7,800	22,000	20,000

Source: USDA/FAS, Washington, D.C.

In the European Community, 25% of the processing tomatoes go into "peeled tomatoes". The European Community, which operates under a quota system with price supports for tomatoes, had an output of processing tomatoes estimated at 7.3 million tons in 1990, up 3% from 1989. Production of "peeled tomatoes" amounted to 1.2 million tons of net weight. This has been a very strong area for the European producers, but with reduced access to the U.S. market and sluggish sales in the important U.K. market, inventories were reported to have reached record high levels as of 4/15/91.

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[1] Preliminary.

[2] Forecasted.

The 100% U.S. tariff duty imposed on E.C. canned tomatoes, a repercussion of the beef hormone dispute between the two entities, resulted in European exports of these products to U.S. markets dropping from 66,000 metric tons in 1988 to 20,000 metric tons in 1990. This has opened the door for other suppliers of canned tomatoes (notably Chile, Argentina, and Israel) to increase their share of this market (see Schedule D-5).

Schedule D-5

U.S. IMPORTS OF CANNED TOMATOES
(WHOLE OR IN PIECES)
(Data in Metric Tons)

Source	1988	1989	1990
European Community	66,527	14,980	19,910
Argentina	-	4,967	4,485
Chile	3,418	7,660	12,113
Canada	146	1,139	2,719
Israel	4,295	9,044	14,825
Taiwan	3,785	9,896	3,582
Turkey	481	1,043	1,400 e
Other Countries	968	1,851	3,240
Total	79,620	50,580	62,274

e = Estimated.

Source: US Customs.

In July, 1989, the Japanese began a series of steps aimed toward further opening their markets to the imports of tomatoes and tomato products. In 1989 they imported 18,874 metric tons of tomatoes, two-thirds of them coming from the European Community (see Schedule D-6).

Schedule D-6

JAPANESE IMPORTS - 1989
TOMATOES, PREPARED OR PRESERVED
WHOLE OR IN PIECES, WITHOUT SUGAR ADDED

Country	Metric Tons
Italy	12,495
Taiwan	3,916
U.S.A.	1,191
China	547
Chile	363
Bulgaria	261
United Kingdom	90
Turkey	8
Total	18,874
Total E.C.	12,586

Source: Japan External Trade Organization (JETRO)

The above discussion included whole peeled, wedged, diced, crushed and other non-concentrated tomatoes. Of particular interest for LAC producers will be diced tomatoes. The markets for this product have been growing rapidly over the past few years. Dicing is a much smaller-scaled manufacturing process (than paste operations) and is labor intensive. Diced tomatoes are used industrially in the manufacture of spaghetti sauces, pizza sauces and soups. Separate statistics are not kept for this product, but the category in which it is contained ("others") grew from a pack of 3,000,000 actual cases in 1984 to 10,000,000 cases in 1988 - accounting for the entire increase in the canned tomato category. According to industry sources, this growth has continued since 1988.

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C. Competition

For all practical purposes, the only accessible markets to the LAC producers would be the United States and Japan.

1. Competition in the United States Market

Mexico

Mexico is the leading supplier of tomato paste to the United States, accounting for 24,825 metric tons (40%) of 1990 U.S. imports. Mexican production is centered in Sinaloa with seven processing plants currently in operation and another expected to start-up in 1991. Total installed capacity in Sinaloa currently is about 6,350 tons (raw material) per day. Yields for processing in Mexico average about 22 tons per acre. Year-to-year costs of inputs have been rising significantly over the past few years, with fertilizer costs alone expected to increase 100% in 1991. Please refer to Appendix IV-10 for the average Mexican processing tomato production costs for the 1989/90 season. The exchange rate as of 12/3/90 was 2,940 pesos per dollar.

Mexican processors traditionally contract with independent growers for their raw material tomato supply. The growers under contract are provided with transplants, fertilizers and technology for pest control by the processors. The costs for any inputs are deducted by the processors from the final amount paid to the growers.

Most of the trade in tomato paste from Mexico comes in 55 gallon drums containing 540 pounds of 29 Brix tomato paste. One refrigerated railroad box car holds 227 drums. Railroad tank cars that hold some 185,000 pounds, or the equivalent of 350 drums, at 33 Brix are commonly used. The cost of transportation from Sinaloa to the East Coast are approximately equal to transportation costs from California. Mexican product must pay a 12.8% duty when entering the country.

Canned whole and diced tomatoes from Mexico are not currently a factor in the United States markets.

Chile

One of the most notable developments in world trade in tomato products over recent years has been the emergence of Chile as a producer and an exporter. Large scale expansion of this industry has given Chile a major influence on events, particularly in trade with the United States where it has now become one of the top suppliers of canned tomatoes and paste.

Production capacity in Chile continues to increase. Paste capacity is currently estimated at around 45,000 tons (net product

weight) per year and an additional plant is due to come on stream in 1991. This new plant will add 11,000 more tons to Chile's paste capacity. This new plant is expected to start diced and whole tomato processing in 1992.

There are currently 12 companies involved in tomato processing, 7 of which account for the bulk of the output. Production is roughly divided into 15% for domestic consumption, and 85% for export.

The majority of tomatoes used are grown on contract with farmers who have plots averaging 4 to 5 hectares in size, with a maximum size of roughly 20 hectares. Yields average between 60 and 70 metric tons per hectare.

Processing firms provide the farmers with seedlings for transplanting, lower priced fertilizers and chemicals, extension services and, in some cases, cash advances. Most operations try not to use herbicides, but rather rely exclusively on hand labor for weed control. This permits maintaining the same pool of labor throughout the season, including harvest. Processing occurs from mid-January to mid- or late-April. The season lasts 90 to 100 days.

Chile is now in its third year of drought, which has reduced the water supply available for irrigation and may have an effect on next season's tomato production.

Wage rates for non-agriculture workers in Chile recently surged as low unemployment in these sectors led to more competition for labor. This trend in wages is expected to spill over into the agriculture sector, with salary increases for farm workers curtailing Chile's low labor cost advantage.

There is a divergence of opinion concerning the ability of arid regions in the North of Chile to sustain profitable tomato production for processing - an expansion to these regions could extend Chile's growing season to 10 months. A trial project is underway south of Copiapo. The project's goal is to add 30 days to Chile's growing season, thus expanding the season to roughly 120 days. Test plots show that this area produces relatively low yields, but high quality tomatoes. According to production engineers, interim results indicate that production is possible in this area, but that water is a significant enough constraint that the low yields may not prove to be adequate to justify tomato production in the area.

Mexico and Chile, between them accounted for 70% of the paste imported into the United States in 1990. With canned tomatoes, despite the tariff, Italy was still the leading exporter to the U.S. with 16,000 tons in 1990. Italy is followed by Israel with

almost 15,000 tons, and Chile with over 12,000 tons. These three countries accounted for close to 70% of the canned tomato imports into the United States in 1990.

Italy

Italy continues to be a major exporter of canned tomato products to the United States, despite the 100% duty on their product. Most of the Italian production is located in the Southern regions of Campania and Apulia which account for 45% of the national output. Seventy-five percent of the Italian crop is harvested mechanically. In 1989 yields averaged 22 tons per acre.

The E.C. minimum grower prices for the 1989/90 season for the San Marzano variety (used for canning) were 14.752 ECU/100 KG (24,931 lire/100 KG), net weight FOB farm. For the Roma variety prices were 11.349 ECU/100 KG (19,180 lire/100 KG) net weight FOB farm. (Exchange rates during the 1989/90 marketing year: 1 ECU = 1,690 lire; 1 US$ = 1,230 lire.) The impact of E.C. aid as a percentage of grower price was 57% for paste; 58% for the San Marzano variety and 53% for the Roma variety. Planted tomatoes are restricted in Italy to the E.C. quota (see Appendix IV-2). Only tomatoes grown under this quota are eligible for the subsidy.

The average factory yield in Italy requires 1.2 kg of fresh tomatoes per 1 kg of canned whole tomatoes. The most popular canning varieties in Italy are actually hybrid tomatoes. The hybrids are referred to as "San Marzanos" and are similar to the original San Marzano variety (which was not a hybrid). However, true San Marzanos account for only 10% of the volume used for processing. The seeds of the new hybrid varieties are imported, mainly from the United States.

Israel

The processing season in Israel is from July through October. Farm gate price to Israel's growers was $80 per metric ton in 1989 when yields averaged 34 short tons per acre. In 1990 Israel's production dropped by 10% because of lower prices offered by the processors and a severe cut in irrigation water allocations imposed by the government.

Virtually the entire crop is grown under irrigation, and growing and processing are almost entirely mechanized. The product is grown on large scale kibbutz farms that provide specialized trained manpower through all stages of crop growth. This is probably the main factor in high yields and continued yield improvements.

In Israel the main competitors for land, water and labor in the summer are processing tomatoes, corn and cotton. All three of these crops consume relatively large quantities of water and the

major factor in determining the relative size of the three enterprises is the expectations of return per unit of irrigation water in July.

Rated plant capacity is approximately 450,000 metric tons (raw material) annually. However, most sources feel that the functional capacity is actually between 350,000 and 400,000 metric tons. It is pointed out that in 1989, with 305,000 metric tons, processors had difficulty absorbing all the fruit they had contracted to accept. There are two large, and five small factories operating in Israel.

Israeli processors focus on production of products with high added value, such as diced tomatoes and pizza sauces. The locally developed tomato variety "hofit" was found to be especially suitable for this purpose, and the resulting product has been very popular in both the United States and Europe.

2. Competition in the Japanese Market

The Japanese maintain a duty free quota in order to soften the impact on Japan's tomato producers from the liberalization of the ketchup and tomato sauce imports in connection with the GATT agreement. Imports exceeding the duty free quota level are subject to a 20% duty. Industry sources expect this market to grow rapidly in the coming years. The major suppliers of tomato paste in 1989 were Turkey with 21,606 metric tons, followed by Taiwan with 17,244 metric tons. These two countries together accounted for more than 50% of the paste imports into Japan. Italy was the major exporter of canned tomatoes with 12,495 metric tons in 1989, which accounted for roughly two-thirds of the Japanese imports.

Turkey

Rapid annual production increases since the early 1980's have made Turkey the world's second largest exporter of tomato paste, after Italy. Turkey's biggest marketing breakthrough has been their trade with the Japanese. Exports to this market have grown annually. Furthermore, with increased investments by Japanese companies in the Turkish industry, the trade links look set to become even stronger in future years. However, after years of production expansion, there is now (for the first time) talk of more modest growth. 1990's production of processing tomatoes was estimated at 1.5 million tons, down 200,000 tons from 1989.

There is no support price policy or other specific government assistance for producers of tomatoes or tomato products. The government does help farmers by providing easy term credit through the Agricultural Bank of Turkey. And, the Turkish government continues to encourage tomato paste exports through means of a $50 per ton subsidy.

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Most of the processing tomato production in Turkey is in the Marmara and Aegean regions. There are about 25 large, and 12 small tomato paste plants. No mechanization is used in crop production and harvesting in Turkey and most tomatoes are grown in small plots in family operations. Yields were not available.

Taiwan

Taiwan's production of processing tomatoes decreased in 1990 due to shrinking profit margins, strong competition in export markets, shortages of local farm labor and the attraction of more profitable, less labor intensive crops such as corn and peanuts. The 1991 tomato crop is expected to remain small. Farmers are reluctant to continue to produce the less profitable processing tomatoes and are switching to the other crops.

Foreign competition and currency fluctuations have also produced deep erosions in the Taiwan export market for canned tomatoes, as entrepreneurs now tend to perceive the enterprise as too risky. Total exports plunged from 52,000 metric tons in 1988/89 to 25,000 metric tons in 1989/90.

Taiwan's major processing varieties are the Kagome/70, the UC/134, the PT/933, the Taiman Selection #2, and the Manu #112. The Kagome/70 represents about 50% of the total domestic production since this variety is preferred by the Japanese market. Yields have been declining in Taiwan - from 65 metric tons per hectare in 1986/87 to 57 metric tons per hectare in 1990/91 (25 short tons per acre).

3. Competitive Factors

Seasonality

The seasonal nature of the tomato processing industry has contributed significantly to its economic inefficiency. The uncertainty of raw material supply, the seasonality of finished goods production, and an inelastic demand for products have resulted in unstable prices and profits for growers and processors throughout the industry over the years.

Under the normal distribution of the raw product supply, insufficient volumes early in the processing season result in inefficient use of plant facilities and consequently poor economic returns on fixed capital investment. Similarly, excess supplies during peak periods result in economic waste to growers as each processor normally places a limit on the quantity of raw material that can be delivered per day when supply exceeds the capacity of the processing plant.

Under current industry conditions, processors must project raw product requirements, contracted acreage and sales of finished

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product nearly a full year preceding the processing season. Errors in estimating raw material product acreage requirements result in reduced returns for growers and processors. Losses to growers due to glut supply and inaccurate raw product projections have been estimated at two to four tons per acre (source: Commercial Vegetable Processing, Luh and Woodroof).

Processing seasons vary from location to location, but a good rule of thumb is an average 3 month season. A tomato paste processing plant will require an investment of $4 to $5 million, and a tomato canning operation about $1.5 to $2 million. The facilities are normally not used for manufacture of any other products - making the investment cost per ton of fruit processed extremely high.

LAC areas having micro-climates which would allow an extended growing period would have a significant competitive cost advantage. However, in most areas in LAC, tomatoes grown during the rainy season have poor yields, poor quality and high costs. Meanwhile, tomatoes grown during certain periods in the dry season, experience poor yields due to blossom drop, as well as quality problems with the set fruit - a repercussion of intense heat and sun.

Plant labor costs

A 10 ton per hour canned tomato operation uses about 70 workers per shift for direct labor, and about 25 who would be classified as overhead labor. Yields of finished product average 9 tons per hour. This means that every $1.00 per hour differential in the wage rate has an impact of $10.50 per ton on canned tomatoes. A representative sales price is $450/ton (FOB east coast). This means that every $1.00 per hour variance in labor costs has an impact of over 2% of sales value.

Tomato production costs/yields

A detailed cost breakdown for California, and a schedule of prices paid to California growers over the past few years is contained in Schedule D-2 and Appendices IV-11 and IV-12. Tomatoes are not labor intensive unless they are hand harvested. In the United States and Europe virtually all processing tomatoes are now machine harvested. Machine harvesting is reportedly competitive with hand harvesting even in low wage areas. A worker can hand harvest 3,000 pounds of tomatoes per day.

In all major competing countries chemicals are sold at world prices. There would be some minor disadvantage in LAC countries merely due to the freight costs and any duties that might apply on imports of chemicals into their countries. Also some LAC countries because of climatic reasons may have to use more chemicals than are necessary in the temperate zones. Chemical usage can be compared

against the sample California production budgets in Appendices IV-11 and IV-12.

Yield is the most serious cost problem. Yields in most LAC countries run 12 to 13 tons per acre. Yields in major producing areas, on the other hand, run 22 to 34 tons per acre. It is not known whether the low yields in many LAC countries is due to generally adverse growing conditions, or the result of poor technique. Some exception to the low yields have been noted in the Lima area of Peru and the Comayagua Valley in Honduras, where yields in excess of 20 tons/acre have been reported.

To understand the impact of yields, assume for illustration purposes a growing cost similar to that of Monterey, California of $1,160 per acre (exclusive of harvesting costs). And also assume that the lower yields would not reflect lower input costs, which may or may not be true. At 30 tons/acre, cost per ton is $39; at 22 tons/acre, cost per ton is $53; and at 12 tons/acre, cost per ton is $97. For tomato paste this would result in a raw material cost per ton of $260, $360, and $640 respectively. This is compared to a representative sales price of about $800/ton (that could vary $200/ton in either direction). Under this scenario for diced canned tomatoes, raw material costs would be $43, $59, and $108 per ton respectively - against a representative sales price of about $450/ton. The cost impact is greater on the paste as a result of the concentration that takes place.

Quality

For tomato paste the three most important quality criteria are color, bostwick (consistency), and mold count. For canned tomatoes, color is the foremost quality concern.

In the manufacture of tomato paste often a certain amount of mold finds its way into the product, and the FDA has set tolerance levels for this. The experience has been poor regarding mold counts with many developing world processors. The sense in the industry is that this is a management problem rather than anything inherent in the growing and processing conditions.

The causes for problems with bostwick are less clear. Problems can be partially attributed to management, ie: utilization of over-ripe or green tomatoes, improper processing procedures, or the variety of tomatoes used. It is also possible that problems could be caused by something in the growing conditions themselves.

Color is usually a result of variety and growing conditions although it is possible that improper processing procedures (ie: attempting to process green tomatoes) can have some effect. Industry sources have expressed skepticism relative to the ability to grow tomatoes with good color in the tropics. Team members, however, have had experience with processing tomatoes in the

Comayagua Valley in Honduras. The color looked very good and samples sent to a leading U.S. laboratory for analysis received the highest possible rating for color.

The capability of producing quality product will have to be addressed on a locality by locality basis.

Packaging costs

Tomato paste for international trade is packed aseptically in 300 pound plastic bags and placed into fiberboard containers or steel drums. This should not present a competitive cost problem for LAC countries. Canned tomatoes are, as the name implies, canned. The trade that the LAC countries would be particularly interested in would be institutional and industrial packs. The standard pack for this market are called "#10 cans", which hold about 9 pounds of diced tomatoes. They are packed 6 to a box. There has been some canning of tomatoes in 55 gallon drums, but the quality has been poor and it has failed to achieve widespread market acceptance.

Lack of a can manufacturing facility within reasonable proximity (that charges affordable prices) would be a limiting factor. The switch from leaded to welded cans has made the investment in can manufacturing equipment too expensive to be practical for a small canning operation. Leaded cans are no longer acceptable for products to be shipped into the United States.

Transportation

The following are representative transportation rates for canned tomatoes from Appendix III, Vol.I:

To northeast United States		Dollar rate
From:	San Joaquin Valley, Calif.(truck)	$ 3,012
	Chile	2,545
	Dominican Republic	3,185
	Israel	2,950
	Peru	2,477
To south Florida		
From:	San Joaquin Valley	3,012
	Costa Rica	2,780
	Dominican Republic	1,144
	Peru	2,649

To Japan

From:		
	Chile	10,750
	Costa Rica	no established rate
	Dominican Republic	2,607
	Israel	4,649
	Peru	9,750

Again, it must be emphasized that these rates are subject to negotiation. For example, it is believed that the high rate in Chile and Peru to Japan can be reduced substantially.

Duties

Duty for imports from the European Community into the United States amount to 100%. Imports from Israel, CBI recipients, and in the near future the Andean Initiative recipients will be duty free. All other countries pay 13.6% for paste and puree, and 14.7% for canned tomatoes.

D. Market Access Strategies

There is a sense in the industry that despite the rapidly growing volume, there is enough installed capacity currently in place to more than cover demand. Consequently, any new suppliers from LAC would have to be in the position to displace some existing exporters - not an easy task.

In terms of transportation and duties, LAC producers would be in a good competitive position in the U.S. canned tomato market vis a vis Italy, Israel and Chile; and versus Chile for tomato paste.

Despite the Japanese interest in Turkey, it is doubtful that situation is truly sustainable over the long run. For now, LAC producers should be competitive into Japan. Although it has not happened yet, one would have to expect the development of a competitive tomato industry in China, which would service the Japanese market.

Production of #10 whole and diced tomatoes would seem to hold the most promise for LAC processors with good growing conditions and access to cans. These products require a smaller investment, have a significant labor component, and are less sensitive to variances in yields. Diced tomatoes which are used in spaghetti sauces have experienced phenomenal growth.

Another interesting possibility is the #2 1/2 pack of whole tomatoes, which is a small volume item, but one that has consistently commanded higher prices.

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Given favorable in-country cost conditions, a LAC exporter could be very competitive with these both of these products.

It is important to note that despite the overall drop in canned tomato imports, imports of the #10 package (over 1.4 kg) continued to increase (see Schedule 7).

Schedule D-7

U.S. CANNED TOMATO IMPORTS SUMMARIZED by OVER 1.4 KG (Data in Metric Tons)

	1989	1990 [1]
Taiwan	9,561	3,564
Chile	7,185	11,040
Argentina	3,616	3,926
Israel	6,612	11,476
European Community	8,512	10,843
Canada	-	1,190
Turkey	-	1,021
Other	3,467	2,142
TOTAL	38,953	45,202

Source: United States Customs Report.

As with the other products discussed, we would not recommend moving on building a plant until formal volume commitments are obtained from marketing "partners" in the target markets. Arrangements could be made through brokers, a Japanese trading group, or retail buying groups, or U.S. manufacturers. See Appendix IV-15 for Directory.

E. Implementation/USAID Intervention Options

Because of the negatives discussed in the Competitive section above, it becomes even more essential that a very thorough feasibility study be done prior to undertaking any projects. There are only a limited number of instances where a tomato operation may be successful in the LAC region. The canned tomatoes, with their lower capital investment, greater sensitivity to labor rates, and less sensitivity to production yields, would provide better

[1] 12 months ending November 30.

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possibilities in most instances than the more capital intensive tomato paste.

Two key considerations for canned tomatoes are: the ability to obtain an excellent product color; and access to reasonably priced welded cans.

The most appropriate area for USAID assistance would be in development of an adequate base of raw material (with the necessary color and other characteristics) to support the plant. Especially when dealing with smaller growers, AID could help in improving yields; variety selection; technical assistance for safe and effective pesticide usage; land preparation; planting and harvesting schedules and methods; etc.

A tomato processing facility might lend itself to remote locations, provided there are adequate roads. There would be additional freight costs from the remote location to the port. However, the generally competitive freight rates from most LAC countries when shipping product to market, might make it possible to absorb this additional cost. And, trucks coming to pick up finished product could deliver empty cans with no added incremental cost for empty can delivery.

The number of hectares required would depend upon the length of the season and the yield per hectare. Over a 12 week period, the plant described in the Manufacturing Parameters section (with an effective through-put of 10 tons per hour) would probably run between 10,000 and 11,000 tons of tomato raw material annually. This assumes a 7 day week, 16 hours a day when tomato supplies permit, and takes into consideration the lesser volumes at the beginning and end of the cycle. At a yield of 55 tons per hectare, this would require about 200 hectares. The ideal circumstance would be an area with a much longer growing season.

F. Manufacturing Parameters

1. Introduction

As discussed earlier, there has been substantial interest in tomato processing throughout the LAC region. The team has decided to focus on the processing of whole and diced tomatoes, since this represents an area within the tomato processing business that has a relatively high labor component, low capital investment, and is somewhat less sensitive to yield fluctuations. It was felt that the highly mechanized, high capital investment, high volume and low labor content of tomato paste would be suitable only in a more limited number of LAC areas.

The proposed plant would have two basic lines: one to handle prime product, and the second to handle culls. The prime line would handle primarily diced and whole tomatoes for industrial and institutional use. However, depending on market conditions at the time, with a relatively small capital investment, retail sizes could also be packed in limited numbers. For example, for some reason over the past few years the prices of size 2 1/2 canned whole tomatoes have remained fairly firm.

The product would be packed in #10 cans. If, at the proposed location there is no access to reasonably priced cans, the project could not proceed.

What product is made on the cull line will depend on the situation in the country where the processing is taking place. The example given in the following assumes the tomatoes are being manufactured into an export quality sauce. However, any number of products, suitable preferably for the domestic market are possible, with a relatively low investment. This includes various types of tomato-based hot sauces, ketchup, tomato and other vegetable juice blends.

2. Process

Growers will deliver the tomatoes in either lug boxes or gondolas. When they arrive, the tomatoes will be graded, weighed and recorded. The product then would be unloaded at the 9 to 10 tons per hour into a washing flume, where dirt and soil are loosened from the fruit. The water in these flumes would be continuously recirculated to guide the tomatoes to flight-type spray elevators for additional washing and cleaning.

Tomatoes would then be conveyed onto an inspection belt where rotten and non-ripened fruit would be removed by the workers. The tomatoes would next be treated with a hot caustic solution, peeled, rinsed and placed in a bath of citric acid to insure total caustic removal.

The peeled fruits would again be inspected with workers selecting the best fruit for dicing. The remaining fruit would be utilized for sauce-type base material.

The tomatoes designated for dicing would be diced according to specifications, and filled into #10 cans, topped with acidified tomato juice, closed, heated at 212 degrees F. for 45 minutes and cooled to 90 degrees F. (see Appendix IV-14 for example product specifications) The cans of diced product would then be removed to the facility warehouse for storage until shipment.

The fruit designated for sauce would be chopped, concentrated 2 to 2 1/2 times, filled hot into #10 cans, held and cooled to 90

degrees F. The cans of sauce product would then be removed to the facility warehouse for storage until shipment.

3. Equipment Needed - Floor Space - Cost

A total of 15 acres would be needed for the facility site, both for the plant and out buildings, and for waste disposal areas and holding ponds.

A total of 12,600 square feet would be needed for warehouse and production space, a small cafeteria and kitchen, a quality control laboratory, and an office. The total cost of the equipment would be $1,036,000.00 (see Appendix IV-7 for details). This would be FOB Baltimore, transportation and installation costs would have to be added. A rule of thumb for installation costs is 15% of the equipment purchase price, but this can vary depending upon the situation in the individual country. The equipment will fill approximately 5 containers for shipping purposes. The quote is from A.K. Robins & Company, Baltimore, Maryland, 3/31/91.

In addition, a variety of supplemental equipment will be needed, such as pick-up trucks, lift trucks, yard tractors, etc. Also not included is equipment that is related to the building such as boiler, etc.

4. Raw Materials/Yields

A reasonable estimate of yields would be that 50% of received product weight would go to the primary processing line, 40% to the secondary line, and 10% as waste. The 40% going to the secondary or sauce line would be concentrated by 2 1/2 times, which means that 60% of the product going to that line will be evaporated as water, and 40% will be packed as product.

The yield conversion can be expressed as 34 cases of six #10 whole tomatoes per short ton of farm product.

Canned diced tomatoes would have 9 pounds per can. The secondary product (the sauce) would have 10 pounds per can. There are 6 cans per case.

The plant should be able to run effectively 10 tons of raw material per hour.

5. Direct Labor Costs

Direct labor needs to cover one 8 hour shift would amount to 70 persons. It is anticipated that in full swing the plant would run two 10 hour shifts, requiring some overtime, with 4 hours break

allowed for clean-up. The tasks of these 70 workers are detailed in Appendix IV-8.

6. Overhead Requirements, Labor and Other

Indirect labor requirements would arise in the areas of fresh tomato procurement (field men), sales, general and administrative overhead, and plant clean-up. A total of 23 persons would be required (see Appendix IV-9).

7. Packaging and Product Standards

The product would be packed primarily in #10 cans, 6 to a cardboard box. USDA standards for processing tomatoes and an example of commercial standards issued by a major corporation are attached (see Appendices IV-13 and IV-14).

8. Energy Consumption

Energy Used in Whole Peeled Tomato Canning (per 220 tons)

Operation	Electrical Kwh	Thermal X10/6 BTU
Cost to peel	43	31
Fill/seam	80	-
Retort	110	139

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V. Dried Tropical Fruits

Major Competitors for Dried Tropical Fruits

V. DRIED TROPICAL FRUITS

Executive Summary

Drying is one of the oldest techniques of food preservation known to man, and sun drying still accounts for the major volume of dried fruits consumed in the world today. Only moderate amounts of fruits are dried mechanically, but quantities are rising rapidly - due in part to the high degree of sophistication attained by dehydration technology over the past 25 years, resulting in a broad range of high quality products that are gaining increased consumer acceptance in retail markets.

During a two month sample period in 1990, sales of all dried fruit through U.S. supermarkets were estimated at $107 million. Dried fruit snacks, a separate category, amounted to an additional $90 million. These two categories were up 6% and 18% respectively from the prior year (the statistical subcategories containing tropicals showed phenomenal growth, expanding 25% and 18% respectively over the previous year - July, August 1990 versus July, August 1989).

In addition, in the United States annual estimated sales of all dried fruit through health food stores are about $60 million, and industrial sales are estimated to be over $600 million.

An average overall rate of growth of 4.6% annually, in real terms, through the year 2000 is forecasted in the United States.

Tropical dried fruits represent a small portion of this market and the following is the only import volume information available.

United States 1989 imports:
- dried pineapple 1,918 metric tons
- dried papaya 621 metric tons
- dried mango 169 metric tons.

Anecdotal evidence and a review of distribution outlets indicates that the largest international market for tropical dried fruit is Europe, where demand is strongest for dried pineapple and banana slices (chips). Dried diced mango and papaya are also used, primarily as a component in tropical fruit mixes.

The only separately recorded imports into the European Community in 1989 were:
- dried banana 1,594 metric tons (includes fried chips)
- dried papaya 757 metric tons.

Dried mango imports into the E.C. have been estimated to be equal to or slightly greater than papaya imports.

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In the European Community, Germany and France are the largest consumers of dried tropical fruits, accounting for over 50% of the volume. The Netherlands is the largest importer, but they act primarily as a redistribution point to other European countries.

Currently, the dried fruit market is primarily made up of sweetened and sulfite products. However, there is a movement toward unsweetened, organically grown products without sulfites.

Grouped together under dried tropical fruits classification are two distinct types of fruit: banana chips (and sometimes plantain chips); and all other tropical fruits. The distinction is that the banana chip is fried in coconut oil, and the other fruits are all atmospherically dried.

While industry sources suggest solid and steady growth, the market seems to be currently in balance. Importers and traders have consistently described the quality of the product available today as excellent, and report a high level of satisfaction with present suppliers. Consequently, this may be a difficult market for LAC producers to penetrate.

Thailand, and to a lesser extent the Philippines and Taiwan, are the major exporters of most dried tropical fruits with the exception of bananas. Reportedly, processors in Thailand possess "state of the art" equipment, and quality control is very good.

The disproportionate geographic concentration of production in southeast Asia may provide some competitive opportunities for the LAC region into the United States and Europe, but despite the distances, the freight rates from Thailand and the Philippines are competitive into the northeast United States and Europe.

Duties on dried pineapple from Thailand into the United States are 3.66% - mangos and papaya are duty free. All dried products from CBI countries are duty free.

The model processing plant, as described in the Manufacturing Parameters chapter, would have a total effective capacity of about 300 metric tons annually. The United States market for dried pineapple, papaya and mango amounts to about 2,700 metric tons annually. Similar figures are not available for the European market, but it is considered to be substantially larger. It is safe to assume a total annual market for the U.S. and Europe of at least 6,000 metric tons for all dried tropicals, excluding dried banana chips and desiccated coconut. Consequently, total capacity for the plant would be the equivalent of about 5% of trade for the targeted markets.

Two firms (one U.S. and one European) have expressed interest in working with any new plant that commences production in the LAC region, assuming quality standards can be met.

When dealing with these small volume products, innovative ideas, such as maintaining a broad base of fruit offered would be useful. Special offerings would include multiple fruits, and product with and without sulphur and sugar. Offering mixed containers ("one stop shopping") would also be worthwhile. Maintaining inventories in target markets so that shipments can be made quickly, reducing lead times for customers is another way an export processor can differentiate himself.

Processes should be investigated for eliminating the sulphur preservative. This area is fairly new, and the team had a sense that there is no standard acceptable process yet.

The amount of hectares that would be required to produce the 300 tons would depend upon the product(s) involved. It is difficult to see a need for more than 10 to 20 hectares of production area. A USAID product-specific project would not be warranted under these circumstances. Rather, this type of operation might simply participate in an overall program aimed at promoting small enterprises.

Processing equipment would total $461,000.00 (FOB Baltimore) for the standard cabinet drying method. The plant would require about 1.5 acres of land, and the plant itself an estimated 9,096 square feet. The limiting factor to through-put is the cabinet drier. The drier recommended has a rated capacity of 3,400 pounds of finished product per 16 hour day. The net effective capacity would be about 2,900 pounds per 16 hour day. Approximately 12 workers would be required.

A. General Description of Dried Fruit Industry

Drying is one of the oldest techniques of food preservation known to man. Dried fruits are used in the production of convenience items such as dehydrated fruit snacks and fruit drinks; pie fillings and mixes; and natural foods, ie: fruit products processed without the use of chemical additives.

The essential feature of drying is reducing the moisture content of food to a level below that at which micro-organisms can grow. Sun drying still accounts for the major part of the dried fruits consumed in the world today. Mechanically dried fruits are produced in relatively small amounts but the quantities of these are rising rapidly, due in part to the high degree of sophistication attained by dehydration technology during the past 25 years. This has resulted in a broad range of high quality products that are gaining increased consumer acceptance in retail markets.

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Fruits that are properly dehydrated have the following advantages:[1]

- a shelf life of one to two years,
- substantially lower transportation, handling and storage costs since they do not require costly refrigeration,
- a calorie and mineral content virtually unchanged from the fresh,
- a consistent product (with modern technology),
- maximum convenience, flexibility and economics for use as industrial food service ingredients because they can be sized, shaped, formed, etc. to fit almost any requirement, and
- the use of economical and disposable packaging. The two major considerations in packaging dried fruits are the exclusion of moisture and oxygen.

Dried fruits are gaining popularity in the health food sector. This vital sector generally demands sulphur- and sugar-free products. The big re-manufacturers, on the other hand, are more cost oriented and deal primarily in sugared and sulphured products. The ability of a processor to offer both types of products would therefore be very important.

During a two month period sampled in 1990 (July through August, Information Resources, Inc.), sales of all dried fruit through U.S. supermarkets, based on 2,700 supermarkets with scanners, were estimated at $107 million. Dried fruit snacks, a separate category, amounted to an additional $90 million. These two categories were up 6% and 18% respectively from the prior year. In addition, Business Trends Analysts estimate sales through health food stores at about $60 million annually, and industrial sales at over $600 million annually. Business Trends Analysts estimate an average overall rate of growth of 4.6% annually, in real terms, through the year 2000.

B. Selected Products

Tropical dried fruits represent a small market and volume information is not readily available for this category. Industry sources tended not to be helpful in estimating total volume, and in most instances these products are grouped with other products in the various statistical reports. United States 1989 import figures were available for the following: (See Appendix V-1).

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[1] from: Commercial Fruit Processing, Second Edition. Edited by Jasper Guy Woodroof and Bor Shiun Luh. Published by AVI Publishing Company, 1986. Authors, L.P. Somgyi and B.S. Luh.

- dried pineapple 1,918 metric tons
- dried papaya 621 metric tons
- dried mango 169 metric tons.

Recorded imports into the European Community in 1989 were as follows:

- dried banana 1,594 metric tons (includes fried chips and dried)
- dried papaya 757 metric tons

Dried mango imports into the E.C. have been estimated to be equal or slightly greater than papaya imports.

Anecdotal evidence and a review of distribution outlets indicates that the largest international market for tropical dried fruit is Europe, where demand is strongest for dried pineapple and banana slices (chips). Dried diced mango and papaya are also used, primarily as a component in tropical fruit mixes.

In the European Community Germany and France are the largest consumers of dried tropical fruits, accounting for over 50% of the volume (EUROSTAT). The Netherlands is the largest importer, but they act primarily as a redistribution point to other European countries.

According to Jacques Domont, Agro 10, a major distributor of dried tropical fruits in Europe, the European market has been growing in recent years and he expects this growth to continue.

A survey conducted by the team covering 32 supermarkets in South Florida, the New York metropolitan area, New England, Nevada and Baltimore indicated that 5.5% of all dried displays were dedicated to tropical fruits. This varied from 1.3% in New England to 8.9% in South Florida. In addition, 3.5% of the space was occupied by blended products that had some tropical components. Banana chips and dried bananas accounted for one-third of the tropical products displayed. In addition to the standard products discussed earlier, there was a surprising amount of carambola (star fruit) which accounted for 4% of the tropical fruit being displayed. The team also found a small quantity of dried Jack fruit.

A survey of small groceries, health food stores and specialty stores in the same areas indicated 15% of the dried fruit displays were dedicated to tropical fruits; with a high of 54% recorded in South Florida, and a low of 5% in the New York metropolitan area. In addition to the main products, dried apple banana was prevalent in Miami as were plantain strips in New York.

In the supermarket sampling discussed in Section A, there were two supermarket subcategories: "All Other Dried Fruit" and "Dried

Fruit Snacks". These subcategories contain tropicals among other miscellaneous dried fruits. They showed phenomenal growth for the sample period, expanding 25% and 18% respectively over the previous year (July, August 1990 versus July, August 1989). Unfortunately, it is not possible to determine the specific products contained in this subcategory.

Should tropicals be picked up by a major cereal manufacturer, volume could skyrocket in the industrial sector.

Currently, the market is primarily made up of sweetened and sulfite products. However, there is a movement toward unsweetened, organically grown products without sulfites.

Grouped together under these dried tropical fruits are two distinct types of fruit: banana chips, and sometimes plantain chips; and all other tropical fruits. The distinction is that the banana chip is fried in coconut oil, and the other fruits are all atmospherically dried. These are two totally different processes, and require totally different equipment. This report will concentrate on atmospherically dried fruit, which also includes a small amount of atmospherically dried banana.

C. Competition

While industry sources suggest solid steady growth, the market seems to be currently in balance. Importers and traders have consistently described the current quality of the product as excellent, and report a high level of satisfaction with present suppliers. Consequently, this may be a difficult market to penetrate. In terms of seeking an additional or alternative product source, the team did get two expressions of interest - one from an American firm (SeaWind Trading, Carlsbad, California), and the other from Agro 10 in Europe. Agro 10 estimates that they have 8% of the European tropical fruit market.

Thailand, and to a lesser extent the Philippines and Taiwan are the major exporters of most dried tropical fruits with the exception of bananas - Ecuador is the primary international banana chip supplier.

Reportedly, processors in Thailand possess "state of the art" equipment, and quality control is excellent. Labor is inexpensive. The raw material supply is furnished by many small "family" farms; consequently, raw material delivered to the plant is frequently erratic (in terms of varieties, maturity, quality, etc.) which can affect yield and plant efficiency. Some Thai operators have their own sales/import offices in the United States.

As with the tropical fruit juices, pulps and concentrates, category, the disproportionate geographic concentration of

production in southeast Asia may provide some competitive opportunities for the LAC region into the United States and Europe. However, the proximity of the current producing countries to Japan would make this a difficult market for LAC to compete in.

Representative freight rates, drawn from our transportation analysis, Appendix III Vol.I:

To south Florida		Dollar Rate
From:	Costa Rica	$ 2,780
	Dominican Republic	1,140
	Peru	4,517
To northeast United States		
From:	Dominican Republic	$ 3,185
	Peru	4,488
	The Philippines	3,315
To Rotterdam		
From:	Costa Rica	$ 2,370 (20 ft.)
	Dominican Republic	4,050
	Peru	6,200
	The Philippines	3,166
	Thailand	3,266
To Japan		
From:	Dominican Republic	$ 2,607
	Peru	9,750
	The Philippines	880

The above indicates that despite the distances, the freight rates from Thailand and the Philippines are competitive into the northeast United States and Europe. However, it must be restated that these rates are negotiable. Once regular volume is moving from a port, it is very possible to negotiate more favorable terms.

A 40 foot container would hold 20 short tons of dried product. Duties on dried pineapple from Thailand are 3.66% - mangos and papaya are duty free. All dried products from CBI countries are duty free.

D. Market Access Strategies

A drying facility must concentrate on pineapple, the highest volume product among the atmospherically dried tropicals and support this with as wide a range of products as possible.

The plant, as described in the Manufacturing Parameters chapter, would have a total effective capacity of about 300 metric tons annually. The United States market for dried pineapple, papaya and mango amounts to about 2,700 metric tons annually. Similar figures are not available for the European market, but it is considered to be substantially larger. It is safe to assume a total annual market for the U.S. and Europe of at least 6,000 metric tons for all dried tropicals, excluding dried banana chips and desiccated coconut. Consequently, total capacity for the plant would be the equivalent of about 5% of trade for the targeted markets. This is not an unreasonable target.

As stated above, two firms have expressed interest in working with any new plant that starts up in the LAC region, assuming quality standards can be met. They are: Agro 10 (Jacques Domont, contact), and SeaWind (Steve Ward, contact). In addition, Appendix V-5 lists distributors in the United States and in the European Community who handle dried tropical products. Follow-up contacts should be made with these organizations.

Innovative ideas, such as maintaining as broad a base of fruit as possible (with and without sulphur and sugar), for shipping mixed containers ("one stop shopping") would be useful. Also consideration of maintaining inventories in target markets so that shipments can be made quickly, reducing lead times for customers.

Processes should be investigated for eliminating the sulphur preservative. This area is fairly new, and the team had a sense that there is no standard acceptable process yet. Also, organically grown dried fruit may offer opportunity for product differentiation, particularly if one could set up an organic certification program. It would be anticipated that the organic program and the non-sulphur programs would all be run in conjunction with the traditional processes. Again, when dealing with these small volume products, from a marketing standpoint, it is best to have as wide a range of product as possible.

E. Implementation/ USAID Intervention Options

The amount of hectares that would be required to produce the 300 tons would depend upon the product(s) involved. It is difficult to see a need for more than 10 to 20 hectares of production area.

A USAID product-specific project would not be warranted under these circumstances. Rather, this type of operation might simply participate in an overall program aimed at promoting small enterprises.

F. Manufacturing Parameters

1. Introduction

Before proceeding, it will be useful to define commonly used dehydration terms. These terms are often misused or applied indiscriminately.

a. **Dried** is the term applied to all dried products, regardless of the method of drying.

b. **Evaporation** refers to the use of sun and forced air driers to evaporate moisture away from fruit to a fairly stable product. Usually, drying conditions, such as humidity, temperature and air flow are now carefully controlled during the processing of evaporated fruit. The general industry standard for the moisture level of evaporated fruit is 14%, plus or minus 4%.

c. **Dehydration** refers to the use of mechanical equipment and artificial heating methods under carefully controlled conditions of temperature, humidity, and air flow. Although the term "dehydrated" does not refer to any specific moisture in the finished product, it is usually considered to imply virtually complete water removal to a range of one to five percent moisture. Products with such low water content can be stored at room temperature for periods well in excess of two years with no detectable change in quality, and indications are that most low moisture fruits will remain acceptable for periods of five years or more when stored under temperate conditions (about 65 degrees F.) in moisture-proof containers.

d. **Freeze drying** is a method of drying in which the fruit is frozen and then dried under high vacuum to around 2% moisture. The ice sublimes off as water vapor without melting. Controlled heat is usually applied to the

process without melting the frozen material; this is called **accelerated freeze drying.**

e. **Vacuum drying** is a method of drying in a vacuum chamber under reduced atmospheric pressure to remove water from food at less than the boiling point under ambient conditions.

There are three basic types of drying processes:

- sun drying and solar drying,
- atmospheric dehydration including:
  - stationary or batch processes (kiln, tower and cabinet driers), and
  - continuous processes (tunnel, continuous belt, belt trowel, fluidized bed, explosion pulping, foam mat, spray, drum, and microwave heated driers), and
- sub-atmospheric dehydration (vacuum shelf, vacuum belt, vacuum drum, and freeze driers).

Sun drying for fruit crops is still practiced for certain fruits such as grapes and dates. Atmospheric dehydration processes utilizing kiln, tower and cabinet driers are used for most other fruits. Continuous processes, are mainly used for vegetables. Spray drying is suitable for fruit juice concentrates, and vacuum dehydration processes are useful for low moisture fruits with high sugar contents such as peaches, pears or apricots.

The selection of drying methods depends on the following factors: [1]

- form of raw material - liquid; paste, slurry, pulp, thick liquid; large aggregates; small aggregates,
- properties of raw material - very sensitive oxidation; sensitive to temperature damage; thermal plastic residues; none of these,
- desired product characteristics - powder; instant solubility; excellent rehydration; retention of shape, and
- cost - low; medium; high; very high.

Preparation of raw fruits for drying is similar to that for canning and freezing except sulphur is often applied to preserve

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[1] Source: Commercial Fruit Processing, Second Edition. Edited by Jasper Guy Woodroof and Bor Shiun Luh. Published by AVI Publishing Co. 1986. Authors: L.P. Somgyi and B.S. Luh.

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the color of dried fruits. The steps involved in the common pre-drying treatments applied to the important fruits are:

- selection and sorting for size, maturity and soundness
- washing
- peeling by hand, lye solution or abrasion
- cutting into halves, wedges, slices, cubes or nuggets
- blanching for certain fruits and for certain cases
- sulphuring in certain cases.

Sulphur is the only chemical additive widely used for dried fruits for its anti-oxidant and preservative effects. Recently the use of sulfur dioxide has been opposed by various consumer groups because of allergic reactions, and as a result the FDA has ordered that consumers must be informed if sulfites are applied to the fruits or vegetables. Sulphuring becomes essential for sun-dried fruits to avoid browning.

Important markets such as Germany and Japan have regulations that substantially limit the use of sulphur in low moisture fruits, and within the United States there are increasing demands for sulphur-free dried fruits.

Alternate methods have included the use of citric or other organic acids, rapid dehydration to very low water contents, use of ascorbic acid or other anti-oxidants, Individual Quick Blanching, and osmotic treatment.

2. Process

Atmospheric dehydration, using stationary or batch processes is the drying system most often commercially used for tropical fruits. The following will discuss a traditional process, utilizing a cabinet drier. This information was taken from the Waldo Heron report for Chemonics - Pre-feasibility Study for a Tropical Fruit Dehydration Plant in La Ceiba, Honduras, March, 1988.

In this report, Mr. Heron recommended a batch process cabinet drier as the most cost effective. The fruit preparation is largely manual. Product is received in lug boxes containing about 50 pounds of fruit and the fruit is dumped into a washer. After this papaya would be moved onto a peeling and cutting conveyor, and pineapple would be moved manually to a sized corer where the fruit is peeled and the core removed. The peeling and cutting conveyor can also be used to prepare specialty items such as chunks and spears that may be requested by different clients.

After peeling and trimming, the fruit is inspected and further trimming done where necessary. The clean product is then be taken

to the slicer/dicer for further cutting to meet the client's specifications.

The fruit is then transported to a hot water blancher to be processed for 3 minutes at 90 degrees Centigrade, then cooled as rapidly as possible to prevent excessive leaching of solids during the osmotic process.

After cooling, the fruit is moved to an enclosed sugar room, where it is mixed with a syrup solution containing 1,500 ppm sodium metabisulphate and 100 ppm potassium sorbate. This syrup is a mixture of water and sugar, based on a ratio of clean raw fruit to sugar of 1:1, by weight.

For best results, it is recommended the fruit be placed in a weak (25%) sugar solution for about 4 hours, then transferred into a 70% sugar solution. The first (more diluted) sugar treatment is to minimize the leaching of flavor and fruit solids into the sugar medium.

The fruit is held in the second solution until it reaches 65 degrees Brix. This may require 18 to 24 hours. The sorbate-sulphite additives in the sugar solution are used to control fermentation. Insect control is very important during this phase of the operation.

After the fruit pieces have reached the 65 degrees Brix equilibrium, they are placed on the drying trays and moved into the cabinet drier. Drying may require 16 to 20 hours to achieve a 14% to 18% moisture in the product. The actual drying times will have to be determined by practical experience as there is some difference of opinion on the drying times required.

After drying, the fruit should be cooled to room temperature on the trays, then placed into plastic bags. Moisture equalization will take place in the bags and will avoid the formation of large clusters that may occur in the equalizing bin.

Raw material selection is very important for high quality in the finished product, therefore all the fruit must have the same maturity or ripeness and be free from bruises and other damage that will lower yields.

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3. Equipment Needed - Floor Space - Cost

Processing equipment would total $461,000.00 for the standard cabinet drying method (see Appendix V-3). Again, transportation to the plant site, and installation costs must be added. For a rule of thumb, installation is commonly estimated in the industry at 15% of cost. This may vary from country to country. The following cost was quoted by A.K. Robins & Company, Baltimore, Maryland 3/15/91.

The plant would require about 1.5 acres of land, and the plant itself an estimated 9,096 square feet, as follows:

Fruit Receiving Platform	640 square feet
Dehydration Production Area	4,882
Quality Control Laboratory	210
Sugar Storage	600
Boiler Room	320
Machine Shop	280
Warehouse	792
Office	1,020
Women's Dressing Room	224
Men's Dressing Room	128
Total	9,096 square feet

4. Raw Materials/Yields

The limiting factor to through-put is the cabinet drier. The drier being recommended has a rated capacity of 3,400 pounds of finished product per 16 hour day. The net effective capacity would be about 2,900 pounds per 16 hour day.

As stated earlier, the business is very small and lacks standardization. The team has not been able to determine the particular variety or varieties that are traditionally used for this drying process.

In the case of pineapples, the Smooth Cayenne is used for virtually every other type of processing, and would also be acceptable for drying. This variety yields approximately 35% in good usable fruit. In the case of mango and papaya, a wide variety of product is commonly used in processing, with significant differences in yield. An overall reasonable yield estimate for mangoes and papayas is 50% usable fruit.

With the additional weight from the sugaring process, Waldo Heron reports yields of 55% of the usable fruit at 14% to 18% moisture content of finished product.

There will be a significant quantity of other ingredients needed in this process:

- sugar - will be required on a 1:1 basis to the fruit entering the system,
- sodium metabisulphite - will be used at a rate of 0.15% of raw fruit weight, and
- potassium sorbate - used at a rate of 0.01% of raw fruit weight.

Industry sources identified the raw material cost as the single most critical competitive factor for these products.

5. Direct Labor Costs

As stated earlier, the process involves: 1) preparation of the fruit for drying; 2) placing fruit on trays; 3) inserting trays in cabinet drier; and 4) drying for 16 hours. This effectively limits the operation to one shift per day. In an analysis of the proposed drying plant in Honduras, Heron estimated the labor needs as: two skilled workers, one unskilled male worker, eight unskilled women workers, and one supervisor.

6. Overhead Requirements

This plant would require the following administrative staff: one manager, one accountant, one secretary, one watchman, one quality control, one field man, one mechanic, and two clean-up men; for a total of nine people. It is estimated that maintenance, as a rule of thumb, would amount to approximately 3% of the equipment cost annually.

7. Packaging and Product Standards

The shelf life of dehydrated fruit products is influenced to a large extent by its packaging, which must conform to certain special criteria:

- protection of the dehydrated product against moisture, light, air, dust, micro-flora, foreign odor, insects and rodents,
- strength and stability to maintain original container integrity through storage, handling and marketing,
- size, shape and appearance to promote salability of the product,
- composition approved for use in contact with foods, and
- acceptable cost.

The hygroscopic nature of low moisture fruit tissue makes it imperative that special precautions be taken against moisture absorption. Low moisture products must be packaged as soon as possible after removal from the dehydrator; and hermetically sealed containers are required to prevent absorption of moisture which would result in subsequent caking and loss of quality during extended storage.

Dehydrated fruits are packed for institutional and remanufacturing use in large units such as bags, drums, bins, cartons and cans ranging from 10 to 40 kilos. Heat sealed polyethylene liners are usually required for bulk packs.

There is no standardization in the industry for packaging. Specifications vary according to each buyer's requirements. See Appendix V-2 for examples. However, assuming a plastic bag holding 25 pounds, over-wrapped in a corrugated shipping case, the packaging material cost would be approximately $1.10 per package, FOB Miami.

8. Energy Consumption [1]

Fuel

A 100 horsepower boiler will be required for the plant. It could be designed to use Bunker C fuel. A boiler this size would consume 42 gallons of fuel oil per hour, and would operate 16 hours a day.

Electricity

The dehydration line equipment uses relatively small motors, most of them under 2 horsepower, and the daily consumption of electricity is estimated at about 185 kWh per 16 hour day.

Water

Water consumption has been estimated at 40 cubic meters per day.

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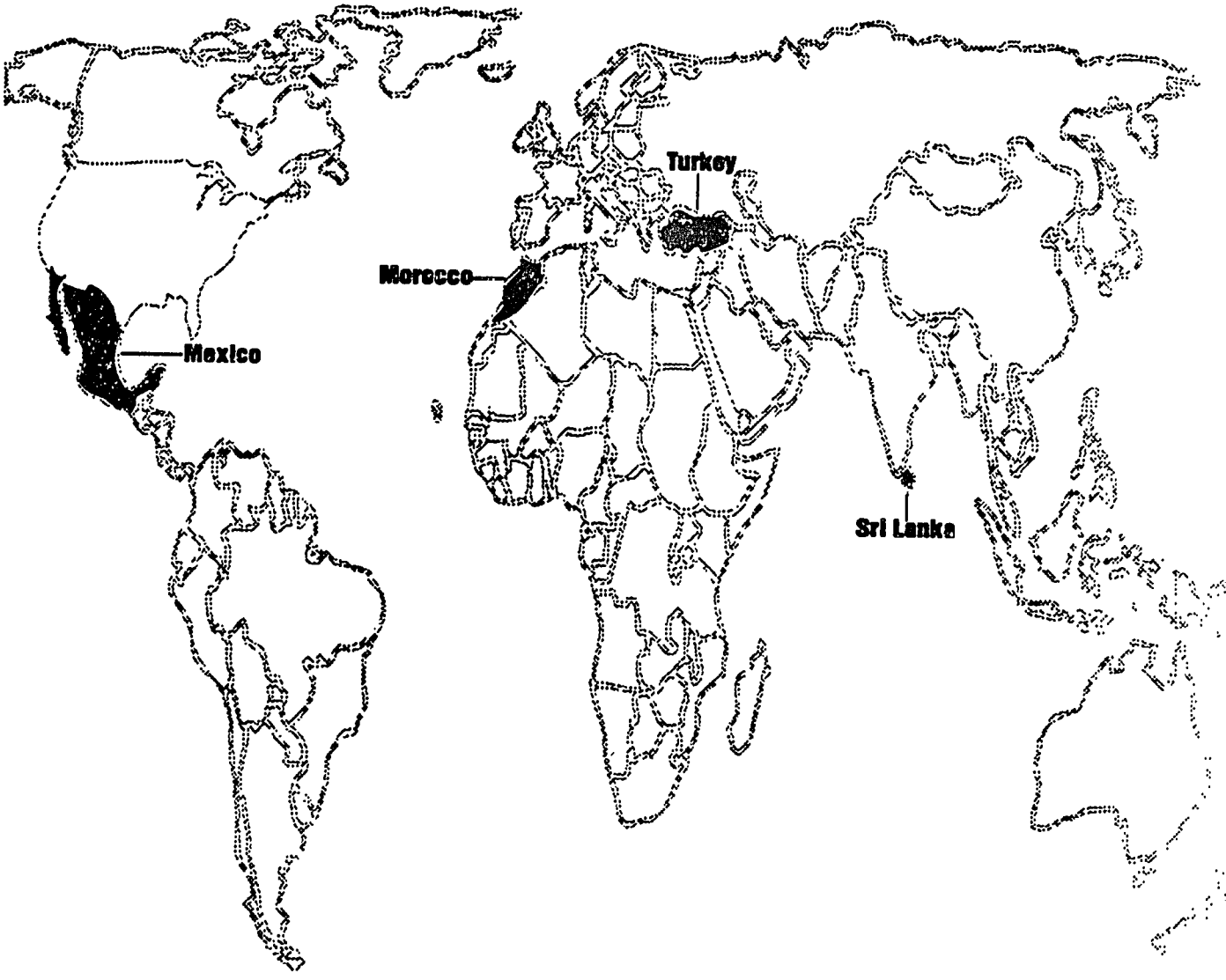
[1] Source: Waldo Heron Pre-feasibility Study for a Tropical Fruit Dehydration Plant in La Ceiba, Honduras. March, 1988.

VI. Pickles

Major Competitors for Bulk Pack Pickles



VI. PICKLES

Executive Summary

Pickles are produced by preserving vegetables with acid, salt and sugar. The methods for preparing and fermenting vegetables have been practiced since ancient times. Specific recipes vary the blending of primary vegetable, spices, sugar, salt and vinegar to achieve distinctive flavors, and there are countless names given to the resulting products. Pickles prepared from cucumbers are the most popular pickled consumer item.

The pickled products of particular interest for the LAC countries are the extremely small cucumber pickles known as midgets, gherkins and/or cornichones. Although this is a relatively small market, these pickles are very labor intensive, and are suitable for growth on small plots. The processing is extremely low-tech and the product is not perishable once processed. This sort of enterprise might work in remote areas where there is difficulty in finding appropriate agriculture export products.

The two target markets for LAC producers are Europe and the United States. Japanese imports amounted to only 711 tons in 1989.

The overall market value of pickles and other pickled products totalled over $1 billion in the United States in 1990 and imports amounted to 3,517 metric tons, worth just under $4 million. Cornichon/gherkin pickle volume is not isolated in these statistics, but they are estimated to account for $88 million in grocery sales and about one-half of the total imports.

The European Community is an important market for pickles. Total market value for pickles was not available, but 58,429 metric tons of cucumber pickles and Cornichones were imported in 1989. The major sources of supply were Morocco, Hungary and Turkey, who between them accounted for 73% of the total.

The European market is differentiated by very diverse taste preferences. Generally speaking, the southern European countries prefer a sour, more acid pickle; the mid-European countries favor a sweet-sour flavor (dill); while northern countries fancy sweet tasting pickles. Distinctive and time-honored recipes produce these various flavors - but the sweeter flavors cannot be produced from the brine packed raw material.

There are two approaches to processing. Pickles are either packed initially in consumer packages using fresh raw materials, or first bulk packed in brine and later re-packed in consumer sizes. The two methods result in a product with different flavor

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characteristics. The pickles packed "fresh" in consumer size are generally more preferred in Northern Europe and the United States. Those re-packed from brine are preferred in France and Southern Europe. Due to the labor intensity of the harvest, packing in brine in drums for shipment to the U.S. and Europe is a viable enterprise for some developing countries.

Pickle production has been moving off shore. Sri Lanka, the largest exporter to the United States of gherkin/cornichones, began exports of bulk brine pickles only three years ago. And, Vlasic Pickle, the largest U.S. pickle manufacturer, is actively seeking potential sources for non-brine pickles. There are three options for sourcing the non-brine pickles off shore:

- Source fresh raw material to process in the target market. This option requires delivery within 3 days of harvest in order to maintain the integrity of the fresh product,
- Produce a consumer-ready pack off shore. The concerns here are the cost of packaging materials in LAC regions, and the image of the producing country,
- Develop a different process for bulk packing pickles that allows production of the type of pickle preferred in the United States and Northern Europe.

The amount of technology and equipment needed for a bulk pickle packing plant is minimal. A broad line of supplementary products could also be processed in the facility (for example: pickled baby corn, extra fine green beans, and jalepeno peppers). With very little modification to the plant, any combination of these supplemental products could be manufactured. Initial production should be geared to specific customer requirements.

The most appropriate areas for USAID support would be:

- providing for production of an adequate raw material supply to support the plant,
- assistance in forming grower/processor/shipper cooperatives, and
- promote appropriate research which addresses the constraining factors for LAC production, particularly in methods of shipping non-brine pickles.

The model plant would require 80 hectares and would employ 30 workers.

A. General Description of the Pickle Industry

Pickles are vegetable substances preserved in part by acid, salt and sugar. The skillful blending of spices, sugar, salt and vinegar with vegetables gives crisp, firm texture and pungent, sweet-sour flavor. Pickles prepared from cucumbers are by far the most common types and are the most popular consumer item.

The number of names applied to commonly marketed pickles is confusing. Practically all manufacturers have their own formulas, which they have developed over a period of years. The formulas, and often the processes are considered to be proprietary by the manufacturers, which caused difficulty in obtaining data.

Pickles may be grouped into three classes: dill, sour, and sweet. The following list indicates some common products in each group:

Dill Pickles
- fermented dill pickles, including genuine, kosher style, overnight, baby and Polish or Hungarian
- unfermented dill pickles, including pasteurized and iceberg or quartered
- pickles made from salt stock, including summer and kosher.

Sour Pickles
- sour pickles, including plain sour or hot sour
- mixed sour, including spiced or hot mixed and mixed chutney
- relish, chow-chow

Sweet Pickles
- plain sweet pickles, including standard, midget, gherkin, cornichon, sliced, chips or wafer, candied chips, sweet dill, bread and butter, and peeled
- mixed sweet pickles, including plain, mustard and Jamaica
- relish, including plain, spread, piccalilli, fruit, Mexican and vegetable

Nearly all vegetable substances, whether leafy, tuberous or containing seeds, can be pickled. Pickled cocktail onions and beets are very popular in the United States and Europe; and cauliflower and other vegetables are frequent additional ingredients to mixed pickle products. In Asia a wide variety of blends of pickled and fermented vegetables are popular.

The market value of pickles and other pickled products totalled over $1 billion in the United States in 1990. Strong demand in both the retail and food service sectors is expected to yield a 5.2% average annual rate of growth over the next decade (source: Business Trends Analysts). Grocery store sales of pickled

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products increased from $527 million in 1985 to $686 million in 1989 (30% growth). There are no statistics available for the food service market, but this segment is believed to be extremely strong as well, mirroring the rapid expansion of fast food operations over the past decade. Vlasic Foods Inc., a division of Campbell's Soup Company, is the nation's leading pickle marketer. Dean Foods Company is the second largest pickle processor and marketer in the United States. Schedule F-1 lists U.S. cucumber pickle imports in 1990.

Schedule F-1

1990 - U.S. IMPORTS OF CUCUMBERS, INCLUDING GHERKINS PREPARED OR PRESERVED BY VINEGAR OR ACETIC ACID

	Metric Tons	Dollars (000)
Sri Lanka	837	$ 438
Israel	643	711
Poland	586	396
Germany	330	466
Taiwan	218	387
France	207	602
Hungary	104	38
All Others	592	943
GRAND TOTAL	3,517	$ 3,981

Source: United States Customs.

Cornichon/gherkin pickle volume has not been broken out of these import statistics, but they are believed to account for about one-half of the total.

The total market value for pickles in the European Community was not available. However, in 1989 the twelve E.C. countries imported 58,429 metric tons of cucumber pickles and Cornichones. The major sources of supply were Morocco, Hungary and Turkey, who between them accounted for 73% of the total European imports (see Schedule F-2).

Schedule F-2

1989 E.C. IMPORTS OF CUCUMBERS, INCLUDING GHERKINS PREPARED OR PRESERVED BY VINEGAR OR ACETIC ACID (Volume in Metric Tons)

Country	Volume
Morocco	17,758
Hungary	14,574
Turkey	10,430
Yugoslavia	3,406
Czechoslovakia	3,220
Bulgaria	2,035
Poland	1,229
Mexico	1,104
Sri Lanka	896
Argentina	406
Others	3,375
Total	58,429

Source: EUROSTAT.

According to an analysis of the European Community's pickle market (published by Food for Thought in April, 1990), Germany and the United Kingdom accounted for two-thirds of the E.C. pickle consumption. However, strictly in terms of imports, Germany and France have been the largest markets, importing 25,985 and 22,742 metric tons respectively (83% of total imports).

The Food for Thought analysis indicated that sales are dynamic in the United Kingdom, Ireland and the Netherlands, but seem to have reached a saturation point in other E.C. markets. Two German (Kohne and Hengsten-Berg) and one French (BSN) suppliers were the E.C. market leaders with a presence in two or three countries each. Private label product accounted for a substantial portion (14%) of the market, particularly in France, Belgium and the Netherlands (see Appendix VI-1).

There are no statistics available for total value for sales of pickle products in Japan. However, Japanese imports amounted to only 711 tons in 1989 (see Schedule F-3).

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Schedule F-3

IMPORTS OF PICKLES AND PICKLED PRODUCTS
JAPAN - 1989
(Data in Tons)

Country	Quantity
Sweden	2
Germany	50
Poland	65
Czechoslovakia	12
Hungary	73
USA	147
Netherlands	13
Belgium	1
France	44
Italy	1
Total	711

Source: Japan External Trade Organization (JETRO).

B. Selected Products

The pickled products of particular interest for the LAC countries are the extremely small cucumber pickles known as midgets, gherkins and/or cornichones.

Imports of midgets, gherkins and cornichones into the United States were estimated at about 1,600 metric tons in 1990. The imports were a mixture of bulk and packaged products, the packaged products being mostly cornichones from France. European imports of midget gherkins and cornichones in 1989 were estimated at over 30,000 metric tons; with over 22,000 imported into France, primarily from Morocco. One firm marketing in France (Unimark, based in Texas) estimates that there is a 2,000 metric ton annual shortfall in France. Estimated Japanese imports of midget gherkins and cornichones amounted to less than 50 tons.

A survey conducted by the team of 67 U.S. supermarkets and specialty stores in 5 metropolitan areas, showed that 15% of the cucumber pickles (excluding relishes) were made up of gherkins, midgets, and/or cornichones. Based on 1989 overall pickle sales of $686 million (Information Resources, Inc.) would indicate total U.S. grocery sales of approximately $100 million.

These "pickling" cucumbers are picked early when they are still very small. The most commonly traded size is the 180 to 200 per kilo count. A standard hybrid variety, the Calypso, and to a

lesser extent the Premier are predominately used. For exports destined for France, French varieties are preferred. These seeds are readily available. In addition, a number of companies have proprietary varieties which they have developed over the years.

As a result of the small size of the cucumber, harvesting is very labor intensive. All harvesting is done by hand - experiments have been attempted with mechanical harvesting but too much damage was caused to the delicate cucumbers. Warm weather tends to rapidly put size on the cucumbers, which can necessitate up to two pickings per day. At other times harvesting can be two to three days apart. Based on production experience, there is normally a 75 day production cycle, and production and harvesting requires about 1,100 man days per hectare (15 workers). Ideal temperatures for growing and harvesting range between 60 and 90 degrees F.

There are two approaches to processing. Pickles are either packed initially in consumer packages using fresh raw materials, or first bulk packed in brine and later re-packed in consumer sizes. The two methods result in a product with different flavor characteristics. The pickles directly packed in consumer size are generally more preferred in Northern Europe and the United States. Those re-packed from brine are preferred in France and Southern Europe. Due to the labor intensity of the harvest, packing in brine in drums for shipment to the U.S. and Europe is a viable enterprise for some developing countries.

There has, in fact, been continuous movement of production of pickles offshore. Sri Lanka, the largest exporter to the United States of gherkin/cornichones, began exports only three years ago. Vlasic Pickle, the largest U.S. pickle manufacturer, has recently been in Central America investigating the potential for sourcing product there. This will be discussed further in the Market Access section.

In summary, although this is a relatively small market, these pickles are very labor intensive, are suitable for growth on small plots, and are not perishable once processed. The processing is extremely low-tech, and this sort of enterprise might work well in some of the more remote areas where there is difficulty in finding appropriate agriculture export products.

C. Competition

The two target markets for LAC producers are Europe and the United States.

Europe is by far the largest importer and consumer of these pickles. The major sources of supply for all types of pickles into the European Community are Morocco, Hungary and Turkey. The Moroccan operations typically date back to long-time relationships with French concerns. It is believed that the Moroccan and Turkish production is focused on the cornichones. A cause for concern would obviously be the differential in freight that exists between potential LAC producers and these competitors.

According to trade sources, there is a short-fall in supply estimated to be about 2,000 metric tons in France alone. Morocco has reportedly experienced serious disease problems over the past few years, which may in part account for this deficit. Mexico and Sri Lanka exported approximately 2,000 metric tons to Europe in 1989.

In the United States, the per capita consumption of these pickles is smaller. Most of the product is domestically produced. It is the opinion of those in the trade that more and more production will start moving off shore due to the labor intensive nature, particularly for harvesting.

Sri Lanka has been exporting pickles in brine for about three years; most of their product goes to Australia. Yields in Sri Lanka vary from 5 to 15 metric tons per hectare, depending on location. One group with 6 metric tons per hectare yields (for 100/kg to 300/kg counts) reported total growing costs, exclusive of labor, at $1,575 per hectare (26 cents per kilo). Another exporter estimated production costs at 50 cents per kilo, including labor. Processing and internal transport was reported at 8 cents per kilo. Drums (55 gallon) purchased from India cost 22 cents per kilo. All other direct and overhead costs amounted to 28 cents per kilo. Total FOB production costs amounted to $1.08 per kilo.

Unit growing costs are substantially lower for the larger pickles. Yields were reportedly as high as 25 metric tons per hectare and production and harvest cost, including labor, was $1,250 per hectare.

At least one Sri Lanka shipper stopped buying 100 to 300 sizes in 1991 - evidence of a weakness in the market. They are, however, continuing to pack and ship the larger (10 to 100 count) sizes. Prices paid to growers were as follows:

Count (per kg)	Prices 89/90	Prices 90/91
250 - 300	67 cents	not buying
180 - 200	59 cents	not buying
100 - 120	15 cents	not buying
80 - 100	15 cents	not buying
50 - 60	15 cents	25 cents
40 - 50	15 cents	25 cents
30 - 40	5 cents	10 cents
20 - 30	5 cents	10 cents
10 - 20	5 cents	10 cents

Most gherkin farms in Sri Lanka are less than two hectares, with the average size less than one-half hectare. Usually the commercial companies prefer to keep farms small so that the farmer does not have to hire outside labor.

Vlasic is currently sourcing about 10% of their gherkin pickle raw material in Mexico (in fresh form). Unimark sources brine product in Mexico for export to France. Mexican growers are only able to produce one crop a year due to climatic constraints. Mexico's first frost-free month is March, and their rainy season begins in the summer. The cucumber plants are very sensitive to rain as wet weather tends to promote disease which drastically reduces yields. There may be some advantage for LAC areas with conducive weather conditions or special micro-climates to produce two or even three harvests a year.

CBI beneficiaries, and it is expected Andean Initiative beneficiaries will be able to export pickles into the United States duty free. Duty into Europe is 12% to 16% for Sri Lanka (depending on product classification), 16% for Eastern block countries, and 22% for Latin American countries. Morocco and Turkey currently enter European markets duty free, and this is not expected to change even after the E.C.Common Market is established in 1992.

A 20 foot container holds 80 drums with a net drained weight of 250 to 300 pounds per drum, or approximately 11 tons of drained weight product per container.

Following are representative freight rates drawn from our transportation analysis Appendix III Vol.I:

To south Florida		Dollar rate
From:	Costa Rica	$ 2,780
	Dominican Republic	1,144
	Peru	no established rate

To New York City		
From:	Dominican Republic	$ 3,185
	Peru	no established rate
	Sri Lanka (20 ft container)	2,105

To Rotterdam		
From:	Costa Rica (20 ft container)	$ 2,370
	Dominican Republic	3,120
	Peru	6,200
	Sri Lanka	3,073
	Thailand	3,266

The above indicates no freight advantage to any market by LAC producers as compared to Sri Lanka. Once again, we mention the caveat that these rates are all negotiable. Once significant volume starts to develop in LAC countries it is very possible that lower rates can be achieved. This may, in fact, be one reason for the very competitive rates expressed for Sri Lanka.

D. Market Access Strategies

In the United States the team found substantial interest in the development of prospective import projects.

Vlasic Pickle is extremely interested in finding alternative or additional sources of supply. Currently approximately 90% of the gherkin pickles produced by Vlasic are processed from fresh raw material sourced domestically - with very expensive labor costs. The company has, in fact, recently been in Central America investigating the potential for sourcing product there. However, Vlasic does not use the brine product as it does not meet their quality requirements. According to a company representative, there are only three realistic options for them in sourcing off shore:

- Source fresh raw material to process in their plant in Mississippi. This option requires delivery within 3 days of harvest in order to maintain the integrity of the fresh product.

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- Produce a consumer-ready pack off shore. The concern here has been a reluctance on the part of the marketing department to state on the Vlasic label that the product was produced outside of the United States.
- Develop a different process for bulk packing pickles that will maintain the flavor that is preferred in U.S. and Northern European markets.

In addition to Vlasic, there is a California-based investment group headed by Dr. Kanti Rawal that is currently investigating the feasibility of establishing a pickle processing in the developing world.

The European market is differentiated by very diverse taste preferences. Generally speaking, the southern European countries prefer a sour, more acid pickle; the mid-European countries favor a sweet-sour flavor (dill); while northern countries fancy sweet tasting pickles. Distinctive and time-honored recipes produce these various flavors - but the sweeter flavors cannot be produced from the brine raw material.

These taste preferences therefore have significant implications for prospective LAC processors contemplating entering the European market. The sour, acid flavors (and to a lesser extent the dill flavors) can be produced from the brine raw material, and LAC processors should target their products to France, Italy, Spain, etc. It is extremely important for a new processor to thoroughly understand the individual segment preferences of his target market(s).

A broad line of supplementary products could also be preserved in the pickling method to meet specific customer requests. Some examples are pickled baby corn, extra fine green beans, and jalepeno peppers. With very little modification the plant, any combination of these supplemental products could be produced at the same facility. Another benefit to these products is that they have very short growing seasons.

Unimark, of Argyle, Texas maintains an office in, France and is actively seeking new sources of supply for the French market. They now export brine product to France from Mexico.

Two other European pickle manufacturer/distributors were identified who expressed an interest in alternative or additional sources of supply: Nico Breuers of Nic. Breuers BV, the Netherlands; and Julio Jauregui, San Sebastian, Spain. Mr. Jauregui has been in Chile seeking a source this past year.

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E. Implementation/USAID Intervention Options

The amount of equipment needed for a bulk pickle packing plant is so minimal that there is no real through-put capacity. The capacity is judged by how many people are on the line and how many hectares are supplying the processing facility. The first step in implementation would be to find the appropriate location (in terms of both favorable climatic conditions, and a suitable site for the facility) and prepare a detailed feasibility study. Once a suitable location has been selected, negotiations should begin with some of the interested marketing parties identified previously. Initial production should be geared to their requirements.

For illustration purposes, we will assume an annual export of 1,000 tons. This is roughly the level that Mexico and Sri Lanka are at now, and represents approximately 3% of the total volume now believed to be traded on an annual basis. Average yield will be assumed to be 5 tons/acre. At this yield, a cultivated area of 200 acres (or 80 hectares) would be required to support the facility. Although this is a very small area it is a very intensive production operation which will lend itself well to small plots. The total labor requirements would be for 88,000 man days for production and harvest. Growing could be done on small plots, utilizing family labor.

Again, for illustration purposes, assuming a 20 week growing season, this would result in the average processing of 50 metric tons per week, or approximately 7 metric tons per day.

Despite the limited size of the project, the nature of it is such that it would seem to warrant a project-specific USAID intervention. This intervention would appropriately be aimed at the supply of raw material - providing technical assistance to the small farmers on growing the product, improving yields, training on chemical usage, etc.

Raw material sourcing has consistently been a problem throughout the developing world, and is reportedly a problem for this product category as well. Bon Appetit, a pickle processor in El Salvador has recently leased 200 hectares to farm exclusively in order to assure a supply for the processing plant. Cucumbers are not a traditional crop in LAC and growers generally lack experience in cultivation techniques. For this reason, grower education in growing, harvesting, post harvest management, etc. will be needed for any start-up operation. USAID training support could be very effective.

The actual processing (recipe selection, etc.) and marketing will be best left to the private sector people involved. However, there is a viable option for insuring adequate raw material supplies for the plant, while enlisting active involvement of the growers in the operation. This option would be to establish the

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enterprise as a cooperative venture with the coop doing the growing, packing and shipping. In this case, USAID assistance in the organization of the cooperative would also be warranted.

Theoretically, it would be difficult for LAC to compete with Turkey and Morocco in the European market. This competitive threat could well be compounded by emerging Eastern European producers. On a long term basis, the U.S. market should be the center of focus. However, the team found considerable interest in Europe for imports since, for whatever reason, the Moroccan and Turkish producers cannot seem to keep up with the demand. Whether targeting U.S. or European markets the producers need to understand the preferences and traditions of that market's population.

Another option for USAID would be to support research in bulk pickle packing techniques, that would result in flavors more palatable to U.S. and Northern European tastes. If this could be accomplished, a market worth hundreds of million of dollars, for labor intensive products could be opened to developing countries. The research project could be done as a cooperative venture between a LAC based Institution and a U.S. University.

F. Manufacturing Parameters

1. Introduction

Pickled food may be defined as a food to which edible acid, like lactic acid or acetic acid in the form of vinegar, has been added. A fermented food is a food in which acid is produced from sugar in a food product by the fermentation of lactic acid bacteria. Both pickled and fermented foods are preserved primarily by acidification. When low quantities of salt are added to vegetables, the brine becomes cloudy, and the product acquires an acid flavor. This acid flavor partially balances the excessively salty flavor making it appropriate for certain recipes. The history of pickled and fermented vegetables such as cucumbers extends so far into antiquity that no precise time can be established for its origin. The methods of preparing and fermenting vegetable substances presumably originated in the Orient as early as 300 BC.

The secret of preparing good pickles lies in developing a desirable flavor and texture, consistent with a good balance of the flavors of spice, sugar, salt and acid. Satisfactory pickled products can be obtained only when good quality ingredients are used.

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2. Process

The bulk pickle processing plant schematic shown in Appendix VI-3 is offered for illustration purposes only since bulk packing requirements are dependent upon purchaser's specifications. Buyer's, the final processors of pickled products, will make known their requirements for packing containers, brine salinity, product size and other variables that significantly affect packing facility layout and equipment needs. The schematic illustrates basic processes of a hand packing operation.

In the field, product is cut from the vine, placed in transport containers, and delivered to the hose-down area just outside the packing facility. Product is gently showered (note stand pipes for water) to remove field debris; containers are placed on the conveyor; and moved to wash tanks. Product is emptied into the wash tanks and containers are stacked in the hose-down area for return to the field.

At the wash tanks product is cleaned and placed in collection containers. Obviously damaged or unacceptable product is culled. Acceptable product is moved to sizing/sorting tables constructed with mesh or otherwise ventilated h ses to allow excess moisture to drain. 1/16 inch is cut from the blossom end of each piece of fruit before it is packed into adjacent barrels or other containers; brined and full containers moved to a holding area. If the specified containers are large and the facility is not mechanized, the final containers should be placed on dollies before packing to enable workers to more easily transport the product to storage. Holding tanks for brine should be located within the facility for ease of use.

Purchaser's requirements may be such that additional brine and/or salt must be added periodically before shipping. Such requirements may mandate storage methods that allow easy access to the storage containers and ability for the tops to be opened several times if additions are necessary. Storage for short periods may be feasible without additional construction. Lengthy storage, particularly if brine salinity must be increased, will require additional structures where product can be protected against infestation and excess heat.

The following is a description of current pickle packing operations in Sri Lanka.

Each commercial company involved in gherkins will establish a brining operation in the heart of their growing region. This operation will consist of a sorting/grading shed, a small washing area, and the brining area. Each grower's fruit must be kept separate through grading so a proper count can be made for payment purposes. Packers are all women who sometimes bring their small children to assist them with chores. An office houses 3 to 4

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clerks for each field agent, who usually handles no more than 50 farmers. The clerks record every transaction with each farmer, ie: seeds issued, fertilizer issued, grades and weights harvested, deductions for advances, etc. - all elaborately recorded by hand.

Gherkins are received from farmers who bring them on a bicycle, on foot, or in a truck they may have hired for this purpose. Sorting is immediate and the farmer leaves with a receipt once his gherkins have been graded. During peak season farmers may wait 2 hours to have their product sorted.

The gherkins are washed by hand, in old fashioned wash tubs to remove the dirt, sand, etc. Then they are placed in black plastic barrels. The "drums" are imported from India. They do not use a liner. The salt solution is made separately and added to the barrels once they are full. There is much walking around, carrying, bending, mixing by hand, etc. as everything is manual. At one installation there is a mechanical grader, imported from Holland (it is broken).

Now in brine, the pickles are left to stand in the hot sun, covered only by dried palm fronds. They are stored in this manner until they are shipped to Colombo for export.

3. Equipment Needed - Floor Space - Cost

The bulk packing equipment required is minimal. It can be acquired for under $10,000. Equipment would include: two portable brine agitators (electric), two hand-lift trucks, two steam cleaners, two pH meters, two saline refractometers, two sugar refractometers, two portable pressure washers, 100 processing container (nesting type), six mixing paddles, 500 feet of one inch flex hose. The area requirements for processing would be about 1,600 square feet, storage would be about 5,000 square feet. No copper, brass, iron or aluminum equipment could be used. Plant capacity per day would be 55 to 60 barrels per 8 hour day.

4. Raw Materials/Yields

Seed varieties would primarily be Calypso, Premier, French stock, and proprietary (see Appendix VI-2 for cultural practices). Other material needed would be quarter inch plastic mesh and salt. Production yields are estimated at 5 tons per acre. There would be 100% recovery as culls would be charged back to the grower.

5. Direct Labor Costs

Staff requirement would be 30 individuals made up of:

Supervisor	1
Packers	16
Washers	8
Fork lift operator	1
Clerk	1
Laborers	3
Total	30

6. Overhead Requirements

Overhead requirements for this relatively simple operation would be minimal - a general manager and a clerk.

7. Packaging and Product Standards

Bulk packing at the plant will be into 55 gallon drums. The drums cannot be metal or wood, and plastic drums are the standard. It is possible to use second hand drums (from the olive industry). A 40 foot container will hold 160 empty drums and 80 filled drums. The drained product weight of the drums is 260 to 300 pounds.

The most common container for food service customers is a 5 gallon plastic container.

8. Energy Consumption

Electricity use would be minimal. Fresh water requirements would be about 2,000 gallons per day.

APPENDICES

I. Fresh Pre-Cut Fruits and Vegetables

II. IQF Fruits and Vegetables

III. Tropical Fruit Juices, Pulps and Concentrates

IV. Processed Tomatoes

V. Dried Tropical Fruits

VI. Pickles

2'06'

APPENDIX I - FRESH PRE-CUT FRUITS AND VEGETABLES

I - 1. Pre-cut Packaging and Product Standards

I - 2. Selected Manufacturers & Distributors of Fresh Pre-cut Fruits & Vegetables - US

Appendix I - 1

PRE-CUT PACKAGING AND PRODUCT STANDARDS

MANN PACKING CO., INC.

California Vegetables

CAR LOT SHIPPER AND BROKER

P.O. BOX 690 • TELEPHONE (408) 422-7405 • SALINAS, CALIFORNIA 93902

SUNNY SHORES Precut Foodservice Yield Facts

When a restaurant or retail grocer prepares its own florettes or spears from a 21 pound box of bunched broccoli, wastes can be expected.

	YIELD	WASTE
8 + pounds of florettes	40%	60%
9 pounds of Broccoli Wokly	45%	55%
12 pounds of 3-4" spears	60%	40%
15 pounds of 6" spears	75%	25%

The efficient operator can easily see that using SUNNY SHORES precut foodservice packs of 100% NET USABLE PRODUCT saves:

* Prep time
* Freight costs per unit
* Storage space
* Disposal/Waste problems
* Risk of injury

SUNNY SHORES precut foodservice packs of broccoli and cauliflower mean real $$$$ savings.

Other Advantages:

All SUNNY SHORES precut foodservice products are shipped in salt-free ice.

We offer fixed prices on broccoli florettes, 3-4" gourmet broccoli spears, Broccoli Wokly 18 lbs. and Cauliettes to aid in your menu planning. Foodservice operators and retailers can Depend on Mann for stable pricing year round.

The accompanying sheets list areas of comparison which show the advantages of using Mann's SUNNY SHORES 100% net usable foodservice precut products. Let Mann be your daily helper.

4/3# Broccoli Florettes

Listed below are areas of comparison which indicate the advantages for a foodservice operator to purchase 4/3# broccoli florettes as opposed to purchasing bunch broccoli and cutting his/her own florettes. (4/3# = Four 3-pound mesh bags of florettes per carton)

Florette yield

1 carton of 4/3# broccoli florettes
equals
1.5 cartons of bunched Broccoli 14's

Floor Space Savings in Truck

1 pallet of 4/3# Broccoli florettes (72 cartons)
equals
2.25 pallets of bunch broccoli (48 per pallet, 108 cartons total)

Freight weight savings

1 pallet of 4/3# iced Broccoli florettes weighs approximately 2628lbs. versus
2.25 pallets of iced bunch Broccoli weighs approximately 4860 lbs.

Space savings in the foodservice operator's cooler

4/3# carton dimensions:
11" high x 12" long x 13" wide = 1716 cubic inches.
Bunched Broccoli carton dimensions:
11" high x 20" long x 13" wide = 2860 cubic inches.

Portion information

Average of 65 bite size florettes per pound
Average of 135 bite size florettes per gallon
Two pounds of florettes average one gallon measurement
48-4 ounce portions per 4/3# carton

**** All of the above data are based on averages which may vary due to season and variety of Broccoli.**

Broccoli Wokly® Florettes - 9#

Listed below are areas of comparison which indicate the advantages for a foodservice operator to purchase 9# Broccoli Wokly® florettes as opposed to purchasing bunch broccoli and cutting his/her own florettes.

Florette yield

1 carton of 9# Broccoli Wokly® florettes
equals
1 carton of bunched Broccoli 14's

Floor Space Savings in Truck

1 pallet of 9# Broccoli Wokly® florettes (72 cartons)
equals
1.5 pallets of bunch broccoli (48 per pallet, 72 cartons total)

Freight weight savings

1 pallet of 9# iced Broccoli Wokly® florettes weighs approximately 1944lbs. versus
1.5 pallets of iced bunch Broccoli weighs approximately 3240 lbs.

Space savings in the foodservice operator's cooler

9# Broccoli Wokly® carton dimensions:
11" high x 12" long x 13" wide = 1716 cubic inches.
Bunched Broccoli dimensions:
11" high x 20" long x 11.5" wide = 2530 cubic inches.

Portion information

Average of 36-4 ounce protions per 9# carton of Broccoli Wokly®.

**** All of the above data are based on averages which may vary due to season and variety of Broccoli.**

3-4" Broccoli Spear - 15#

Listed below are areas of comparison which indicate the advantages for a foodservice operator to purchase a 15# carton of 3-4" Broccoli spears as opposed to purchasing bunch broccoli and cutting his/her own.

Spear yield

1 carton of 15# 3-4" Broccoli spears
equals
1.2 cartons of bunched Broccoli 14's

Floor Space Savings in Truck

1 pallet of 15# 3-4" broccoli spears (48 cartons)
equals
1.2 pallets of bunch broccoli (48 per pallet, 58 cartons total)

All spear boxes have the same dimensions which are:

11" high x 20" long x 13" wide = 2680 cubic inches.

Portion information

1 carton of 3-4" 15# broccoli spears will average 60-4 ounce portions.

**** All of the above data are based on averages which may vary due to season and variety of Broccoli.**

6" Broccoli spear - 15#

Listed below are areas of comparison which indicate the advantages for a foodservice operator to purchase a 15# carton of 6" Broccoli spears as opposed to purchasing bunch broccoli and cutting his/her own.

Spear yield

1 carton of 15# 6" Broccoli spears
equals
1 carton of bunched Broccoli 14's

6" Broccoli Spear - 21#

Listed below are areas of comparison which indicate the advantages for a foodservice operator to purchase a 21# carton of 6" Broccoli spears as opposed to purchasing bunch broccoli and cutting his/her own.

Spear yield

1 carton of 21# 6" Broccoli spears
equals
1.4 cartons of bunched Broccoli 14's

Floor Space Savings in Truck

1 pallet of 21# 6" brcccoli spears (48 cartons)
equals
1.4 pallets of bunch broccoli (48 per pallet, 67 cartons total)

All spear boxes have the same dimensions which are:

11" high x 20" long x 13" wide = 2680 cubic inches.

Portion information

1 carton of 6" 21# broccoli spears will average 57 spears.

**** All of the above data are based on averages which may vary due to season and variety of Broccoli.**

2/3# CAULIETTES® (cauliflower florettes)

Listed below are areas of comparison which indicate the advantages for a foodservice operator to purchase 2/3# cauliettes® as opposed to purchasing head cauliflower and cutting his/her own. (2/3#= two 3-pound bags of cauliflower florettes)

Cauliettes® yield

1 carton of 2/3# Cauliettes®
equals
2 flats of head cauliflower

Floor Space Savings in Truck

1 pallet of 2/3# Cauliettes® (72 cartons)
equals
2.8 pallets of head cauliflower (52 flats, 144 flats)

Space savings in the foodservice operator's cooler:

2/3# Cauliettes® carton dimensions:
8.5" high x 12" long x 13" wide = 1326 cubic inches.
Head Cauliflower carton dimensions:
6" high x 24" long x 20" wide = 2880 cubic inches.

Portion information:

Average of 23 bite size cauliettes® per pound
Average of 89 bite size cauliettes® per gallon
3.8 pounds of cauliettes® average one gallon measurement
24-4 ounce portions per carton of 2/3# cauliettes®

**** All of the above data are based on averages which may vary due to season and variety of Cauliflower.**

SUNNY SHORES®

The Original

Vitamin Vegetable®

Brand

CROWN CUT

FRESH FIVE INCH BROCCOLI SPEARS

- Farm fresh
- 100% net product
- No waste
- Consistent quality
- Accurate portion control
- Labor saving fresh
- No additives
- Easy to prepare
- Ideal plate coverage
- Uniform size
- Space saving carton
- Grown, packed and shipped in U.S.A.

PRODUCT AND PREP INFORMATION

Item	Size	How packed	Product Net weight	Per pallet
Fresh Broccoli Spear	5 inches	Loose	20 lbs. per carton	48 cartons

Pricing and other current information

For best results

- Keep wet and cold
- Rinse before use
- Cook or eat raw
- Microwave
- Boil in minimum water
- Steam
- Blanche and freeze
- Serve hot or cold
- Stir fry

Keep fresh broccoli wet and cold — 32° F ideal temperature

Mann Packing Co. Inc.

CAULIETTE®

The Original

Vitamin Vegetable® Brand

CAULIFLOWER FLORETTE

- Farm fresh
- 100% net product
- No Waste
- Consistent quality
- Accurate portion control
- Labor saving fresh
- No additives
- Easy to prepare
- Ideal plate coverage
- Bite size
- Space saving carton
- Packed and shipped in salt-free ice

PRODUCT AND PREP INFORMATION

Item	Size	How packed	Product Net Weight	Per pallet
Fresh Cauliflower florette	Bite size Random cut	Two 3-pound bags	6 lbs. per carton	72 cartons
Fresh Cauliflower florette	Bite size Random cut	Four 3-pound bags	12 lbs. per carton	48 cartons

Pricing and other current information

For best results

- Keep dry and cold
- Rinse before use
- Cook or eat raw
- Microwave
- Boil in minimum water
- Steam
- Blanche and freeze
- Serve hot or cold
- Stir fry

Keep fresh cauliflower dry and cold -- 32° F ideal temperature

Manr Packing Co. Inc. 1996

SUNNY SHORES®

The Original

Vitamin Vegetable® Brand

SIX INCH FRESH WHOLE BROCCOLI SPEARS

- 100% net product
- No waste
- Consistent quality
- Accurate portion control
- Labor saving fresh
- No additives
- Easy to prepare
- Ideal plate coverage
- Farm fresh
- Uniform size
- Space saving carton
- Packed and shipped in salt-free ice

PRODUCT AND PREP INFORMATION

Item	Size	How packed	Product Net weight	Per pallet
Whole broccoli spear	Six inches	Loose	21 lbs per carton	48 cartons
Whole broccoli spear	Six inches	Loose	15 lbs per carton	48 cartons

Pricing and other current information

For best results

- Keep wet and cold
- Rinse before use
- Cook or eat raw
- Microwave
- Boil in minimum water
- Steam
- Blanche and freeze
- Serve hot or cold

Keep fresh broccoli wet and cold - - 32° F ideal temperature

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Mann Packing Co. Inc.

SUNNY SHORES®

The Original

Vitamin Vegetable® Brand

GOURMET
FRESH 3-4 INCH WHOLE BROCCOLI SPEARS

100% net product
No waste
Consistent quality
Accurate portion control
Labor saving fresh
No additives

- Easy to prepare
- Ideal plate coverage
- Farm fresh
- Uniform size
- Space saving carton
- Packed and shipped in salt-free ice

PRODUCT AND PREP INFORMATION

Item	Size	How packed	Product Net weight	Per pallet
Gourmet broccoli spear	3-4 inches	Loose	15 lbs per carton	48 cartons

Pricing and other current information

or best results

Keep wet and cold
Rinse before use
Cook or eat raw
Microwave
Boil in minimum water
Steam
Blanche and freeze
Serve hot or cold

eep fresh broccoli wet and cold - - 32° F ideal temperature

Mann Packing Co. Inc. ©198

SUNNY SHORES®

The Original

Vitamin Vegetable® Brand

BROCCOLI FLORETTES

- Farm fresh
- 100% net product
- No Waste
- Consistent quality
- Accurate portion control
- Labor saving fresh
- No additives
- Easy to prepare
- Ideal plate coverage
- Bite size florette
- Space saving carton
- Packed and shipped in salt-free ice

PRODUCT AND PREP INFORMATION

Item	Size	How packed	Product Net Weight	Per pallet
Fresh Broccoli florette	Bite size	Three 3-pound mesh bags	9 lbs. per carton	72 cartons
Fresh Broccoli florette	Bite size	Four 3-pound mesh bags	12 lbs. per carton	72 cartons
Fresh Broccoli Florette	Bite size	Six 3-pound mesh bags	18 lbs. per carton	48 cartons

Pricing and other current information

For best results

- Keep wet and cold
- Rinse before use
- Cook or eat raw
- Microwave
- Boil in minimum water
- Steam
- Blanche and freeze
- Serve hot or cold
- Stir fry

Keep fresh broccoli wet and cold -- 32° F ideal temperature

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SELECTED MANUFACTURERS AND DISTRIBUTORS OF FRESH PRE-CUT FRUITS AND VEGETABLES - US

COMPANY	CITY	STATE	TELEPHONE	CONTACT
American Produce & Veg. Co.	Dallas	TX	214-233-5750	Lucian LaBarba
Andrew Smith Co.	Salinas	CA	408-757-2230	Andy Smith
Bano Quality Produce, Inc.	Baton Rouge	LA	504-923-0160	S.J. Montalbano
Club Chef	Cincinnati	OH	513-563-6050	Tom Murtaugh
Custom Cuts, Inc.	Milwaukee	WI	414-645-2387	Brad Beckman
Dole Fresh Vegetable Co., Inc.	Salinas	CA	408-422-8871	Barton E. Good
Hearn-Kirkwood	Hanover	MD	301-796-1000	Peter Gilbert
J.C. Brock Corporation	Buffalo	NY	716-827-3777	Bill Stetler
Mann Packing Co.	Salinas	CA	408-422-7405	David Stidolph
Mr. Salads, Inc.	Pensacola	FL	904-432-7669	Milton Law
Orval Kent	Wheeling	IL	708-459-9000	Jim Nazarowski
R.C. McEntire & Company	Columbia	SC	803-799-3388	R.C. McEntire
Ready Pac Produce	Pasadena	CA	818-449-1128	Dennis Gertmenian
The Salad Factory, Inc.	Marietta	GA	404-427-8791	Benny Helton
Unimark	Argyle	TX	817-455-2103	Bjorn Buddi
Yarbrough Produce	Birmingham	AL	205-323-8651	Kenny Yarbrough

APPENDIX II - IQF FRUITS AND VEGETABLES

II - 1a. Price Trends of Frozen Vegetables: Jan., 1989 - Dec., 1990

II - 1b. Price Trends of Frozen Vegetables: Jan., 1987 - Dec., 1988

II- 1c. Average US Prices Received by Farmers from Freezers, Years 1985 - 1987

II - 2. Additional US Pack Statistics by Product

II - 3. California Production Cost Information

II - 4. Mexican Production Cost Information

II - 5. Supplemental Trade & Pack Statistics

II - 6. Product Specifications

II - 7. Plant Layout

II - 8. Selected Contact List

Price Trends of Frozen Vegetables: January, 1989 - December, 1990 (Part One)

1989:

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Asparagus:												
Spears, 12/2.5-lb.	2.18	2.18	2.18	1.88	1.88	1.91	1.91	1.91	1.91	2.08	2.08	2.15
	2.28	2.28	2.28	1.94	1.94	1.97	1.97	1.97	1.97	2.12	2.12	2.21
Cuts & Tips, 12/2.5-lb.	1.53	1.58	1.58	1.28	1.28	1.37	1.37	1.37	1.37	1.46	1.46	1.54
Broccoli:												
Spears, 24/10-oz.	11.10	11.10	11.10	11.10	11.10	11.10	11.10	11.10	11.10	11.10	11.10	11.10
	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40	11.40
12/2-lb.	.595	.595	.595	.61	.61	.61	.61	.61	.61	.61	.61	.61
Cuts, 24/10-oz.	9.10	9.10	9.10	9.10	9.10	9.10	9.10	9.10	9.10	9.10	9.10	9.10
	9.40	9.40	9.40	9.40	9.40	9.40	9.40	9.40	9.40	9.40	9.40	9.40
12/2.5-lb.	.48	.48	.48	.50	.50	.50	.50	.50	.50	.50	.50	.50
Chopped, 24/10oz.	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25
	8.55	8.55	8.55	8.55	8.55	8.55	8.55	8.55	8.55	8.55	8.55	8.55
12/2.5-lb.	.47	.47	.47	.49	.49	.49	.49	.49	.49	.49	.49	.49
Brussels Sprouts:												
24/10-oz.	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.45
12/2.5-lb.	.56	.56	.56	.56	.56	.56	.56	.56	.56	.56	.57	.60
Cauliflower:												
24/10-oz.	11.35	11.35	11.35	11.35	11.35	11.35	11.35	11.60	11.60	11.60	11.60	11.60
	11.65	11.65	11.65	11.65	11.65	11.65	11.65	11.95	11.95	11.95	11.95	11.95
12/2.5-lb.	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60	.60
	.62	.62	.62	.62	.62	.62	.62	.62	.62	.62	.62	.62
Cut Corn:												
24/10-oz.	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	8.74	9.70	9.70	9.00
									9.70			9.70
12/2.5-lb.	.57	.57	.57	.57	.57	.57	.57	.57	.57	.57	.57	.57
	.58	.58	.58	.58	.58	.58	.58	.58	.58	.58	.58	.58
Cob Corn:												
12/4	11.53	11.38	11.98	11.38	11.38	11.38	11.38	11.38	11.38	11.58	11.58	11.58
	11.92		12.82									11.98
48/1	11.48	11.43	11.48	11.48	11.48	11.48	12.56	12.56	12.56	12.56	12.56	12.56
		11.55	11.56	11.56	11.56	11.56						
Lima Beans:												
24/10-oz.	12.10	12.10	13.30	13.30	13.30	12.45	13.60	13.60	13.00	13.00	14.20	14.20
	12.70	12.70				13.30			13.60	13.60		
12/2.5-lb.	.80	.80	.80	.80	.80	.71	.71	.71	.785	.785	.785	.785
						.80	.80	.80	.80	.80	.80	.80
Fordhook Lima Beans:												
24/10-oz.	13.50	13.50	13.50	13.50	13.50	13.50	16.50	16.50	16.50	16.50	16.50	16.50
	13.85	13.85	13.85	13.85	13.85	13.85	16.90	16.90	16.90	16.90	16.90	16.90
12/2.5-lb.	.76	.76	.76	.76	.76	.76	.96	.96	.96	.96	.96	.96
	.86	.86	.86	.86	.86	.86						
Mixed Vegetables:												
24/10-oz.	8.70	8.70	8.70	8.70	8.70	8.70	8.70	8.70	8.70	8.74	8.74	9.00
										9.70	9.70	9.70
12/2.5-lb.	.57	.57	.57	.57	.57	.57	.57	.57	.57	.57	.57	.57
	.58	.58	.58	.5625	.5625	.5625	.58	.58	.58	.58	.58	.58

1990:

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Asparagus:												
Spears, 12/2.5-lb.	2.15	2.15	2.15	1.85	1.85	1.85	1.85	1.85	1.98	1.98	2.03	2.03
	2.21	2.21	2.21	1.87	1.87	1.87	1.87	1.87	2.03	2.03	2.05	2.06
Cuts & Tips, 12/2.5-lb.	1.54	1.54	1.54	1.25	1.25	1.25	1.25	1.25	1.43	1.43	1.43	1.43
Broccoli:												
Spears, 24/10-oz.	11.10	11.10	11.10	11.10	9.50	9.50	9.50	9.50	9.50	9.50	9.50	9.50
	11.40	11.40	11.40	11.40	11.10	11.10	11.10	11.10	9.75	9.75	10.25	10.25
12/2-lb.	.56	.56	.56	.56	.52	.52	.52	.52	.50	.50	.55	.55
	.61	.61	.61	.61					.52	.52	.56	.56
Cuts, 24/10-oz.	9.10	9.10	9.10	9.10	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50
	9.40	9.40	9.40	9.40	9.10	9.10	9.10	9.10	9.10	9.10	9.10	9.10
12/2.5-lb.	.49	.49	.49	.49	.41	.41	.41	.41	.41	.41	.43	.43
	.50	.50	.50	.50							.47	.47
Chopped, 24/10oz.	8.25	8.25	8.25	8.25	6.65	6.65	6.65	6.65	6.65	6.65	6.65	6.65
	8.56	8.56	8.56	8.56	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25
12/2.5-lb.	.43	.43	.43	.43	.40	.40	.40	.40	.40	.40	.42	.42
	.49	.49	.49	.49							.46	.46
Brussels Sprouts:												
24/10-oz.	10.45	10.45	10.45	10.45	10.45	10.45	10.45	10.45	10.45	10.25	10.25	10.45
										10.45	10.45	
12/2.5-lb.	.60	.60	.57	.57	.57	.57	.57	.57	.57	.57	.57	.57
			.58	.58	.58	.58	.58	.58	.58	.58	.58	.58
Cauliflower:												
24/10-oz.	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60	11.60
	11.95	11.65	11.65	11.65	11.65	11.65	11.65	11.65	11.65	11.65	11.65	11.65
12/2.5-lb.	.62	.62	.62	.62	.62	.62	.62	.62	.62	.62	.65	.65
	.66	.66	.66	.66	.66	.66	.66	.66	.66	.66	.67	.67
Cut Corn:												
24/10-oz.	9.00	9.00	9.00	8.50	9.00	9.00	9.00	9.10	9.10	8.98	8.98	8.98
	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.10	9.10	9.10
12/2.5-lb.	.56	.57	.57	.54	.54	.53	.53	.54	.54	.47	.53	.53
	.58	.58	.58	.57	.57			.57	.57	.54	.57	.57
Cob Corn:												
12/4	11.58	11.58	11.58	11.58	11.58	11.58	11.58	11.58	11.58	11.58	11.58	11.58
	11.98	11.98	11.98	11.98	11.98	11.98	11.98	11.98	11.98	11.98	11.98	11.98
48/1	12.56	12.56	12.56	12.56	12.56	12.56	12.56	12.56	12.56	12.56	11.15	11.15
											12.25	12.25
Lima Beans:												
24/10-oz.	14.20	14.20	14.20	13.60	13.60	13.60	13.30	13.00	13.00	13.00	13.00	13.00
12/2.5-lb.	.785	.785	.785	.77	.77	.77	.77	.77	.74	.74	.74	.68
	.80	.80	.80	.80	.80	.80	.80	.80	.77	.77	.77	.74
Fordhook Lima Beans:												
24/10-oz.	16.50	16.50	16.50	16.00	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50
	16.95	16.95	16.95	16.95	16.95	16.95	16.95	17.10	17.10	17.10	17.10	17.10
12/2.5-lb.	.96	.96	.96	.75	.75	.75	.75	.90	.90	.90	.90	.90
								1.00	1.00	1.00	1.00	1.00
Mixed Vegetables:												
24/10-oz.	8.70	8.70	9.00	9.00	9.00	9.10	8.74	8.74	8.98	8.98	8.74	8.74
						9.70	9.10	9.70	9.10	9.10	8.98	8.98
12/2.5-lb.	.57	.57	.57	.57	.57	.57	.57	.57	.57	.53	.53	.53
	.58	.58	.58	.58	.58	.58	.58	.58	.58	.56	.53	.56

Note: All prices f.o.b. West Coast basis.

Price Trends of Frozen Vegetables — January 1987
December 1988—Part I

	1987 Jan.	Feb.	Mar.	Apr	May	June	July	Aug	Sept.	Oct.	Nov.	Dec.	1988 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug	Sept	Oct	Nov	Dec
Asparagus:																								
Spears, 12/2½-lb.	1.91	1.80	1.78	1.78	1.78	1.78	1.78	1.83	1.83	1.90	1.90	1.90	1.90	1.90	2.10	1.85	1.85	1.87-1.95	2.02	2.02	2.02	2.09-2.11	2.09-2.11	2.09-2.11
Cuts and Tips, 12/2½-lb.	1.27	1.27	1.23	1.23	1.23	1.23	1.23	1.28	1.28	1.35	1.35	1.35	1.35	1.35	1.40-1.45	1.25	1.25	1.25-1.27	1.42	1.42	1.42	1.49-1.51	1.49-1.51	1.49-1.51
Broccoli:																								
Spears, 24/10-oz.	9.75-10.00	10.25-10.50	10.25-10.50	9.75-10.00	9.75-10.00	9.75-10.00	9.50-9.75	9.50-9.75	9.75-10.00	9.75-10.00	9.75-10.00	9.75-10.00	10.25-10.50	10.25-10.50	10.25-10.50	10.25-10.50	10.25-10.50	10.25-10.80				10.80-11.10	10.80-11.40	11.10-11.40
12/2-lb.	52-57	52-57	52-57	52-57	52-57	52-57	48-53	48-53	48-53	48-53	48-53	48-53	51-53	52-54	52-54	52-54	52-54	57-57½	10.80-57½	10.80-57½	10.80-57½	57-59½	59½	59½
Cuts, 24/10-oz.	7.75-7.95	8.25-8.45	8.25-8.45	7.75-7.95	7.75-7.95	7.75-7.95	7.50-7.70	7.50-7.70	7.75-7.95	7.75-7.95	7.75-7.95	7.75-7.95	7.75-7.95	7.75-7.95	7.75-7.95	7.75-7.95	7.75-7.95	8.20-8.50	8.20-8.80	8.80	8.80	8.80	8.80-9.10	9.10-9.40
12/2½-lb.	41-46	41-46	41-46	41-46	41-46	41-46	41-46	41-46	41-46	41-46	41-46	41-46	41-46	41-46	41-46	41-46	41-46	46	46	46	.46	46	48	48
Chopped, 2/10-oz.	6.90-7.25	7.40-7.75	7.40-7.75	6.90-7.25	6.90-7.25	6.90-7.25	6.65-7.00	6.65-7.00	6.90-7.25	6.90-7.25	6.90-7.25	6.90-7.25	7.25	7.25	7.25	7.25	7.25	7.90-7.95	7.90-7.95	7.95	7.95	7.95	7.95-8.25	8.25-8.55
12/2½-lb.	.39-.43	39-43	39-43	39-43	39-43	39-43	39-43	39-43	39-43	39-43	39-43	39-43	39-43	39-43	39-43	39-43	39-43	45	45	45	45	45	47	47
Brussels Sprouts:																								
24/10-oz.	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70-10.00	9.70-10.00	10.00	10.00	10.00	10.00	10.00
12/2½-lb.	.56	.56	.56	.56	.56	.56	.56	.56	.56	.56	.56	.56	.56	.56	.56	.56	.56	56-58	56-58	56-58	56	56	56	56
Cauliflower:																								
24/10-oz.	10.65-10.95	10.65-10.95	10.65-10.95	10.65-10.95	10.65-10.95	10.65-10.95	10.65-10.95	10.65-10.95	10.65-10.95	10.65-10.95	10.65-10.95	10.65-10.95	10.65-10.95	10.65-10.95	10.65-10.95	10.75-10.95	10.75-10.95	10.75-11.15	11.00-11.15	11.00-11.15	11.00-11.15	11.00-11.15	11.00-11.65	11.35-11.65
12/2-lb.	58-61	58-58	58-58	58-58	58-61	58-61	58-61	58-61	58-81	58-58	58-58	58-61	58-61	58-61	58-61	58-61	58-61	58-61	58-61	58-61	58-61	58-61	58-62	60-62
Cut Corn:																								
24/10-oz.	6.84-7.20	6.84-7.20	7.80	7.80-8.20	7.80-8.20	8.20	8.20	8.20	7.48-8.20	7.48-8.20	7.24-8.20	7.24-8.20	7.24-7.80	7.24-7.60	7.24-7.60	7.24-7.60	7.24-8.20	8.20-8.50	8.20-8.50	8.50-9.00	8.80-9.10	9.10	9.10-9.40	9.40-9.70
12/2½-lb.	41-44	41-44	44-46	41-49	44-49	49	49	49	47-49	47-49	47-49	47-.49	46-49	46-49	46-49	46-49	42-49	49-51	49-51	51-53	51-.53	53-55	53-55	53-55
Cob Corn:																								
12/4-ear	8.60-8.89	8.60-8.89	8.89	8.89	8.89	8.89	8.85-9.35	8.85-9.35	8.85-9.35	8.85-9.35	8.85-9.35	8.85-9.35	8.85-9.35	8.85-9.35	8.85-9.35	8.85-9.35	8.85-9.85	9.85	9.85-11.02	10.88-11.02	10.97-11.18	10.97-11.18	10.97-11.18	11.53-11.92
48/1-ear	7.88-8.38	7.88-8.38	8.38	8.38	8.38	8.38	8.38-8.88	8.38-8.88	8.38-8.88	8.38-8.83	8.38-8.88	8.38-8.88	8.38-8.83	8.38-8.88	8.38-8.88	7.38-8.88	7.38-8.88	9.38-9.98	9.38-9.98	9.98-10.58	9.98-10.58	10.52-10.58	10.52-10.58	10.52-10.58
Lima Beans:																								
Babies, 24/10-oz.	10.60	10.60	10.60	10.60	10.60	10.60	10.60	10.60	10.60	10.60	10.60-10.90	10.60-10.90	10.50-11.20	10.50-11.20	10.50-11.20	10.50-11.20	10.50-11.20	10.50-11.20		11.50-12.45	11.50-12.45	11.50-12.45	11.50-12.45	12.10-12.45
12/2½-lb.	60-62	60-62	60-62	60-62	60-62	60-62	60-62	60-62	60-62	60-62	60-62	60-62	61-63	61-63	61-63	61-63	61-63	81-63	11.50-63-65	63-65	63-.65	63-65	70-80	70-80
Fordhooks, 24/10-oz.	11.30	11.30	11.30	11.30	11.30	11.30	11.30	11.30	11.30	11.30	11.30-11.90	11.30-11.90	11.30-11.90	11.90	11.90	11.90	11.90	11.90-12.90	12.90-12.95	12.90-12.95	12.90-12.95	12.90-12.95	12.90-12.95	12.90-12.95
12/2½-lb.	67	67	67	67	67	67	62	67	67	67	67-69	67-69	69-71	69-71	69-.71	69-71	69-71	69-71	.71	71	72-73	.72-80	78-86	78-86
Mixed Vegetables:																								
24/10-oz.	7.23-7.35	7.23-7.35	7.23-7.35	7.23-7.35	7.48-7.60	7.48-7.60	7.48-7.60	7.48-7.60	7.24-7.60	7.24-7.60	7.24-7.60	7.24-7.60	7.24-7.60	7.24-7.60	7.24-7.60	7.24-7.60	7.24-8.20	8.20-8.50	8.20-8.50	8.50-9.10	8.80-9.10	9.10	9.10-9.40	9.70
12/2½-lb.	48-.48	48-.48	46-.48	.46-.48	46-49	46-49	46-49	46-49	.42-49	42-.49	42-49	.42-.49	.42-.49	46-.49	46-.49	46-49	46-49	46-51	48-.51	51-53	51-53	53-55	53-55	53-55

AVERAGE U.S. PRICES RECEIVED BY FARMERS FROM FREEZERS

YEARS - 1985, 1986, and 1987

(Data in Cents per Pound)

	1985	1986	1987	1988	1989
Broccoli	.19	.18	.18	.19	.185
Cauliflower	.13	.135	.135	.14	.135
Asparagus	.45	.465	.45	.53	.51

Source: The Almanac.

ADDITIONAL U.S. PACK STATISTICS BY PRODUCT

- Brussels Sprouts
- Bell Peppers
- Okra
- Combinations and/or Blends
- California Blend
- Italian Blend
- Northwest Blend
- Oriental Blend
- Winter Blend
- Fordhook Lima Beans
- Speckled Butter Beans
- Black-Eyed Peas

BRUSSELS SPROUTS

Container Size	1986	1987	1988	1989
Retail				
Carton	]			21,554
Boil-in-Bag	] 12,185	13,407	12,681	--
Poly	9,354	14,734	15,665	15,340
Foodservice and Bulk				
Carton	9,457	10,777	8,497	7,047
Poly	--	--	2,936	1,265
18 - 60 pound	7,452)1	1,554	6,295	272
Tote and Bin	-458)2	5,188	3,713	1,079
Total	37,990	45,660	49,787	46,557

)1 Includes IQF and other uses
)2 Deficit attributable to previous years' carryover and imported product repacked in the U.S.

BELL PEPPERS

Container Size	1988 Red	1988 Green	1988 Total	1989 Red	1989 Green	1989 Total
Retail						
Carton	--]			--]		
Poly	--]	1,307	1,307	--]	2,821	2,821
Foodservice and Bulk						
Carton/Poly	465)1	2,851	3,316)1	91)1	2,020	2,111
21 to 60 pound	2,027	3,684	5,711	7,041	7,478	14,519
Bulk & IQF	5,580	8,649	14,229	2,436	3,220	5,656
Sub-Total	8,072	16,491	24,563	9,568	15,539	25,107
*Other Uses**	4,101	1,009	5,110	4,352	1,276	5,628
Total	12,173	17,500	29,673	13,920	16,815	30,735

)1 Includes small amount of retail.

** Initially frozen vegetable weight going into canned and combination (mixed) vegetables.*
Note: Includes Some Breaded.

OKRA

Container Size	1986 Whole	1986 Cut	1986 Total All Styles	1987 Whole	1987 Cut	1987 Total All Styles
Retail						
Carton/Poly	6,046	23,731	29,777	8,783	15,162	23,945
Foodservice and Bulk						
Carton)1	3,227	62,537	65,764	6,940	21,883	28,823
Bulk	-2,655)2	-19,726)2	-22,381)2	-4,800)2	22,504	17,704
Total	6,618	66,542	73,160	10,923	59,549	70,472

Container Size	1988 Whole	1988 Cut	1988 Total All Styles	1989 Whole	1989 Cut	1989 Total All Styles
Retail						
Carton/Poly	8,625	20,162	28,787	7,326	13,507	20,833
Foodservice and Bulk						
Carton/Poly)1	5,239	88,736	93,975	3,462	58,104	61,566
Bulk)2	-5,683	-51,371	-57,054	-2,223	-20,171	-22,394
Total	8,181	57,527	65,708	8,565	51,440	60,005

)1 Includes I.Q.F.
)2 Deficit attributable to previous years' carryover and imported product repacked in the U.S.

Note: Includes Some Breaded.

COMBINATIONS AND/OR BLENDS

Approximate Composition of Blends:
CALIFORNIA BLEND *includes Broccoli,Cauliflower,Carrots.*
ITALIAN BLEND *includes Cauliflower,Zucchini,Italian Green Beans,and Onions.*
NORTHWEST BLEND *includes Corn,Green Beans,Sliced Carrots and Peas.*
ORIENTAL BLEND *includes Green Beans,Broccoli,Onions,Mushrooms.*
WINTER BLEND *includes Broccoli,Cauliflower.*

Container Size	1986	1987	1988	1989
CALIFORNIA BLEND				
Retail				
Carton	]		]	6,583
Boil-in-Bag	]		]	--
Poly	] 54,686	46,073	13,004	58,272
Foodservice and Bulk			51,124	
Carton/Poly	7,413	9,633	8,810	13,378
20 pound	7,143	13,491	]	7,776
30 pound and over	4,657	2,936	] 10,084	2,286
TOTAL	73,899	72,133	83,022	88,295
ITALIAN BLEND				
Retail				
Carton	] 19,680	17,829	18,614	1,107
Poly	]			19,975
Foodservice				
Carton/Poly	2,580	3,772	4,038	6,001
20 pound	4,164	4,843	]	
30 pound and over	2,830	1,502	] 5,708	6,370
TOTAL	29,254	27,946	28,360	33,453
NORTHWEST BLEND				
Retail Poly	9,233]			3,974
Foodservice Carton	5,752]	3,690	3,545	1,095
TOTAL	14,985	3,698	3,545	5,069
ORIENTAL BLEND				
Retail				
Carton	]	--	6,855	1,125
Poly	] 39,387	29,885	20,159	25,500
Foodservice and Bulk				
Carton/Poly	]		2,583	3,576
20 pound	] 4,944	5,920	3,728	4,231
TOTAL	44,331	35,805	33,325	34,432
WINTER BLEND				
Retail				
Carton/Poly	]			20,571
Boil-in-Bag	] 27,327	24,806	18,994	--
Foodservice and Bulk				
Carton/Poly	1,746	1,593	1,864	2,425
20 pound	12,647	3,494	4,108	4,787
TOTAL	41,720	29,893	24,966	27,783
GRAND TOTAL	204,189	169,475	173,218	189,032

F O R D H O O K L I M A B E A N S

Container	1986	1987	1988	1989
Retail				
Carton.	6,166	8,192	2,667	6,063
Poly.	9,044	9,855	5,563	5,378
Foodservice				
Carton/Poly	2,519	3,038	1,335	4,226
20 pound case	1,186	1,474	432	515
Bulk				
31 to 60 pound . . .]			--	689
Tote and Bin. . . . .]	10,296)2	4,392)2]	10,914)2	-3,409)3
Other Uses)1. . . . .]		]		3,624
Total.	29,211	26,951	20,911	17,036

)1 *Initially frozen vegetable weight going into canned,prepared and combination (mixed) vegetables.*
)2 *Includes IQF*
)3 *Deficit attributable to previous years' carryover and imported product repacked in the U.S.*

S P E C K L E D B U T T E R B E A N S

Container Size	1986	1987	1988	1989
Retail)1	3,180]		3,579	4,385
Foodservice	1,784]	6,102	2,700	1,999
Bulk.				
31 to 60 pound. . . .]		--	--	--
Tote and Bin & IQF. .]	2,076	- 389)2	94	1,005
Total.	7,040	5,713	6,373	7,389

)1 *Predominantly Polyethylene Bag.*
)2 *Deficit attributable to previous years' carryover and imported product repacked in the U.S.*

B L A C K - E Y E D P E A S

Container Size	1988 Black-eye/ Peas	1988 Other /So.Peas*	1988 / Total /AllTypes	1989 Black-eye/ Peas	1989 Other /So.Peas*	1989 / Total /AllTypes
Retail						
Carton.	1,699]			923]		
Poly.	6,829]	8,667	17,195	5,925]	9,195	16,043
Foodservice and Bulk						
Carton/Poly)1. . . .	16,865	10,814	27,679]		5,830]	
Bulk)2	-5,481	-9,235	-14,716]	17,144	-5,517)2]	17,457
Total.	19,912	10,246	30,158	23,992	9,508	33,500

)1 *Includes IQF*
)2 *Deficit attributable to previous years' carryover and imported product repacked in the U.S.*
)3 *Includes Foodservice Poly*

* *Southern types; i.e.,Crowder,Field,Lady,Creme,Purple Hull,Butter,White Acre,Peas with Snaps,etc.*

Appendix II - 3

Broccoli Projected Production Costs 1989-1990

Mechanical operations at custom rates. Hand labor at $5.75 per hour ($4.50 plus Social Security, unemployment insurance, transportation, supervision and fringe benefits)

Yield--500 26-lb. cartons 85-110 days to maturity.

OPERATION	CUSTOM RATE	MATERIALS Type	MATERIALS Cost	HAND LABOR-- Hours	HAND LABOR-- Dollars	COSTS Per Acre
				Field Pack		
LAND PREPARATION						
Stubble disc	18.25					18.25
Subsoil	29.25					29.25
Disc 1x	9.50					9.50
Landplane 2x	10.00					20.00
Border,cross check						20.00
& break borders	15.00					15.00
Flood		Water 1/2 ac/ft	5.50	1	5.75	11.25
Disc 2x	9.50					19.00
Fertilize	6.00	450# -- 11-52-0	61.00			67.00
Triplane 1x	3.75					8.75
List	11.50					11.50
TOTAL LAND PREPARATION						229.50
GROWING PERIOD						
Precision plant	14.50	Hybrid seed-1.5# @	150.00/#			239.50
Sprinkler irrigate						135.00
Spray herbicide	8.00	Herbicide	33.75			41.75
Thin				8	46.00	46.00
Cultivate 3x	10.75					32.25
Fertilize & furrow out 1x	10.00	80# N @ .31	24.80			34.80
Water-run fertilizer		40# N @ .31	12.40			12.40
Hand weed				4	23.00	23.00
Irrigate 8x		4 1/2 ac/ft	49.50	8	46.00	95.50
Insect Control 5x	5.00	Insecticides	42.50			67.50
Disease Control 5x	6.00	Fungicide	18.75			48.75
Chop stalks	10.00					10.00
TOTAL GROWING PERIOD COSTS						786.45
GROWING PERIOD & LAND PREPARATION COSTS						1015.95
Land Rent (net acres)						200.00
Cash Overhead----		12% of preharvest costs & land rent				145.91
TOTAL PREHARVEST COSTS						1361.86
Harvest (field pack)						
Custom harvest, pack, sell and haul to cooler		500 26 lb cartons @	3.50/carton			1750.00
TOTAL ALL COSTS						3111.86

PROJECTED INCOME ABOVE COSTS (PER ACRE)

		price/carton 5.00	6.00	7.00	8.00	9.00	Breakeven $/carton
	300	-912	-612	-312	-12	288	8.04
Cartons	400	-762	-362	38	438	838	6.90
per	500	-612	-112	388	888	1388	6.22
acre	600	-462	138	738	1338	1938	5.77
	700	-312	388	1088	1788	2488	5.45

BROCCOLI CULTURE
1989-1990

YEAR	ACRES	YIELD/ACRE (CARTONS)	VALUE/ACRE
1988	9250	437	$ 3059
1987	7874	427	2493
1986	7390	359	2106
1985	5795	466	2978
1984	4994	340	2801

PLANTING DATES: Broccoli is normally planted from August 25 - November 15. Double-row 42 inch beds are used to grow the crop. Harvesting begins November 25 and continues through March 15. Broccoli will germinate at temperatures of 40-95°F.

VARIETIES: "Green Duke", "Pirate", "Emperor", "NS 649", "Vantage", "Ninja", "Packman" and "Cruiser" are the major varieties grown. All are hybrids. The seed is planted 1/8 - 1/4 inch deep at 2 - 3 inch spacing early season then thinned to 5 - 8 inches between plants. Later most growers plant to a stand without thinning, especially in cool weather.

SOILS: Well-drained soils are preferred, although broccoli may be grown on a wide range of soil textures. Broccoli has greater salt tolerance than does lettuce, carrots or onions.

IRRIGATION: Broccoli is irrigated 6 to 8 times during the season. Sprinkler irrigation is normally used for stand establishment.

FERTILIZERS: Four hundred fifty pounds of 11-52-0 are normally broadcast prior to listing the beds. About 80 pounds of nitrogen are applied in a single sidedress application. Additional nitrogen is applied water-run.

PEST CONTROL: Several herbicides are available for application preplant. Consult your weed control farm advisor for further information.

Cabbage loopers, armyworms, salt-marsh caterpillars, cutworms, sugarbeet nematodes, flea beetles and aphids can cause extensive damage unless controlled. Downy mildew often attacks foliage and heads. For the latest information on pest control along with precautions on use of pesticides, consult your farm advisor.

HARVESTING: Fields are harvested twice and sometimes three times. Broccoli heads are hand cut and placed on the table of a field harvesting machine. Two to four heads are trimmed to an 8 inch cut and secured by a rubber band. The broccoli is packed in 22 pound, waxed-fiberboard cartons containing 14-18 bunches. Broccoli requires rapid cooling to insure quality. Liquid icing is the standard cooling method. Cooling and palletizing are charged to the buyer.

MEXICAN PRODUCTION COST INFORMATION

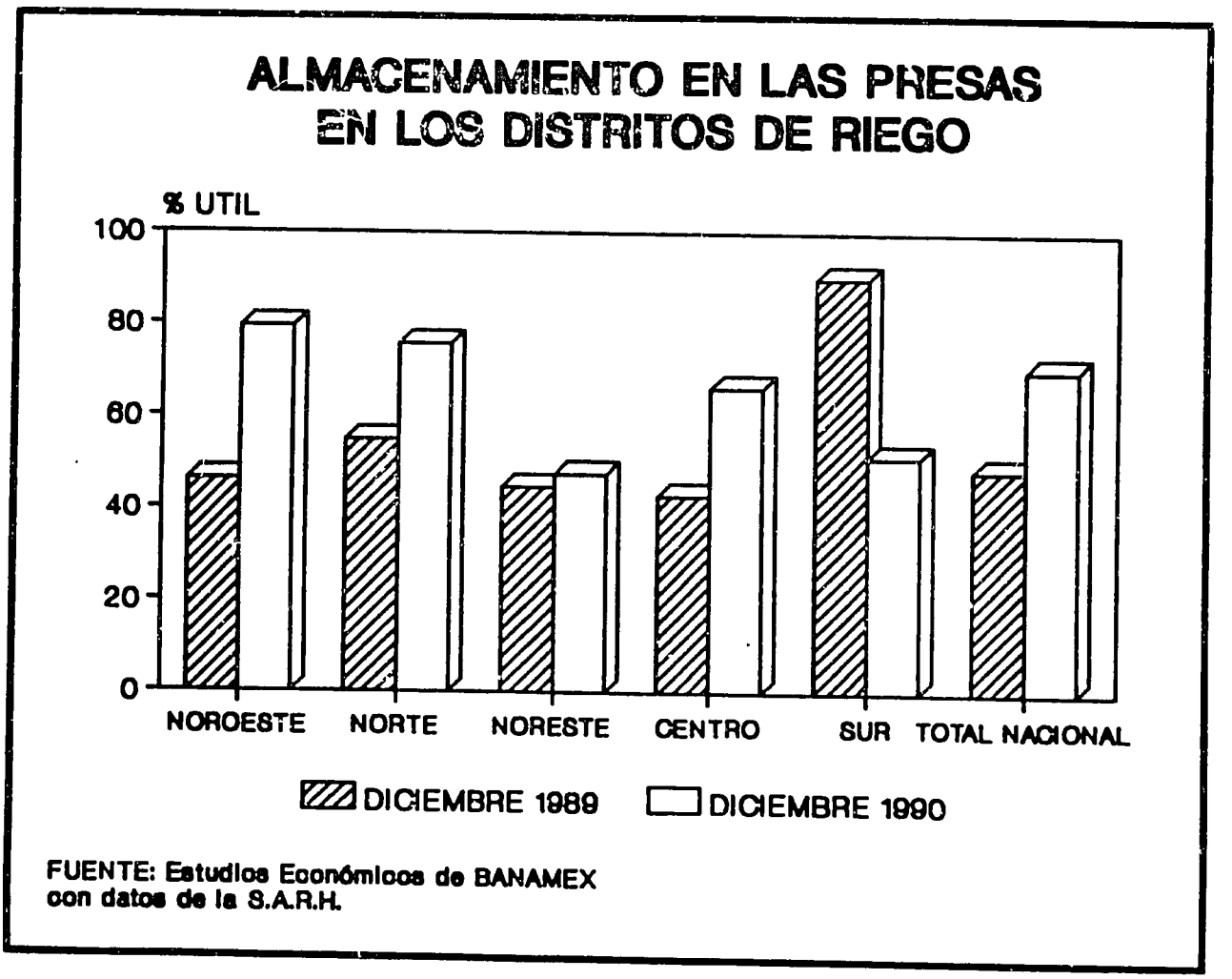
- Porcentaje De Agua Para Tiego En Las Presas % De La Capacidad Almacenada
- Tasas De Interes Del Banco De Mexico (F.I.R.A.) Al Productor
- Indice De Precios De Tractores
- Precio De Los Tractores
- Indice De Precios De Combustibles
- Indice De Precios De Fertilizantes Base 1986 = 100
- Indice De Precios De Plaguicidas Base 1986 = 100
- Tipos De Cambio Al Final De Cada Mes
- Seguro Agricola
- Ventas De Tractores

1) PORCENTAJE DE AGUA PARA RIEGO EN LAS PRESAS

% DE LA CAPACIDAD ALMACENADA

	DICIEMBRE 1989	DICIEMBRE 1990	VARIACION % 89/88	VARIACION % 90/89
NOROESTE	46.3	79.4	-14.10%	71.49%
NORTE	54.9	75.6	-28.98%	37.70%
NORESTE	44.6	47.5	-38.48%	6.50%
CENTRO	42.8	66.2	-21.18%	54.67%
SUR	90.1	51.2	-4.35%	-43.17%
TOTAL NACIONAL	48.4	70.5	-23.5%	45.04%

FUENTE: Departamento de Estudios Económicos de **BANAMEX** con datos de la S.A.R.H.

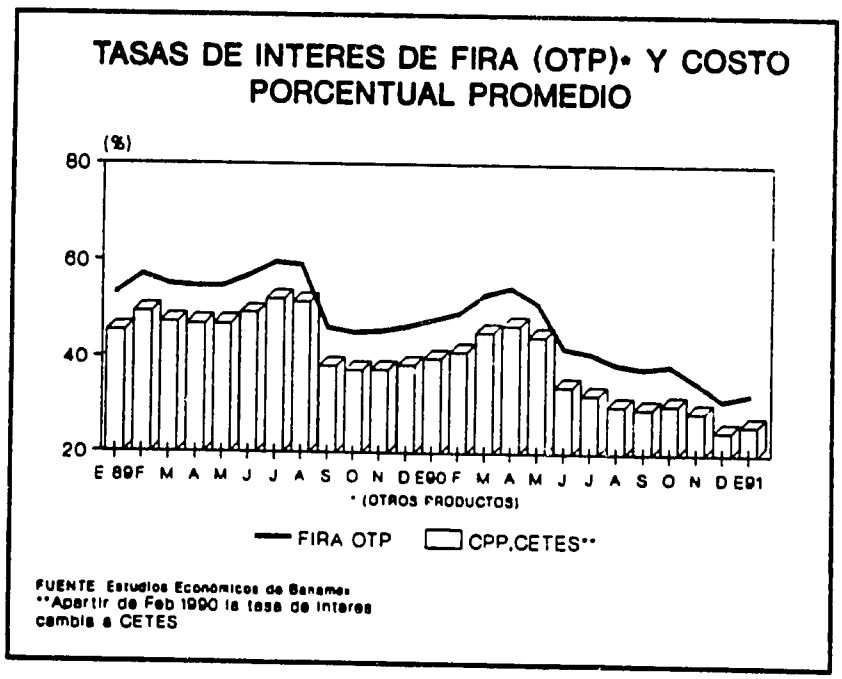


2) TASAS DE INTERES DEL BANCO DE MEXICO (F.I.R.A.) AL PRODUCTOR

	ENEROENERO		VARIACION %	
	1990	1991	90/89	91/90
CREDITOS DE AVIO				
PARA PRODUCTORES:				
DE BAJOSINGRESOS	38.61	24.78	-12.25%	-35.82%
DE OTRO TIPO:				
A) PRODUCTOS BASICOS	42.81	29.09	-11.70%	-32.05%
B) OTROS PRODUCTOS	46.81	33.09	-10.80%	-29.31%
CREDITOS REFACCIONARIOS				
DE BAJOSINGRESOS	37.81	24.78	-12.48%	-34.46%
DE OTRO TIPO :				
A) PRODUCTOS BASICOS	40.81	27.09	-12.20%	-33.62%
B) OTROS PRODUCTOS	44.81	31.09	-11.23%	-30.62%
CETES	39.81	26.09	-26.47%	-34.46%

NOTA: A partir del 15 de febrero de 1990, se modificó la base para determinar la tasa de interés por medio de los Cetes, tomandose el correspondiente al mes inmediato anterior.

FUENTE: Departamento de Estudios Económicos de **BANAMEX** con datos del Banco de México.



3) INDICE DE PRECIOS DE TRACTORES

BASE 1986 = 100

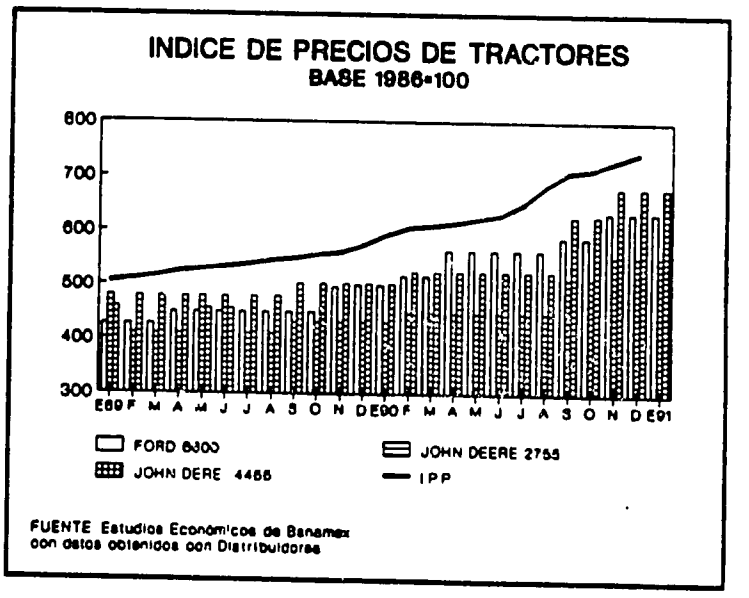
TIPO	ENERO 1990	ENERO 1991	VARIACION % 90/89	VARIACION % 91/90
FORD MOTOR 6600	499.40	633.96	17.15%	26.94%
JOHN DEERE 2755	430.21	552.46	-10.16%	28.42%
JOHN DEERE 4455	501.73	677.80	9.75%	35.09%

3.1) PRECIO DE LOS TRACTORES

(DOLARES PREFERENCIALES POR UNIDAD)

	DICIEMBRE 1990	DICIEMBRE 1991	VARIACION % 90/89	VARIACION % 91/90
JOHN DEERE 8450	88,600.00	88,600.00	---	---
JOHN DEERE 8650	108,824.00	108,824.00	---	---
JOHN DEERE 8850	137,290.00	137,290.00	---	---

FUENTE: Departamento de Estudios Económicos de **BANAMEX** con datos obtenidos con distribuidores de tractores.

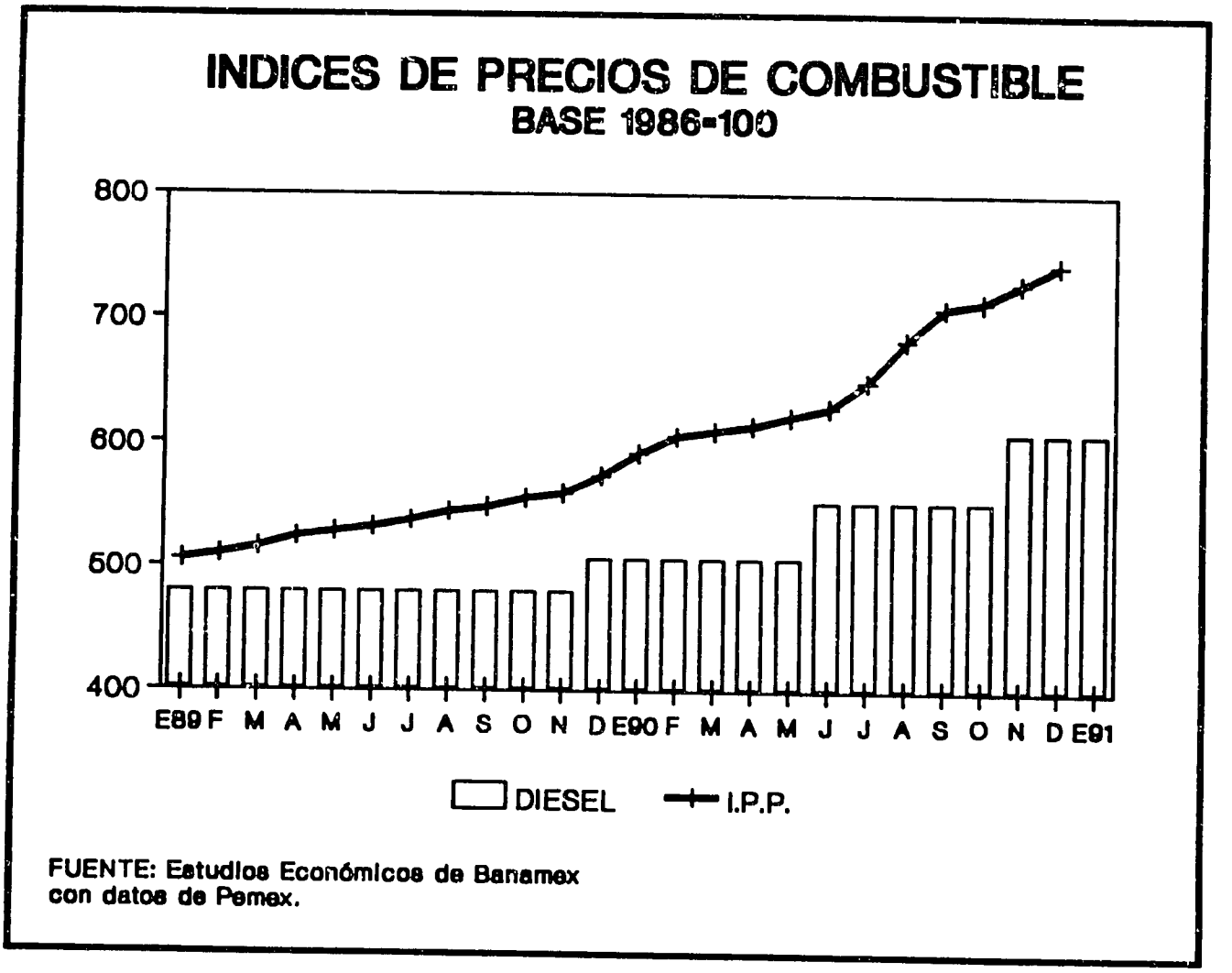


4) INDICE DE PRECIOS DE COMBUSTIBLES

BASE 1986 = 100

	ENERO 1990	ENERO 1991	VARIACION % 90/89	VARIACION % 91/90
DIESEL	506.41	608.02	5.62%	20.06%

FUENTE: Departamento de Estudios Económicos de **BANAMEX** con datos de Pemex.



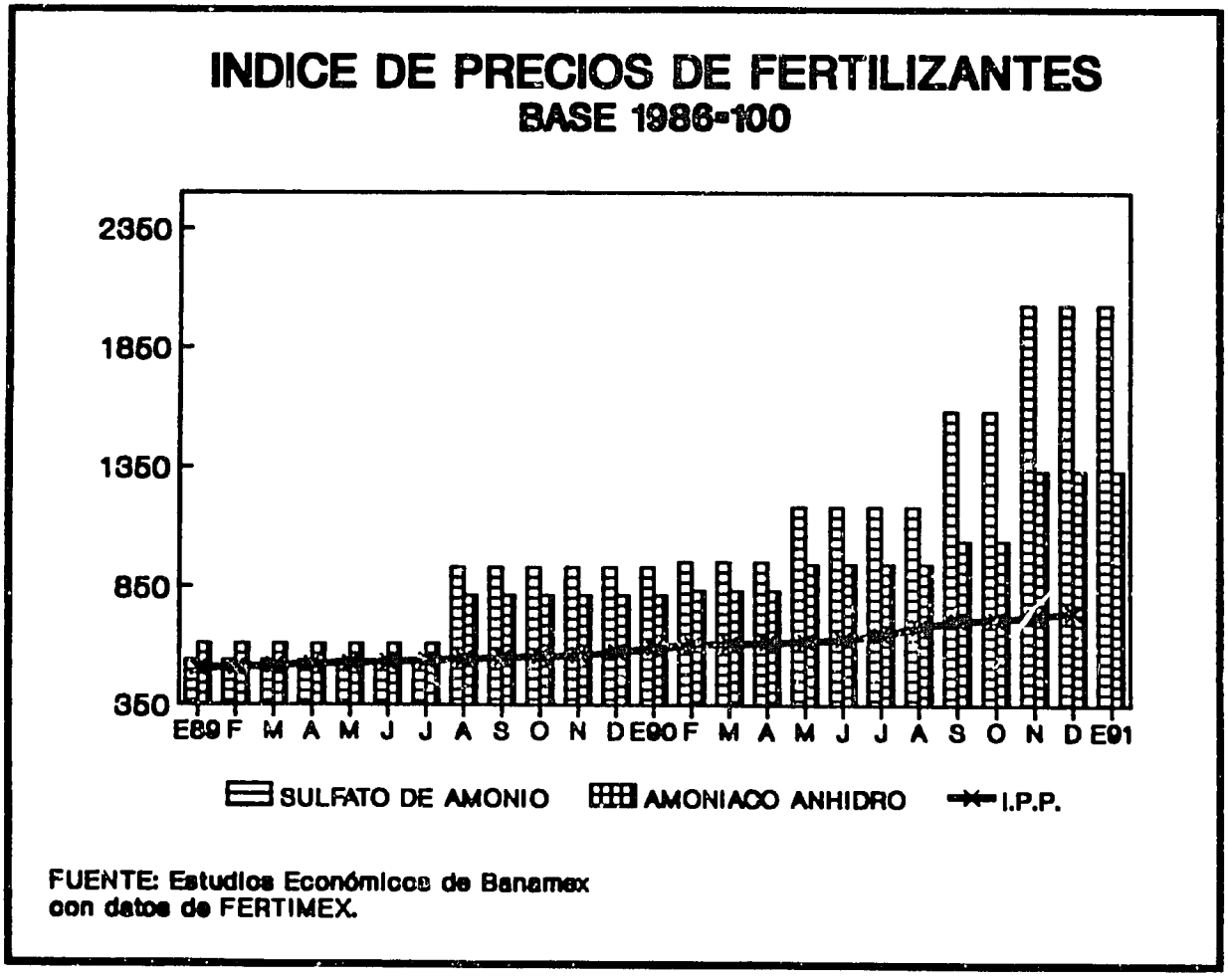
FUENTE: Estudios Económicos de Banamex con datos de Pemex.

6) INDICE DE PRECIOS DE FERTILIZANTES

BASE 1986 = 100

	ENERO 1990	ENERO 1991	VARIACION % 90/89	VARIACION % 91/90
SULFATO DE AMONIO	930.34	2,028.76	72.86%	118.07%
NITRATO DE AMONIO	781.79	1,484.60	62.19%	89.90%
AMONIACO ANHIDRO	815.61	1,331.70	33.44%	63.28%
UREA	681.57	1,219.54	54.75%	78.93%
SUPERFOSFATO SIMPLE	1,042.19	1,587.05	90.00%	52.28%
SUPERFOSFATO TRIPLE	814.28	1,218.58	68.48%	49.65%
FOSFATO DIAMONICO	647.43	949.71	17.22%	46.69%

FUENTE: Departamento de Estudios Económicos de **BANAMEX** con datos de Fertilizantes Mexicanos.



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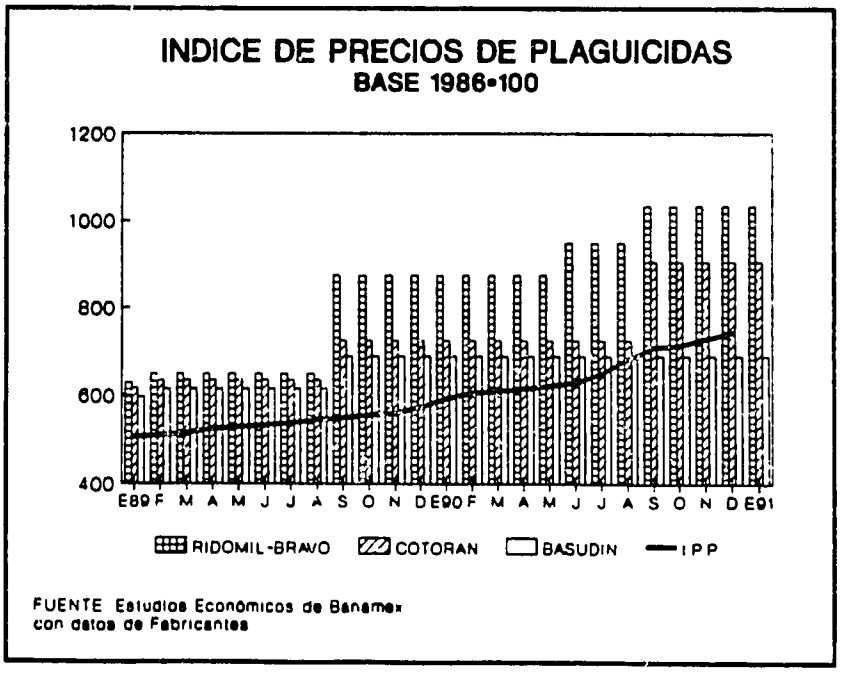
7) INDICE DE PRECIOS DE PLAGUICIDAS

BASE 1986 = 100

	ENERO 1990	ENERO 1991	VARIACION % 90/89	VARIACION % 91/90
DUPONT:				
MANZATE 200	550.84	666.33	18.12%	20.97%
KARMEX	564.94	713.48	20.00%	26.29%
LANNATE 90	577.39	698.84	23.84%	21.03%
BAYER:				
CUPRAVIT	371.48	478.14	5.92%	28.71%
SURCOPUR	449.10	613.84	29.09%	36.68%
GUSATION M-20	599.17	668.15	3.18%	11.51%
CIBA GEIGY:				
RIDOMIL BRAVO	874.34	1,033.69	39.09%	18.23%
COTORAN	724.11	905.13	17.58%	25.00%
BASUDIN %GRAN.	689.09	689.09	15.62%	---

FUENTE: Departamento de Estudios Económicos de **BANAMEX** con datos Obtenidos con Fabricantes de Plaguicidas.

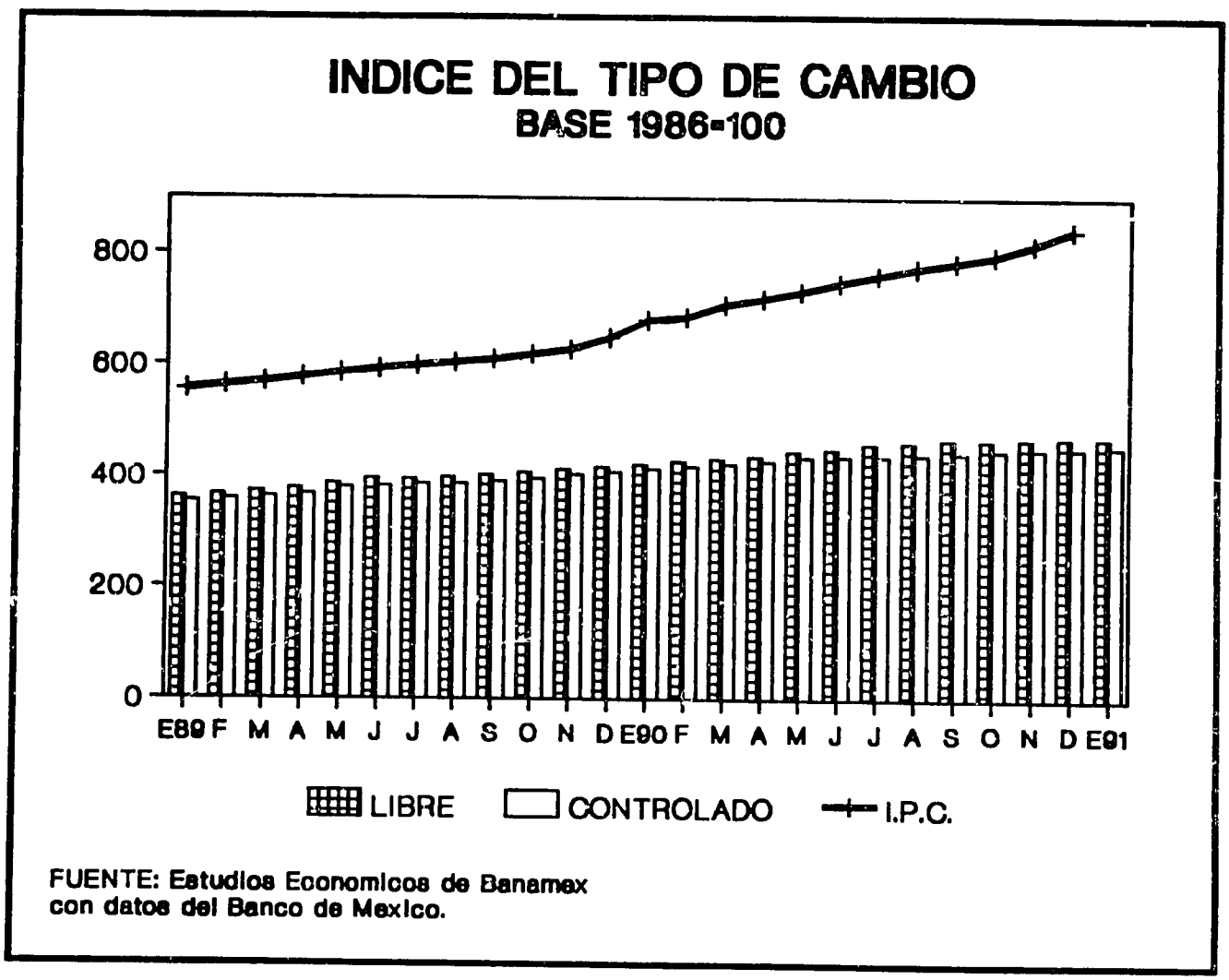


15) TIPOS DE CAMBIO AL FINAL DE CADA MES

(PESOS POR DOLAR)

	ENERO 1990	ENERO 1991	VARIACION % 90/89	VARIACION % 91/90
MERCADO LIBRE	2,701.32	2,973.00	16.74%	10.06%
MERCADO CONTROLADO	2,656.32	2,963.00	16.76%	11.55%

FUENTE: Departamento de Estudios Económicos de BANAMEX con datos del Banco Nacional de México.



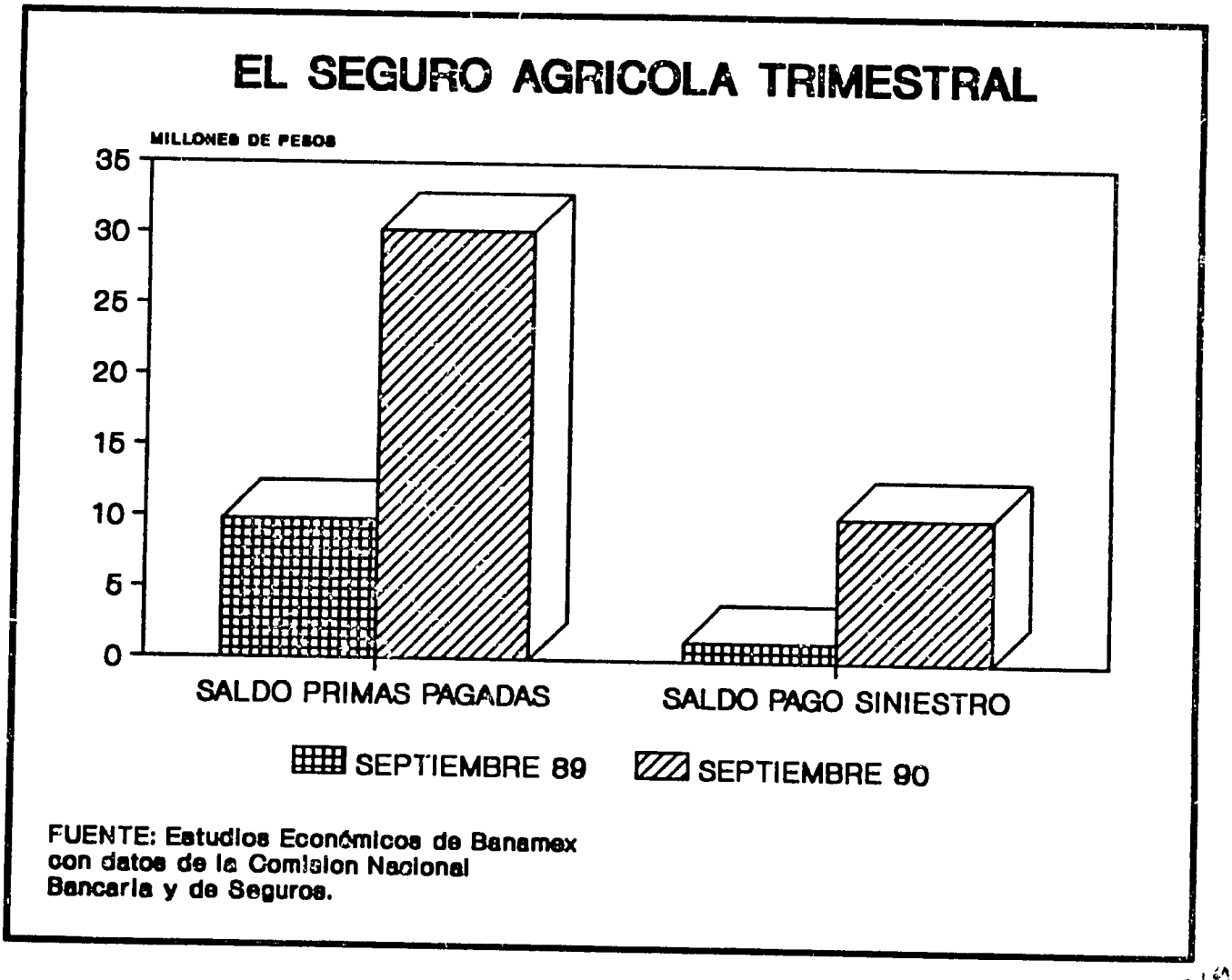
16) SEGURO AGRICOLA

(MILLONES DE PESOS)

	SEPTIEMBRE 1989	SEPTIEMBRE 1990	VARIACION % 89/88	VARIACION % 90/89
SALDO PRI. PAGADAS	9,799,570	30,224,000	110.23%	208.42%
SAL. PAGO SINIESTRO	1,359,995	10,174,000	-11.94%	648.09%
RELACION SIN./PRIMAS	13.88	33.66		

FUENTE: Departamento de Estudios Económicos de **BANAMEX** con datos de la Comisión Nacional Bancaria y de Seguros.

(Información Trimestral)



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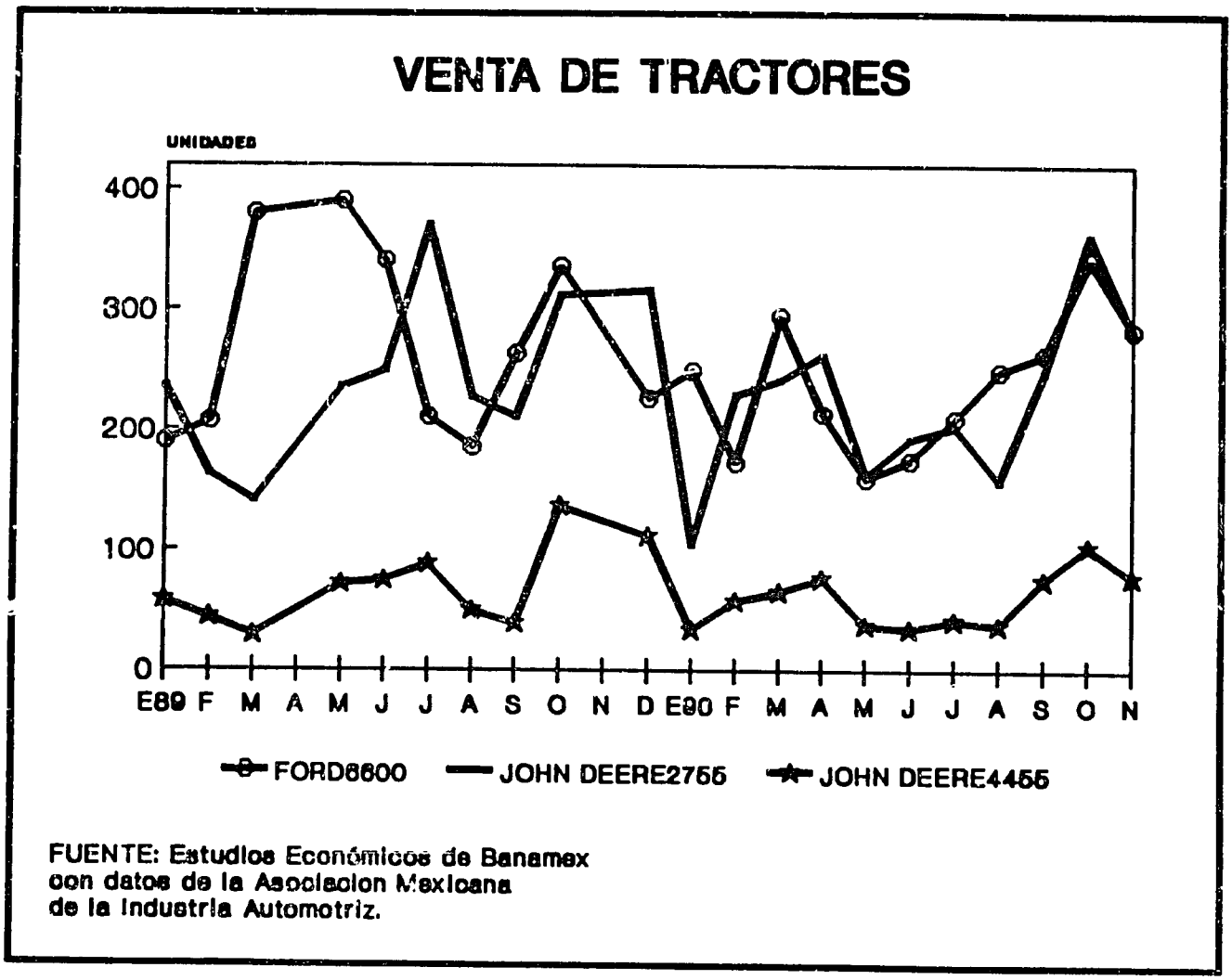
17) VENTAS DE TRACTORES (UNIDADES)

TIPO	NOVIEMBRE 1989	NOVIEMBRE 1990	VARIACION % 89/88	VARIACION % 90/89
FORD MOTOR 6600	400	342	19.05%	-14.50%
JOHN DEERE 2755	480	361	---	-24.79%
JOHN DEERE 4455	141	104	2.92%	-26.24%

FUENTE: Departamento de Estudios Económicos de **BANAMEX** con datos de la Asociación Mexicana de la Industria Automotriz.



SUPPLEMENTAL TRADE AND PACK STATISTICS

- Chilean Exports of Frozen Vegetables - 1989
- Chilean Exports of Frozen Fruits - 1989
- Chilean Raspberries
- Japanese Imports of Frozen Vegetables - 1989
- Japanese Production of Frozen Foods
- French Production of Frozen Vegetables
- Netherlands Production of Frozen Vegetables
- West German Production of QF Vegetables
- European Imports of Frozen Strawberries
- European Imports of Frozen Raspberries
- Imports of QF Blackcurrants into Western Europe
- Spanish Frozen Food Exports
- EC Imports of Frozen Sweet Peppers
- EEC Imports of Frozen Vegetables from all sources - 1989
- EC Imports of Frozen Berries
- Food Service Packs of Frozen Vegetables
- U.S. Frozen Broccoli Production - By Style of Pack
- U.S. Frozen Cauliflower Production - By Style of Pack
- U.S. Frozen Asparagus Production - By Style of Pack
- Production by Container Size and Style of Pack
- Frozen Broccoli Sales - 1987
- Frozen Cauliflower Sales - 1987
- U.S. Selling Price Per Pound
- Production, Yield and Value - Broccoli and Cauliflower
- Frozen Asparagus - U.S. Imports by Principal Sources

CHILEAN EXPORTS OF FROZEN VEGETABLES — 1989		
	Metric tons	US$'000
Asparagus	1 478	4 327
Melonballs	674	538
Corn kernel	468	367
Broccoli	341	345
Peppers	20	13
Cauliflower	17	12
Total	2 998	5 602

Source. AGEPCO (Chilean Frozen Food Association)

CHILEAN EXPORTS OF FROZEN FRUITS — 1989		
	Metric tons	US$'000
Raspberries	3 284	4 154
Blackberries	2 563	1 851
Strawberries	1 026	766
Kiwis	477	628
Grapes	811	493
Peaches	211	153
Apricots	89	64
Cherries	43	55
Boysenberries	37	32
Pears	1	2
Other fruits	10	7
Total	8 552	8 205

Source AGEPCO (Chilean Frozen Food Association)

CHILEAN RASPBERRIES

Marketing Year	Area (Hectares)	Production	Exports 1/
		-------Metric tons--------	
1987/88	1,150	3,200	1,112
1988/89	1,570	4,870	2,247
1989/90	1,790	8,500	7,868
1990/91 2/	2,010	10,760	9,280

Source: U.S. Agricultural Attache. 1/ Frozen. 2/Forecast.

U.S. imports of fresh raspberries in 1990 totaled 6,419 tons, down 30 percent from 1989, and 46 percent from the record level imported in 1987. Canada continues to supply the bulk of U.S. fresh berry imports with about 80-plus percent annually, with Chile supplying most of the balance. In 1990, U.S. frozen raspberry imports totaled 3,505 tons, with Canada and Chile supplying 40 and 45 percent, respectively. (Emanuel McNeil, 202-447-2083)

JAPANESE IMPORTS OF FROZEN VEGETABLES — 1989

(In metric tons)

Country of origin	Potato	Corn	Green soybeans	Other beans	Others
USA	109 167	29 653	2	6 446	18 272
Taiwan	—	2	34 001	19 227	16 135
China	20	—	229	11 178	14 488
New Zealand	—	3 372	—	8 368	4 929
Canada	20 137	21	—	105	243
West Germany	5 075	—	—	—	—
Others	4 185	580	10	4 240	5 269
Total	**138 584**	**33 629**	**34 241**	**49 564**	**59 336**
Total volume (89/88)	109%	84%	93%	107%	101%
Total value (89/88)	125%	106%	133%	116%	124%

Source: Japan Monthly Trade List 1989, Ministry of Finance.

JAPANESE IMPORTS OF FROZEN VEGETABLES

(Metric tons)

	1989	1990
Potato	138 584	130 794
Other beans	49 564	47 575
Green soyabeans	34 241	40 071
Corn	33 629	35 408
Others	59 336	51 296
Total	**315 354**	**305 144**
of which from:		
USA	163 540	167 388
Taiwan	69 365	65 143
China	25 915	23 757
New Zealand	16 670	18 189
Canada	20 506	14 035
Netherlands	—	3 129
Others	14 283	12 863

Source: Japan Monthly Trade List, 1990, Ministry of Finance.

JAPANESE PRODUCTION OF FROZEN FOOD

(In metric tons)

Vegetables	1988	1989
French fried potato	17 226	17 259
Other potato	12 105	14 019
Pumpkin	9 803	12 238
Spinach	6 325	7 515
Corn (cobs)	5 595	6 298
Corn (kernel)	5 913	5 310
Beans	770	948
Other vegetables	22 532	26 844
Fruits		
Tangerine	1 241	2 019
Strawberry	534	561
Other fruits	626	519
Fish products		
Fish	28 738	29 634
Squid	21 342	23 114
Lobster/shrimp	17 374	15 771
Shell fish	13 630	12 382
Crabs	3 032	1 457
Octopus	903	1 389
Other products	4 063	3 710
Total	**171 752**	**180 987**
Total value (million yen)	**98 628**	**98 423**

Source: Japan Monthly Trade List 1989, Ministry of Finance

FRENCH PRODUCTION OF FROZEN VEGETABLES

(In metric tons)

	1987	1988	1989
Beans†	57 895	52 832	59 914
Spinach	33 940	42 653	47 500
Peas	33 927	40 852	46 898
Mushrooms	14 296	20 325	28 437
Cauliflower	11 927	27 245	25 187
Sweet corn	8 684	11 999	20 693
Carrots	15 874	19 009	20 170
Courgettes	4 323	5 287	9 085
Flageolets	9 749	9 094	9 066
Brussels sprouts	7 165	9 451	8 793
Tomatoes	4 708	7 371	7 643
Onions	4 685	5 122	6 058
Peppers	3 056	5 720	5 983
Salsify	2 854	3 273	4 434
Celery	1 586	2 118	3 719
Leeks	1 621	2 923	3 323
Broccoli	1 056	1 803	2 761
Artichokes	20	1 462	1 896
Aubergines	663	1 175	1 455
Other items	7 045	8 797	19 035
Total	**226 074**	**278 511**	**332 030**
of which for: industrial use	34 321	43 664	33 978

†Includes whole green and white beans (haricots beurro).
Source: Fédération Interprofessionelle de la Congélation Ultra Rapide (FICUR).

NETHERLANDS PRODUCTION OF FROZEN VEGETABLES

(In metric tons)

	1987	1988	1989
Spinach	32 297	35 376	41 765
Carrots	7 857	13 834	22 390
French beans	10 694	10 949	11 411
Peas	5 964	7 741	9 323
Onions	2 593	4 863	6 472
Mushrooms	1 380	4 966	5 901
Leeks	5 601	9 399	5 265
Kale	5 303	6 991	5 191
Brussels sprouts	3 988	3 055	3 972
Red cabbage	4 248	4 389	3 562
Endive	1 315	1 988	1 911
Cauliflower	*	†	1 900
Sliced beans	2 218	1 689	1 584
Broad beans	3 186	818	1 550
Kohirabi	1 336	2 320	1 470
Celeriac	1 255	1 135	633
Other vegetables	2 990	6 391	11 344
Total	**92 225**	**115 904**	**135 644**

*Not disclosed for reasons of secrecy.
†Included under other vegetables.
Source: Central Bureau (CBS).

WEST GERMAN PRODUCTION OF QF VEGETABLES

(In metric tons)

	1987	1988	1989
Spinach	38 146	41 940	44 333
Green cabbage	4 458	5 079	4 755
Red cabbage	4 190	5 224	4 301
Leeks	3 073	3 615	2 461
Green beans	2 218	2 403	2 065
Peas	2 179	2 462	1 992
Carrots	2 910	2 662	1 598
Brussels sprouts	438	458	468
Other vegetables	7 662	8 872	11 435
Totals	**65 274**	**72 715**	**73 408**

Source Bundenvarband der obst und gemuseverarbeitenden industrie

EUROPEAN IMPORTS OF FROZEN STRAWBERRIES

(In metric tons)

	1987	1988	1989
West Germany	22 280	29 128	29 649
France	15 303	15 779	18 611
Netherlands*	10 537	11 615	13 834
UK	7 055	6 930	7 398
Belgium/ Luxembourg	3 002	2 288	4 221
Italy	2 234	2 309	2 826
Denmark	2 996	3 276	2 309
Rep. of Ireland	65	31	27
Total (EEC 12)	**63 472**	**71 356**	**78 875**
Sweden	3 210	3 429	3 732
Finland	2 679	2 725	2 583
Norway (b)	700	400	2 033
Austria (a)	1 930	2 194	NA
Switzerland (b)	2 139	2 052	1 951
Total (17 countries)	**74 130**	**82 156**	**89 174**

*Shipments of Polish strawberries into the Netherlands are not listed FOODNEWS calculations are therefore based on Polish export data

(a) A large percentage of Austrian imports are held in transit for re-export

(b) Estimated for 1987

Source National Statistics/EUROSTAT

EUROPEAN IMPORTS OF FROZEN RASPBERRIES

(In metric tons)

	1987	1988	1989
West Germany	19 214	19 059	21 792
France	9 264	9 685	12 247
Netherlands	5 757	5 624	6 780
Belgium/ Luxembourg	2 854	2 947	3 628
UK	2 464	2 591	2 981
Denmark	2 752	2 347	2 005
Italy	964	1 036	940
Rep. of Ireland	100	62	24
Total (EEC 12)	**42 496**	**43 428**	**50 397**
Sweden	2 315	2 307	3 006
Switzerland*	3 173	3 043	2 756
Finland	1 711	1 616	2 139
Norway*	[illegible]	[illegible]	[illegible]
Austria*	[illegible]	[illegible]	[illegible]
Total (17 countries)	**51 649**	[illegible]	[illegible]

*Estimated for 1987 as [illegible] out until 1988

NB Includes figures for EEC [illegible] not shown above

Source National Statistics/EUROSTAT

IMPORTS OF QF BLACKCURRANTS INTO WESTERN EUROPE

	1987	1988	1989*
West Germany	7 928	6 626	6 475
UK	1 525	2 143	1 924
Netherlands	1 766	1 641	1 690
Denmark	4 630	3 465	1 612
France	825	764	1 247
Other EEC*	1 019	1 486	870
Total (EEC 12)	**17 693**	**16 125**	**13 673**
Finland	818	662	505
Austria	1 127	1 383	NA
Total (14 countries)	**18 623**	**18 170**	**14 178**
Of which from:			
Poland	10 682	11 475	7 741
EEC*	3 132	4 046	4 578
New Zealand	1 389	687	630
Czechoslovakia	2 190	1 092	408

*January-September only

Source: National Statistics/EUROSTAT.

SPANISH FROZEN FOOD EXPORTS

(In metric tons)

VEGETABLES	1988	1989
Peppers	10 210	13 365
Cauliflower	12 400	11 300
Sweet corn	4 750	9 393
Broccoli	3 200	3 200
Artichokes	2 751	2 964
Asparagus	1 000	1 000
Pumpkins and Zucchini	1 000	1 000
Green peas	5 291	926
Tomatoes	1 295	788
Mushrooms	692	501
Mixes	2 166	2 080
Other frozen vegetables	11 822	6 315
TOTAL	**56 577**	**52 834**
FRUITS		
Strawberries	13 994	17 019
Raspberries	1 246	724
Blueberries	50	259
Cherries	193	32
Other frozen fruits	5 400	5 378
TOTAL	**20 883**	**23 412**

Source. Direccion General de Aduanas and ASE VEC

1989 Quantity - Quantités: 1000 kg Import

Origin / Consignment Origine / Provenance Comb. Nomenclature Nomenclature comb.	Reporting country - Pays déclarant											
	EUR-12	Belg.-Lux.	Danmark	Deutschland	Hellas	España	France	Ireland	Italia	Nederland	Portugal	U.K.
0710 80-51 SWEET PEPPERS -UNCOOKED OR COOKED BY STEAMING OR BY BOILING IN WATER-, FROZEN												
003 NETHERLANDS	2362	1400	20	791	.	.	47	1	13	.	.	90
004 FR GERMANY	2096	783	179	.	.	18	29	.	3	1074	.	18
005 ITALY	792	68	4	479	.	.	73	.	.	149	.	19
010 PORTUGAL	2297	657	17	1343	.	.	123	.	.	118	.	39
011 SPAIN	10833	433	325	2146	.	.	2423	.	529	733	20	4224
048 YUGOSLAVIA	7656	580	35	3244	.	.	414	.	.	2996	.	387
052 TURKEY	5686	1419	118	3476	.	.	21	.	20	612	.	20
064 HUNGARY	3184	.	36	2756	.	.	.	.	.	116	.	276
1000 W O R L D	36884	5457	751	15039	1	19	3260	18	566	6463	20	5298
1010 INTRA-EC	19982	3413	562	5347	1	19	2825	18	546	2624	20	4607
1011 EXTRA-EC	16906	2044	189	9693	.	.	435	.	20	3840	.	683
1020 CLASS 1	13363	1999	153	6720	.	.	435	.	20	3629	.	407
1040 CLASS 3	3541	45	36	2973	.	.	.	.	.	211	.	276
0713 80-59 FRUITS OR GENUS CAPSICUM OR PIMENTA (EXCL. SWEET PEPPERS) -UNCOOKED OR COOKED BY STEAMING OR BY BOILING IN WATER-, FROZEN												
011 SPAIN	1568	34	.	57	.	.	12	.	.	9	.	1456
1000 W O R L D	3189	174	324	465	.	11	121	2	.	158	1	1933
1010 INTRA-EC	2559	159	285	361	.	2	59	2	.	55	1	1635
1011 EXTRA-EC	631	16	39	104	.	9	62	.	.	104	.	297
2004 90-95 ARTICHOKES, PREPARED OR PRESERVED (OTHERWISE THAN BY VINEGAR OR ACETIC ACID), FROZEN												
005 ITALY	582	67	2	139	.	.	316	1	.	11	.	46
011 SPAIN	380	.	.	92	.	.	207	1	46	9	7	18
1000 W O R L D	1104	83	2	296	.	1	523	2	53	37	7	100
1010 INTRA-EC	1085	83	2	296	.	1	522	2	53	37	7	82
1011 EXTRA-EC	20	.	.	.	.	.	1	.	.	.	.	19

EEC IMPORTS OF FROZEN VEGETABLES FROM ALL SOURCES — 1989

(Metric tons)

	Artichokes	Beans	Tomatoes	Peas	Potatoes	Peppers	Spinach	Mixed veg	Other veg	Onions	Total
West Germany	503	16 464	4 441	25 490	144 686	15 039	13 556	21 710	138 181	238	380 308
France	2 557	15 609	3 574	5 403	143 253	3 260	7 961	6 083	90 954	51	278 705
UK	129	10 934	1 779	12 925	170 155	5 290	4 403	2 019	45 025	101	252 760
Italy	876	1 516	54	32 280	77 113	566	2 080	2 306	9 727	118	126 636
Belgium/Luxembourg	378	5 212	1 599	9 511	41 274	5 457	4 207	1 907	26 928	15	96 488
Netherlands	40	4 293	725	9 466	28 610	6 463	2 616	3 080	30 582	45	85 920
Spain	31	6 850	34	16 768	36 912	19	2 486	4 558	6 157	—	79 019
Ireland	4	1 003	55	3 109	44 647	18	40	2 651	4 518	17	56 062
Denmark	26	2 735	151	13 888	9 900	751	943	2 325	9 664	80	40 463
Greece	162	1 706	—	5 490	18 933	1	477	1 109	1 919	2	29 799
Portugal	10	137	1	2 419	1 680	20	108	472	357	—	5 204
Total	**4 716**	**66 459**	**12 413**	**136 749**	**717 163**	**36 884**	**38 877**	**48 220**	**364 012**	**667**	**1 426 160**

1989

Quantity - Quantités: 1000 kg

Import

Origin / Consignment Origine / Provenance Comb. Nomenclature Nomenclature comb.	EUR-12	Belg.-Lux.	Danmark	Deutschland	Hellas	Espagne	France	Ireland	Italia	Nederland	Portugal	U.K.
0811.10-11												
1010 INTRA-EC	275	.	21	2	.	.	.	1	17	7	.	227
1011 EXTRA-EC	326	155	.	113	.	.	.	.	.	20	.	38
0811.10-19 STRAWBERRIES, WITH SUGAR CONTENT =< 13 %, UNCOOKED OR COOKED BY STEAMING OR BOILING IN WATER, FROZEN												
011 SPAIN	678	22	.	.	.	.	517	.	.	188	.	23
1000 W O R L D	1439	40	21	132	.	.	543	58	.	126	.	519
1010 INTRA-EC	1044	40	21	59	.	.	543	58	.	126	.	197
1011 EXTRA-EC	395	.	.	73	.	.	.	.	.	.	.	322
0811.10-90 STRAWBERRIES, UNCOOKED OR COOKED BY STEAMING OR BOILING IN WATER, FROZEN, (EXCL. WITH ADDED SUGAR OR SWEETENER) ML: BREAKDOWN BY COUNTRIES INCOMPLETE												
001 FRANCE	655	46	22	36	.	.	.	.	244	130	.	177
002 BELG.-LUXBG.	3878	.	.	53	3	4	560	2	5	3198	.	53
003 NETHERLANDS	13688	2870	341	7275	2	2	2243	.	624	.	20	1111
004 FR GERMANY	4686	203	273	.	.	40	2521	.	285	594	.	770
005 ITALY	3818	11	.	779	.	.	2629	.	.	318	.	81
011 SPAIN	11172	712	340	1931	.	.	5506	.	411	1366	40	866
048 YUGOSLAVIA	4605	74	132	2704	16	.	671	.	1088	.	.	.
052 TURKEY	4191	55	20	1764	.	.	732	.	25	.	.	1595
060 POLAND	21984	936	1044	14279	.	.	3657	.	160	.	.	1988
977 SECRET COUNT	8286	.	.	.	.	.	.	.	.	8286	.	.
1000 W O R L D	79270	4308	2308	29658	21	88	18634	28	2822	14027	60	7324
1010 INTRA-EC	38629	3095	1082	10199	5	46	13498	28	1569	5701	60	3586
1011 EXTRA-EC	32296	1213	1224	19451	17	42	5176	.	1194	48	.	3937
1020 CLASS 1	9213	129	157	4748	16	42	1483	.	1034	48	.	1644
1040 CLASS 3	22525	978	1068	14693	.	.	3657	.	160	.	.	1969
0811.20 FROZEN RASPBERRIES, BLACKBERRIES, MULBERRIES, LOGANBERRIES, BLACK, WHITE OR RED CURRANTS AND GOOSEBERRIES, UNCOOKED OR COOKED BY STEAMING OR BOILING IN WATERR												
0811.20-11 RASPBERRIES, BLACKBERRIES, MULBERRIES, LOGANBERRIES, BLACK-, WHITE- OR RED- CURRANTS AND GOOSEBERRIES, WITH SUGAR CONTENT > 13 %, UNCOOKED OR COOKED BY STEAMING OR BOILING IN WATER, FROZEN												
1000 W O R L D	344	4	25	89	.	.	5	25	.	.	.	196
1010 INTRA-EC	313	4	25	58	.	.	5	25	.	.	.	196
1011 EXTRA-EC	31	.	.	31	.	.	.	.	.	.	.	.
0811.20-19 RASPBERRIES, BLACKBERRIES, MULBERRIES, LOGANBERRIES, BLACK-, WHITE- OR RED- CURRANTS AND GOOSEBERRIES, WITH SUGAR CONTENT > 13 %, UNCOOKED OR COOKED BY STEAMING OR BOILING IN WATER, FROZEN												
060 POLAND	477	.	.	439	.	.	.	.	20	.	.	18
1000 W O R L D	1559	60	9	973	.	.	64	4	60	33	.	356
1010 INTRA-EC	620	60	9	122	.	.	64	4	40	26	.	295
1011 EXTRA-EC	938	.	.	851	.	.	.	.	20	7	.	60
1040 CLASS 3	467	.	.	507	.	.	.	.	20	7	.	43
0811.20-31 RASPBERRIES, UNCOOKED OR COOKED BY STEAMING OR BOILING IN WATER, FROZEN (EXCL. WITH ADDED SUGAR OR SWEETENER)												
002 BELG.-LUXBG.	3546	.	1	44	3	3	387	1	2	3113	.	70
003 NETHERLANDS	7322	1715	95	3770	1	.	1131	.	57	.	.	553
004 FR GERMANY	4443	736	422	.	.	.	2219	.	297	496	.	273
005 ITALY	638	.	.	189	.	.	429	.	.	20	.	.
006 UTD. KINGDOM	379	.	27	165	.	2	140	24	.	21	.	.
011 SPAIN	618	35	111	244	.	.	63	.	3	23	.	119
048 YUGOSLAVIA	24121	517	389	12341	.	.	6860	.	457	2808	.	749
060 POLAND	3179	304	615	1840	.	.	200	.	.	220	.	.
064 HUNGARY	4085	.	184	2467	.	.	650	.	13	142	.	629
512 CHILE	1046	142	.	170	.	.	150	.	5	76	.	503
1000 W O R L D	50596	3670	1984	21794	5	9	12289	25	939	6973	.	2908
1010 INTRA-EC	17163	2542	670	4480	3	9	4288	25	465	3673	.	1028
1011 EXTRA-EC	33412	1129	1314	17313	2	.	8000	.	474	3299	.	1881
1020 CLASS 1	24533	650	515	12658	.	.	6878	.	457	2826	.	749
1030 CLASS 2	1046	142	.	170	.	.	150	.	5	76	.	503
1040 CLASS 3	7836	338	799	4686	2	.	972	.	13	397	.	629
0811.20-39 BLACK- CURRANTS, UNCOOKED OR COOKED BY STEAMING OR BOILING IN WATER, FROZEN, (EXCL. WITH ADDED SUGAR OR SWEETENER)												
001 FRANCE	323	13	.	123	.	.	.	.	131	.	.	56
002 BELG.-LUXBG.	769	.	.	45	1	3	72	1	.	616	.	31
003 NETHERLANDS	2597	215	.	997	.	.	548	.	84	.	.	753
004 FR GERMANY	1223	24	8	.	.	.	441	.	304	.	.	446
006 UTD. KINGDOM	545	.	10	308	.	.	.	2	.	225	.	.
060 POLAND	9703	157	1211	5379	.	.	348	.	420	1178	.	1010
062 CZECHOSLOVAK	672	.	75	512	.	.	.	.	.	85	.	110
064 HUNGARY	719	.	48	314	.	.	186	.	.	69	.	70
804 NEW ZEALAND	630	.	182	261	.	.	.	.	.	117	.	.
1000 W O R L D	17697	414	1613	8198	1	4	1633	3	940	2313	.	2578
1010 INTRA-EC	5776	252	18	1687	1	3	1077	3	520	841	.	1374
1011 EXTRA-EC	11920	162	1594	6511	.	1	556	.	420	1472	.	1204
1020 CLASS 1	786	.	268	284	.	1	21	.	.	139	.	73
1040 CLASS 3	11135	162	1326	6227	.	.	535	.	420	1333	.	1132
0811.20-51 RED- CURRANTS, UNCOOKED OR COOKED BY STEAMING OR BOILING IN WATER, FROZEN, (EXCL. WITH ADDED SUGAR OR SWEETENER)												
003 NETHERLANDS	1733	226	.	865	.	42	131	.	179	.	.	290
004 FR GERMANY	1183	15	137	.	.	.	718	.	1	166	.	66
060 POLAND	5912	78	432	3227	.	.	628	.	.	1410	.	137
062 CZECHOSLOVAK	1578	.	24	1448	.	.	20	.	.	74	.	20
064 HUNGARY	1547	20	.	898	.	.	61	.	38	345	.	193
1000 W O R L D	12973	339	633	6898	3	50	1663	.	227	2394	.	766
1010 INTRA-EC	3428	241	137	976	3	50	954	.	189	482	.	396
1011 EXTRA-EC	9546	98	496	5922	.	.	710	.	38	1912	.	370
1040 CLASS 3	9883	98	496	5563	.	.	710	.	38	1828	.	350
0811.20-59 BLACKBERRIES AND MULBERRIES, UNCOOKED OR COOKED BY STEAMING OR BOILING IN WATER, FROZEN, (EXCL. WITH ADDED SUGAR OR SWEETENER)												
002 BELG.-LUXBG.	1099	.	.	23	4	1	25	.	.	1027	.	19
003 NETHERLANDS	3439	872	.	2218	.	.	79	.	87	.	.	183
004 FR GERMANY	867	482	11	.	.	.	381	.	27	84	.	62
048 YUGOSLAVIA	5519	152	61	3986	59	.	101	.	92	837	.	231
512 CHILE	2538	1	163	260	.	20	805	.	394	672	.	223
1000 W O R L D	15308	1475	271	7129	65	32	1689	.	741	2998	10	898
1010 INTRA-EC	6258	1274	48	2398	4	13	757	.	192	1193	18	369
1011 EXTRA-EC	9051	201	223	4739	61	20	932	.	548	1798	.	529
1020 CLASS 1	5555	164	61	3999	59	.	112	.	92	837	.	231
1030 CLASS 2	2622	1	163	281	.	20	805	.	457	672	.	223
1040 CLASS 3	874	35	.	459	2	.	15	.	.	288	.	75
0811.20-90 LOGANBERRIES, WHITE CURRANTS AND GOOSEBERRIES, UNCOOKED OR COOKED BY STEAMING OR BOILING IN WATER, FROZEN, (EXCL. WITH ADDED SUGAR OR SWEETENER)												
003 NETHERLANDS	1611	56	49	1098	.	.	36	.	22	.	.	350
004 FR GERMANY	757	97	56	.	.	.	.	1	41	200	.	362
1000 W O R L D	6886	311	216	2814	2	.	352	52	71	894	.	1294
1010 INTRA-EC	3121	186	142	1286	2	.	219	52	71	227	.	936
1011 EXTRA-EC	2884	125	73	1528	.	.	133	.	.	667	.	358
1040 CLASS 3	2442	45	25	1425	.	.	.	.	.	636	.	311
0811.90 FROZEN FRUIT AND NUTS (EXCL. 0811.10 AND 0811.20), UNCOOKED OR COOKED BY STEAMING OR BOILING IN WATERR												
0811.90-10 FRUIT AND NUTS, UNCOOKED OR COOKED BY STEAMING OR BOILING IN WATER, FROZEN, WITH SUGAR CONTENT > 13 %, (EXCL. STRAWBERRIES, RASPBERRIES, BLACKBERRIES AND MULBERRIES AND LOGANBERRIES)												
508 BRAZIL	684	.	.	15	.	.	.	.	.	589	.	.
1000 W O R L D	1889	91	3	44	.	81	67	75	41	897	.	510

FOOD SERVICE PACKS OF FROZEN VEGETABLES

(Data in Millions of Pounds)

Vegetable	1989	1988	1987
Broccoli	80	94	114
Okra	62	94	28

Note: These two are the only vegetables being considered for LAC production appearing in the Top 10 Food Service Items.

Source: Frozen Food Age. June, 1990.

UNITED STATES FROZEN BROCCOLI PRODUCTION - BY STYLE OF PACK

(Data in Thousands of Pounds)

	1985	1986	1987	1988	1989
Retail					
Cuts	38,170	43,353	53,275	46,008	54,131
Chopped	35,365	27,338	23,758	22,983	20,981
Spears	80,079	74,469	70,311	80,607	80,716
Total	159,614	144,160	147,344	149,598	155,828
Food Service					
Cuts	29,897	32,888	35,380	28,787	27,140
Chopped	12,454	9,228	9,035	8,682	7,021
Spears	72,063	66,094	69,349	56,599	46,271
Total	114,414	108,210	113,764	94,068	80,432
Bulk					
Cuts	23,313	27,748	-5,583	-1,865	-5,812
Chopped	3,176	7,724	7,940	1,797	11,999
Spears	2,749	-13,323	-2,973	-4,211	-16,709
Total	29,239	22,149	-616	-4,279	-10,522
Other *					
Cuts	55,705	34,677	51,968	n/a	n/a
Chopped	3,835	included in bulk		-	-
Spears	-	included in bulk		-	-
Total	59,540	50,000	51,968	50,059	64,828
Total					
Cuts	147,085	138,666	135,040	122,989	137,849
Chopped	54,830	43,290	40,733	33,462	42,439
Spears	154,891	142,563	136,687	132,995	110,278
Total	356,806	324,519	312,460	289,446	290,566

* "Other" category represents initial frozen broccoli weight going into combination (mixed) vegetables and prepared foods.

Note: Negative numbers due to previous year's carry-over and re-packing of imported product.

Source: American Frozen Food Institute.

UNITED STATES FROZEN CAULIFLOWER PRODUCTION - BY STYLE OF PACK

(Data in Thousands of Pounds)

	1985	1986	1987	1988	1989
Retail	27,004	28,217	28,266	26,000	27,106
Food Service and Bulk	28,540	35,190	20,330	25,949	52,584
Other *	39,073	25,713	29,162	26,813	30,132
Total	94,617	89,120	77,758	78,762	109,822

* "Other" category represents initial frozen cauliflower weight going into combination mixed vegetables and prepared foods.

Source: American Frozen Food Institute.

UNITED STATES FROZEN ASPARAGUS PRODUCTION - BY STYLE OF PACK

(Data in Thousands of Pounds)

	1985	1986	1987	1988	1989
Retail					
Spears	4,236	4,031	4,818	5,963	4,604
Cuts and Tips	965	1,222	1,370	987	1,614
Total	5,201	5,253	6,188	6,950	6,218
Food Service					
Spears	5,486	4,100	2,973	3,728	4,021
Cuts and Tips	3,616	2,681	2,354	2,388	2,901
Total	9,102	6,781	5,327	6,116	6,922
Bulk [1]					
Spears	56	-5	-21	784	1,498
Cuts and Tips	5,631	5,979	5,231	4,205	5,103
Total	5,687	5,974	5,210	4,989	6,601
Total					
Spears	9,778	8,126	7,770	10,475	10,123
Cuts and Tips	10,212	9,882	8,955	7,580	9,618
Total	19,990	18,008	16,725	18,055	19,741

Note: Negative numbers due to previous year's carry-over and re-packing of imported product.

Source: American Frozen Food Institute.

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[1] Includes totes and 20-60 pound cartons.

PRODUCTION BY CONTAINER SIZE AND STYLE OF PACK

(Data in Thousands of Pounds)

	1985	1986	1987
BROCCOLI			
Retail Containers			
Cartons and Poly Bags	75,358	81,147	72,410
Wt of Broccoli in Mixtures	23,581	27,395	26,755
Total	98,939	108,542	99,165
Food Service Containers			
2 - 60 Pounds	49,792	53,344	51,043
Bulk Tote Boxes (over 400 Pounds)	54,799	64,440	53,240
TOTAL	203,530	225,326	203,448
CAULIFLOWER			
Retail Containers			
Cartons and Poly Bags	19,107	19,208	18,050
Wt of Broccoli in Mixtures	15,019	16,485	15,837
Total	34,126	35,693	33,923
Food Service Containers			
2 - 60 Pounds	15,521	18,787	17,308
Bulk Tote Boxes (over 400 Pounds)	34,320	26,933	22,598
TOTAL	83,967	81,413	73,829

Source: Compiled from data submitted in response to questionnaires of the US International Trade Commission. No figures available after 1987.

FROZEN BROCCOLI SALES - 1987

MARKET OUTLETS OF DOMESTICALLY GROWN PRODUCT BY PRIMARY FREEZERS IN CALIFORNIA AND OTHER US FREEZERS AND OF FOREIGN GROWN PRODUCT BY ALL US FREEZERS

Market Outlet	Domestically Grown		Foreign Grown
	Primary Freezers in CA	Other US Freezers	
RETAIL:			
Major Chain Stores	45%	29%	28%
Other Retail Outlets	2%	15%	5%
FOODSERVICE	30%	24%	12%
GOVERNMENT PURCHASES	3%	5%	1%
REPROCESSORS or MANUFACTURERS	9%	5%	7%
REPACKERS	5%	2%	9%
DISTRIBUTORS or JOBBERS	5%	20%	38%
OTHER SALES OUTLETS	1%	0	0
QUANTITY OF TOTAL SALES BY RESPONDENTS (millions of lbs)	174.8	45.7	84.4

Source: Compiled from data submitted in response to questionnaires of the US International Trade Commission. No later updates available.

FROZEN CAULIFLOWER SALES - 1987

MARKET OUTLETS OF DOMESTICALLY GROWN PRODUCT BY PRIMARY FREEZERS IN CALIFORNIA AND OTHER US FREEZERS AND OF FOREIGN GROWN PRODUCT BY ALL US FREEZERS

Market Outlet	Domestically Grown		Foreign Grown
	Primary Freezers in CA	Other US Freezers	
RETAIL			
Major Chain Stores	47%	20%	25%
Other Retail Outlets	4%	14%	6%
FOODSERVICE	31%	32%	2%
GOVERNMENT PURCHASES	3%	8%	0
REPROCESSORS or MANUFACTURERS	2%	14%	8%
REPACKERS	7%	3%	18%
DISTRIBUTORS or JOBBERS	6%	9%	41%
OTHER SALES OUTLETS	0	0	0
QUANTITY OF TOTAL SALES BY RESPONDENTS (millions of lbs)	45.5	19.6	25.6

Source: Compiled from data submitted in response to questionnaires of the US International Trade Commission. No later updates available.

UNITED STATES SELLING PRICE PER POUND

	1985	1986	1987
Institutional Packs:			
Frozen Asparagus Spears	2.00	1.80-2.10	1.90
Frozen Asparagus Cuts and Tips	1.85	1.30-1.35	1.30
Frozen Broccoli Spears	.53-.55	.53-.55	.55
Frozen Broccoli Cuts	.42-.44	.44	.44
Cauliflower	.60	.60	.60

Source: International Trade Commission, Competitive Conditions in the U Market for Asparagus, Broccoli and Cauliflower, Nov. 1988.

PRODUCTION, YIELD and VALUE

BROCCOLI AND CAULIFLOWER

	1985	1986	1987	1988	1989
Broccoli					
US Production (fresh & processed)					
US Harvested Acres	109,500	119,100	120,200	114,400	116,800
CA Harvested Acres	97,700	106,400	107,600	101,100	101,600
Yield/Acre (hundred weight)					
California	98	98	96	115	120
For Processing Only					
Production (1,000 Tons)					
US Total	173.7	154.4	141.1	138.5	138.4
California	158.0	138.0	125.0	123.0	120.0
Value/Ton ($s)					
California	388	362	360	381	368
Cauliflower					
US Production (fresh & processed)					
US Harvested Acres	61,200	67,800	66,100	62,800	67,700
CA Harvested Acres	45,600	53,000	51,100	48,000	52,500
Yield/Acre (hundred weight)					
US average	109	111	112	125	116
For Processing Only					
Production (1,000 Tons)					
US Total	87,900	81,100	72,300	68,700	59,600
California	55,000	58,000	48,000	45,000	33,000
Value/Ton ($s)					
US average	264	270	274	279	269

Source: The Almanac of the Canning, Freezing, Preserving Industries.

FROZEN ASPARAGUS

UNITED STATES IMPORTS BY PRINCIPAL SOURCES

(Data in Thousands of Pounds)

	1985	1986	1987
Mexico	734	2,136	4,575
Spain	136	28	66
Canada	0	88	43
Guatemala	0	70	61
Taiwan	20	132	17
Netherlands	0	0	7
New Zealand	12	5	4
Belgium/Luxembourg	0	0	1
All Other	15	125	0
TOTALS	917	2,584	4,774

Total U.S. Production and Imports (1,000 lbs)	21,000	21,000	21,000

Source: Department of Commerce.

Appendix II - 6

PRODUCT SPECIFICATIONS

- Pineapple Dices IQF
- Pineapple Tidbits IQF
- Exotic Fruit Products
- Broccoli Florets
- Broccoli Spears Blockfrozen
- Broccoli Spears IQF
- Broccoli Cuts
- Broccoli Stalk Dices
- Broccoli Crumble
- Cauliflower Florets
- Romanesco Florets
- USDA Frozen Broccoli

SPECIFICATIONS

PINEAPPLE

ORIGINS : THAILAND, MALAYSIA, SOUTH-AFRICA

PINEAPPLE DICES IQF

DESCRIPTION : DICES OF 10X10X10 MM, MADE OF RIPE, PEELED AND CORED PINEAPPLE, DEEPFROZEN(IQF)
COLOUR : YELLOW, WITHOUT DISCOLOURATION
BRIX (AVERAGE) : 12
TOLERANCES : SMALL PIECES : 5 % MAX BY WEIGHT
DISCOLOURED PIECES : 1 % MAX BY WEIGHT
FOREIGN MATERIAL : 0,5 % MAX BY WEIGHT
STICKING PIECES (MORE THAN 10) DUE TO NATURAL BRIX: 3 % MAX BY WEIGHT
DARK PARTS : 1/KG MAX
STAND.PACKAGING : CARTONS/PE-BAG 1X12 KG

PINEAPPLE TIDBITS IQF

DESCRIPTION : 1/16 CUT OF PINEAPPLE SLICES (AFTER PEELING AND CORING), DEEPFROZEN(IQF)
COLOUR : YELLOW, WITHOUT DISCOLOURATION
BRIX (AVERAGE) : 12
TOLERANCES : IRREGULAR CUT : 10 % BY WEIGHT
DISCOLOURED PIECES : 1 % MAX BY WEIGHT
FOREIGN MATERIAL : 0,5 % MAX BY WEIGHT
STICKING PIECES (MORE THAN 10) DUE TO NATURAL BRIX: 3 % MAX BY WEIGHT
DARK PARTS : 1/KG MAX
STAND.PACKAGING : CARTONS/PE-BAG 1X12 KG

PINEAPPLE CRUSHED CANNED

DESCRIPTION : CRUSHED PARTS OF RIPE, PEELED AND CORED PINEAPPLE, CANNED WITH NATURAL JUICE(ABOUT 15%), WITHOUT OTHER ADDITIVES
COLOUR : YELLOW, FREE OF BROWNISH PARTS
PH (AVERAGE) : 3,5 - 4
BRIX (AVERAGE) : 14
TOLERANCES : BROWNISH OR DARK PARTS : 1/KG MAX (DRAINED)
FOREIGN MATERIALS : 0,02 PIECES/KG MAX
STAND.PACKAGING : CANS A10 NET WEIGHT : 3035 GRS
DRAINED WEIGHT : 2550 GRS
6 CANS/CARTON

PINEAPPLE JUICE CONCENTRATE ASEPTIC

DESCRIPTION : CONCENTRATED JUICE OF RIPE PINEAPPLE
BRIX : 60 / 61 / 65 (-+ 1)
ACIDITY(AVERAGE): 2,75
B/A RATIO(AVER.): 23
PULP(AVERAGE) : 10 %
STAND.PACKAGING : STEEL DRUMS OF 260 KG(N.W.) WITH ASEPTICALLY PACKED AND SEALED BAG
WITH PALLETS : 60 DRUMS/20 FT CONTAINER
WITHOUT PALLETS : 72 DRUMS/20 FT CONTAINER

FROST IMPEX

SPECIFICATIONS

E X O T I C F R U I T P R O D U C T S

GUAVA	: ORIGIN	: THAILAND, BRASIL
	COLOUR	: YELLOWISH GREEN, WHITE
	PRODUCT	: DICES 10 X 10 IQF
GRAPES	: ORIGIN	: CHILI
	COLOURS	: RUBY AND WHITE
	VARIETIES	: SEEDLESS GRAPES
	PRODUCT	: GRAPES IQF
KIWI	: ORIGIN	: NEW-ZEALAND, CHILI
	PRODUCTS	: SLICES IQF
		DEEPFROZEN PUREE WITH SEEDS
		DEEPFROZEN PUREE WITHOUT SEEDS
MANDARINS	: ORIGIN	: SPAIN
	PRODUCTS	: WHOLE PEELED SEGMENTS IQF
		BROKEN PEELED SEGMENTS BLOCKFROZEN
	PACKING	: COATED CARTONS (WITHOUT PE-BAG)
		ON SPECIAL REQUEST
MANGO	: ORIGIN	: THAILAND
	COLOUR	: ORANGE
	PRODUCTS	: DICES 15 X 15 , 20 X 20 IQF
		SLICES IQF
MELON	: ORIGIN	: CHILI, SPAIN
	VARIETIES	: CANTALOUPE (ORANGE)
		HONEYDEW (GREEN)
	PRODUCTS	: BALLS 20 MM IQF
		DEEPFROZEN PUREE
PAPAYA	: ORIGIN	: THAILAND
	COLOUR	: REDDISH ORANGE - RED
	PRODUCT	: DICES 15 X 15 MM IQF
PINEAPPLE	: ORIGIN	: THAILAND, MALAYSIA
	PRODUCTS	: TIDBITS IQF
		DICES 10 X 10 IQF
		CANNED TIDBITS
		CANNED CRUSHED
		CANNED SLICES
		CONCENTRATE - DEEPFROZEN AND ASEPTIC

THIS RANGE ALSO INCLUDES ALL E X O T I C F R U I T P U R E E S.

FROST IMPEX

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SPECIFICATIONS

BROCOLI FLORETS

ORIGINS : GUATEMALA, MEXICO, CHILI, SPAIN, ITALY.
VARIETIES : BRASSICA OLERACEA L., ITALICA PLENCK, GREEN VALIANT, SHOGUN, MATHADOR, ACEPHOLA.
PROCESSING : CLEANING, CUTTING, SORTING OUT, BLANCHING, IQF FREEZING.

SIZE GRADINGS : DIAMETER AND LENGTH : 13/26 MM, 20/40 MM, 30/40 MM OR 40/60 MM.

TOLERANCES / 500 G :
- UNDERSIZE : MAX. 10 WT. %
- OVERSIZE : MAX. 5 WT. %
- FRAGMENTS : MAX. 10 WT. %
- DISCOLOURATIONS : MAX. 10 PCS

STANDARD PACKAGING : (10 X 1 KG) CARTONS, 10 KG CARTONS.

BROCOLI SPEARS BLOCKFROZEN

ORIGINS : GUATEMALA, MEXICO, CHILI, SPAIN, ITALY.
VARIETIES : BRASSICA OLERACEA L., ITALICA PLENCK, GREEN VALIANT, SHOGUN, MATHADOR, ACEPHOLA.
PROCESSING : SORTING OUT, CLEANING, CUTTING, BLANCHING, BLOCKFREEZING

SIZE GRADINGS : HEAD + STALK LENGTHS : 60 MM, 110 MM OR 120/130 MM.

TOLERANCES / 500 G :
- UNDERSIZE : MAX. 10 WT. %
- OVERSIZE : MAX. 5 WT. %
- HEAD / STALK RATIO : 50 / 50
- DISCOLOURATIONS : MAX. 10 PCS
- FRAGMENTS : MAX. 5 WT. %

STANDARD PACKAGING : (4 X 2.5 KG) CARTONS, (10 X 1 KG) CARTONS, (12 X 2 LB) CARTONS.

BROCOLI SPEARS I.Q.F.

ORIGINS : GUATEMALA, MEXICO, SPAIN, ITALY.
VARIETIES : BRASSICA OLERACEA L., ITALICA PLENCK, ACEPHOLA.
PROCESSING : SORTING OUT, CLEANING, CUTTING, BLANCHING, IQF FREEZING.

SIZE GRADINGS : HEAD + STALK LENGTHS : 60 MM OR 70/100 MM

TOLERANCES / 500 G :
- UNDERSIZE : MAX. 10 WT. %
- OVERSIZE : MAX. 5 WT. %
- HEAD / STALK RATIO : 50 / 50 OR 35 / 65
- DISCOLOURATIONS : MAX. 10 PCS
- FRAGMENTS : MAX. 5 WT. %

STANDARD PACKAGING : (10 X 1 KG) CARTONS, (12 X 2 LB) CARTONS, 10 KG CARTONS.

FROST IMPEX

SPECIFICATIONS

BROCOLI CUTS

ORIGINS : MEXICO, SPAIN, ITALY.

VARIETIES : BRASSICA OLERACEA L., ITALICA PLENCK, ACEPHOLA.

PROCESSING : TRIMMING, WASHING, BLANCHING, IQF FREEZING.

SIZE GRADINGS : CUT SIZES : 10 / 10 MM OR 26 / 26 MM

TOLERANCES / 500 G : UNDERSIZE : MAX. 20 WT. %
OVERSIZE : MAX. 10 WT. %
HEAD / STALK RATIO : 35 / 65 OR 50 / 50
DISCOLOURATIONS : MAX. 3 WT. %

STANDARD PACKAGING : 10 KG CARTONS, 20 KG SACKS.

BROCOLI STALK DICES

ORIGINS : SPAIN, ITALY.

VARIETIES : BRASSICA OLERACEA L., ITALICA PLENCK, ACEPHOLA.

PROCESSING : CLEANING, CUTTING, BLANCHING, IQF FREEZING.

SIZE GRADINGS : DICE CUT : 10 / 10 MM

TOLERANCES / 500 G : UNDERSIZE : MAX. 5 WT. %
OVERSIZE : MAX. 10 WT. %
DISCOLOURATIONS : MAX. 5 WT. %
CLUMPING : MAX. 10 WT. %

STANDARD PACKAGING : 25 KG SACKS.

BROCOLI CRUMBLE

ORIGINS : SPAIN, ITALY.

VARIETIES : BRASSICA OLERACEA L., ITALICA PLENCK, ACEPHOLA.

PROCESSING :

SIZE GRADINGS : DIAMETER PIECES HEAD MATERIAL AND STALKS : < 5 MM

TOLERANCES / 500 G : DISCOLOURATIONS : MAX. 5 WT. %

STANDARD PACKAGING : 20 KG CARTONS.

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SPECIFICATIONS

CAULIFLOWER FLORETS

ORIGIN : BELGIUM, FRANCE, SPAIN, ITALY.

VARIETY : BRASSICA OLERACEA L., BOTRYTIS L.

PROCESSING : CLEANING, TRIMMING, CUTTING, SORTING, BLANCHING, IQF FREEZING.

SIZE GRADINGS : DIAMETERS : 0/10 MM, 10/20 MM, 20/40 MM, 40/60 MM OR 30/60 MM

TOLERANCES / 1 KG :

UNDERSIZE	: MAX. 10 WT. %
OVERSIZE	: MAX. 10 TO 40 WT. % (DEPENDING ON CUT SIZE)
MAJOR DEFECTS	: MAX. 4 PCS
MINOR DEFECTS	: MAX. 15 PCS
LOOSE STALK PIECES	: MAX. 5 WT. %
E.V.M.	: MAX. 5 PCS

STANDARD PACKAGING : (4 X 2.5 KG) CARTONS, 10 KG CARTONS.

ROMANESCO FLORETS

ORIGINS : ITALY, GUATEMALA.

VARIETY : BRASSICA OLERACEA L.

PROCESSING : WASHING, TRIMMING, CUTTING, BLANCHING, IQF FREEZING.

SIZE GRADINGS : FLORET + STALK SIZE : 20 / 40 MM

TOLERANCES / 500 G :

UNDERSIZE	: MAX. 15 WT. %
OVERSIZE	: MAX. 15 WT. %
MAJOR DEFECTS	: MAX. 2 PCS
MINOR DEFECTS	: MAX. 10 PCS

STANDARD PACKAGING : 10 KG CARTONS.

FROST IMPEX

UNITED STATES STANDARDS

for grades of

FROZEN BROCCOLI

Sixth Issue

EFFECTIVE JANUARY 22, 1980

UNITED STATES DEPARTMENT OF AGRICULTURE
FOOD SAFETY AND QUALITY SERVICE
FRUIT AND VEGETABLE QUALITY DIVISION
PROCESSED PRODUCTS BRANCH

These standards supersede the standards which have been in effect since
July 1, 1975

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This is the sixth issue of the United States Standards for Grades of Frozen Broccoli. This issue was published in the *FEDERAL REGISTER* of January 22, 1980, to become effective February 22, 1980.

The previous issues of these standards were:

Tentative (First issue):	*Effective July 1, 1942*
Second Issue:	*Effective August 1, 1950*
Recodified:	*Effective December 9, 1953*
Third Issue:	*Effective March 1, 1959*
Fourth Issue:	*Effective April 14, 1962*
Fifth Issue:	*Effective July 1, 1975*

These standards are included in the Code of Federal Regulations, Title 7 — Agriculture, Part 2852.

Issued under the authority of the Agricultural Marketing Act of 1946, which provides for the development of official U.S. grades to designate different levels of quality, the grade standards are for the voluntary use of producers, suppliers, buyers, and consumers. As in the case of other standards for grades of processed fruits and vegetables, these standards are designed to facilitate orderly marketing by providing a convenient basis for buying and selling, for establishing quality control programs, and for determining loan values.

These standards will also serve as a basis for the inspection and grading of this commodity by the Federal inspection service, which is also provided under the Agricultural Marketing Act of 1946. This service, available for inspection and grading of other processed products as well, is offered to interested parties, upon application, on a fee-for-service basis.

These standards are issued by the Department after careful consideration of all data and views submitted, and the Department welcomes suggestions which might aid in improving the standards in future revisions. Comments may be submitted to, and copies of standards obtained from:

Chief, Processed Products Branch
Fruit and Vegetable Quality Division, FSQS
U.S. Department of Agriculture
Washington, D.C. 20250

UNITED STATES STANDARDS FOR GRADES

OF FROZEN BROCCOLI

EFFECTIVE FEBRUARY 22, 1980

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(Authority: Agricultural Marketing Act of 1946, Secs. 203, 205, 60 Stat. 1087, as amended 1090, as amended; 7 U.S.C. 1622, 1624).

NOTE: Compliance with the provisions of these standards shall not excuse failure to comply with the provisions of the Federal Food, Drug, and Cosmetic Act, or with applicable State laws and regulations.

§2852.631 PRODUCT DESCRIPTION.

"Frozen broccoli" is the product prepared from the fresh, clean, sound stalks or shoots of the broccoli plant (Brassica oleracea [Italica group]) by trimming, washing, blanching, sorting, and properly draining. The product is frozen in accordance with good commercial practice and maintained at temperatures necessary for its preservation.

§2852.632 STYLES OF FROZEN BROCCOLI.

(a) *"Spears"* or *"stalks"* mean the head and adjoining portions of the stem, with or without attached leaves, which may range in length from 9 cm (3.5 in) to 15 cm (5.9 in). The spears or stalks may be cut longitudinally.

(b) *"Short spears"* or *"florets"* mean the head and adjoining portions of the stem, with or without attached leaves, which may range in length from 2.5 cm (1 in) to 9 cm (3.5 in). Each short spear or floret must weigh more than 6 g (0.2 oz). The short spears or florets may be cut longitudinally.

(c) *"Cut"* means spears or short spears cut into portions which may range in length from 2 cm (0.8 in) to 5 cm (2 in). Head material should be at least 62.5 g (2.2 oz) per 250 g (8.8 oz) and leaf material should not be more than 62.5 g (2.2 oz) per 250 g (8.8 oz).

(d) *"Chopped"* means spears or short spears cut into portions which are less than 2 cm (0.8 in) in length. Head material should be at least 12.5 g (0.4 oz) per 50 g (1.8 oz) and leaf material should not be more than 12.5 g (0.4 oz) per 50 g (1.8 oz).

(e) *"Pieces"* or *"random cut pieces"* mean cut or chopped portions of spears or short spears or other units which do not meet the requirements for "cut" or "chopped" styles.

§2852.633 CLASSIFICATION OF STYLE DEFECTIVES.

For the purpose of determining compliance with style requirements, each nonconforming unit is considered as either a minor or major defective. Each "X" in Table I represents "one (1) defective."

TABLE I

Classification of Style Defectives

Style	Defectives		Minor	Major
	Longer than:	Shorter than:		
Spears or Stalks (each spear)	15.5 cm (6.1 in)	8.5 cm (3.3 in)	X	
Short Spears or Florets (each spear)	9.5 cm (3.7 in)	2.0 cm (0.8 in)	X	
Cut (each 5 g) 1/	5.0 cm (2.0 in)	----------		X
	----------	1.5 cm (0.6 in)	X	
Chopped (each 2.5 g) 1/	2.0 cm (0.8 in)	----------	X	

1/ Leaf material is not considered in the classification of style defectives.

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§2852.634 *TOLERANCES FOR STYLE DEFECTIVES.*

Defective units for style shall not exceed the Acceptable Quality Levels (AQL) in Table II, Table III or Table IV, as applicable for the style. An insignificant weight increment of style defectives, limited to the first weight increment, shall not be considered.

TABLE II

Spears (or Stalks) and Short Spears (or Florets)

	Minor
AQL 1/	10.0

TABLE III

Cut

	Minor	Major
AQL 2/	10.0	6.5

TABLE IV

Chopped

	Minor
AQL 3/	8.5

1/ AQL expressed as percent defective.

2/ AQL expressed as percent defective (50-5 g increments in 250 g).

3/ AQL expressed as percent defective (100-2.5 g increments in 250 g).

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§2852.635 *DEFINITIONS OF TERMS.*

(a) Terms applicable to all styles of frozen broccoli:

(1) *Acceptable Quality Level (AQL).* The maximum percent of defective units, or the maximum number of defects per hundred units of product, that, for the purpose of acceptance sampling can be considered satisfactory as a process average.

(2) *Blemished.* A unit of broccoli that is blemished by pathological injury, hollow stems, pithy stems, insect injury, discolored, or by other means such as, but not limited to, small orange or yellowish-orange buds and olive-green petiole, to the extent that the appearance or eating quality is affected:

(i) Slightly;

(ii) materially; or

(iii) seriously.

(3) *Defect (or defective).* Any nonconformance of a unit(s) of product from a specified requirement of a single characteristic.

(4) *Development.*

(i) *Reasonably well developed.* The individual buds are not more than moderately enlarged and practically none of the individual buds are in the flowering stage.

(ii) *Poorly developed.* The individual buds are in the flowering stage or are more than moderately enlarged with or without reaching the flowering stage.

(5) *Extraneous vegetable material (EVM).*

(i) *Edible.* Tender, green blades of grass or weeds or leaves which are harmless.

(ii) *Inedible.* Coarse blades of grass or weeds or leaves which may or may not be tender or green and which are harmless.

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(6) *Fiber.* Tough or woody fiber that has developed near the outside portion of the broccoli stem.

(7) *Flavor and odor.*

(i) *Good flavor and odor.* The product has a good characteristic flavor and odor and is free from objectionable flavors or objectionable odors of any kind.

(ii) *Fairly good flavor and odor.* The product may be lacking in good flavor and odor but is free from objectionable flavors or objectionable odors of any kind.

(8) *Sample unit.* The amount of product specified to be used for inspection. It may be:

(i) The entire contents of a container; or

(ii) A portion of the contents of a container; or

(iii) A combination of the entire contents of two or more containers; or

(iv) A portion of unpacked product.

(9) *Unit.* Any individual portion of broccoli other than loose leaves or individual buds.

(b) Terms applicable to spear and short spears only:

(1) *Broken.* Detached portions, other than loose leaves or portions thereof, which weigh more than 6 g (0.2 oz) and are definitely not intact units.

(2) *Color* (individual unit).

(i) *Good color.* The outside of the stalk is a bright, distinct green. The top of the head is a bright, distinct green and may show a slight purplish cast. The color may also include lighter colored areas on the outside of the head which is typical of young and tender broccoli.

(ii) *Reasonably good color.* The outside of the stalk may be dull and may possess a slight brownish, yellowish, or grayish cast. The head may be dull and possess a slight brownish, grayish, or yellowish cast and yellow buds due to flowering that do not seriously affect the overall brightness.

(iii) *Poor color.* The presence of yellow buds due to flowering, or any brownish, grayish or yellowish casts that seriously affect the overall brightness.

(3) *Damage.* The head of the spear is damaged by mechanical injury, other than "broken," to the extent that the appearance or eating quality is materially affected.

(4) *Detached fragments.* Any small piece or detached portion other than loose leaves or portions thereof, which weighs 6 g (0.2 oz) or less.

(5) *Development.*

(i) *Well developed.*

(A) The spreading of the branching bud clusters which comprise the head of the unit does not materially affect the appearance of the unit; and

(B) The broccoli is in the early stage of maturity such that the individual buds and immediate stems supporting the individual buds form a compact bud cluster.

(ii) *Reasonably well developed.*

(A) The spreading of the branching bud clusters which comprise the head of the unit does not seriously affect the appearance of the unit; and

(B) The broccoli is the intermediate stage of maturity such that the individual buds and the immediate stems supporting the individual buds form a reasonably compact bud cluster.

(iii) *Poorly developed.*

(A) The branching bud clusters which comprise the head of the unit may be spread to the extent that the appearance of the unit is seriously affected; and

(B) The broccoli is in the advanced stage of maturity such that the individual buds and the immediate stems supporting the individual buds form a loosely structured bud cluster.

(6) *Diameter of a spear.* The greatest dimension at the right angle to the longitudinal axis 2.5 cm (1 in) from the base end.

(7) *Loose leaves or pieces of leaves.* Broccoli leaves or pieces of leaves not attached to a unit.

(8) *Trim.*

(i) *Well trimmed.* The appearance of the unit is not materially affected by the presence of attached leaves or pieces of leaves and not more than slightly affected by ragged or partial removal of leaves or small side shoots, or by cutting of the stem.

(ii) *Reasonably well trimmed.* The appearance of the unit is not seriously affected by the presence of attached leaves or pieces of leaves and not materially affected by ragged or partial removal of leaves or small side shoots, or by cutting of the stem.

(iii) *Poorly trimmed.* The appearance of the unit is seriously affected by the presence of attached leaves or pieces of leaves, ragged or partial removal of leaves or small side shoots, or by cutting of the stem.

(c) Terms applicable to cut and chopped broccoli only:

(1) *Head material.* The buds or bud clusters whether or not attached to a portion of a spear and includes the fine stem material by which the buds or bud clusters are attached to the main stem.

(2) *Leaf material.* Any portion of leaf not attached to a portion of a spear.

§2852.636 RECOMMENDED SAMPLE UNIT SIZES.

(a) For head material and leaf material:

(1) Cut style—250 g (8.8 oz).

(2) Chopped style--50 g (1.8 oz).

(b) For style and quality factors:

(1) Spears and short spears—50 units.

(2) Cut, chopped, and pieces--250 g (8.8 oz).

(c) Associated material:

(1) Broken, crushed, or similarly damaged portions of units of product in the styles of spears and short spears are to be reassembled and included in the count as whole units.

(2) Head and leaf material in the styles of cut and chopped, loose leaves or pieces in the styles of spears and short spears, and extraneous vegetable material in all product styles are part of the standard sample unit size. They are not included in the count of spears and short spears but are included in the weight of cut, pieces, and chopped broccoli. Such pieces and extraneous vegetable material are considered part of the sample unit.

(i) When they are in a container whose entire contents are included in the sample unit;

(ii) When they are in the last of several containers included in the sample units and 50 percent or more of the contents are required for the sample unit. None of the pieces and EVM in the last of several containers is considered part of the sample unit when less than 50 percent of its contents are required for the sample unit; and

(iii) When they are commingled with the product required for the sample unit and such product is taken from, but is not, the entire contents of a single container.

§2852.637 GRADES.

(a) *"U.S. Grade A"* is the quality of frozen broccoli that:

(1) Meets the following prerequisites in which the broccoli:

(i) Has similar varietal characteristics;

(ii) Has a good flavor and odor;

(iii) Is practically free from grit and silt;

(iv) Has a good overall brightness; and

(v) In the styles of cut, chopped, and pieces, the individual buds are at least reasonably well developed.

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(2) Is within the limits for defects as classified in Table V and specified in Tables VI, VII, or VIII, as applicable for the style.

(b) *"U.S. Grade B"* is the quality of frozen broccoli that:

(1) Meets the following prerequisites in which the broccoli:

(i) Has similar varietal characteristics;

(ii) Has at least a fairly good flavor and odor;

(iii) Has no more than a trace of grit and silt;

(iv) Has at least a reasonably good overall brightness which may be slightly dull; and

(v) In the styles of cut, chopped, and pieces, the individual buds may be poorly developed if they do not materially affect the appearance of the product.

(2) Is within the limits for defects as classified in Table V and specified in Tables VI, VII, or VIII as applicable for the style.

(c) *Substandard* is the quality of frozen broccoli that fails to meet the requirements of U.S. Grade B.

§2852.638 *FACTORS OF QUALITY.*

The grade of frozen broccoli is based on compliance with requirements for the following quality factors:

(a) Prerequisite quality factors:

(1) Similar varietal characteristics (all styles);

(2) Flavor and odor (all styles);

(3) Freedom from grit and silt (all styles);

(4) Overall brightness (all styles); and

(5) Development (cut, chopped, and pieces only).

(b) Classified quality factors:

(1) Spears and short spears:

(i) Color (individual unit);

(ii) Uniformity of size;

(iii) Detached fragments;

(iv) Loose leaves or pieces of leaves;

(v) Broken;

(vi) Damage;

(vii) Blemish;

(viii) Trim;

(ix) Development;

(x) Fiber; and

(xi) Extraneous vegetable material.

(2) Cut, chopped, and pieces

(i) Blemish;

(ii) Fiber; and

(iii) Extraneous vegetable material.

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§2852.639 CLASSIFICATION OF DEFECTS.

Defects are classified as "minor," "major," "severe," or "critical." Each "X" in Table V represents "one (1) defect."

TABLE V

Classification of Defects

Quality Factor	Defect	Classification			
		Minor	Major	Severe	Critical
	SPEARS				
Color (Individual unit)	Reasonably good color in grade A only (each spear)		X		
	Poor color in grades A and B (each spear)			X	
Uniformity of Size	Length variation is greater than 5 cm (each spear)		X		
	Diameter variation is greater than 2 cm (each spear)	X			
Detached Fragments	Each 28 g increment		X		
Loose Leaves and Pieces of Leaves	Each 14 g increment	X			
Broken Spear	Each spear	X			
Damaged Spear	Each spear	X			
Blemished Spear	Slightly (each spear)	X			
	Materially (each spear)		X		
	Seriously (each spear)			X	

TABLE V (continuation)

Quality Factor	Defect	Classification			
		Minor	Major	Severe	Critical
	SPEARS (continuation)				
Trim	Reasonably well trimmed in grade A only (each spear)	X			
	Poorly trimmed:				
	In grade A only (each spear)		X		
	In grade B only (each spear)	X			
Development	Reasonably well developed in grade A only (each spear)	X			
	Poorly developed in grades A and B (each spear)		X		
Fiber	Nonwoody (each spear)	X			
	Woody (each spear)			X	
Extraneous Vegetable Material	Edible (each piece)			X	
	Inedible (each piece)				X
	SHORT SPEARS				
Color (Individual unit)	Reasonably good color in grade A only (each spear)		X		
	Poor color in grades A and B (each spear)			X	
Uniformity of Size	Largest unit is more than 4 times heavier than the smallest unit (each spear)	X			

TABLE V (continuation)

Quality Factor	Defect	Classification			
		Minor	Major	Severe	Critical
	SHORT SPEARS (continuation)				
Detached Fragments	Each 28 g increment				X
Loose Leaves and Pieces of Leaves	Each 14 g increment		X		
Broken Spear	Each spear		X		
Damaged Spear	Each spear		X		
Blemished Spear	Slightly (each spear)		X		
	Materially (each spear)			X	
	Seriously (each spear)				X
Trim	Reasonably well trimmed in grade A only (each spear)		X		
	Poorly trimmed:				
	In grade A only (each spear)			X	
	In grade B only (each spear)		X		
Development	Reasonably well developed in grade A only (each spear)		X		
	Poorly developed in grades A and B (each spear)			X	

TABLE V (continuation)

Quality Factor	Defect	Classification			
		Minor	Major	Severe	Critical
	SHORT SPEARS (continuation)				
Fiber	Nonwoody (each spear)		X		
	Woody (each spear)			X	
Extraneous Vegetable Material	Edible (each piece)			X	
	Inedible (each piece)				X
	CUTS AND PIECES				
Blemished	Slightly (each 5 g increment)	X			
	Materially (each 5 g increment)		X		
	Seriously (each 5 g increment)			X	
Fiber	Nonwoody (each 5 g increment)	X			
	Woody (each 5 g increment)			X	
Extraneous Vegetable Material	Edible (each 2.5 cm increment)			X	
	Inedible (each 2.5 cm increment)				X

TABLE V (continuation)

Quality Factor	Defect	Classification			
		Minor	Major	Severe	Critical
	CHOPPED				
Blemished	Slightly (each 2.5 g increment)	X			
	Materially (each 2.5 g increment)		X		
	Seriously (each 2.5 g increment)			X	
Fiber	Nonwoody (each 2.5 g increment)		X		
	Woody (each 2.5 g increment)			X	
Extraneous Vegetable Material	Edible (each 2.5 cm increment)			X	
	Inedible (each 2.5 cm increment)				X

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§2852.640 TOLERANCES FOR DEFECTS.

An insignificant weight increment of defects limited to the first weight increment shall not be considered.

TABLE VI

Spears and Short Spears

	Grade A				Grade B			
	Total 1/	Major	Severe	Critical	Total 1/	Major	Severe	Critical
AQL 2/	20.0	6.5	0.65	0.25	25.0	10.0	2.5	0.65

TABLE VII

Cuts and Pieces

	Grade A				Grade B			
	Total 1/	Major	Severe	Critical	Total 1/	Major	Severe	Critical
AQL 3/	6.5	2.5	1.0	0.4	15.0	5.0	1.5	1.0

TABLE VIII

Chopped

	Grade A				Grade B			
	Total 1/	Major	Severe	Critical	Total 1/	Major	Severe	Critical
AQL 4/	6.5	2.5	1.0	0.25	15.0	5.0	1.5	0.65

1/ Total = Minor + Major + Severe + Critical.

2/ AQL expressed as defects per 100 units.

3/ AQL expressed as defects per 100 units (50-5 g increments in 250 g).

4/ AQL expressed as defects per 100 units (100-2.5 g increments in 250 g).

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§2852.641 SAMPLE SIZE.

The sample size to determine compliance with requirements of these standards shall be as specified in the sampling plans and procedures in the "Regulations Governing Inspection and Certification of Processed Fruits and Vegetables, Processed Products Thereof, and Certain Other Processed Food Products" (§§2852.1-2852.83), for lot inspection and on-line inspection, as applicable.

§2852.642 DETERMINING PROPORTIONS OF HEAD MATERIAL AND LEAF MATERIAL.

(a) *Method.* The proportions of head material and leaf material in cut and chopped broccoli may be determined as follows:

(1) Equipment needed:

(i) 250 ml beaker;

(ii) gram scale, or other suitable balance;

(iii) laboratory tweezers, scalpel, or other suitable instrument for separating the stem material, leaf material, and head material; and

(iv) flat grading tray.

(2) Procedure:

(i) Thoroughly mix the sample unit to be tested if it is not the entire contents of a container;

(ii) Weigh 50 g (1.8 oz) in the case of chopped broccoli into a previously tared 250 ml beaker;

(iii) Weigh 250 g (8.8 oz) in the case of cut broccoli into a previously tared container;

(iv) Spread the weighed product out on a flat grading tray;

(v) Separate the stem material from the head and leaf material; and

(iv) Separate the leaf material from the head material. Weigh each separately and record the weight.

§2852.643 COMPLIANCE WITH STYLE REQUIREMENTS.

(a) *Lot inspection.*

(1) *Spears and short spears.* A lot of frozen broccoli spears or short spears is considered as meeting the requirements for style if the Acceptable Quality Levels (AQL) in Table II are not exceeded.

(2) *Cut and chopped.* A lot of cut or chopped frozen broccoli is considered as meeting the style requirements for cut or chopped if:

(i) The requirements with respect to leaf material and head material in §2852.632 are met;

(ii) No individual sample unit of cut broccoli contains less than 37.5 g (1.3 oz) of head material or more than 87.5 g (3.1 oz) of leaf material;

(iii) No individual sample unit of chopped broccoli contains less than 8.5 g (0.3 oz) of head material or more than 17.5 g (0.6 oz) of leaf material; and

(iv) The Acceptable Quality Levels (AQL) specified in Table III or Table IV, as applicable, are not exceeded.

(b) *On-line inspection.*

(1) *Spears and short spears.* A portion of production of frozen broccoli spears or short spears is considered as meeting the requirements for style if the Acceptable Quality Levels (AQL) in Table II are not exceeded.

(2) *Cut and chopped.* A portion of production of frozen broccoli is considered as meeting the style requirements for cut or chopped if:

(i) The requirements with respect to leaf material and head material in §2852.632 are met;

(ii) No individual sample unit of cut broccoli contains less than 37.5 g (1.3 oz) of head material or more than 87.5 g (3.1 oz) of leaf material;

(iii) No individual sample unit of chopped broccoli contains less than 8.5 g (0.3 oz) of head material or more than 17.5 g (0.6 oz) of leaf material; and

(iv) The Acceptable Quality Levels (AQL) specified in Table III or Table IV, as applicable, are not exceeded.

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(c) *Single sample unit.*

(1) *Spears and short spears.* Each unofficial sample unit of spears or short spears submitted for quality evaluation will be treated individually and is considered as meeting the requirements for style if the Acceptable Quality Levels (AQL) in Table II are not exceeded.

(2) *Cut and chopped.* Each unofficial sample unit of frozen broccoli is considered as meeting the style requirements for cut or chopped if:

(i) The requirements with respect to leaf material and head material in §2852.632 are met; and

(ii) The Acceptable Quality Levels (AQL) specified in Table III or Table IV, as applicable, are not exceeded.

§2852.644 COMPLIANCE WITH QUALITY REQUIREMENTS.

(a) *Lot inspection.* A lot of frozen broccoli is considered as meeting the requirements for quality if:

(1) The prerequisite requirements specified in §2852.637 are met; and

(2) The Acceptable Quality Levels (AQL) in Tables VI, VII, or VIII, as applicable for the style, are not exceeded.

(b) *On-line inspection.* A portion of production is considered as meeting requirements for quality if:

(1) The prerequisite requirements specified in §2852.637 are met; and

(2) The Acceptable Quality Levels (AQL) in Tables VI, VII, or VIII, as applicable for the style, are not exceeded.

(c) *Single sample unit.* Each unofficial sample unit submitted for quality evaluation will be treated individually and is considered as meeting the requirements for quality if:

(1) The prerequisite requirements specified in §2852.637 are met; and

(2) The Acceptable Quality Levels (AQL) in Tables VI, VII, or VIII, as applicable for the style are not exceeded.

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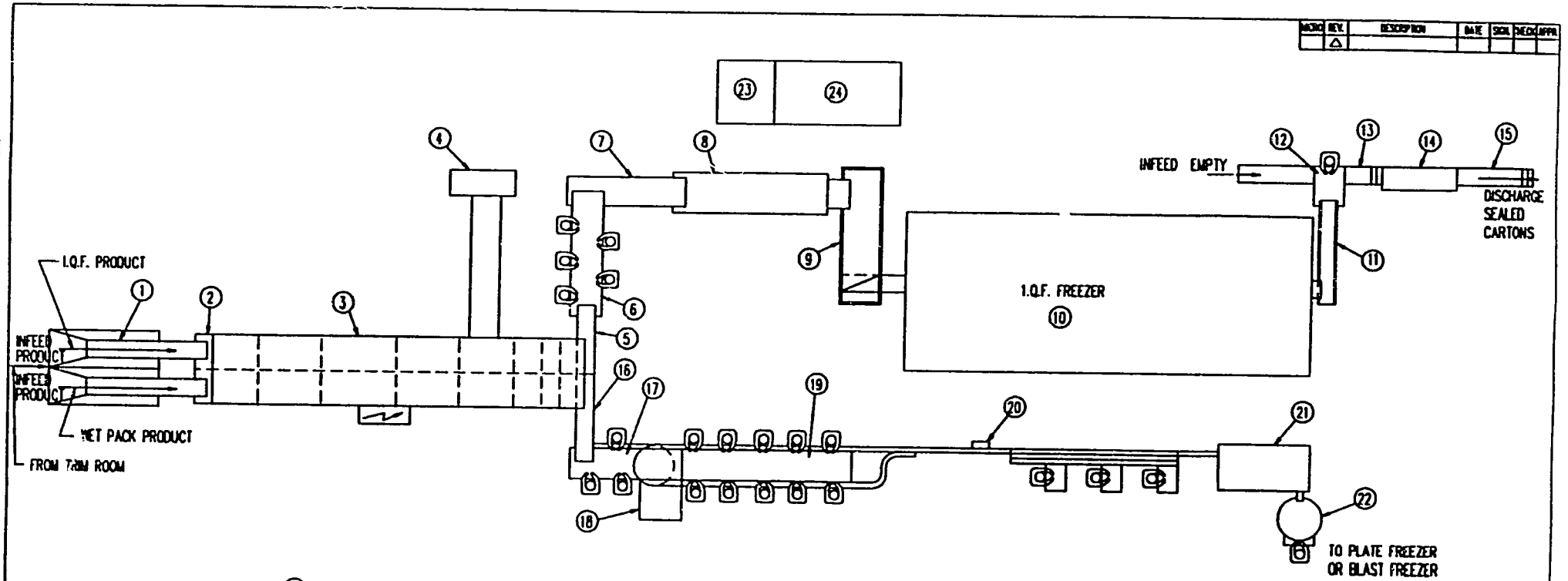

1. VEGETABLE WASHER/SOAKER SYSTEM
2. TWO-LAYER DISTRIBUTOR/FEEDING TO BLANCHER
3. I.B.C. BLANCHER
4. CHILLED WATER UNIT
5. COLLECTION CONVEYOR, TRANSFER TO I.Q.F. LINE
6. INSPECTION CONVEYOR/TABLE
7. ELEVATING CONVEYOR
8. DEWATERING EQUIPMENT
9. INFEED SHAKER
10. I.Q.F. FREEZER
11. GOOSENECK ELEVATOR
12. WEIGHING SYSTEM
13. ROLLER CONVEYOR
14. CARTON SEALER
15. ROLLER CONVEYOR
16. COLLECTION CONVEYOR, TRANSFER TO WET PACK LINE
17. INSPECTION CONVEYOR/TABLE
18. CARTON ERECTOR
19. PACKING LINE FOR WET PACK PRODUCT
20. WEIGHING SYSTEM
21. CARTON SEALER
22. ROTARY TABLE
23. STEAM GENERATOR
24. REFRIGERATION EQUIPMENT

FRIGOSCANDIA

FRIGOSCANDIA CONT. INC.
PROCESS LINE FOR BROCCOLI

75631

Appendix II - 8

SELECTED TRADE CONTACTS

* Selected Distributors & Processors of Frozen Asparagus - US/Canada

* Selected Distributors & Processors of Broccoli & Cauliflower - US/Cana

* Selected Distributors & Processors of Brussels Sprouts - US/Canada

* Selected Distributors & Processors of Peppers - US/Canada

* Selected Distributors & Processors of Okra - US/Canada

* Selected Distributors & Processors of Lima Beans - US/Canada

* Selected Brokers of Frozen Fruits & Vegetables - US/Canada

* Selected Distributors & Processors of Frozen Fruits & Vegs - Europe

* Selected Distributors & Processors of Frozen Fruits & Vegs - Japan

SELECTED DISTRIBUTORS AND PROCESSORS OF FROZEN ASPARAGUS - US/CANADA

COMPANY	CITY	ST	TELEPHONE	FAX
Cascadian Farm, Inc.	Concrete	WA	206-853-8175	206-853-8353
Chase Farms, Inc.	Walkerville	MI	616-873-3337	616-873-5699
Coloma Frozen Foods, Inc.	Coloma	MI	616-849-0500	NA
D & K Frozen Foods, Inc.	Walla Walla	WA	509-525-7890	NA
Delicious Foods Co.	Grand Island	NE	308-382-7770	308-382-0210
Fraser Valley Foods	Sardis, BC V2R 2R2	Canada	604-858-7151	604-858-3168
J.R. Wood, Inc.	Atwater	CA	209-358-5643	209-358-0543
Johnson Fruit & Cold Storage Co., Inc.	Sunnyside	WA	509-837-4214	NA
L.J. Rench & Co.	Dover	DE	302-736-6781	NA
McCain Foods Limited	NB E0J 1K0	Canada	506-392-5541	506-392-8156
Michigan Freeze Pack	Hart	MI	616-873-2175	616-873-3025
National Frozen Foods Corp.	Seattle	WA	206-322-8900	206-322-4458
Norcal-Crosetti Foods, Inc.	Watsonville	CA	408-722-8500	NA
Norpac Foods, Inc.	Stayton	OR	503-769-2101	503-769-5411
Peterson Farms, Inc.	Shelby	MI	616-861-6333	616-861-6550
Richard A. Shaw, Inc.	Watsonville	CA	408-728-2281	408-728-1458
Smeltzer Orchard Co.	Frankfort	MI	616-882-4421	616-882-4430
Sno Pac Foods	Caledonia	MN	507-724-5281	NA
Snowcrest Packers Ltd.	Abbotsford, BC V2S 4J8	Canada	604-859-4881	604-859-1426
Snyder & Sons, Inc.	Bedford, PQ J0J 1A0	Canada	514-861-6056	514-248-3175
Southern Frozen Foods	Montezuma	GA	912-472-8101	912-472-6351
Strathroy Foods	Strathroy, ON N7G 3J2	Canada	519-245-4600	519-245-3661
United Foods, Inc. Frozen Veg Division	Bells	TN	901-422-7600	NA

SOURCE: The Directory of the Canadian Frozen Processing Industry [illegible]

SELECTED DISTRIBUTORS AND PROCESSORS OF BROCCOLI AND CAULIFLOWER - US/CANADA

COMPANY	CITY	ST	TELEPHONE	FAX
Agripac, Inc.	Salem	OR	503-363-9255	503-371-5682
Alpac Foods, Inc.	Santa Maria	CA	805-928-4414	805-922-0671
Cascadian Farm, Inc.	Concrete	WA	206-853-8175	206-853-8353
Cobi Foods, Inc.	Port Williams, NS B0P 1T0	Canada	902-542-5722	NA
Cohen's Famous Frozen Foods, Inc.	Newark	NJ	201-824-2700	NA
Colby Starch Co.	Caribou	ME	207-496-0361	207-764-6474
Country Pride Foods Ltd.	Trenton, ON K8V 5R1	Canada	613-394-4111	613-394-3263
Delicious Foods Co.	Grand Island	NE	308-382-7770	308-382-0210
Fatima Food Products, Ltd.	Toronto, ON M6K 1P4	Canada	416-537-1213	NA
Fraser Valley Foods	Sardis, BC V2R 2R2	Canada	604-858-7151	604-858-3168
Frio Foods, Inc.	Uvalde	TX	512-278-4525	512-278-6317
International Frozen Foods	McAllen	TX	512-692-1491	512-686-6101
J.R. Simplot Co., Veg. Business Unit	Boise	ID	208-348-8000	NA
J.R. Wood, Inc	Atwater	CA	209-358-5643	209-358-0543
Lakeside Packing Co.	Manitowoc	WI	414-684-3356	NA
Little Farm Frozen Foods	Brownsville	TX	512-544-1919	NA
McCain Foods Limited	Florenceville, NB E0J 1K0	Canada	506-392-5541	506-392-8156
National Frozen Foods Corp	Seattle	WA	206-322-8900	206-322-4458
Norcal-Crosetti Foods, Inc.	Watsonville	CA	408-722-8500	NA
Norpac Foods, Inc.	Stayton	OR	503-769-2101	503-769-5411
Northland Frozen Foods Inc.	Fort Kent	ME	207-834-3702	207-834-3703
O'Donnell-Usen Fisheries Corp.	Boston	MA	617-542-2700	617-482-3527
Omstead Foods, Ltd.	Wheatley, ON N0P 2P0	Canada	519-825-4611	519-825-7144
Paris Foods Corp.	Trappe	MD	301-476-3185	301-476-3527
Patterson Frozen Foods, Inc.	Patterson	CA	209-892-2611	NA
Pillsbury Canada Ltd.	Willowdale, ON M2J 4Z5	Canada	416-494-2500	NA
Produce Processors Ltd.	Trenton, ON K8V 5R1	Canada	613-394-3317	613-394-3263
Richard A. Shaw, Inc.	Watsonville	CA	408-728-2281	408-728-1458
Rio Grande Foods	McAllen	TX	512-682-1368	NA

SOURCE: The Directory of the Canning, Freezing, Preserving Industries 1990-91

SELECTED DISTRIBUTORS AND PROCESSORS OF BROCCOLI AND CAULIFLOWER - US/CANADA

COMPANY	CITY	ST	TELEPHONE	FAX
Royal City Foods Ltd.	Burnaby, MC V5A 2T4	Canada	604-420-3510	604-420-8754
Seneca Foods Corp., Central Div.	Janesville	WI	608-752-7891	NA
Sno Pac Foods	Caledonia	MN	507-724-5281	NA
Snyder & Sons, Inc.	Bedford, PQ J0J 1A0	Canada	514-861-6056	514-248-3175
Southern Frozen Foods	Montezuma	GA	912-472-8101	912-472-6351
Stilwell Foods, Inc.	Stilwell	OK	918-696-7222	918-696-0646
Stouffer Foods Corp.	Solon	OH	216-248-3600	NA
United Foods, Inc., Frozen Veg. Div.	Bells	TN	901-422-7600	NA
Universal Packers, Inc.	Clearbrook, BC V2T 1V5	Canada	604-859-4743	604-859-1734
Valley Foreign Trading Co., Inc.	McAllen	TX	512-630-1124	512-630-1943
Value Frozen Foods, Inc.	Edcouch	TX	512-262-4723	NA
Wornick Family Foods Co.	Edinburg	TX	512-383-3877	512-383-0177

SELECTED DISTRIBUTORS AND PROCESSORS OF BRUSSELS SPROUTS - US/CANADA

COMPANY	CITY	ST	TELEPHONE	FAX
Alpac Foods, Inc.	Santa Maria	CA	805-928-4414	805-922-0671
Cobi Foods, Inc.	Port Williams, NS B0P 1T0	Canada	902-542-5722	NA
Country Pride Foods Ltd.	Trenton, ON K8V 5R1	Canada	613-394-4111	613-394-3263
Fraser Valley Foods	Sardis, BC V2R 2R2	Canada	604-858-7151	604-858-3168
J.R. Simplot Co., Veg. Business Unit	Boise	ID	208-348-8000	NA
J.R. Wood, Inc.	Atwater	CA	209-358-5643	209-358-0543
McCain Foods Limited	NB E0J 1K0	Canada	506-392-5541	506-392-8156
Norcal-Crosetti Foods, Inc.	Watsonville	CA	408-722-8500	NA
Omstead Foods, Ltd.	Wheatley, ON N0P 2P0	Canada	519-825-4611	519-825-7144
Paris Foods Corp.	Trappe	MD	301-476-3185	301-476-3527
Patterson Frozen Foods, Inc.	Patterson	CA	209-892-2611	NA
Pillsbury Canada Ltd.	Willowdale, ON M2J 4Z5	Canada	416-494-2500	NA
Richard A. Shaw, Inc.	Watsonville	CA	408-728-2281	408-728-1458
Rio Grande Foods	McAllen	TX	512-682-1368	NA
Royal City Foods Ltd.	Burnaby, BC V5A 2T4	Canada	604-420-3510	NA
Snowcrest Packers Ltd.	Abbotsford, BC V2S 4J8	Canada	604-859-4881	604-859-1426
Snyder & Sons, Inc.	Bedford, PQ J0J 1A0	Canada	514-861-6056	514-248-3175
Southern Frozen Foods	Montezuma	GA	912-472-8101	912-472-6351
Stilwell Foods, Inc.	Stilwell	OK	918-696-7222	918-696-6646
United Foods, Inc., Frozen Veg. Div.	Bells	TN	901-422-7600	NA
Universal Packers, Inc.	Clearbrook, BC V2T 1V5	Canada	604-859-4743	NA
Valley Foreign Trading Co., Inc.	MaAllen	TX	512-630-1124	512-630-1943

SOURCE: The Directory of the Canning, Freezing, Preserving Industries 1990-91

SELECTED DISTRIBUTORS AND PROCESSORS OF PEPPERS - US/CANADA

COMPANY	CITY	ST	TELEPHONE	FAX
Anchor Food Products, Inc.	Appleton	WI	414-734-2828	NA
Basic American Foods	San Francisco	CA	415-981-5590	NA
Bil Mar Foods, Inc.	Zeeland	MI	616-875-8131	NA
Border Foods, Inc.	Deming	NM	505-546-8863	NA
Bueno Food Products	Albuquerque	NM	505-243-2722	NA
Carando Gourmet Frozen Foods	Agawam	MA	413-786-9321	NA
Cascadian Farm, Inc.	Concrete	WA	206-853-8175	206-853-8353
Cedar Springs Cherry Growers Co-Op	Blenheim, ON N0P 1A0	Canada	519-676-8123	NA
Cleugh's Rhubarb Co.	Buena Park	CA	714-521-1002	714-670-1731
Cobi Foods, Inc.	Port Williams, NS B0P 1T0	Canada	902-542-5722	NA
Country Chef Foods, Inc.	Bronx	NY	212-792-9233	NA
Delicious Foods Co.	Grand Island	NE	308-382-7770	308-382-0210
Dickinson Frozen Foods, Inc.	Fruitland	ID	208-452-5200	208-452-5365
Diners Delite Foods Ltd.	Niagara Falls, ON L2E 6S6	Canada	416-295-4698	NA
Eckert Cold Storage	Manteca	CA	209-823-3181	209-823-2499
Garden State Packing Co.	Elm	NJ	609-561-2070	609-567-2934
Grasso Foods Inc.	Swedesboro	NJ	609-467-2222	609-467-5474
Snowcrest Packers Ltd.	ABbotsford, BC V2S 4J8	Canada	604-859-4881	604-859-1426

SELECTED DISTRIBUTORS AND PROCESSORS OF OKRA - US/CANADA

COMPANY	CITY	ST	TELEPHONE	FAX
Delicious Foods Co.	Grand Island	NE	308-382-7770	308-382-0210
Frio Foods, Inc.	Uvalde	TX	512-278-4525	512-278-6317
International Frozen Foods	McAllen	TX	512-682-1491	512-686-6101
Paris Foods Corp.	Trappe	MD	301-476-3185	301-476-3527
Richard A. Shaw, Inc.	Watsonville	CA	408-728-2281	408-728-1458
Rio Grande Foods	McAllen	TX	512-682-1368	NA
Southern Frozen Foods	Montexuma	GA	912-472-8101	912-472-6351
Stilwell Foods, Inc.	Stilwell	OK	918-696-7222	918-696-6646
United Foods, Inc., Frozen Veg. Div.	Bells	TN	901-422-7600	NA
Value Frozen Foods, Inc.	Edcouch	TX	512-262-4723	NA

SOURCE: The Directory of the Canning, Freezing, Preserving Industries 1990-91

SELECTED DISTRIBUTORS AND PROCESSORS OF LIMA BEANS - US/CANADA

COMPANY	CITY	ST	TELEPHONE	FAX
Alpac Foods, Inc.	Santa Maria	CA	805-928-4414	805-922-0671
Delagra Corp.	Bridgeville	DE	302-337-8206	NA
Hanover Brands, Inc.	Hanover	PA	717-632-6000	NA
J.G. Townsend, Jr. & Co.	Georgetown	DE	302-856-2525	302-855-0922
Lakeside Packing Co.	Manitowoc	WI	414-684-3356	414-684-8217
Paris Food Corp.	Trappe	MD	301-476-3185	301-476-3527
Patterson Frozen Foods, Inc.	Patterson	CA	209-892-2611	NA
Richard A. Shaw, Inc.	Watsonville	CA	408-728-2281	408-728-1458
Saulsbury Bros., Inc.	Ridgely	MD	301-634-2141	301-634-1901
Seabrook Brothers & Sons, Inc.	Seabrook	NJ	609-455-8080	609-455-9282
Southern Frozen Foods	Montezuma	GA	912-472-8101	912-472-6351
Stilwell Foods, Inc.	Stilwell	OK	918-696-7222	918-696-6646

SOURCE: The Directory of the Canning, Freezing, Preserving Industries, 1999-01

SELECTED BROKERS OF FROZEN FRUITS AND VEGETABLES - US/CANADA

COMPANY	CITY	STATE	TELEPHONE	FAX
American Frozen Marketing Inc.	McAllen	TX	512-631-7177	512-630-1757
Continental Processors Inc.	Concord	CA	415-827-2668	415-687-0813
DBB Marketing Company	San Francisco	CA	415-956-7860	415-956-3120
John Stanley Horne Co.	San Francisco	CA	415-781-6769	NA
Noon International Inc.	Oakland	CA	415-272-9661	415-839-6196
Valley Packing Service	Watsonville	CA	408-724-7551	408-728-5708

SOURCE: 1991 National Frozen Food Association Membership Directory

SELECTED DISTRIBUTORS AND PROCESSORS OF FROZEN FRUITS AND VEGETABLES - EUROPE

COMPANY	COUNTRY	TELEPHONE	FAX
Ardovries NV	Belgium	(051) 31 06 21	(051) 30 59 97
Boreal	Belgium	(051) 74 69 81	(051) 74 69 88
Comfood B.V.	Holland	03444 1914	03444 3529
D'Arta Belgium	Belgium	051-74 69 91	051-74 69 68
Danisco A/S Svendborg Fabrikker	Denmark	+45-62 21 25 06	+45-62 21 77 90
Distibucions Jordi	Spain	977-23 48 14	977-23 48 28
Emborg Foods Aalborg A/S	Denmark	+45 98 13 12 54 19	+45 98 12 54 19
Frost Impex N.V.	Belgium	32 56 66 53 01	32 56 66 83 08
Frosta France	France	(1) 45746092	NA
Gelagri Bretagne	France	(33) 98 25 30 00	(33) 98 25 32 78
Gustav Wulff	West Germany	040 32 81 92-0	040 33 7751
H.P. Esper	West Germany	02103 6706	0213 8212
Helmink Groep B.V.	Holland	+31 8352-56111	+31 8352 56333
Ijsboerke France S.A.R.L.	France	(0) 33-28 48 16 42	NA
John Stanley Horne Co.	USA	415-781-6789	NA
Keizer B.V.	The Netherlands	(+4168)2196	1865
Malcolm Burton	UK	(0) 44-782 637 197	NA
MDC Foods Lts.	UK	0582 460014	0582 461661
Mister T Ltd.	UK	0372 69869	0372 66977
O.D.C. Italia s.r.l.	Italy	0309-901733	0309-901734
O.D.C. Picaway Ltd.	UK	0472-361377	0472-240085
Peter Collins Foods Ltd.	UK	0293 776771	0293 820560
Pinguin Romenstr.3 B	Belgium	051 77 87 91	051 77 83 82
Sunbird Foods Limited	U.K.	0990 27323	0990 872108
Top Frost International Ltd.	U.K.	081-942 9424	081-336 1214
Vivermont	France	75 58 11 15	NA
Walter Kaiser	Germany	(0) 49-6047 4306	NA

SELECTED DISTRIBUTORS AND PROCESSORS OF FROZEN FRUITS AND VEGETABLES - JAPAN

COMPANY	CITY	COUNTRY	FAX
A-OH Co., Ltd.	Tokushima City, Tokushima 770	Japan	81-886-54-2405
Fuso Trading Co., Ltd.	Tsukiji, Chuo-Ku, Tokyo 104	Japan	03-542-0598
Ikeda Tohka Industries Co., Ltd.	Fukuyama-shi, Hiroshima 720	Japan	8133-558-6234
JAL Trading, Inc.	Shibaura, Minato-ku,Tokyo 108	Japan	8133-456-8016
Kansai Boeki K.K.	Kyogo-Ku, Kobe 652	Japan	078-681-7609
Mitsuboishi Boiki Limited	Chuo-ku, Kobe, Hyogo, Tokyo 101	Japan	8178-391-5324
Shin-Nippon Commerce, Inc.	Tsukiji, Chuo-ku, Tokyo 104	Japan	8133-545-0507
Shinyei Kaisha	Chuo-ku, Kobe 650	Japan	078-332-0217
Shoei Foods Corporation	Taito-ku, Tokyo 110	Japan	03-253-0063
Showa Boeki Co., Ltd.	Nishi-ku, Osaka 550	Japan	81-06-444-6060
T. Waico & Co., Ltd.	Higashi-Nada-ku, Kobe 658	Japan	8178-451-3225
Toshin Trading Co., Ltd.	Shinagawa-ku, Tokyo 140	Japan	81-33-298-1806

SOURCE: JETRO (Japanese External Trade Organization)

APPENDIX III - TROPICAL FRUIT JUICES, PULPS & CONCENTRATES

III - 1. Imports of Fruit & Vegetable Juices, by Major Markets, 1984 - 1988

III - 2. Exports of Fruit & Vegetable Juices, by Major Suppliers, 1984 - 1988

III - 3. Selected Recent New Product Introductions: Fruit Juices

III - 4. Selected Recent New Product Introductions: Fruit Drinks

III - 5. Fruit Juice Sales & Imports

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Imports of fruit and vegetable juices, by major markets, 1984-1988
(in millions of United States dollars)

Importing country/area	1984		1985	1986	1987	1988	
	Value	% of total	Value	Value	Value	Value	% of total
United States	1,090.02	38.9	822.77	868.97	974.30	1,119.35	27.9
Germany, Fed. Rep. of	312.14	11.1	359.85	416.92	530.45	66[illegible].23	16.6
United Kingdom	225.93	8.1	243.69	226.36	323.67	412.99	10.3
Netherlands	145.41	5.2	165.66	177.28	245.92	316.52	7.9
Canada	231.21	8.3	240.56	206.81	238.52	249.19	6.2
France	124.89	4.5	131.43	138.19	182.27	246.47	6.1
Belgium-Luxembourg	64.30	2.3	69.28	86.52	98.55	123.93	3.1
Japan	36.23	1.3	79.38	61.42	78.02	114.37	2.9
Italy	23.67	0.8	32.84	43.67	67.53	85.78	2.1
Sweden	48.03	1.7	41.80	47.03	58.43	76.71	1.9
Saudi Arabia	154.00	5.5	117.91 a/	89.31	78.56	70.00 b/	1.7
Switzerland	35.66	1.3	38.55	39.85	52.34	65.12	1.6
Denmark	30.70	1.1	30.60	33.73	44.12	58.73	1.5
Israel	37.66	1.3	22.02	21.21	31.12	56.93	1.4
Austria	33.03	1.2	41.85	47.47	62.04	56.53	1.4
Spain	9.93	0.4	8.67	11.60	22.45	40.24	1.0
Finland	14.16	0.5	14.04	14.03	21.10	31.72	0.8
Norway	18.75	0.7	19.00	21.87	30.26	29.75	0.7
Korea, Rep. of	5.78	0.2	7.53	4.58	10.35	22.86	0.6
Ireland	11.68	0.4	12.03	14.54	14.95	18.91	0.5
Greece	1.88	0.1	2.64	4.16	6.61	17.90	0.4
New Zealand	9.32	0.3	10.89	6.56	14.14	14.83	0.4
Singapore	8.50	0.3	8.91	9.01	9.98	14.43	0.4
Hong Kong	9.94	0.4	8.78	10.43	12.44	14.23	0.4
Kuwait	13.42	0.5	12.00 b/	11.66	10.00 b/	10.00 b/	0.3
Portugal	1.70	0.1	1.27	1.81	3.12	7.52	0.2
Venezuela	2.90	0.1	3.78	2.73	4.92	6.19	0.2
Poland	8.93	0.3	6.36	6.12	6.04	6.00 b/	0.2
Panama	4.14	0.1	5.93	7.00	8.85	5.97	0.1
Yugoslavia	3.77	0.1	3.05	3.90	4.90	5.65	0.1
Australia	33.65	1.2	18.02	10.04	6.65	5.00 b/	0.1
Others	48.87	1.7	40.11	35.41	48.[illegible]	41.83	1.0
Total	2,801.20	100.0	2,624.20	2,680.19	3,300.74	4,012.88	100.0

Source: COMTRADE Data Base of the United Nations Statistical Office.

a/ National import statistics.
b/ ITC estimates.

Exports of fruit and vegetable juices, by major suppliers, 1984-1988 a/
(in millions of United States dollars)

Origin	1984		1985	1986	1987	1988	
	Value	% of total	Value	Value	Value	Value	% of total
Brazil	1,258.21	45.2	1,028.26	923.36	1,180.27	1,538.21	38.3
United States	250.16	9.0	244.20	205.20	256.94	323.08	8.[illegible]
Netherlands	125.49	4.5	148.86	168.37	238.50	308.21	7.7
Germany, Fed. Rep. of	156.79	5.6	159.08	227.63	261.00	307.41	7.7
Israel	164.09	5.9	195.40	150.50	210.59	270.84	6.8
Italy	128.39	4.6	145.12	158.30	193.12	193.82	4.8
Belgium-Luxembourg	51.75	1.9	57.45	91.20	96.63	115.80	2.9
Mexico	60.62	2.2	13.84	33.26	58.80	98.15	2.4
Argentina	50.68	1.8	52.91	57.31	84.68	92.80	2.3
Austria	44.32	1.6	51.12	60.43	75.45	65.97	1.6
Spain	31.74	1.1	39.05	39.99	47.93	60.86	1.5
France	28.12	1.0	36.11	50.28	56.32	57.62	1.4
Poland	21.48	0.8	30.53	48.94	46.38	48.17	1.2
Morocco	15.17	0.5	25.25	22.26	11.37	41.62	1.0
Philippines	31.43	1.1	36.11	39.93	40.60	40.23	1.0
Denmark	29.45	1.1	23.50	33.18	37.52	39.30	1.0
Thailand	13.02	0.5	17.68	22.40	22.46	34.05	0.8
South Africa	23.36	0.8	24.03	27.55	21.86	31.93	0.8
United Kingdom	14.95	0.5	15.70	17.04	22.57	27.85	0.7
Hungary	9.65	0.3	14.89	20.16	35.37	24.24	0.6
Belize	11.53	0.4	11.79	11.49	15.04	22.84	0.6
Switzerland	19.14	0.7	12.38	23.78	26.69	20.78	0.5
Yugoslavia	12.56	0.5	12.93	12.57	17.38	17.36	0.4
Japan	81.63	2.9	61.54	41.78	23.47	16.04	0.4
Australia	3.84	0.1	6.10	17.58	16.48	15.[illegible]5	0.4
Chile	5.39	0.2	5.95	13.85	15.10	15.46	0.4
Canada	14.62	0.5	12.65	18.13	14.90	15.30	0.4
Kenya	9.20	0.3	9.71	11.22	11.95	12.49	0.3
New Zealand	5.57	0.2	5.49	10.13	8.81	11.41	0.3
Turkey	4.20	0.2	5.71	4.57	10.86	10.45	0.3
Greece	14.01	0.5	14.11	8.15	13.74	8.93	0.2
Korea, Rep. of	1.30	0.0	2.10	5.08	6.76	8.44	0.2
Colombia	3.59	0.1	2.37	2.36	6.17	7.95	0.2
USSR	0.93	0.0	2.56	5.22	8.04	7.58	0.2
Cyprus	6.24	0.2	6.24	7.87	8.01	7.11	0.2
Peru	3.43	0.1	4.96	5.61	5.19	6.66	0.2
Portugal	2.67	0.1	2.04	3.51	4.46	5.63	0.1
Cuba	2.48	0.1	1.76	3.03	1.68	5.50	0.1
India	8.62	0.3	5.75	5.33	5.01	4.81	0.1
Czechoslovakia	2.17	0.1	2.99	4.05	5.94	4.40	0.1
Ireland	9.33	0.3	6.16	5.59	6.17	4.37	0.1
Bulgaria	3.56	0.1	5.18	7.23	5.56	4.35	0.1
China (Taiwan Province)	4.47	0.2	4.66	2.95	2.66	3.41	0.1
Jamaica	4.24	0.2	4.29	3.54	2.76	3.35	0.1
Egypt	7.86	0.3	3.71	2.40	2.81	3.07	0.1
United Arab Emirates	3.39	0.1	3.43	3.25	3.91	2.80	0.1
Singapore	3.40	0.1	3.22	4.16	2.97	2.71	0.1
Ecuador	0.30	0.0	1.35	2.62	2.08	2.49	0.1
Sweden	1.02	0.0	1.25	1.77	1.86	2.37	0.1
Others	25.33	0.9	44.13	26.92	34.42	37.60	0.9
Total	2,784.89	100.0	2,609.34	2,667.85	3,289.24	4,011.37	100.0

Source: COMTRADE Data Base of the United Nations Statistical Office.

a/ Based on import figures.

SELECTED RECENT NEW PRODUCT INTRODUCTIONS: FRUIT JUICES

Manufacturer	Product	Description
Coca-Cola Foods	Minute Maid Pink Grapefruit Juice	Frozen concentrate in a 6- or 12-oz. size, sold in supermarkets nationally.
	Minute Maid Pulp-Free Orange Juice	Available in 12-oz. frozen cans, 64-oz. cartons, and 96-oz. bottles. Sold in supermarkets nationally.
	On The Go Juices	Six flavors are orange, pineapple, apple, grapefruit, concord punch, and fruit punch. Sold in 10-oz. bottles.
Cold Hollow Cider Mill	Cold Hollow Cider Mill Juices	A line of apple and apple-fruit juice blends. Sold nationally in gourmet stores, in 10-oz. and 1-liter glass bottles.
Dole	Paradise Fruit Juice Blends	Two varieties: Pine-Orange-Guava and Pine-Passion-Banana. Available in 12-oz. frozen concentrates for $1.69 or 64-oz. cartons for $2.69.
Ferraro's Fine Juices	Juice Flavors	Four flavors added to the line: Papaya, Spirulina, Tangerine, and Garden Vegetable. Sold in 10-oz. paper cartons, nationally, in health food stores.
Goya Foods	Apple Juice	Addition to line of juices sold nationally in supermarkets, a 10-oz. bottle retails for 69¢.

Table Continued . . .

SELECTED RECENT NEW PRODUCT INTRODUCTIONS: FRUIT JUICES

Manufacturer	Product	Description
After the Fall	Organic Juices	Five juice flavors sold in 32-oz. bottles in health food stores nationally.
Apple & Eve	Natural Cranberry Juice Blend	Blend of cranberry, pear, apple, and white grape juice. Sold in supermarkets in the Northeast, in 48-oz. glass bottles.
Applemaid (Div. of JWI)	Fit For Life 100% Pure Apple Juice Cider	Fresh-pressed juice, one of many products bearing the "Fit For Life" label. Sold in supermarkets nationally, in bottles.
Chiquita Brands	Caribbean Splash Juice	Blend of pineapple, banana, mango, and guava juice. Sold nationally in supermarkets, in 64-oz. refrigerator containers.
	Tropical Squeeze Juice	Pear, banana, pineapple, and passionfruit blend, in half-gallon containers.
Citrus World	Citrus Juices	Ruby Red 100% Pure Grapefruit Juice and Home Squeezed Style Orange Juice added to line. In Southeast supermarkets, 64-oz. size.
	Donald Duck Pineapple Orange Juice	Features Donald Duck on the package. Sold in southern supermarkets in four-packs of 10-oz. bottles, for $1.99 per pack.

Table Continued . . .

(Continued)

SELECTED RECENT NEW PRODUCT INTRODUCTIONS: FRUIT JUICES

Manufacturer	Product	Description
Heinke's	Berry Juices	For health food buyers, varieties are Berry Patch, a blend of apple juice and four exotic berries; and Mountain Raspberry, a blend of apple juice and raspberries. Sold nationally, in 32-oz. bottles.
H.P. Hood	Natural Blenders	Apple/Raspberry added to the line. Upscale adult packaging, sold in New England supermarkets, in plastic quarts.
Knudsen	Kiwi Juices	Kiwi Nectar and Kiwi Lime Cooler, sold in health food stores, in 32-oz. glass bottles.
	Nectars	Peach Nectar and Raspberry Nectar in aseptic containers.
	Orange Juice Concentrate	Organically grown, sold in gourmet stores nationally, in 12-oz. canned concentrate.
	Premier Juices	Five flavors added to the line of shelf-stable juices, sold nationally in health food stores, in 32-oz. glass bottles.

Table Continued . . .

(Continued)

SELECTED RECENT NEW PRODUCT INTRODUCTIONS: FRUIT JUICES

Manufacturer	Product	Description
Land O' Lakes	Fruit Juice	Three additions to the line: Tropic Orange, Grapefruit, and Orange-Pineapple-Banana. Sold nationally in supermarkets, in plastic half-gallons.
	Pure Choice Florida Squeezed Orange Juice	Not from concentrate, sold in half-gallons and 6-oz. trial sizes.
Mott's (Cadbury Schweppes)	Mott's Fruit Punch	Shelf-stable, 8.45-oz. aseptically boxed.
Natural Fruit Products	White House Apple Juice	Sold in Florida supermarkets, in 32-oz. Tetra Pak paper boxes.
Nestle	Juicy Juice	Two flavors added to the line: Apple Grape and Berry. Sold in 46-oz. cans for $1.75 each.
	Juicy Juice Concentrate	Shelf-stable concentrate in three flavors: Punch, Cherry, and Berry. Sold in New York City supermarkets, a 12.8-oz. container makes 64 fluid ounces.
	Libby Ripe Nectars	Five flavors, sold in four-packs of 8-oz. bottles. Sold in Boston supermarkets for $2.19.

Table Continued . . .

(Continued)

SELECTED RECENT NEW PRODUCT INTRODUCTIONS: FRUIT JUICES

Manufacturer	Product	Description
New Age Distributors	True Lime Juice	Sold in 8-oz. bottles, test marketing in Miami supermarkets.
Ocean Spray	Sweetened Concord Grape Juice Concentrate	Offers 100% of RDA for vitamin C. In juice boxes.
Seneca Foods	Liquid Concentrate Apple Juice	Each two-pack container of this shelf-stable liquid concentrate makes 42 ounces of juice. Being tested by Seneca in Louisville, Kentucky supermarkets.
Sierra Hills Packing	Specialty Apple Juices	Granny Smith Apple Juice and Fuji Apple Juice, available in Minneapolis supermarkets for $2.79 per 44-oz. bottle.
Treesweet	Pink Grapefruit Juice	Frozen concentrate, sold nationally for $1.79 per 12-oz. can.
Tree Top	Apple Juice Blends	Frozen concentrates in two varieties: Apple Citrus Juice and Apple Raspberry Juice. Sold nationally in supermarkets for $1.33 per 12-oz. can.
Tropicana	Orange Strawberry Banana Juice	Sold in 23-oz. refrigerated containers.

Table Continued . . .

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SELECTED RECENT NEW PRODUCT INTRODUCTIONS: FRUIT JUICES

Manufacturer	Product	Description
Upstate Milk Cooperative	Upstate Farm Juices	Orange-pineapple, orange, and apple juices sold in 1-quart refrigerated cartons.
Welch	Apple Orange Pineapple Juice	New fruit juice blends in quart bottles.
	First Press Grape Juice	Made from 100% concord grapes. Test marketing in Grand Junction, Colorado for $2.39 per 32-oz. bottle.

Source: Compiled by Business Trend Analysts

SELECTED RECENT NEW PRODUCT INTRODUCTIONS: FRUIT DRINKS

Manufacturer/Marketer	Product	Description
Aloha Pacific	Chiller Fruit Drinks	Intended for children, each 6-oz. bottle has a built-in straw. All four flavors available in Denver supermarkets, retailing at 33¢ each.
Capri Sun	Safari Punch	A blend of orange, passionfruit, kiwi, and mango flavors. Sold in 10-pouch boxes.
	Capri Sun 3-Packs	Four flavors: Fruit Punch, Maui Punch, Orange, and Raspberry Apple. Sold in three-packs of 6.75-oz. aseptic boxes.
Citrus World	Bluebird Juice Flavors	Three new flavors: Pink Grapefruit, Cocktail Orange-Banana Drink, and Papaya Punch. Sold in supermarkets nationally, in 11.5-oz. cans.
Coca-Cola Foods	Minute Maid Citrus Punch	In 64-oz. refrigerator cartons or 8- and 16-oz. frozen cans. In supermarkets nationally.
Cosmos International	Dinosaurs Creamy Coolers	Fruit-flavored drinks in straw bottles. Four varieties are: Triceraptops-Yellow, Tyrannosauraus Rex-Green, Apatosaurus-Pink, and Pteranodon-Blue. Sold nationally in supermarkets, 6.1-oz. size retails for 39¢.
Del Monte USA	Fruit Blends	Apple Cherry, Apple Cranberry, and Grape Apple in 8.45-oz. aseptic boxes.

Table Continued . . .

SELECTED RECENT NEW PRODUCT INTRODUCTIONS: FRUIT DRINKS

Manufacturer/Marketer	Product	Description
Del Monte	Hawaiian Punch Passion Fruit	Contains 10% fruit juice (a combination of seven fruits). Sold in aseptic packages, 1-quart bottles, 46-oz. cans, and 12-oz. frozen concentrates.
Fresh Juice	Just Pik't Lemonade	Addition to the line of nonpasteurized juices shipped frozen and sold frozen or refrigerated. An 8.45-oz. screw-top bottle is available in supermarkets.
General Foods	Berry Blue Kool-Aid	Sold in 0.21-oz. envelopes.
	Kool-Aid Picnic Pak	Eleven ounces of Kool-Aid mix in an HDPE collapsible bottle that expands as water is added. One bottle makes eight quarts. Chicago supermarkets are test-marketing Cherry and Lemonade flavors for $2.79 per bottle.
	Kool-Aid Purplesaurus Rex Grape Lemonade	Powder concentrate, in sugar-sweetened 6-oz. and 24-oz. sizes, and unsweetened in envelopes.
	Tang-Flavors	Mixed Fruit and Cherry Fruit flavored drinks in 8.45-oz. aseptic boxes.
	Tang Tropical Orange Punch	Sold in six-packs of 8.4-oz. bottles, in supermarkets nationally.

Table Continued . . .

(Continued)

SELECTED RECENT NEW PRODUCT INTRODUCTIONS: FRUIT DRINKS

Manufacturer/Marketer	Product	Description
Goya Foods	Passion Fruit Juice Cocktail	Sold nationally in supermarkets, in 10-oz. bottles for 69¢ each.
Heinke's	Honey-Sweetened Juices	Two varieties: Organic Honey Strawberry and Organic Honey Apricot. Sold nationally in health food stores, in 32-oz. bottles.
Iberia Foods	Coco-Pina Tropical Nectar	Coconut-pineapple flavored beverage, sold in Miami supermarkets, in 7- and 12-oz. cans.
Lipton	Wyler's Big Squeeze Fruit Drinks	Contain 10% fruit juice, in Fruit Punch, Orange, Grape, and Cherry flavors. Sold in six-packs of 8-oz. plastic bottles; remove the cap and squeeze the bottle to drink.
Ocean Spray	Cran-Strawberry Drink	Being test-marketed in Cleveland supermarkets. Sold in 48-oz. bottles.
	Diet Cranberry Juice Cocktails	Sweetened with NutraSweet, in 64-oz. cartons.
Santa Cruz Natural	Natural Organic Orangeade	Made with Valencia oranges, wild honey, and mountain spring water. Sold in health food stores, in bottles.

Table Continued . . .

(Continued)

SELECTED RECENT NEW PRODUCT INTRODUCTIONS: FRUIT DRINKS

Manufacturer/Marketer	Product	Description
Santa Cruz Natural (cont'd.)	Organic Apple Raspberry, Orange Sunshine	Two new flavors made from spring water, wild honey, and juice. sold in health food stores, in 32-oz. bottles.
Stroh Brewery	Sundance Sparkler	Three flavors added to the line: Sour Cherry, Tropical Lemon, and Black Currant.
Sun Dew Sales	Sun Dew Guzzlers Juice Drinks	Available in eight flavors. Sold in East Coast supermarkets, in 16-oz. bottles.
Tree-Ripe	Strawberry Daquiri Mix	Strawberry flavor, with a touch of lime juice. Sold in supermarkets, nationally, in glass liter bottles.
Tropicana Products	Tropicana Twister Flavors	Orange Raspberry and Orange Peach added to line. Sold nationally in supermarkets, in 46-oz. glass bottles.
Veryfine	Pink Grapefruit Juice Cocktail	The twenty-third flavor in the Veryfine line. Available in Northeast supermarkets in 10- and 16-oz. Plasti Shield bottles and 11.5-oz. cans.
Welch	Cranberry Orange Juice Cocktail	Marketed as a breakfast beverage, sold nationally in supermarkets, in 12-oz. frozen concentrate.

Table Continued . . .

(Continued)

SELECTED RECENT NEW PRODUCT INTRODUCTIONS: FRUIT DRINKS

Manufacturer/Marketer	Product	Description
White Rock Products	Old Style Lemonade	Contains 10% lemon juice. Sold in East Coast supermarkets at $1.49 for a three-pack of 12-oz. boxes.
Wisdom Import Sales	Tamarindo Mexican Soft Drink	The company describes this as a sweet-spicy fruit drink with a flavor like iced tea. Sold nationally in supermarkets, in six-packs of 11.5-oz. bottles.

Source: Compiled by Business Trend Analysts

FRUIT JUICE/NECTAR SALES IN FRANCE

(In '000 litres)

	1987	1988	1989
Juices			
Orange	101 008	120 166	147 139
Apple	45 077	49 654	49 031
Grape	31 605	32 751	33 594
Pineapple	15 216	20 459	25 126
Grapefruit	14 367	18 756	24 978
Cocktail	4 122	4 180	7 335
Tomato	5 451	6 018	6 399
Vegetable	508	812	1 080
Others	1 986	2 606	3 200
Total	219 340	255 402	297 862
Nectars			
Orange	7 701	11 371	18 914
Apricot	8 616	9 222	11 153
Tropical	4 197	5 961	5 352
Pear	2 175	3 045	3 457
Others	10 924	13 048	14 244
Total	33 613	42 647	53 120
TOTAL	252 953	298 049	351 002

Source: Union Nationale des Producteurs de Jus de Fruits.

FRENCH IMPORTS OF FRUIT JUICE CONCENTRATES

(In metric tons)

	1987	1988	1989
ORANGE			
Israel*	34 491	19 538	25 896
Brazil	18 060	12 770	14 371
Morocco	5 624	8 747	12 810
Spain	3 745	8 776	8 871
USA	5 909	554	825
Italy	1 931	414	610
Other countries	20 009	7 592	11 657
Total	89 769	58 391	75 040
GRAPEFRUIT			
Israel*	9 082	9 771	NA
USA	2 397	3 074	NA
Brazil	1 566	2 166	NA
Morocco	122	841	NA
Other countries	4 002	3 870	NA
Total	17 169	19 722	NA
PINEAPPLE			
Philippines	1 707	2 493	3 071
Netherlands	1 262	1 308	1 816
Belgium	1 835	1 922	1 616
Ivory Coast	2 193	755	1 335
Kenya	613	1 344	1 168
Brazil	166	409	349
Other countries	2 735	2 695	5 474
Total	10 511	10 926	14 829

*Including bases/syrups.
Source: Direction Nationale des Statistiques du Commerce Extérieur.

GERMAN IMPORTS OF FRUIT JUICES/CONCENTRATES

(In metric tons)

	Full year 1988	Full year 1989	Jan.-Sept. 1990
Orange			
Brazil	148 111	156 661	124 459
Israel	15 868	17 002	11 340
Italy	8 261	11 750	10 703
Morocco	7 809	11 255	6 228
Netherlands	3 233	3 494	2 920
Spain	3 529	2 480	1 983
Other countries	16 556	15 877	18 690
Total	203 367	218 519	176 323
Grapefruit			
Israel	5 349	3 626	3 263
Argentina	1 841	2 581	2 099
USA	2 535	1 960	1 466
Brazil	587	1 532	1 073
South Africa	614	1 375	779
Other countries	2 070	1 809	2 813
Total	12 996	12 883	11 493
Pineapple			
Thailand	1 120	3 107	2 088
South Africa	1 103	2 473	2 085
Brazil	1 415	2 889	2 000
Kenya	112	100	511
Mexico	342	493	412
Philippines	304	334	144
Other countries	1 589	519	1 497
Total	5 985	9 915	8 737

Source: Statistisches Bundesamt.

IMPORTS OF FRUIT JUICES/CONCENTRATES INTO JAPAN

(In '000 litres)

	1985	1986	1987	1988	1989	1990
Apple†	—	—	—	3 955	14 868	42 724
Orange						
— frozen	14 998	12 660	10 810	10 129	12 937	23 023
— non-frozen*	—	—	—	1 019	7 712	6 045
Grapefruit	5 182	5 867	8 748	11 088	11 061	11 731
Lemon	2 611	2 997	3 120	3 729	7 873	9 952
Grape	3 865	3 466	3 828	5 423	7 489	7 539
Pineapple	284	329	516	427	623	5 034
Lime	183	208	79	52	87	131
Others	464	4 410	5 609	—	—	—
Total	31 769	29 937	32 710	35 822	62 650	106 179

*Mainly ready-to-drink product. †Clear 70° brix and cloudy 40° brix product.
Source: Federation of Fruit Juice Agricultural Co-operatives.

Europe: major suppliers, market requirements for, and import prices of, selected tropical fruit juices and other products in bulk packs, August 1981

Product / Origin	Normal form	Strength (Brix) a/	Hot-packed/frozen aseptic	Indicative price ($ c.i.f./ton)
Passion fruit				
Brazil, Kenya, Colombia, Peru, Sri Lanka, Ecuador, Burkina Faso, Venezuela, Costa Rica, India	Juice, single-strength Concentrate	12° - 15° 21° - 30° 50°	Hot packed/frozen Frozen Frozen	1,000-1,100 (single s.) 3,500 (50°)
Mango				
Brazil, India, Mexico, Philippines, Colombia, Côte d'Ivoire, Haiti, Peru, Taiwan Province (China), Mali, Guatemala, Venezuela, Thailand	Pulp Concentrate Slices	13° - 18° 28° - 30°	Hot-packed/frozen Frozen/Aseptic IQF	700 (single s. 15°) 1,300 (concentrate) 2,200 (slices)
Guava				
Taiwan Province (China), India, Philippines, South Africa, Mexico, Brazil, Peru, Colombia, Venezuela, Thailand	Pulp	8° - 14°	Hot-packed/frozen	600 - 700
Pineapple				
Côte d'Ivoire, South Africa, Kenya, Thailand, Philippines, United States (Hawaii), Brazil, Mexico, Swaziland, Venezuela, Honduras	Pulp; juice, single-strength Concentrate	15° 60°	Hot-packed/frozen Mainly frozen	 1,300 (concentrate)
Papaya				
India, Malaysia, Taiwan Province (China), Mexico, Brazil, Colombia, Malaysia, Costa Rica, Thailand	Pulp Concentrate	10° - 13°) 25°)	Mainly hot-packed; also frozen	600 (pulp) 2,200 (concentrate)
Banana				
Honduras, Guatemala, El Salvador, Nicaragua, Panama, Costa Rica, Brazil, Ecuador, Peru	Purée Slices		Hot-packed/aseptic Frozen Hot-packed	800 (purée)
Cashew				
Brazil	Pulp and concentrate	60°		-
Kiwi				
New Zealand, United States (California), France, Italy, Spain, Chile, Israel	Pulp and purée Slices	12° - 14°) 45° - 65°)	Frozen IQF	700 - 800 (single s.) 2,500 (45°) 2,500 (slices)
Pomegranate				
Peru, Brazil, Colombia, Mexico, the Caribbean	Pulp Concentrate	14°) 50°)	Hot-packed and frozen	-
Naranjilla/lulo				
Brazil, Peru, Colombia, Ecuador	Pulp Concentrate	15°) 60°)	Hot-packed and frozen	-
Umbu				
Brazil	Purée	8° - 11°	Frozen	-
Caja				
Brazil	Purée	9° - 12°	Frozen	-
Cherimoya				
Mexico, Venezuela, Philippines, Brazil, Colombia, Ecuador	Pulp	14°	Hot-packed	1,500 - 1,600
Acerola (Barbados cherry)				
Brazil, the Caribbean	Purée Concentrate	7° - 8° 16°	Frozen Frozen	-

Source: Trade sources in the Federal Republic of Germany.

a/ Concentration in per cent of sugar by weight according to the Brix scale

Europe: major suppliers, market requirements for, and import prices of, selected tropical fruit juices and other products in bulk packs, August 1990

Product / Origin	Normal form	Strength (Brix) a/	Hot-packed/frozen aseptic	Indicative price ($ c.i.f./ton)
Passion fruit				
Brazil, Kenya, Colombia, Peru, Sri Lanka, Ecuador, Burkina Faso, Venezuela, Costa Rica, India	Juice, single-strength Concentrate	12° - 15° 24° - 30° 50°	Hot packed/frozen Frozen Frozen	1,000-1,100 (single s.) 3,500 (50°)
Mango				
Brazil, India, Mexico, Philippines, Colombia, Côte d'Ivoire, Haiti, Peru, Taiwan Province (China), Mali, Guatemala, Venezuela, Thailand	Pulp Concentrate Slices	13° - 18° 28° - 30°	Hot-packed/frozen Frozen/Aseptic IQF	700 (sinc s. 15°) 1,300 (concentrate) 2,200 (slices)
Guava				
Taiwan Province (China), India, Philippines, South Africa, Mexico, Brazil, Peru, Colombia, Venezuela, Thailand	Pulp	8° - 14°	Hot-packed/frozen	600 - 700
Pineapple				
Côte d'Ivoire, South Africa, Kenya, Thailand, Philippines, United States (Hawaii), Brazil, Mexico, Swaziland, Venezuela, Honduras	Pulp; juice, single-strength Concentrate	15° 60°	Hot-packed/frozen Mainly frozen	 1,300 (concentrate)
Papaya				
India, Malaysia, Taiwan Province (China), Mexico, Brazil, Colombia, Malaysia, Costa Rica, Thailand	Pulp Concentrate	10° - 13°) 25°)	Mainly hot-packed; also frozen	600 (pulp) 2,200 (concentrate)
Banana				
Honduras, Guatemala, El Salvador, Nicaragua, Panama, Costa Rica, Brazil, Ecuador, Peru	Purée Slices		Hot-packed/aseptic Frozen Hot-packed	800 (purée)
Cashew				
Brazil	Pulp and concentrate	60°		-
Kiwi				
New Zealand, United States (California), France, Italy, Spain, Chile, Israel	Pulp and purée Slices	12° - 14°) 45° - 65°)	Frozen IQF	700 - 800 (single s.) 2,500 (45°) 2,500 (slices)
Pomegranate				
Peru, Brazil, Colombia, Mexico, the Caribbean	Pulp Concentrate	14°) 50°)	Hot-packed and frozen	-
Naranjilla/lulo				
Brazil, Peru, Colombia, Ecuador	Pulp Concentrate	15°) 60°)	Hot-packed and frozen	-
Umbu				
Brazil	Purée	8° - 11°	Frozen	-
Caja				
Brazil	Purée	9° - 12°	Frozen	-
Cherimoya				
Mexico, Venezuela, Philippines, Brazil, Colombia, Ecuador	Pulp	14°	Hot-packed	1,500 - 1,600
Acerola (Barbados cherry)				
Brazil, the Caribbean	Purée Concentrate	7° - 8° 16°	Frozen Frozen	-

Source: Trade sources in the Federal Republic of Germany.
a/ Concentration in per cent of sugar by weight according to the Brix scale.

SWISS IMPORTS OF FRUIT JUICE CONCENTRATES

(In metric tons)

	1988	1989
PINEAPPLE		
Brazil	325	405
South Africa	69	130
Philippines	34	104
Other countries	217	245
Total	645	884

Source. Eidgen, Oberzolidirektion

NORWEGIAN IMPORTS OF FRUIT JUICE CONCENTRATES

(In metric tonnes)

	1987	1988	1989
PINEAPPLE			
Netherlands	40	178	73
Kenya	—	32	28
Philippines	19	25	17
Other countries	62	94	70
Total	121	329	188

FINNISH IMPORTS OF FRUIT JUICE CONCENTRATES

(In metric tonnes)

	1987	1988	1989
PINEAPPLE			
Israel	406	594	433
Philippines	•	253	367
Thailand	•	249	347
Brazil	78	82	186
Kenya	—	96	96
Other countries	167	120	188
Total	651	1 394	1 617

AUSTRIAN IMPORTS OF FRUIT JUICE CONCENTRATES

(In metric tons)

	1988	1989
PINEAPPLE		
Brazil	173	NA
Philippines	33	NA
Thailand	17	NA
Other countries	37	NA
Total	260	NA

Source: Osterreichisches Statistisches Zentralamt.

SWEDISH IMPORTS OF FRUIT JUICE CONCENTRATES

(In metric tonnes)

	1987	1988	1989
PINEAPPLE			
USA	134	104	146
Brazil	74	141	134
Philippines	133	97	104
Israel	60	44	32
Other countries	881	362	453
Total	1 282	748	869

IMPORTS OF FRUIT JUICE CONCENTRATE INTO JAPAN

(In '000 litres)

	1987	1988	1989	1990
PINEAPPLE				
Philippines	226	282	391	2 572
USA	20	3	36	846
Thailand	—	139	127	765
Brazil	—	—	66	419
Other countries	1	4	3	432
Total	247	428	623	5 034

Source. Japan Tariff Association

PINEAPPLE JUICE CONCENTRATE EXPORTS BY MAJOR SUPPLY SOURCES

(In metric tonnes)

	1985	1986	1987	1988	1989
Thailand					
USA	15062	18598	17427	20879	32828
Netherlands	482	1581	5257	7649	9461
Spain	*	*	*	4086	4196
UK	263	186	63	150	1048
West Germany	180	447	561	498	896
Saudi Arabia	358	366	298	504	520
Other countries	1106	2214	4614	6401	9686
Total	**17451**	**23392**	**28220**	**40167**	**58635**
Average export price in Baht per tonne fob	**17763**	**15437**	**15864**	**16697**	**NA**
Philippines					
USA	19212	18566	22834	21187	27023
Spain	559	533	585	1066	2115
Netherlands	1022	2350	2639	2509	1452
Israel	678	817	933	1441	428
Belgium/ Luxembourg	780	337	331	358	185
France	228	202	176	349	107
Middle East	540	224	359	249	*
UK	215	510	56	189	*
Other countries	1087	2499	3981	1751	1203
Total	**24321**	**26038**	**31894**	**29099**	**32513**
Average export price in US$ per tonne fob	**NA**	**678**	**623**	**589**	**NA**
Brazil					
Netherlands	4727	7016	6855	7035	NA
USA	5333	3871	3512	1304	NA
Middle East	289	166	543	545	NA
West Germany	724	21	13	396	NA
UK	32	490	263	222	NA
Spain	268	222	50	101	NA
Canada	95	36	18	164	NA
Finland	257	72	50	70	NA
Other countries	1293	462	607	1337	NA
Total	**13018**	**12356**	**11911**	**11264**	**11776**
Average export price in US$ per tonne fob	**972**	**849**	**904**	**851**	**762**
Mexico					
USA	1201	5980	8685	NA	NA
Argentina	166	1825	1593	NA	NA
Saudi Arabia	36	—	—	NA	NA
Other countries	11	509	1291	NA	NA
Total	**1414**	**8314**	**11569**	**NA**	**NA**
Average export price in US$ per tonne fob	**1030**	**500**	**500**	**NA**	**NA**
Kenya					
Netherlands	3065	2187	3294	6165	NA
UK	2637	3504	3341	2627	NA
France	246	613	497	*	NA
Other countries	500	2623	1795	19	NA
Total	**6448**	**8927**	**8927**	**8811**	**12000**
Average export price in Keh per tonne	**18025**	**14826**	**16201**	**16827**	**NA**

*Included in other countries. Source: FOODNEWS based on National Statistics.

USA IMPORTS OF BANANA PULP†

(In metric tons)

	1985	1986	1987	1988	1989
Ecuador	—	—	440	948	5277
Honduras	4216	5074	4335	3916	3507
Panama	2586	3641	5788	6315	2283
Costa Rica	2359	2360	3315	4565	2147
Other countries	821	636	513	473	3441
Total	9984	11711	14391	16217	18655

†Figures include banana products other than pulp.
Source: US Bureau of Census

EEC IMPORTS OF BANANA PULP*

(In metric tons)

	1988	1989
West Germany	14256	14077
Netherlands	6531	7966
France	3619	4821
UK	4810	4781
Italy	1405	2475
Belgium/ Luxembourg	1662	1526
Denmark	254	396
Rep. of Ireland	189	100
Spain	27	93
Greece	—	26
Portugal	11	20
Total EEC (12)	32764	36281
A) of which from "third" countries:		
Brazil	3653	6051
Philippines†	4655	3584
Panama	3020	3465
Honduras	2619	2986
India†	1803	1582
Thailand	938	1030
Ecuador	216	771
P.R. of China	1055	442
Costa Rica	102	155
Other countries	3589	4262
Total "third"	21700	24528
B) Total Intra-EEC trade	11065	11952

*Customs no 2008 9949 incl. unspecified quantities of other fruit pulps. †High share of imports consists of other pulps.
Source: EUROSTAT.

WORLD EXPORTS OF PASSION FRUIT JUICE/CONCENTRATE

(In metric tons)

	1985	1986	1987	1988	1989
Brazil	3265	5370	8173	8382	7051
Peru†	3437	1988	3382	2032	2000
Colombia	NA	1985	4777	7215	3887
Total	6702	9343	16332	17629	12438
Average shipment price from Brazil in US$/ tonne fob	1009	1496	2908	2295	1582

Source: National Statistics †1989 estimate.

EEC IMPORTS OF TROPICAL FRUIT JUICES/CONCENTRATES

	1986	1987	1988	1989*
Brazil	5129	4694	6388	4837
Colombia	418	1432	3783	2579
Peru	2132	433	941	1187
Thailand	364	509	1099	1178
Ecuador	525	380	496	454
Venezuela	149	527	136	353
USA	156	153	493	345
Sri Lanka	617	729	415	240
Mexico	•	•	183	164
India	237	169	410	137
South Africa	302	68	211	77
Kenya	126	97	114	62
Other countries	NA	NA	689	627
Total EEC	10155	9191	15358	12240

Source: EUROSTAT/FOODNEWS. *Jan-Sept only.

REPORT IM146
PERIOD 12-90

U.S. IMPORTS FOR CONSUMPTION (CUSTOMS VALUE)
CURRENT MONTH AND CUMULATIVE, JANUARY TO DATE

COUNTRY	CSC	CURRENT MONTH COUNT	QTY-1	QTY-2	CUSTOM VAL	CAL DUTY	RP	CUMMULATIVE, JANUARY TO DATE COUNT	QTY-1	QTY-2	CUSTOM VAL	CAL DUTY
0811901000BANANAS AND PLANTAINS, UNCOOKED OR COOKED BY STEAMING OR BOILING IN WATER, FROZEN, WHETHER OR NOT SWEETENED												
MEXICO	GSP		37194 KG		27880		18		64664 KG		49983	
MEXICO			37194 KG		27880				64664 KG		49983	
GUATMAL	CBA		KG						21263 KG		9113	
GUATMAL			KG				18		21263 KG		9113	
HONDURA	OGN		92786 KG		33627	2522	61		92786 KG		33627	2522
HONDURA	GSP		KG				18		80655 KG		116868	
HONDURA	CBA		13452 KG		20360		18		436963 KG		253801	
HONDURA			106238 KG		53987	2522			610404 KG		404296	2522
C RICA	GSP		KG				18		15201 KG		22139	
C RICA	CBA		387662 KG		214972		18		4493704 KG		2484023	
C RICA			387662 KG		214972				4508905 KG		2506162	
DOM REP	CBA		KG				18		23694 KG		17322	
DOM REP			KG						23694 KG		17322	
VENEZ	OGN		280 KG		1260	95	61		280 KG		1260	95
VENEZ			280 KG		1260	95			280 KG		1260	95
ECUADOR	GSP		KG				18		16295 KG		4300	
ECUADOR			KG						16295 KG		4300	
THAILND	GSP		4264 KG		7755		18		14395 KG		25344	
THAILND			4264 KG		7755				14395 KG		25344	
PHIL R	OGN		KG				61		232 KG		1380	104
PHIL R	GSP		KG				18		20462 KG		25234	
PHIL R			KG						20694 KG		26614	104
0811901000		32	535538		305854	2617		313	5280594		3044394	2721
0811902000BLUEBERRIES, UNCOOKED OR COOKED BY STEAMING OR BOILING IN WATER, FROZEN, WHETHER OR NOT SWEETENED												
CANADA	OGN		299838 KG		553839		10		7065641 KG		12375391	
CANADA			299838 KG		553839				7065641 KG		12375391	
SWEDEN	OGN		KG				10		540 KG		1307	
SWEDEN			KG						540 KG		1307	
N ZEAL	OGN		1704 KG		1988		10		1704 KG		1988	

0811204000 - 0811902000

SUPPLEMENTARY TRADE STATISTICS

- Exports of Passion Fruit Juice and Concentrate
- Exports of Passion Fruit Juice/Concentrate from Brazil
- Exports of Passion Fruit Juice/Concentrate from Peru
- Exports of Mango Juices and Concentrates
- Main Importers of Mango Juices
- Exports of Mango Pulp from India
- Imports of Mango and Guava Juices into Saudi Arabia
- Guava Volumes Processed
- Guava Production in South America
- Guava Paste and Pulp Imported into the U.S.
- Papaya Production
- Papaya Paste and Pulp Imported into the U.S.
- Imports of Papaya Juice into Japan
- Summary of Philippine Pineapple & Product Exports

EXPORTS OF PASSION FRUIT JUICE AND CONCENTRATE

(Data in Tons)

	1983	1984	1985	1986	1987	1988
Brazil	6,936	5,115	3,265	5,370	8,173	7,512
Peru	623	2,392	3,437	1,988	3,382	2,032
Sri Lanka	1,494	444	302	n.a.	n.a.	n.a.
Colombia	n.a.	n.a.	n.a.	1,559	4,636	n.a.
Kenya	336	329	135	174	278	n.a.

Sources: National Trade Statistics. Tropical Fruits, Fresh/Processed - A Survey of World Trends in Mangos, Guavas, Papayas, and Passion Fruits. Written and researched by Karine Yourassowski. Published by F.N. Research and Marketing, Ltd., England.

EXPORTS OF PASSION FRUIT JUICE/CONCENTRATE FROM BRAZIL

(Data in Tons)

	1983	1984	1985	1986	1987
Netherlands	4,550	4,086	2,429	4,743	7,140
United States	159	83	203	124	512
South Africa	287	447	256	175	131
France	-	-	-	219	97
West Germany	644	149	318	50	30
Others	1,269	350	59	59	262
TOTAL	6,909	5,115	3,265	5,370	8,172

Note: Total for 1988 was 7,513 tons.

EXPORTS OF PASSION FRUIT JUICE/CONCENTRATE FROM PERU

(Data in Tons)

	1983	1984	1985	1986	1987
Netherlands	166	1,556	2,498	1,183	1,939
United States	64	225	211	430	605
France	248	166	158	84	50
Japan	n.a.	n.a.	202	20	39
West Germany	11	326	87	97	25
Others	134	109	181	174	724
TOTAL	623	2,392	3,437	1,988	3,382

Note: Total for 1988 was 2,032 tons.

Source: Tropical Fruits, Fresh/Processed - A Survey of World Trends in Mangos, Guavas, Papayas, and Passion Fruits. Written and researched by Karine Yourassowski. Published by F.N. Research and Marketing, Ltd., England.

EXPORTS OF MANGO JUICES AND CONCENTRATES

(Data in tons)

	1983	1984	1985	1986	1987
India*	14,281	6,474	12,767	6,767	1,246
Taiwan	9,489	1,764	1,078	855	314
Pakistan*	4	134	12	11	35
TOTAL**	23,774	8,372	13,857	7,653	1,595

* Year 83-84=84

** Note: Not all countries report exports for this category. This is not the world total - only the exports of those countries that report.

Source: Tropical Fruits, Fresh/Processed - A Survey of World Trends in Mangos, Guavas, Papayas, and Passion Fruits. Written and researched by Karine Yourassowski. Published by F.N. Research and Marketing, Ltd., England.

MAIN IMPORTERS OF MANGO JUICES

(Data in tons)

	1983	1984	1985	1986	1987
From India					
Yemen	1,344	1,310	1,167	2,566	326
USSR	11,228	2,464	8,926	2,598	355
All Others	1,709	2,700	2,674	1,623	565
Total	14,281	6,474	12,767	6,787	1,246
From Taiwan					
Kuwait	346	315	304	257	204
Saudi Arabia	7,955	1,181	411	-	-
U.A.E.	568	98	16	4	-
All Others	620	169	1,094	594	110
TOTAL	9,489	1,763	1,078	855	314

EXPORTS OF MANGO PULP FROM INDIA

(Data in tons)

	1983/84	84/85	85/86	86/87
Yemen	3,312	4,488	9,410	2,951
Saudi Arabia	2,534	2,796	5,187	1,832
U.A.E.	1,281	683	1,016	1,108
E.E.C.	686	451	1,115	1,794
TOTAL	9,530	10,751	20,299	9,861

Note: Exports doubled from India in the 1985/86 season. This caused a substantial glut on the market with severe price reaction. Exports returned to more normal levels in the 1986/87 season.

Source: Tropical Fruits, Fresh/Processed - A Survey of World Trends in Mangos, Guavas, Papayas, and Passion Fruits. Written and researched by Karine Yourassowski. Published by F.N. Research and Marketing, Ltd., England.

IMPORTS OF MANGO AND GUAVA JUICES INTO SAUDI ARABIA

(Data in Tons and Thousands of Dollars)

Source	1983 tons / dollars	1984 tons / dollars	1985 tons / dollars	1986 tons / dollars	1987 tons / dollars
India	1,920	3,030	5,496	4,784	6,313
	$1,601	$2,424	$4,151	$3,960	$4,387
China	8,129	2,627	44	-	20
	$4,722	$1,467	$403	-	$27
Egypt	6,168	5,795	2,985	2,272	2,852
	$7,302	$6,746	$3,354	$2,194	$2,435
Cuba	7,885	2,676	1,348	2,037	1,289
	$9,276	$2,423	$1,071	$1,084	$573
Total	24,656	14,732	13,823	10,636	15,062
	$23,378	$13,493	$11,344	$8,120	$10,261

Source: Tropical Fruits, Fresh/Processed - A Survey of World Trends in Mangos, Guavas, Papayas, and Passion Fruits. Written and researched by Karine Yourassowski. Published by F.N. Research and Marketing, Ltd., England.

GUAVA VOLUMES PROCESSED (Data in Tons)

	South Africa	Venezuela	Hawaii
1984	19,548	1,118	3,150
1985	16,372	3,943	4,288
1986	21,502	3,160	7,708
1987	n.a.	10,927	8,122

Note: Includes both juice/puree and canned processed guava.

GUAVA PRODUCTION IN SOUTH AFRICA (Data in Tons)

	1985	1986	1987
Juices/Puree	18,680	25,026	20,700

Source: D. Hicks, The Production and Packaging of Non-Carbonated Fruit Juices and Beverages.

GUAVA PASTE AND PULP IMPORTED INTO THE U.S.

(Data in Tons and Thousands of Dollars)

Source	1985 tons dollars	1986 tons dollars	1987 tons dollars	1988 tons dollars
Dominican Republic	1,906 $863	1,698 $908	1,840 $926	2,225 $952
Brazil	1,624 $1,199	3,338 $1,557	1,739 $1,294	2,424 $1,462
Australia	- -	324 $168	386 $271	1,187 $576
TOTAL	3,833 $2,342	6,295 $3,345	4,330 $2,781	6,551 $3,440

Source: Tropical Fruits, Fresh/Processed - A Survey of World Trends in Mangos, Guavas, Papayas, and Passion Fruits. Written and researched by Karine Yourassowski. Published by F.N. Research and Marketing, Ltd., England.

PAPAYA PRODUCTION (Data in 1,000 tons)

	1983	1984	1985	1986	1987
Brazil	758	1,536	1,410	2,108	1,517
Mexico	317	765	660	676	388
Indonesia	241	269	255	315	380
India	270	300	350	286	337
Zaire	160	160	165	170	170
Taiwan	73	77	93	91	117
Malaysia	62	57	58	48	39
Hawaii	28	36	27	27	30
Others	407	745	425	430	422
TOTAL	2,316	3,945	3,443	4,151	3,400

Note: These figures are for countries that record production only. Many countries such as Australia, Thailand, Costa Rica and Colombia grow substantial amounts of papaya but do not record them.

PAPAYA PASTE AND PULP IMPORTED INTO THE U.S.
(Data in Tons and Thousands of Dollars)

Source	1985 tons / dollars	1986 tons / dollars	1987 tons / dollars	1988 tons / dollars
Costa Rica	108 / $116	199 / $129	189 / $105	143 / $61
Dominican Republic	- / -	- / -	- / -	80 / $34
TOTAL	259 / $205	516 / $287	410 / $248	334 / $159

IMPORTS OF PAPAYA JUICE INTO JAPAN
(Data in Tons and Thousands of Dollars)

Source	1984 tons	1984 $'s	1985 tons	1985 $'s	1986 tons	1986 $'s	1987 tons	1987 $'s
Sri Lanka	16	295	8	101	4	65	6	124

Source: Tropical Fruits, Fresh/Processed - A Survey of World Trends in Mangos, Guavas, Papayas, and Passion Fruits. Written and researched by Karine Yourassowski. Published by F.N. Research and Marketing, Ltd., England.

SUMMARY OF PHILIPPINE PINEAPPLE & PRODUCT EXPORTS
(Data in Metric Tons)

	1988	1989	1990 (estimated)
Fresh	154,864	152,055	150,000
Canned	182,840	193,493	195,000
Other Processed	3,991	3,625	3,500
Sgl-Strength Juice	28,348	34,226	35,000
Concentrated Juice	29,099	32,513	33,000

Source: USDA/FAS, Horticultural Products Review.

STANDARDS AND SPECIFICATIONS

- Concentrated Pineapple Juice Specifications
- Passion Fruit Juice Specifications
- Guava Juice Specifications
- Papaya Juice Specifications

Camerican International, Inc

CONCENTRATED PINEAPPLE JUICE SPECIFICATIONS

Concentrated pineapple juice is the juice obtained by mechanical process (which may be centrifuged, but not filtered) from the flesh of sound, ripe pineapples, which is then evaporated by suitable means to a solids content specified by Camerican. It contains finely divided insoluble solids (pulp), but is free from pieces of skin, seeds and other coarse or hard substances. It is free from 'off' odors and flavors and shall have a typical, wholesome pineapple flavor and odor.

1. Where Brix is specified, it is determined by refractometer reading, not corrected for acidity.

2. Where preservatives are called for, it means 0.1% sodium benzoate and 0.1% potassium sorbate, by weight.

3. Brix/acid ratio of all products should be between 18 and 30.

4. Pulp content of concentrate should be such that when reconstituted to single strength, the pulp content will be between 5% and 10%, as determined by the method in the FDA Standard of Identity.

5. No added sugars or acids are permitted in any of these concentrates.

6. Bacteriological requirements:

   a. 72% Brix concentrate with preservatives - yeast and mold content is less than 100 of each per gram.

   b. 60-72% Brix frozen (no preservatives) - yeast and mold content is less than 100 of each per gram.

   c. 60-65% Brix aseptic packaging - packed in Scholle bags or bins - yeast and mold content less than 10 of each per gram.

P.O. BOX 216 Teaneck, N.J. 07666 Tel. (201) 833-2000

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All frozen concentrates and unpreserved concentrates must be stored and shipped at 0°F (-17.8°C).

All equipment, personnel practices and processing operations shall be in accordance with good manufacturing practices.

All deliveries shall be guaranteed to comply with all standards of the U. S. Food & Drug Administration.

Product shall be packed in #10 tins, new steel 55 gallon drums or in 300 gallon Scholle bags as requested by Camerican. Each container shall be labeled with ingredient name, net weight, concentration in degrees, brix, production lot number, Camerican's name and reference number, and country of origin.

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PASSION FRUIT JUICE SPECIFICATIONS

PHYSICAL DESCRIPTION

Passion fruit juice is the product obtained by pressing the yellow passion fruit (Passiflora Edulis var. flavicarpa). The skins and seeds have been removed. For production of puree, only the peel must be removed, seeds may be left in the product.

The juice should have not more than 20% of pulp, whereas the pulp content of puree may run from 50 to 100% of the original fruit insoluble solids.

Both the juice and the puree may be evaporated by heat to produce a product with total soluble solids of 50 to 65%. Natural essence, obtained during evaporation, may be returned to the final juice or puree, to bring the flavor to the original strength, subject to prior agreement.

PRESERVATIVES

Preservatives may not be added except by prior agreement. If sulfites are added, the level must be below 10 ppm on the single-strength basis.

BRIX

The soluble solids by refractometer of single-strength juice should be in the range of 14 to 17%. No added sweeteners are permitted.

ACIDITY

No organic acids may be added. Acidity of single-strength product should be 3.0 to 5.0%, w/w, calculated as citric acid.

COLOR

No artificial or synthetic 'natural' colors are permitted. The color of the juice should be typical of the fruit and should be free from browning.

ODOR & FLAVOR

Odor and flavor should be typical and strong enough to be readily identifiable. They should be free from metallic, fermented, bitter, foreign or other objectionable odors and flavors.

PASSION FRUIT JUICE SPECIFICATIONS - PAGE 2

EXTRANEOUS MATTER

The juice must be free from mold, insects, insect fragments, leaves, stems, peel and other foreign matter.

MICROBIOLOGICAL

Yeast - 500 organisms/gm maximum
Mold - 100 organisms/gm maximum

PESTICIDES & HEAVY METALS

The juice must comply with applicable regulatory tolerances for pesticides, heavy metals and mycotoxins.

SHIPPING & STORAGE

Single-strength and concentrated products should be shipped and stored frozen, at a temperature of -18 degrees C.

May 1990

GUAVA JUICE SPECIFICATIONS

DESCRIPTION

Guava juice is the liquid prepared from properly matured, sound clean guavas. Peel, seeds and stone cells have been removed. Guava juice may be clarified or contain up to 20% pulp. A puree containing 50% pulp may also be prepared for special use by prior arrangement. A concentrate containing 25 to 30% soluble solids prepared by evaporation with heat and low pressure might also be requested.

PRESERVATIVES

Preservatives may not be added except by prior agreement.

BRIX

Soluble guava solids by refractometer shall be not less than 7% on single-strength juice or puree. No added sweeteners are permitted.

ACIDITY

No organic acids may be added. pH of the juice should be in the range of 3.4 to 3.8.

COLOR

No artificial or synthetic 'natural' colors are permitted. The color of the juice should be a medium to strong pink with no browning.

ODOR & FLAVOR

The product should have a normal, mildly sour flavor, typical of guava juice. The odor should be strong enough to be identifiable. It should be free from metallic, fermented, bitter, foreign or other objectionable odors and flavors.

GUAVA JUICE SPECIFICATIONS - Page 2

EXTRANEOUS MATTER

The juice must be free from mold, insects, insect fragments, leaves, stems, peel and other foreign matter.

MICROBIOLOGICAL

Yeast - 500 organisms/gm maximum
Mold - 100 organisms/gm maximum

PESTICIDES & HEAVY METALS

The juice must comply with applicable regulatory tolerances for pesticides, heavy metals and mycotoxins.

SHIPPING & STORAGE

Single-strength and concentrated products should be shipped and stored frozen, at a temperature of -18 degree C.

April 1990

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Camerican International, Inc

PAPAYA JUICE SPECIFICATIONS

DESCRIPTION

Papaya juice is the liquid prepared from properly matured, sound, clean papayas (Carica papaya). Peel and seeds have been removed. The juice should have not more than 20% of pulp, whereas papaya puree should have 50 to 100% of the insoluble solids of the original fruit.

Both the juice and the puree may be evaporated by heat to produce a concentrate with total soluble solids of 50 to 65%. Natural essence, obtained during evaporation, may be returned to the final juice or puree to restore the flavor to its original strength, subject to prior agreement.

PRESERVATIVES

Preservatives may not be added except by prior agreement. If sulfites are added, the level must be below 10 ppm on the single-strength basis.

BRIX

Soluble solids by refractometer of single-strength juice or puree should be in the range of 10 to 13%. No added sweeteners are permitted.

ACIDITY

If pH is above 4.2, then citric acid may be added to the juice or puree and the pH adjusted to 4.0.

COLOR

No artificial or synthetic 'natural' colors are permitted. The color of the juice should be typical of the fruit and should be free from browning or darkening.

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ODOR & FLAVOR

Odor and flavor should be typical and strong enough to be readily identifiable. They should be free from metallic, fermented, bitter, foreign or other objectionable odors and flavors.

EXTRANEOUS MATTER

The juice must be free from mold, insects, insect fragments, leaves, stems, peel and other foreign matter.

MICROBIOLOGICAL

Yeast - 500 organisms/gram maximum
Mold - 100 organisms/gram maximum.

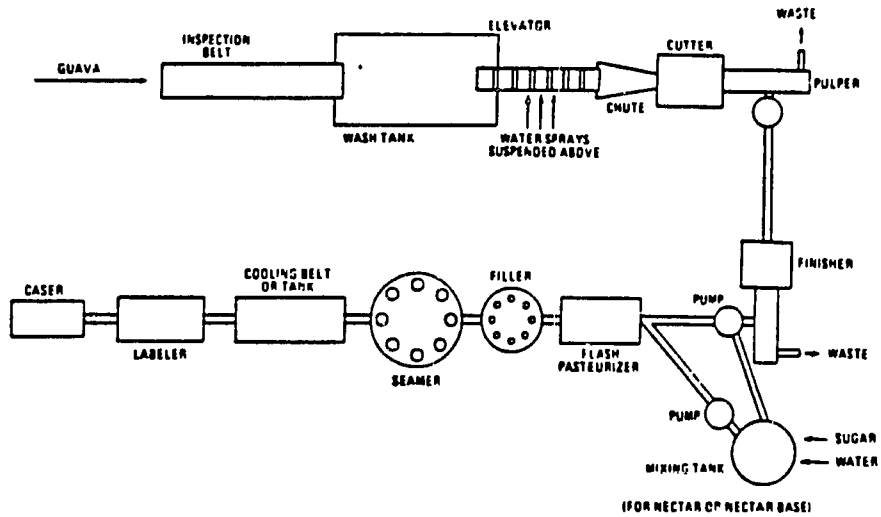
PESTICIDES & HEAVY METALS

The juice must comply with applicable regulatory tolerances for pesticides, heavy metals and mycotoxins.

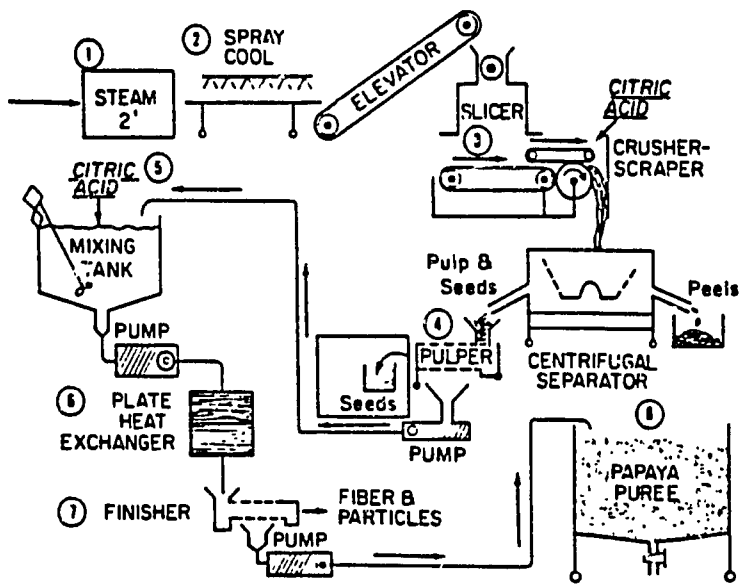
SHIPPING & STORAGE

Single-strength and concentrated products should be shipped and stored frozen, at a temperature of -18 degrees C.

12/04/85



Flow sheet for guava processing line. The pasteurizer and cooling belt are bypassed for frozen products. (From Boyle et al. 1957.)



Papaya puree processing.

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SELECTED TRADE CONTACTS

- Selected Distributors & Processors of Trop Fruits, Pulps & Conc. - US/Canada
- Selected Importers, Distributors & Processors of Trop Fruits, Pulps & Conc. - Europe
- Selected Distributor & Processor of Trop Fruits, Pulps & Conc. - Japan

SELECTED DISTRIBUTORS AND PROCESSORS OF TROP FRUITS, PULPS AND CONCENTRATES - US/CANADA

COMPANY	CITY	STATE	TELEPHONE	FAX
Able Sales	Catano	Puerto Rico	809-788-4141	809-788-6470
Adams Packing Association Inc.	Auburndale	FL	813-967-4431	NA
American Fruit Processors	Pacoima	CA	818-899-9574	818-899-6042
Ancel Products Inc.	Miami	FL	305-325-8444	NA
Berzi Foods Inc.	Baie D'Urfe, PQ H9X 3T5	Canada	514-457-4080	514-457-4499
Butland Industries Ltd.	Caledon, ON L0N 1C0	Canada	519-927-5201	NA
Caribbean Select, Inc.	Highland City	FL	813-646-1418	813-646-5618
Citrus World, Inc.	Lake Wales	FL	813-676-1411	NA
Coca-Cola Foods	Houston	TX	713-888-5000	713-888-5054
Combined Products Co.	Lilburn	GA	404-972-1110	NA
Del Monte Foods	San Francisco	CA	415-442-4000	NA
Dole Packaged Foods, Co.	San Francisco	CA	415-986-3000	415-986-7064
Eau Claire Packing Co.	Eau Claire	MI	616-461-6984	616-461-6254
Erly Foods Group	Houston	TX	713-876-3759	713-876-2643
Everfresh Juice Co.	Franklin Park	IL	708-833-8440	708-833-8452
Fairlee Fruit Juice Ltd.	Rexdale, ON M9W 1L4	Canada	416-244-4224	NA
Flavors From Florida, Inc.	Bartow	FL	813-533-0408	NA
Florida Bottling Inc.	Miami	FL	305-324-5932	305-325-9573
Foremost Dairys Inc.	San Francisco	CA	415-546-1600	NA
Golden Gem Growers, Inc.	Umatilla	FL	904-669-2101	NA
Goya De Puerto Rico, Inc.	Bayamon	Puerto Rico	809-740-4900	809-740-5040
Gregory Packing Inc.	Neward	NJ	201-465-1113	NA
Heinke's Inc.	Paradise	CA	916-877-4847	NA
Home Juice Co.	Melrose Park	IL	312-379-3000	NA
Hood Inc. HP	Boston	MA	617-242-0600	NA
Industrias La Famosa, G.P.O.	San Juan	Puerto Rico	809-251-0060	809-780-1615
JB Food Industries, Inc.	Oakville, ON L6L 5W2	Canada	416-827-8200	NA
John Stanley Horne Co.	San Francisco	CA	415-781-6789	NA
Juice Bowl Products, Inc.	Lakeland	FL	813-665-5515	813-665-5330
Knudsen & Sons, Inc.	Chico	CA	916-891-1517	NA
L & A Juice Co., Ind.	City of Industry	CA	818-336-1666	818-961-2021

SOURCE: Various

SELECTED DISTRIBUTORS AND PROCESSORS OF TROP FRUITS, PULPS AND CONCENTRATES - US/CANADA

COMPANY	CITY	STATE	TELEPHONE	FAX
Leonard's Sytups	Detroit	MI	313-891-4141	NA
Libby's FIDCO Unit	Westchester	NY	914-241-3000	NA
Ludford's	Rancho Cucamonga	CA	818-243-9384	NA
McCain Citrus Inc.	Chicago	IL	312-762-9000	312-762-1856
Morco Food Products of Mississippi, Inc.	Jackson	MS	601-948-8570	NA
Moser Farms	Rockville	CT	203-872-8346	NA
Nestle Foods Corp.	Purchase	NY	914-251-3000	NA
Ocean Spray Cranberries Inc.	Plymouth	MA	617-747-1000	NA
Ocean Spray Cranberries, Inc.	Lakeville-Middleborough	MA	508-946-1000	NA
Orange-Co of Florida Inc.	Lake Hamilton	FL	813-439-1585	NA
Pride Beverages, Ltd.	Burnaby, BC V5A 3L8	Canada	604-420-5556	604-420-1733
Silver Springs Citrus	Howey-In-The-Hills	FL	904-324-2101	NA
Specialty Foods, Inc.	Sulphur Springs	TX	214-885-0881	214-885-9875
Stevens Tropical Plantation, Inc.	West Palm Beach	FL	407-683-4701	NA
Stokes of Vincentown	Vincentown	NJ	609-859-2251	609-859-1792
Sun Pac Foods, Ltd.	Brampton, ON I7G 4S8	Canada	416-792-2700	416-792-8490
Sun Squeeze Juices, Inc.	Guelph, ON N1H 7M4	Canada	519-837-2130	NA
Sundor Canada Inc.	Toronto, ON M5W 1C5	Canada	416-730-5995	416-730-4122
Sunsational Juice Ltd.	Moncton, NB B1C 8T6	Canada	506-857-8049	506-857-8087
Texas Citrus Exchange	Mission	TX	512-585-8321	NA
The H.R. Nicholson Co.	Baltimore	MD	301-764-2323	301-764-9125
Tropical Fruit Products, Co., Inc.	San German	Puerto Rico	809-892-1345	NA
Tropicana Products, Inc.	Bradenton	FL	813-747-4461	NA
Ventura Coastal Corp.	Ventura	CA	805-653-7000	805-653-7777
Veryfine Products, Inc.	Westford	MA	508-692-0030	508-692-9481
Welch's	Westfield	NY	716-326-3131	NA
Whitfield Foods, Inc.	Montgomery	AL	205-263-2541	205-262-4203
Whitlock Packaging Corp.	Ft. Gibson	OK	918-478-4300	NA

SOURCE: Various

SELECTED IMPORTERS, BROKERS AND AGENTS OF TROP FRUIT, PULPS AND CONCENTRATES - US/CANADA

COMPANY	CITY	STATE	TELEPHONE	FAX
BMT Commodities	New York City	NY	NA	212-759-4505
Camerican	Teaneck	NJ	201-833-2000	201-833-9511
Daystar International	Lake Success	NY	516-328-3900	516-358-0508
Hartog Foods International Inc.	New York	NY	212-687-2000	212-687-2659
Henry Broch & Co.	Skokie, Chicago	IL	312-676-2244	NA
ITI (International Trade Impact Inc.)	Lawrenceville	NJ	609-987-0550	609-987-0252
Sunbase U.S.A. Inc.	Ocala	FL	904-351-5355	NA

SOURCE: Various

SELECTED IMPORTERS, DISTRIBUTORS AND PROCESSORS OF TROP. FRUITS, PULPS AND CONC. - EUROPE

COMPANY	COUNTRY	TELEPHONE	FAX
A.B.V.I.E.	France	(1) 43 44 68 77	(1) 43 43 57 44
Cargill BV	The Netherlands	(020) 580 1911	(020) 868 715
Clive Webster Ltd.	United Kingdom	(0483) 811433	(0483) 810920
David Berryman Ltd.	United Kingdom	(0923) 852457	(0923) 857797
Euro Citrus BV	The Netherlands	(01620) 27900	(01620) 54397
Exotrop Products Ltd.	Switzerland	(061) 312 36 66	(061) 311 58 11
First Day Lawson Citrus Ltd.	United Kingdom	(071) 488 0777	(071) 488 9927
Frost Impex	The Netherlands	32 56 66 5301	32 56 66 8308
Gargill	United Kingdom	020 580 1911	020 86 8715
H.J. Uren & Sons Ltd.	United Kingdom	051 342 6276	051 342 8604
Hartwick & Kaden	Fed. Rep. of Germany	(040) 363061	(040) 364358
Hawall Ananas-Import Ges.	Fed. Rep. of Germany	(040) 23 08 18	NA
Heinrich Harmsen GmbH	Fed. Rep. of Germany	(04102) 51336	(04102) 56866
Hikoma AG	Switzerland	(061) 505595	(061) 312009
INDUPRO BV	The Netherlands	(010) 4051234	(010) 4055175
Jack L. Isreal Ltd.	United Kingdom	(0932) 569 600	(0932) 569 582/3/4
Kemna Trading GMBH	Fed. Rep. of Germany	04181 6048	04181 33441
Kiril Mischeff Ltd.	United Kingdom	(071) 9288966	(071) 261 9085
Klaus Bocker GmbH	Fed. Rep. of Germany	(04161) 4012	(04161) 3536
KoelAgri BV	The Netherlands	(1640) 57088	(1640) 52728
Mandy SPRL	Belgium	(02) 347 09 48	(02) 343 82 46
Medibel N.V.	Belgium	32.3 647 23 83	32.3 647 24 31
Mondi BV	The Netherlands	(01806) 14433	NA
Narexim AG	Switzerland	(042) 216 664	(042) 217 464
Passi Ltd.	Switzerland	(062) 454444	(062) 454436
Passi Ltd.	Switzerland	062 454444	062 454436
Pittrex Handelsgesellschaft mbH	Fed. Rep. of Germany	(040) 682 90 91	(040) 682 90 94
Rickertsen Getranke Vertrieb GmbH	Fed. Rep. of Germany	(040) 23 71 71	(040) 2371 7211
S & S Services Ltd.	United Kingdom	(071) 828 9351/6	(071) 630 6303

SOURCE: Various

SELECTED IMPORTERS, DISTRIBUTORS AND PROCESSORS OF TROP. FRUITS, PULPS AND CONC. - EUROPE

COMPANY	COUNTRY	TELEPHONE	FAX
S.A. Medibel N.V.	Belgium	(03) 647 23 83	(03) 647 24 31
S.C.E. Bureau Couacou	France	59 23 69 50	59 41 12 82
Standard Ubersee Handels	West Germany	040 441041	040 443060
Standard Ubersee Handels GmbH	Fed. Rep. of Germany	(040) 44 10 41	(040) 44 30 60
SVZ BV	The Netherlands	(01608) 27321	NA
Tradimpex Agro-Alimentaire	France	(1) 45 93 02 32	(1) 45 93 08 10
Tropimco	France	(1) 43 80 77 69	NA
United Breweries Handels GmbH	Fed. Rep. of Germany	(07543) 2082	(07543) 2084
W. Weddel & Co. Ltd.	United Kingdom	071 248 1212	071 236-3660
Wachsmuth & Krogmann	Fed. Rep. of Germany	(040) 359090	35909190
Wolfgang Jobmann GmbH	Fed. Rep. of Germany	(040) 818094-97	(040) 810975

SOURCE: Various

SELECTED DISRIBUTOR AND PROCESSOR OF TROPICAL FRUITS, PULPS AND CONCENTRATES - JAPAN

COMPANY	COUNTRY	TELEPHONE	FAX
Nisshin Trading Co., Ltd.	Japan	03-431-2333	03-432-1002

APPENDIX IV - PROCESSED TOMATOES

IV - 1a. Price Trend of Canned Tomatoes & Tomato Products (January 1987 - December 1988)

IV - 1b. Prices of Tomatoes & Tomato Products

IV - 2. USDA Imports of Tomato Products; EEC Tomato Quota

IV - 3. Supplementary Tomato Trade Statistics

IV - 4a. Industrial Tomato Paste Opening Prices 1980 - 1989

IV - 4b. Ind. Tomato Paste Market: Jan 1989 - Mar 1991

IV - 5. Process Flow Diagram

IV - 6. Diced Tomato Equipment Floor Plan

IV - 7. Diced Tomato & Sauce Line

IV - 8. Direct Labor Requirements

IV - 9. Proposed Processing Facility, General and Administrative Labor Requirements

IV - 10. Average Processing Tomato Production Costs in the State of Sinaloa

IV - 11. Sacramento Co., CA 1989 Sample Cost to Produce Processing Tomatoes

IV - 12. Imperial Co., CA Processing Tomato Projected Production Costs 1989 - 90

IV - 13. USDA Standards for Processing Tomatoes

IV - 14. Product Specifications for Canned Diced Tomatoes

IV - 15. Selected Trade Contacts

Price Trend of Canned Tomatoes and Tomato Products
January 1987 — December 1988

Dollars Per Case:	1987 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	1988 Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Standard 24/303 f.o.b. California	7.25-7.50	7.25-7.50	7.75-8.00	7.75-8.00	8.00	8.00	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75-8.00	7.75-8.00	7.75-8.00	7.75-8.00	7.75	7.75	7.75	7.75-8.00	8.00-8.25	8.00-8.50	8.00-8.50
Standard 24/303 f.o.b. East	7.50	7.50-8.00	8.00-8.25	8.25	8.25-8.50	8.25-8.50	7.75-8.00	7.75-8.00	7.75-8.00	8.00	8.00	8.00	8.00	8.00-8.25	8.00-8.25	8.00-8.25	8.00-8.25	8.25	8.00	8.00	8.00-8.50	8.50-8.75	8.75	8.75
Extra Standard 24/303 f.o.b. California	7.75-8.00	7.75-8.00	8.25-8.50	8.25-8.50	8.50	8.50	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25-8.50	8.25-8.50	8.25-8.50	8.25-8.50	8.25	8.25	8.25	8.25-8.50	8.50-8.75	8.50-8.75	8.75
Standard 24/303 f.o.b. Midwest	7.50	7.50-8.00	8.25	8.25-8.50	8.25-8.50	8.25-8.50	7.50-8.00	7.50-8.00	7.50-8.00	7.50-8.00	7.75-8.00	8.00	8.00	8.00	8.00	8.00-8.25	8.00-8.25	8.25-8.50	8.25-8.50	8.50	8.50	8.50	8.50-8.75	8.50-8.75
Standard 6/10 f.o.b. California	8.50	8.50	9.50	9.50-10.00	10.00	10.00	9.25-10.00	9.25-10.00	9.50-10.00	10.00	10.00-10.50	10.00-10.50	10.00-10.50	10.50	10.50	10.50	10.50	10.50	10.50	10.50	10.50-11.50	11.50	11.50	11.50
Standard 6/10 f.o.b. East	10.30	10.50	10.50	10.50	10.50-11.50	10.50-11.50	11.00-11.50	11.00-11.50	11.00-11.50	11.00-11.50	11.50	11.50	11.50	11.50	11.50	11.00-11.50	11.00-11.50	11.00-11.50	11.00	11.00	12.00	12.00-12.50	12.50-13.50	13.50
Standard 6/10 f.o.b. Midwest	9.00	9.00-10.00	10.00	N.A.	11.50	11.50	11.00-11.50	11.00-11.50	11.00-11.50	11.00-11.50	11.50	11.50-12.00	11.50-12.00	11.00	11.00	10.50-11.00	10.50-11.00	10.50-11.00	N.A.	N.A.	12.00	12.00	12.50-13.00	12.50-13.00
Tomato Juice 12/46-oz. f.o.b. California	7.75	7.75	7.75	7.75-8.00	7.75-8.00	8.00-8.50	8.00-8.50	8.00-8.50	8.00	8.00	8.00	8.00	7.75-8.00	7.50-8.00	7.50-8.00	7.75-8.00	7.50-7.75	7.50	7.50	7.50	7.50-8.00	8.00	8.00	8.00
Tomato Juice 12/46-oz. f.o.b. Midwest	7.25-7.75	7.25-7.75	7.50-7.75	7.50-7.75	7.50	7.50	7.25-7.50	7.00-7.50	7.00-7.25	7.00-7.25	7.00-7.25	7.00-7.25	7.00-7.25	7.00-7.25	7.00-7.25	7.25-7.50	7.50	7.50	7.50	7.50	7.50	8.00	8.50	8.50
Tomato Juice 12/46-oz. f.o.b. East	7.25	7.25-7.50	7.25-7.50	7.25-7.50	7.25	7.25	7.25	7.50	7.50	7.50	7.50	7.50	7.50	7.50-7.75	7.50-7.75	7.75	7.75	7.75	N.A.	N.A.	N.A.	N.A.	N.A.	8.50
Fancy Catsup 6/10 f.o.b. California	12.50-13.00	12.50-13.00	12.50-13.00	12.50-13.00	12.50-13.00	12.50-13.00	12.50	12.50-13.00	13.00	13.00	13.00-13.50	13.00-13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.25-	13.25-14.00	14.00	14.00-14.75	14.00-14.75
Tomato Paste 48/6-oz. f.o.b. California	10.50	10.25-10.50	10.50	11.00-11.50	11.00-11.50	10.50-11.50	10.50-11.25	10.50-11.25	11.00-11.50	11.00-11.50	11.00-11.50	11.50	11.50	11.50-12.00	12.00	12.00	12.00	11.50	11.50	11.50	11.50-12.00	12.00-12.50	12.25-12.50	12.25-12.50
Tomato Paste 26%, 6/10 f.o.b. California	16.00-17.00	16.50-17.00	17.00-17.50	17.00-17.50	17.50	17.50	18.75-17.00	16.75-17.50	17.50	17.50	17.50-18.50	17.50-18.50	18.50-19.00	19.00	19.00	19.00	19.00	19.00	19.00	19.00-20.00	19.00-21.00	20.50-21.00	20.50-21.00	20.50-21.00
Tomato Paste Drums* f.o.b. California	.37-.38	.37-.38	.37-.38	.38-.39	.38-.39	.38-.39	.36-.38	.37-.38	.38	.38	.38	.38-.39	.38-.39	.39-.40	.39-.40	.39-.40	.39-.40	.40	.40-.41	.40-.41	.41-.44	.44-.46	.46-.48	.48-.50
Puree 1.06-6/10 f.o.b. California	11.25	11.25	11.25	11.25	11.25	11.25	10.00	10.50-11.25	10.50-11.25	10.75-11.25	10.75-11.25	10.75-11.25	10.75-11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25-12.00	11.75-12.00	12.00	12.75

*Per pound.

PRICES OF TOMATOES AND TOMATO PRODUCTS

Date	Standard Peeled 24/303	Standard Peeled 24/2.5	Standard Peeled 6/10	Paste/Lb 55 Gal Drum	Diced 6/10
1-7-89	8.00 - 8.75	12.50 - 13.00	11.50 - 12.00	NA	--
1-14-89	8.75	13.50	12.00	.50 - .60	--
2-11-89	--	--	12.00	NA	14.50 - 15.50
3-4-89	8.75	13.50	12.00 - 12.55	.50 - .60	--
4-1-89	8.75	13.50	12.00 - 12.55	NA	--
4-15-89	--	--	--	.53 - .60	14.50 - 17.00
5-13-89	--	--	--	.50	--
5-20-89	8.75	13.50	12.00 - 2.55	NA	--
5-27-89	--	--	--	.65	--
6-3-89	--	--	--	.55 - .56	--
6-10-89	8.75	13.50	12.00 - 12.55	NA	--
6-15-89	--	--	--	NA	15.50
7-1-89	--	--	--	.55 - .56	--
7-8-89	8.50	13.50	12.50	NA	15.50
8-5-89	8.50	13.50	12.50	NA	15.50
6-12-89	--	--	--	.50	--
9-2-89	8.50	13.50	12.50	.50	--
10-2-89	7.75 - 8.00	13.00 - 13.50	11.50 - 12.00	.56	--
10-21-89	--	--	--	NA	15.50 - 16.50
11-4-89	8.50 - 8.75	--	12.50	.56 - .57	--
11-18-89	8.50 - 8.75	13.50	13.00	NA	16.50
12-2-89	8.50	13.50	12.50 - 13.50	.58	--
1-6-90	8.50 - 8.75	13.50	12.50 - 13.50	.50 - .60	--
1-27-90	--	--	--	NA	11.50
2-3-90	8.50 - 8.75	13.50	12.50 - 13.50	.58 - .60	--
3-3-90	--	--	--	.58 - .60	--
3-10-90	8.50 - 8.75	13.50	12.50 - 13.50	NA	--
4-7-90	8.50 - 8.75	13.50	12.50 - 13.50	NA	--
4-21-90	--	--	--	.57	--
4-28-90	--	--	--	NA	--
5-8-90	8.50 - 8.75	13.00	10.00 - 11.25	NA	--
5-26-90	--	--	--	NA	--
6-2-90	8.50 - 8.75	--	10.00	.38	--
6-9-90	--	--	--	.45 - .47	--
6-30-90	--	--	11.00	NA	14.00
7-7-90	8.50 - 8.75	13.50	11.00	.44 - .47	--
7-14-90	--	--	--	NA	13.00 - 14.00
7-21-90	--	--	--	.43 - .45	--
8-4-90	8.25 - 8.50	13.50	11.00 - 11.50	.43 - .45	--
9-8-90	8.75	13.50	11.00 - 12.50	.44 - .45	--
10-6-90	8.75	13.50	11.00	.43	--
11-10-90	8.25 - 8.50	14.50	11.00	.43 - .45	--
12-1-90	8.25	13.50	11.00	.43	--
1-12-91	8.50	13.50	11.00	.40	--
2-2-91	8.50	13.50	12.50		--
2-9-91	--	--	--	.40	--
3-9-91	8.50	13.50	12.00	.38	--

USA IMPORTS OF TOMATO PRODUCTS

(In metric tons)

Canned tomatoes	1988	1989	1990
Italy	46 980	9 068	16 054
Israel	4 347	8 311	14 825
Chile	3 393	7 169	12 113
Argentina	*	4 967	4 485
Spain	19 393	5 891	3 856
Taiwan	3 785	9 560	3 582
Canada	145	—	2 719
Other countries	1 895	5 614	4 640
Total	79 938	50 580	62 274
Tomato paste			
Mexico	19 269	18 911	24 825
Chile	3 089	19 307	19 730
Israel	1 285	9 167	3 642
Hungary	3 924	3 334	2 140
Turkey	1 990	3 857	1 987
Thailand	*	*	1 961
Argentina	*	14 786	1 730
China	*	*	1 343
Spain	350	2 660	1 216
Portugal	*	*	1 142
Venezuela	*	*	971
Italy	1 689	1 037	602
Brazil	11 599	7 909	261
Taiwan	1	5 606	*
Other countries	1 770	17 027	553
Total	49 211	103 601	62 103

*Included in other countries.
Source: US Bureau of Census.

EEC TOMATO QUOTA

(In metric tons of raw material)

	Tomato concentrate		Tinned whole peeled tomatoes		Other tomato products		Total tomato quota	
	1990/91	1991/92	1990/91	1991/92	1990/91	1991/92	1990/91	1991/92
Italy	1 655 000	1 655 000	1 185 000	1 185 000	453 998	453 998	3 293 998	3 293 998
Greece	967 003	967 003	25 000	25 000	21 593	21 593	1 013 596	1 013 596
Spain	500 000	550 000	219 000	240 000	148 050	177 050	867 050	967 050
Portugal	747 945	832 945	14 600	19 600	32 192	42 192	794 737	894 737
France	278 691	278 691	73 628	73 628	40 087	40 087	392 406	392 406
Total	4 148 639	4 283 639	2 517 228	1 543 228	695 920	734 920	6 361 787	6 561 787

Source: EEC Commission.

SUPPLEMENTAL TOMATO TRADE STATISTICS

- Japan: Processed Tomato Trade
- Tomato Concentrate Exports from Turkey
- Italian Exports of Tomato Concentrate
- Italian Production of Canned Tomatoes
- Italian Exports of Canned Tomatoes

JAPAN: PROCESSED TOMATO TRADE
(Imports by product by country, calendar year, metric tons)

TOMATO PUREE AND TOMATO PASTE	1988	1989
Brazil	955.5	1,891.4
Chile	6,965.3	8,842.4
China	3,738.5	5,492.3
Greece	2,928.1	1,600.3
Israel	0.0	1,035.5
Portugal	8,283.3	7,447.2
Taiwan	17,244.3	23,348.0
Turkey	21,606.6	21,443.3
United States	4,496.5	2,673.8
Others	1,630.4	2,348.8
Total	67,848.5	76,123.0

TOMATO KETCHUP	1988	1989
Taiwan	703.1	226.2
Turkey	220.0	1,982.3
United States	2,821.5	3,411.8
Others	4.0	53.2
Total	3,748.6	5,673.5

SOURCE: Japanese Trade Statistics.

TOMATO CONCENTRATE EXPORTS FROM TURKEY
(In metric tons)

	1983	1984	1985	1986	1987	1988	1989
Japan	5896	5471	7714	10614	17133	22060	27873
Algeria	1179	1795	*	*	4298	10700	23000
Switzerland	1410	2223	6595	6600	4062	19687	21653
Libya	1638	2710	9	27710	13390	7912	20168
Iraq	23881	42427	42468	25385	35230	12095	7801
UK	8752	7145	7693	7470	6565	6638	6728
Canada	2918	2520	1842	4125	4134	5042	5577
USA	3250	1210	2180	4064	4023	2601	4431
Sweden	699	855	973	1739	2744	4003	4056
West Germany	967	465	1016	1976	*	*	*
Other countries	2772	2930	6377	19787	11998	25105	32833
Total	53362	69751	76867	109470	103577	115843	154120

*Included under other countries.
Source: Istanbul Chamber of Commerce/Export Promotion Centre.

ITALIAN EXPORTS OF TOMATO CONCENTRATE*
(In metric tons)

	Full-year 1988	Full-year 1989	Jan-June 1990
West Germany	47820	52568	30516
France	20064	20951	14645
Netherlands	16515	15793	10511
UK	18342	21796	7939
Belgium/ Luxembourg	12792	14354	7227
Other (EEC)	2490	2689	1196
Total EEC	118053	128151	72034
Algeria	9788	16328	13579
Saudi Arabia	18266	16288	9411
Ivory Coast	8432	6930	4516
Switzerland	4351	4579	4069
Zaire	5915	5921	3127
Gambia	4938	1052	2677
Togo	4659	4877	2492
Austria	1170	2057	1314
Benin	4232	3065	1097
North Yemen	2963	2778	1041
United Arab Emirates	5403	4972	707
Sweden	1349	304	517
Kuwait	4085	5231	449
Mauritania	318	1117	395
USA	3713	1078	242
Canada	520	245	223
Nigeria	1143	606	165
Other countries	15014	30484	18508
Total non-EEC	131050	151928	64529
TOTAL WORLD	249103	280079	136563

*Figures for 1989 onwards are on the basis of 28%/30%.

ITALIAN PRODUCTION OF CANNED TOMATOES*

In '000 cartons	1988	1989	1988/89 % change	1990	1989/90 % change
72/300 gramme	1 264	1 262	-0.02	1 359	+7.67
48/500 gramme	19 100	22 433	+17.55	22 609	+0.79
24/1-kilo	10 483	13 203	+25.94	12 152	-7.96
6/3-kilo	20 000	28 696	+43.18	19 404	-32.38
6/3.4-kilo	1 533	534	-65.16	547	+2.37
6/5-kilo	—	1 298	—	948	-26.67
Total	**52 380**	**67 421**	**+28.71**	**57 019**	**-15.42**

*Peeled and crushed. Source: ANFINA.

CANADIAN IMPORTS OF TOMATO PRODUCTS

(In metric tons)

Tomato concentrate	1988	1989	1990
USA	11 830	14 510	23 816
Turkey	4 659	5 705	4 766
Portugal	5 689	4 341	3 215
Brazil	3 680	3 935	2 621
Mexico	3 543	3 636	3 717
Israel	473	855	2 226
Spain	807	574	792
Italy	982	385	496
Other countries	1 164	2 308	2 922
Total	**32 824**	**36 249**	**44 571**
Peeled tomatoes†			
Spain	8 254	10 978	8 117
Italy	8 306	8 254	4 928
USA	5 100	3 997	4 266
Israel	*	*	1 662
Bulgaria	*	*	1 333
Portugal	2 748	1 456	645
Other countries	3 753	5 990	1 836
Total	**28 161**	**30 675**	**22 787**

*Included in "other countries".
†Whole/pieces.
Source: Canadian Trade Statistics.

ITALIAN EXPORTS OF CANNED TOMATOES*

(In million cartons 24/½-kg)

	Full year 1989	Jan-June 1989	Jan-June 1990
UK	22.4	9.8	7.9
West Germany	8.5	3.3	4.4
France	4.3	1.5	2.0
Belgium/ Luxembourg	3.0	1.1	1.4
Netherlands	1.7	0.6	1.0
Others (EEC)	1.7	0.6	0.7
Total EEC	**41.6**	**16.9**	**17.5**
Switzerland	2.0	0.8	0.9
USA	1.3	0.2	0.8
Japan	1.5	0.7	0.4
Australia	1.0	0.2	0.3
Canada	0.8	0.2	0.2
Saudi Arabia	1.9	0.3	0.1
Other countries	2.3	0.9	0.8
Total non-EEC	**10.8**	**3.3**	**3.5**
TOTAL WORLD	**52.5**	**20.2**	**21.0**

*Whole peeled or chopped/diced.
Source: Instituto Centrale di Statistica

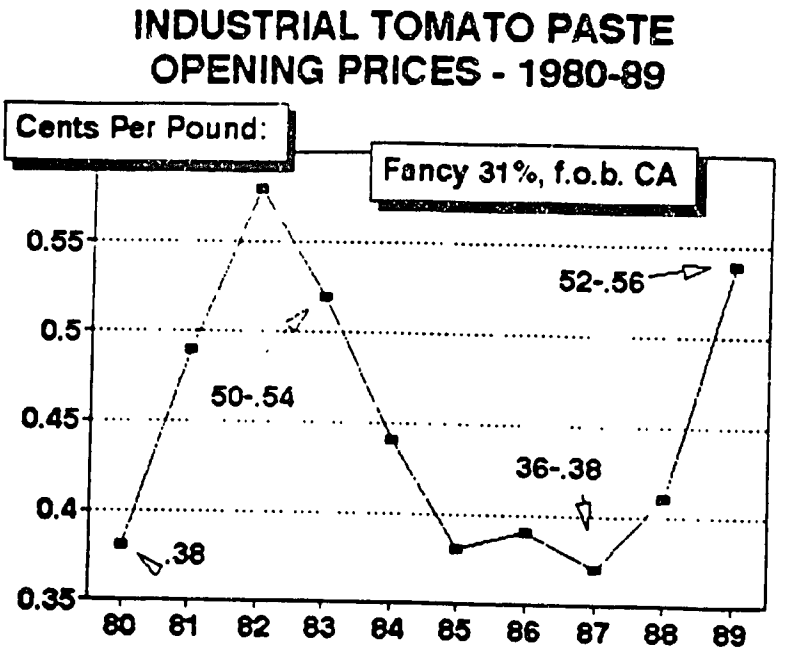
JAPANESE IMPORTS OF TOMATO PRODUCTS

(In metric tons — basis 28%-30%)

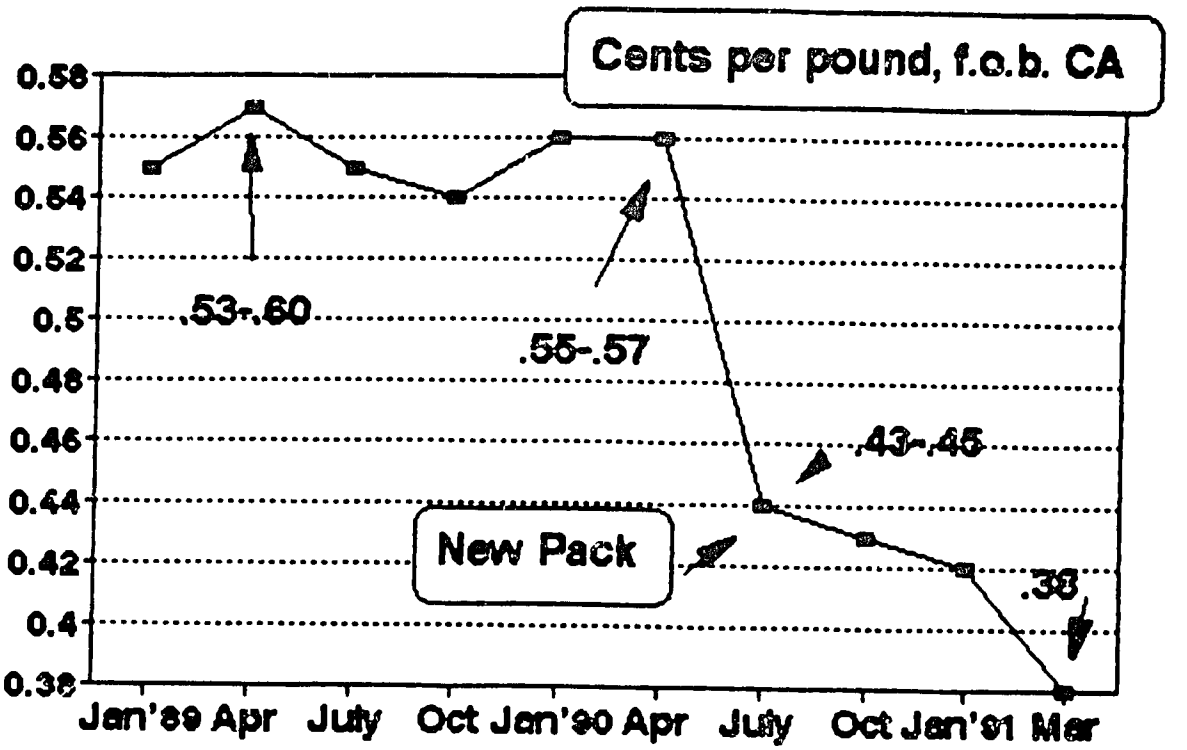
Tomato paste*	1988	1989	1990
Turkey	21 607	21 443	30 410
Taiwan	17 244	23 348	13 478
Portugal	8 283	7 447	5 531
China	4 497	5 492	6 337
Greece	2 928	1 600	742
Other countries	13 290	16 793	20 482
Total	**67 849**	**76 123**	**76 980**
Peeled tomatoes (cartons of 24/500g)			
Italy	1 484 339	1 314 724	1 511 591
Taiwan	514 736	412 042	387 104
USA	*	125 422	51 453
China	24 516	57 555	45 981
Chile	†	†	48 717
Bulgaria	42 719	27 568	36 722
Other countries	42 719	48 611	73 548
Total	**2 117 132**	**1 985 922**	**2 155 116**

*Figures include tomato puree
†Incl. in others.
Source: Japan Tariff Association

INDUSTRIAL TOMATO PASTE
OPENING PRICES - 1980-89



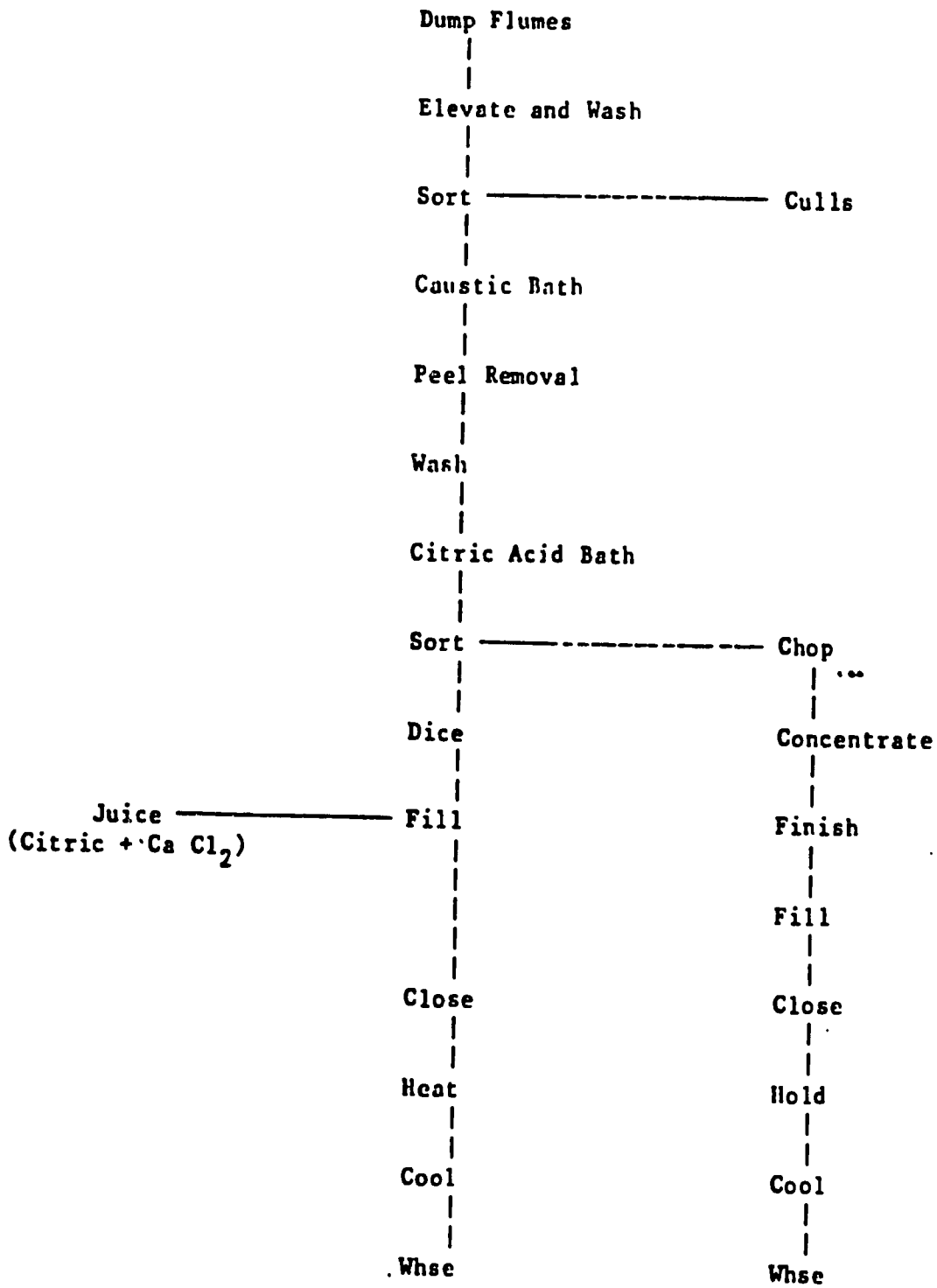
INDUSTRIAL TOMATO PASTE MARKET
JAN. 1989 - MAR. 1991

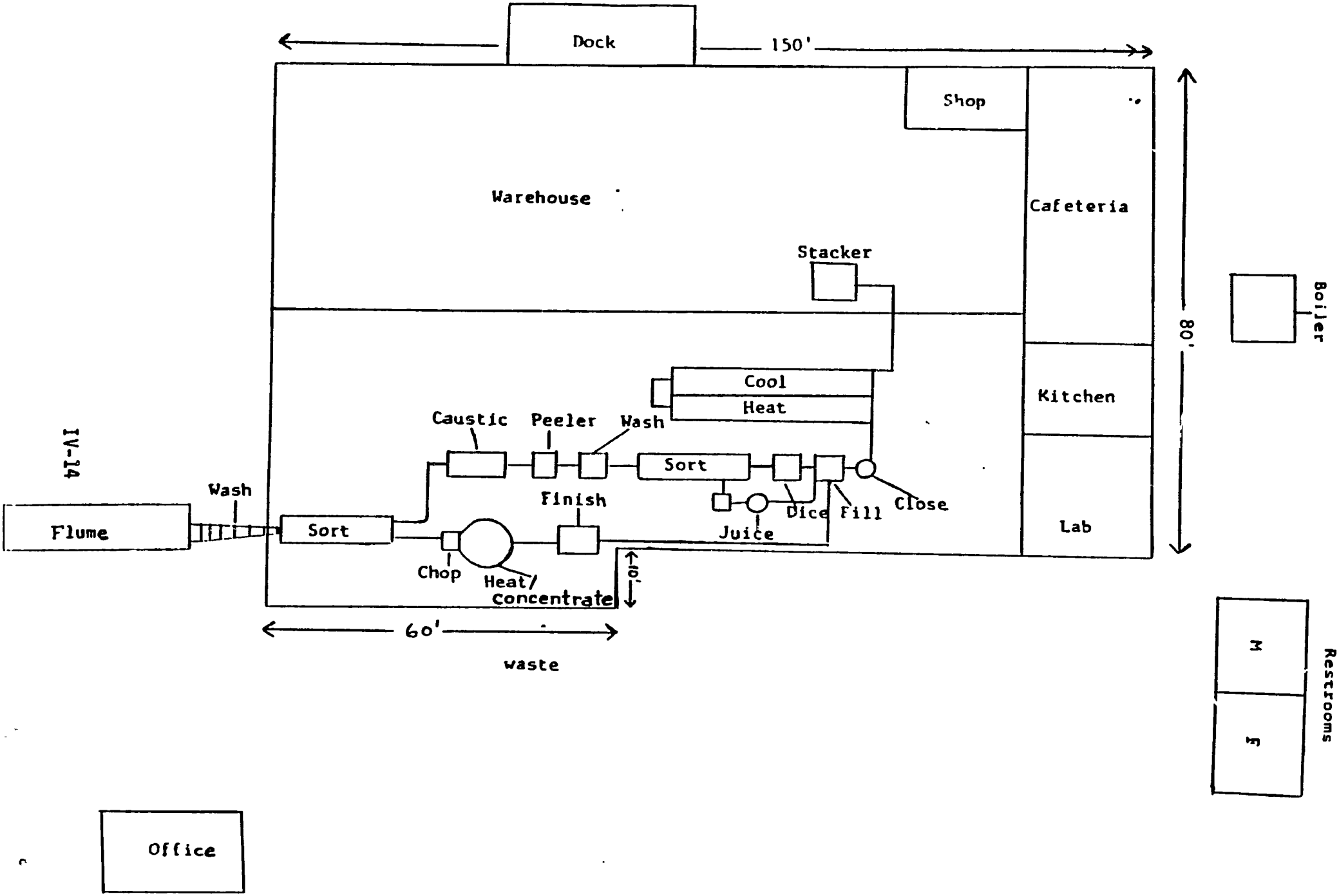


Process Flow Diagram

Diced Tomato Processing Line

Phase I




Dock
150'
Shop
Warehouse
Cafeteria
Stacker
80'
Boiler
Cool
Heat
Kitchen
Caustic
Peeler
Wash
Sort
Finish
Dice
Fill
Close
Juice
Lab
Wash
Flume
Sort
Chop
Heat/
concentrate
10'
60'
waste
M
F
Restrooms
Office

DICED TOMATO AND SAUCE LINE

1 - Robins Dump Flume, Wash Tank with Spray Wash Elevator and Dewatering Waste Screen.....$ 55,000.00

1 - Robins Roller Sorting Table, 30" wide x 15' long with (6) cull chutes.....$ 20,000.00

1 - Robins Even-Flo Regulator-Type Elevator....$ 12,488.00

1 - Robins Ferris Wheel Lye Peeler.....$ 49,000.00

1 - Magnuson WSP III Peeler.....$ 40,000.00

1 - Robins Even-Flo Regulator-Type Elevator....$ 12,488.00

1 - Magnuson Stepeel with overhead sprays.....$ 45,000.00

1 - Robins Citric Acid Bath Tank.....$ 17,430.00

1 - Robins Roller Sorting Table with (12) cull chutes.....$ 20,000.00

1 - Robins By-Pass Conveyor, 12" wide x 10' long for tomatoes designated for sauce.....$ 6,048.00

1 - Langsenkamp Rotary Coil Concentration Tank with coils.....$ 17,523.00

1 - Zacmi Pocket Filler.....$ 80,000.00

2 - 50 Gallon Stainless Steel Tanks.....$ 5,000.00 total

3 - Ladish 2 HP Motor Driven Food Pumps.....$ 18,000.00 total

1 - Langsenkamp Chopper/Finisher.....$ 25,000.00

1 - Closing Machine (Rebuilt).....$ 70,000.00

1 - Dall'Argine & Ghiretti Cooker and Cooler...$425,000.00

1 - Lot 1-1/2" Stainless Steel Sanitary Tubing, Fittings and Valves.....$ 40,000.00

1 - Model 704 Burt Can Labeler.....$ 28,314.00

1 - Mateer-Burt Model PCE Case Packer.....$ 20,048.00

1 - Case Sealer.....$ 30,000.00

$ 1,036,000.00

Direct Labor Requirements

Operation	Position	Number
Receiving Station	Station foreman	1
	Unloaders	4
	Graders	2
	Drivers	3
	Weighers	2
	Recorders	1
	Subtotal	13
Processing Plant	Unloaders	4
	Sorters	20
	Plantmen	10
	Warehousemen	10
	Lift truck men	2
	Drivers	2
	Quality control	3
	Subtotal	51
Shipping	Warehouse foreman	1
	Warehousement	2
	Labelers/Packers	3
	Subtotal	6
	Total	70

Proposed Processing Facility, General and Administrative Labor Requirements

Operation	Position	Number	Wage/ Salary ($/month)
General Management	President/ General Manager	1	6,250
	Plant Manager	1	4,000
	Chief Accountant	1	650
	Payroll/Accountant	2	500
	Watchmen	2	200
Sales	Clerk	1	600
Plant	Cleanup men	10	120
Raw Material Procurement	Fieldmen	5	520
	Total	23	

INPUTS

AVERAGE PROCESSING TOMATO PRODUCTION COSTS
IN THE STATE OF SINALOA.
(1,000 pesos/ha.)

	MY 89/90
Field preparation	397.7
Planting and Transplanting Material	1315.2
Fertilization	1124.6
Insect and Disease control	1689.9
Cultivation	612.3
Irrigation	172.2
Cultivating Materials	16.0
Harvesting	187.1
Others	353.2
Interest on Investment	1344.3
Total	7212.5

NOTE: While from different sources, data on costs of production for MY 1989/90 appear to be roughly comparable with 1988/89 data, as the increase is about equal to inflation rate.

Sacramento County, CA 1989 Sample Cost to Produce Processing Tomatoes

SOILS - Tomatoes are grown on a wide variety of soil types. Generally, soils must be free of salts and diseases, have at least four feet of root zone and good moisture holding capacity. Tomatoes should not be grown where Rhizoctonia, Fusarium, Verticillium, or Phytophthora have been a problem.

PLANTING DATES - February through May. Schedule planting to assure about the same acreage will be available for harvest each week. Plant when the true leaf is about 1/2 inch long in the seedlings of the previous planting.

HARVEST DATES - August, September, or until stopped by rain in the fall, usually mid-October.

VARIETIES - Canners require that a percentage of the contracted acreage be planted to designated varieties. Growers are advised to consult their local UC Farm Advisor, seed company representative, and canner for varieties and cultural characteristics necessary for optimum production.

SEEDING RATES - Open pollinated varieties are usually planted at 0.75 to 1.0 lbs/a (Cost approximately $30/lb). Hybrid varieties are planted at 0.6 to 0.8 lbs/a (Cost approximately $205/lb). Growers are advised to maintain the same seeding rates on either single or double row plantings to insure uniform stand establishment.

FERTILIZER - Preplant nitrogen applied at 100 to 150 lbs/ac. Starter fertilizer is applied 1 inch to the side and 1-2 inches below the seed. Research has shown that starter 25-30 gal/A 8-24-6 can be of benefit in stand establishment. Various products can be used either liquids or drys. Potash and/or liming may be required occassionally.

IRRIGATION - Tomato plants must have adequate water at all times especially prior to and during bloom. Soil moisture should be depleted by harvest. Irrigation cut-off times are dependent upon soil type and environmental conditions. Normally tomatoes will use between 3 and 4 acre feet of water. Excessive irrigation will cause root pruning and disease.

WEED CONTROL - Devrinol + Tillam is a standard preplant incorporated treatment for weed control on tomatoes. Hairy nightshade control is best with Tillam when incorporated no deeper than 2 inches. Yellow nutsedge control is best when Tillam is put on broadcast. Sencor is used for fall beds to keep broadleaf species under control. Herbicides for layby use include Eptam, Treflan and Tillam.

(Continued)

Sacramento County, CA 1989 Sample Cost to Produce Processing Tomatoes

CROP	CANNING TOMATOES	GROSS INCOME	$1,540.00
YIELD/ACRE IN TONS	28	TOTAL CASH EXPENSE/ACRE ...	1,370.60
MARKET VALUE/TON	$ 55.00	NET INCOME	$ 169.40

CULTURAL COSTS: FUEL & SEED

	COST/A	LABOR COST/A	YOUR COST/A
Chop Corn Stubble	$ 0.28	$ 1.50	
Disc 2x (Fall)	1.08	1.76	
Plow	1.00	1.32	
Level plane 1x	0.67	0.88	
Chisel/flat roll roundup application	1.60	2.10	
Disc 1x (Spring)	0.54	0.88	
Float ringroll	0.54	0.88	
List beds/Lilly roterra, tagalong	0.62	1.32	
Preplant herb inc/roll	0.90	2.10	
Plant, starter fert (2 men)	0.90	2.10	
Seed, hybrid (.7 #/a x $205/#)	143.50		
Cultivate 4x sidedr nitrogen	2.64	7.00	
Layby herbicide sidedr 8-24-6 15 gal	0.83	1.75	
Employee pickups	3.14		
TOTAL:	$158.24	$ 23.59*	

IRRIGATION

Sprinkler 2x stand establishment	$ 9.00	$ 15.00	
Sprinkler/Furrow irr. 6x in season	26.97	45.00	
Drain Manitenance	1.00		
TOTAL:	$ 36.97	$ 60.00*	

CHEMICALS

		APPLICATION	
Roundup (1pt/a)	$ 9.00	$ 6.00	
Preplant N (100 #/a) aqua or NH_3	17.00		
Dyfonate 4EC, banded for centipedes	15.82		
Tillam 6E preplant, banded (.75gpa)	30.37	5.50	
Devrinol 2E preplant, banded (.75gpa)	28.88		
Starter 8-24-6 +Zinc (15gpa)	19.20		
Sevin bait for cutworms (40#/a)	26.80	6.00	
Thiodan 3EC for beetles (2/3qt/a)	5.80		
Eptam 7EC layby (3.5pt/a)(or Treflan)	10.79		
Sidedress nitrogen (50#/a) as UN32	10.50		
Micronized sulfur, russet mite (5#/a)(2x)	9.80		
Worm control-Pydrin, Monitor, Lannate, or Bt (2x)	15.81	11.00	
Dithane M45 (3#/a)(2x)	13.20		
Ethrel (may omit) (2pt/a)	17.51	5.50	
TOTAL:	$230.48	$ 34.00	

* Included in Labor Budget

(Continued)

Sacramento County, CA 1985 Sample Cost to Produce Processing Tomatoes

HARVEST	COST/A	YOUR COST/A
Harvester lease	$ 70.00	
Fruit inspection	5.62	
CTRI dues	2.10	
Machine fuel	3.00	
Tractors bulk 2x	1.00	
Move & set up		
Machine driver		
Machine sorters 7	98.00	
Tractor drivers 2		
Electronics refurbishing	16.67	
Tomato Growers Association (.17/ton)	4.76	
TOTAL:	$201.15	

LABOR		
Cultural ($5.25/hr)	$ 23.59	
Irrigation ($4.25/hr)	60.00	
Hand Hoeing (Nightshade)	130.00	
Shop mechanic	10.00	
Overtime (Moving Equipment)	4.64	
TOTAL:	$228.23	

CASH OVERHEAD		
Share rent (15% of gross income)	$231.00	
Management salary/benefits	16.32	
Repairs, maintenance, supplies	70.00	
Employee benefits (36% of labor cost)	82.16	
Office management expense	10.86	
Insurance - Equipment, Liability	5.00	
Crop Insurance	32.94	
Taxes on equipment	2.57	
TOTAL:	$450.85	

DEBT SERVICE		
Interest on operating loan	$ 29.25	
Interest on equipment	1.43	
TOTAL:	$ 30.68	

TOTAL GROSS INCOME $1,540.00
TOTAL CASH EXPENSE/ACRE ... 1,370.60

NET INCOME ..... $ 169.40

NON-CASH COSTS		
Equipment Depreciation	$ 20.00	
Interest on Buildings	0.24	
Building Depreciation	3.33	
TOTAL:	$ 23.57	

Processing Tomato Projected Production Costs 1989-199

Mechanical operations at custom rates. Hand labor at $5.75 per hour ($4.50 plus Social Security, unemployment insurance, transportation, supervision and fringe benefits).

Yield--35 tons. Growing period 140 days.

OPERATION	CUSTOM RATE	MATERIALS Type	MATERIALS Cost	HAND LABOR Hours	HAND LABOR Dollars	COST Per Acr
LAND PREPARATION						
Disc 2x	9.50					19.0
Triplane 2x	8.75					17.5
Fertilizer	4.50	300# 11-52-0	40.50			45.0
List - Inject	12.00	20 gals. 10-34-0	32.00			44.0
Rotovate - Shape	18.50					18.5
TOTAL LAND PREPARATION						144.0
GROWING PERIOD						
Plant - Shape	15.00	Seed 1#	15.00			30.0
Herbicide	8.00	Herbicide	12.00			20.0
Sprinkler irrigate						135.0
Hand thin - weed				17	97.75	97.7
Cultivate 2x	14.00					28.0
Fertilize 2x	12.00	225# N @ .31	69.75			93.75
Irrigation 10x		4 ac/ft	44.00	8	46.00	90.0
Layby herbicide	17.50	Herbicide	2.50			20.0
Pest control 5x	5.00	Insecticides	98.00			123.0
Disease control 3x	6.00	Fungicides	15.00			33.0
Disc out beds	9.50					9.5
TOTAL GROWING PERIOD						680.0
GROWING PERIOD & LAND PREPARATION COSTS						824.0
Land Rent (net acres)						200.0
Cash Overhead--	12% of preharvest costs & land rent					122.8
TOTAL PREHARVEST COSTS						1146.8
HARVEST						
Custom harvest	35 tons @	16.00/ton				560.0
TOTAL ALL COSTS						1706.8

PROJECTED INCOME ABOVE COSTS (PER ACRE)

$/ton	25 tons/acre	30	35	40	45	Breakeven tons
60.00	-207	93	393	693	993	28

(Continued)

PROCESSING TOMATO CULTURE
1989-1990

YEAR	ACRES	YIELD/ACRE (TONS)	VALUE/TON
1988	4017	36	$ 48
1987	2510	31	46
1986	2999	37	48
1985	3324	30	51
1984	3785	31	52

PLANTING: Cannery tomatoes are planted from early January to about February 20. Twin-rows, 12 inches apart are planted on flat beds with 60 inch centers. Sprinklers are used for germination.

VARIETIES: During the past 3-4 years, several varieties have performed well. The square round are the only types used by processors. The varieties "UC 82", "Nema 1200", "Nema 1400", "MOX3032", "FM 6203", "K 100", "P 111B, and several Beatrice Foods, Inc selections are the most widely used. New varieties after they are widely tested under desert area conditions.

SOILS: Medium to heavy well-drained soils are best. Such soils maintain moisture longer and more uniformly than sandy soils. Fields selected should be low in salinity.

FERTILIZER: Nitrogen and phosphorus may be either broadcast preplant or injected at or before planting. A combination of both methods can also be used. All of the phosphorus should be applied preplant or at planting. One hundred to 150 pounds of phosphorus is either injected or broadcast. Fifty pounds of nitrogen may be applied at or before planting. the remaining 150-225 pounds nitrogen is divided up into three or four applications beginning at thinning. Generally, two sidedressings are adequate.

THINNING: All processor cultivars are bush type vines allowing for a high plant population per acre. Single plant spacing is not necessary. Clump thinning which allows two-three plants per hill spaced at 9 to 12 inch centers down the row has performed very well. The use of coated seed and precision planting is possible, eliminating the need for thinning.

IRRIGATION: Moisture should be maintained as uniformly as possible throughout the season. Too much water during the early growth of the plant encourages shallow roots. Adequate moisture needs to be maintained later in the season during maximum fruit development.

PEST CONTROL: The main insect pests are aphids, tobacco budworms, tomato fruit worms, armyworms, pin worms, thrips and stink bugs. Powdery mildew is often a problem requiring control and Phytophthora root rot can cause severe crop loss. Tomato plant decline can be a problem. Do not plant tomatoes in the same field more than two years. Fumigation is required for root knot nematode infested fields at an additional $100.00 per acre. For a list of registered and adapted chemicals for weeds, insects and disease control, consult your Farm Advisor's office.

HARVESTING: Local growers sign contracts with custom harvesters and truckers to harvest and haul to the processor. Harvesting is coordinated with the processor's plant capacity. Harvest normally begins near June 10 and may continue through early August.

(Continued)

GUIDELINES TO PRODUCTION COSTS AND PRACTICES
IMPERIAL COUNTY CROPS, CIRCULAR 104
1989 - 1990

CUSTOM RATE CHARGES

HEAVY TRACTOR WORK	PRICE/ACRE
Plow	$ 24.75
Subsoil 2nd Gear	29.25
Disc, Regular	9.50
Disc, Stubble	18.25
Float	8.25
Triplane	8.75
List, Regular	11.50
List, and Rerun 80" Melon Beds	22.00
Reshape 80" Melon Beds	10.00
Landplane	10.00
Chisel	20.75
PLANTING AND CULTIVATING	
Plant and Shape Melon Beds	16.75
Precision Plant 42" Beds	14.50
Plant Carrots	13.75
Plant Onions	16.75
Cultivate 4-Row 42" Beds	10.75
Cultivate Melon Beds	14.00
Spike and Furrow Out (2 row)	10.50
Lilliston	9.50
Furrow out alone	8.00
Move N-Side 80" Beds for Irrigation	9.50
INCORPORATING, BORDER AND BED WORK	
Power Incorporate herbicides	20.25
Border, Cross checks and Break Borders	15.00
Bust Melon Beds	9.00
Roll Beds	5.00
FERTILIZER APPLICATION	
Broadcast Fertilizer	6.00
Inject Fertilizer (Flat)	9.00
Fertilize and Furrow Out 42" Beds	10.50
Fertilize and Furrow Out 80" Beds	10.50
IRRIGATION	
Custom Sprinkle	135.00-145.00
MISCELLANEOUS	
Motor Grader/Hour	42.75
Chop Broccoli, Corn Stalks, Etc.	10.00
Water truck/Hour	34.00
Cultipacker	6.00
Ground Spray Pesticides (4 Row)	7.00
Aerial Spray 5 Gal. (Insecticides)	4.50
Aerial Spray 10 Gal. (Fungicides)	5.00

UNITED STATES STANDARDS FOR GRADES OF TOMATOES FOR PROCESSING[1]

Effective March 1, 1973
(38 F. R. 3390)

GENERAL

Sec.
51.3310 General.

CATEGORIES

51.3311 Category A.
51.3312 Category B.
51.3313 Category C.

CULLS

51.3314 Culls.

PERCENT USABLE

51.3315 Percent usable.

PERCENT WASTE

51.3316 Percent waste.

COLOR EVALUATION

51.3317 Color evaluation.

EXTRANEOUS MATERIAL

51.3318 Extraneous material.

DEFINITIONS

51.3319 Firm.
51.3320 Fairly firm.
51.3321 Worm injury.
51.3322 Mold or decay.
51.3323 Freezing.
51.3324 Green.
51.3325 Mechanical damage.
51.3326 Defect classification guide.

METRIC CONVERSION TABLE

51.3327 Metric conversion table.

AUTHORITY: Secs. 203, 205, 60 Stat. 1087, as amended, 1090 as amended; 7 U.S.C. 1622, 1624.

GENERAL

§ 51.3310 General.

(a) The standards contained in this subpart apply to an inspection procedure for determining the quality of tomatoes for processing based on two factors: (1) Color measurement by use of a photoelectric instrument (USDA Tomato Colorimeter) or subjective visual color evaluation of individual fruit; and, (2) classification of defects. Calculation of percentages shall be on the basis of weight.

CATEGORIES

§ 51.3311 Category A.

"Category A" consists of tomatoes which meet the following requirements:

(a) Basic requirements:
(1) Firm; and,
(2) Color:
(i) Tomato color index (TCI) shall be as specified in § 51.3317; or
(ii) Fairly well colored. (See § 51.3317.)
(b) Free from:
(1) Any worm attached;
(2) Worm injury;
(3) Freezing;
(4) Stems over 1 inch in length;
(5) Mechanical damage when more than one locule is exposed or when causing a loss of more than 10 percent by weight, of the tomato;
(6) Mold or decay; and,
(7) Any other defect or combination of defects, the removal of which in the preparation for processing causes a loss of more than 10 percent, by weight, of the tomato.

§ 51.3312 Category B.

"Category B" consists of tomatoes which meet the following requirements:

(a) Basic requirements:
(1) Fairly firm; and,
(2) Color;
(i) Tomato color index (TCI) shall be as specified in § 51.3317; or,
(ii) Fairly well colored. (See § 51.3317.)
(b) Free from:
(1) Any worm attached;
(2) Worm injury;
(3) Freezing;
(4) Stems over 3 inches in length;
(5) Mechanical damage when more than two locules are exposed or when causing a loss of more than 20 percent by weight, of the tomato;
(6) Mold or decay; and,
(7) Any other defect or combination of defects, the removal of which in the preparation for processing causes a loss of more than 20 percent, by weight, of the tomato.

§ 51.3313 Category C.

"Category C" consists of tomatoes which meet the following requirements:

(a) Basic requirements:
(1) Fairly firm; and,
(2) Color:
(i) Tomato color index (TCI) shall be as specified in § 51.3317; or,
(ii) Fairly well colored. (See §51.3317.)

[1] Packing of the product in conformity with the requirements of these standards shall not excuse failure to comply with the provisions of the Federal Food, Drug, and Cosmetic Act or with applicable State laws and regulations.

(b) Free from:

(1) Any worm attached;

(2) Worm injury;

(3) Freezing;

(4) Stems over 3 inches in length;

(5) Anthracnose when more than two spots or aggregating more than a circle three-eights inch in diameter; and,

(6) Other mold or decay, or a combination of other defects including mold or decay, the removal of which in the preparation for processing causes a loss of more than 20 percent, by weight, of the individual tomato; including therein not more than 10 percent resulting from mold or decay.

CULLS

§ 51.3314 Culls.

"Culls" are tomatoes which fail to meet the requirements of Category C and, when color evaluation is determined by means of photoelectric instrument, including tomatoes which are completely green.

PERCENT USABLE

§ 51.3315 Percent usable.

"Percent usable" is a calculation of total weight of tomatoes in Category A, plus 85 percent of the weight of tomatoes in Category B, plus 75 percent of the weight of tomatoes in Category C.

PERCENT WASTE

§ 51.3316 Percent waste.

"Percent waste" is a calculation of total weight of Culls, plus 15 percent of the weight of tomatoes in Category B, plus 25 percent of the weight of tomatoes in Category C.

COLOR EVALUATION

§ 51.3317 Color evaluation.

Color shall be determined according to one of the following methods:

(a) Unless otherwise specified, the tomato color index (TCI) of a composite raw juice sample shall not be less than 63.0 as determined by means of a photoelectric instrument (USDA Tomato Colorimeter).

(1) The raw juice used for the color determination shall be extracted from a representative sample by means of a USDA approved extractor fitted with a 0.034-inch mesh screen juice attachment;[8]

(2) Each tomato in the color sample must show a definite change in surface color from green to tannish-yellow, pink, red, or a combination thereof; or

(b) Each tomato shall be "fairly well colored."

(1) "Fairly well colored" means that at least two-thirds of the flesh of the tomato has good red color: *Provided*, That a tomato having flesh of a lighter shade of red shall be considered as "fairly well colored" if sufficient amount of the flesh has a red color equivalent to that of a tomato with two-thirds good red color.

EXTRANEOUS MATERIAL

§ 51.3318 Extraneous material.

(a) Extraneous material is loose stems, vines, and dirt, adhering dirt, stones, trash, and other foreign material.

(b) The amount of extraneous material in any lot may be specified in connection with these standards.

DEFINITIONS

§ 51.3319 Firm.

"Firm" means that the tomato is not water-soaked to the extent that it is so soft, shriveled or puffy that it will lose more than 10 percent of its weight during the peeling or washing process.

§ 51.3320 Fairly firm.

"Fairly firm" means that the tomato is not water-soaked to the extent that it is so soft, shriveled or puffy that it will lose more than 20 percent of its weight during the peeling or washing process.

§ 51.3321 Worm injury.

"Worm injury" means any worm injury that has penetrated through the outer wall of the tomato.

§ 51.3322 Mold or decay.

"Mold or decay" means breakdown, distintegration or fermentation of the flesh of the tomato caused by bacteria or fungi.

§ 51.3323 Freezing.

"Freezing" means that the tomato is frozen or shows evidence of having been frozen.

§ 51.3324 Green.

"Green" means that the surface of the tomato is completely green in color. The shade of green color may vary from light to dark.

§ 51.3325 Mechanical damage.

"Mechanical damage" means that the tomato is bruised, crushed or ruptured.

[8] The extractor and the USDA Tomato Colorimeter are commercially available. Information on where they may be purchased and additional details concerning them, may be obtained from the Fresh Products Standardization and Inspection Branch, Fruit and Vegetable Division, Agricultural Marketing Service, U.S. Department of Agriculture, Washington, D.C. 20250.

§ 51.3326 Defect classification guide.

Defect	Waste	
	More than 10 percent	More than 20 percent
Sunburn (thin superficial type)	When extending more than ¼ inch from stem scar, and more than ¼ of the circumference of a 2½-inch tomato.	When extending more than 1 inch from stem scar, and around the circumference of a 2½-inch tomato.
(Type which penetrates outer wall)	When extending more than ¼ inch from stem scar, and more than ¼ of the circumference of a 2½-inch tomato.	When extending more than ¼ inch from stem scar, and around the circumference of a 2½-inch tomato.
Worms and worm injury	Tomatoes with worms attached or with worm injury that has penetrated through the outer wall, or attached cocoons, shall be classed as "Culls". Worms on the fruit but not attached, and loose worms shall be ignored.	
Insects	Grasshoppers, crickets, spiders, or other insects on the tomatoes shall be disregarded, but tomatoes injured by such insects shall be evaluated on a waste basis.	
Growth cracks	Badly discolored cracks which are not affected by mold or decay shall be evaluated on a waste basis. Cracks affected by mold or decay which has penetrated the fleshy wall of the tomato shall be classed as "Category C", unless additional defects make them "Culls".	
Gray wall, virus mottling, cloudy spot, ghost spot, internal browning and irregular ripening.	Fruit affected by such conditions shall not be handled on a waste basis. Presence of such factors shall be evaluated from the standpoint of their effect on color (See § 51.3317.)	
Blossom end rot	The initial stage of development, occurring as brown or silver discoloration of the skin, shall not be considered as decay. However, if the fleshy wall of the tomato is affected it shall be classed as decay.	
Sunscald	Affected areas showing a darkened, soft watery condition of the flesh or areas slightly sunken with a tough outer wall which has a whitish yellow appearance, shall be evaluated on a waste basis.	
Freezing	Fruit affected by freezing injury develop a wide range of symptoms. Chief symptom of freezing injury is a glassy or water-soaked appearance of the fruit. Tomatoes affected by any amount of freezing injury shall be classed as "Culls".	
Mold or decay	Tomatoes affected by mold or decay which has penetrated the flesh shall be classed as "Category C" or "Culls" depending upon the amount of waste.	

Metric Conversion Table

§ 51.3327 Metric conversion table.

Inches:	*Millimeters* (mm)
1/16 equals	2.2
⅛ equals	6.4
3/16 equals	9.5
½ equals	12.7
⅝ equals	15.9
¾ equals	19.1
⅞ equals	22.2
1 equals	25.4
1½ equals	38.1
2 equals	50.8
2½ equals	63.5

The U.S. Standards for Grades of Tomatoes for Processing (formerly U.S. Standards for Grade Evaluation of Tomatoes for Processing—7 CFR 51.3310–51.3318), shall become effective on March 1, 1973 and the U.S. Standards for Canning Tomatoes (7 CFR 51.4240–51.4250) and U.S. Standards for Grades of Tomatoes for Manufacture of Strained Tomato Products (7 CFR 51.4260–51.4267) are hereby, as of that date, terminated.

Dated: January 30, 1973.

E. L. Peterson,
Administrator,
Agricultural Marketing Service.

[FR Doc.73-2147 Filed 2-5-73;8:45 am]

-45D-

Product Specifications for Canned, Diced Tomatoes

Description:

The raw product to be used in the preparation of this ingredient shall be of a pear shape or plum variety, VF145 or derivative, Red Rock, C28, C37, or other variety approved by Buyer. It shall be normal in odor and flavor and shall have a uniformly bright red color typical of this approved variety. The tomatoes shall be firm, and shall be free of worms and worm damage.

Promptly after harvesting, the tomatoes shall be carefully washed, inspected, peeled in accordance with good commercial practices, trimmed as necessary, and 'positive' selected for dicing. The selected tomatoes shall be diced in a suitable properly functioning dicer. Urschell Model 'HT', 'H', or 'G' is considered suitable.

The diced tomatoes shall be immediately sorted to remove all discolored, defective, or otherwise objectionable material. After sorting, the tomatoes shall be free of foreign material, insects, worms, and insect or worm damage.

Following sorting, the diced tomatoes shall be filled into new clean #10 cans (603 X 700). The cans shall be thoroughly washed, and inspected for grease, solder spatter, dirt, rust, uncoated areas, scorched side-seam enamel, etc. prior to filling. The can and lid construction and plating shall be in accordance with the best procedures for manufacturing containers for tomato products. The interior coating shall be such that there shall be no abnormal detinning or enamel flaking which will impart off-flavors, discoloration, or foreign material to these tomatoes.

To each #10 can shall be added:

Salt - Food Grade	7.80 to 9.80	gms.
Calcium Chloride-Anhydrous -or-	5.80	"
Monohydrate	6.80	"
Citric Acid -Anhydrous -or-	6.50	"
Monohydrate	7.10	"

Additives may be dispensed into the can as powders or tablets, or in solution, or in any combination thereof. They shall be prepared and added in such a manner that each can shall receive the prescribed weight of each additive. If the additives are applied in solution,

(Continued)

the solution shall be preheated to and maintained at 180°F. (82°C) or hotter, and must be added prior to filling the can with diced tomatoes.

The diced tomatoes shall be filled into the cans on a rotary pocket filler or other filling apparatus approved by Buyer. Cycloned tomato juice may be added to top off the cans of tomatoes subject to the approval of Buyer's Representative. The top-off juice shall be heated to and maintained at 180°F. (82°C) or hotter.

After filling, the cans of diced tomatoes shall be "exhausted" through a thermal exhausting chamber or vacuum-inducing closing machine in order to produce a minimum of 4 inches of vacuum in the processed and cooled product.

At the time of can closing, each can lid shall be embossed with a code indicating the period, day, month, and year of the pack. The method of coding shall be Seller's option. Seller shall inform Buyer as to the code's significance. The period code should be changed at least every two hours.

Each can lid shall be lithographed or otherwise indelibly stamped with the following product and packer information:

Diced Tomatoes Net Weight 103 oz.
Ingredients: Tomatoes, Tomato Juice (if added), Salt, Calcium Chloride, Citric Acid.
Packer Name and Address
Country of Origin (If other than USA)

After closing, the cans of diced tomatoes shall be heat processed for a time sufficient to raise the core or center temperature of each can to a minimum of 185°F.(85°C) after which the cans shall be cooled to 95°F.(35°C) or lower. The pH of the tomato liquid measured not sooner than 8 hours after processing shall be 3.9 or below.

It is recommended that processed and cooled cans be stored "bright" for a period of two weeks prior to shipping.

Cans of diced tomatoes shall be stored so that each period code is kept segregated. The segregation shall follow through casing, palletizing, storing, and shipping.

(Continued)

There shall be no paper labels or tickets attached or loose on any can or in any carton of product packed under this contract. The cans shall be packed into new cartons manufactured without metal fasteners. The full cartons (6 cans) shall be properly glued top and bottom. Carton identification, as defined in the contract, shall appear on at least one side panel and one end panel, and shall be totally legible.

Should Buyer elect to store and ship any portion of this pack "bright" or uncased, the code segregation shall be maintained. Pallet loads of cans shall be prominently identified on at least two adjacent sides with the same information as required on the cartons.

GRADING

When graded under "U.S. Standards for Grades of Canned Tomatoes" effective July 24, 1964, the diced tomatoes shall score as follows:

Color - Minimum 27 points Average (May be 26 if approved by Buyer's representative)

Defects - Minimum 27 points

The diced tomatoes shall be practically free of defects. In each can sampled, there shall be:

No foreign material
No insects at any cyclical stage (egg, larva, pupa, adult), nor damage from insects.
Not more than an aggregate area of 4 sq. in. (25.8 cm^2) of peel. The average per day's run shall not exceed 3 sq. in. (19.4 cm^2) per can.
Not more than a trace of harmless extraneous material (Tomato leaves, stems, calyx, bracts).
Not more than an aggregate area of 5/16 sq. in. (2.02 cm^2) of blemish.
Not more than 10 gms (when trimmed from the dice) of fibrous core material, including stem ends greater than 1/8" diameter.
Not more than a trace of sprouted seeds.
Not more than a trace of pathological discoloration.

Drained Weight (when delivered to buyer) - The daily #10 can average shall be not less than 71 oz. (2.01 kilograms). No individual #10 can shall be less than 65 oz. (1.85 kilograms).

Drained Weight Procedure: Completely sever can lid. Holding severed lid in place, invert the can over a 2 mesh 12 inch diameter screen placed at a 30° angle in a drain pan. Slowly remove the lid and, while moving the can in a circular motion allow the tomatoes to

(Continued)

gently fall onto the screen where they remain undisturbed for exactly two minutes, after which the screen with the drained tomatoes is placed in a pan and weighed.

Wholeness - The factor of wholeness shall not be scored. However, the dice character-firmness and wholeness of the dice-shall be considered unofficially. The dice shall be cleanly cut, shall be firm without mushiness, and the majority of the pieces shall be identifiable cubes of uniform size.

In addition to the above grading specifications, the following shall apply:

Flavor and Odor - The diced tomatoes shall have a natural fresh flavor and odor giving consideration to the additives and the heat process.

Net Weight - The daily #10 can average shall be not less than 103 oz. (2.93 kilograms).

Mold Count - The juice fraction in each can of diced tomaotes may have a mold count not exceeding 10% when calculated by the Howard Mold Counting Method.

pH - The juice fraction in each can of diced tomatoes shall have a pH reading not exceeding 3.9 when measured using a properly calibrated pH meter.

SELECTED TRADE CONTACTS

- Selected Manufacturers of Tomatoes - US/Canada
- Tomato Products - Japan

SELECTED MANUFACTURERS OF TOMATOES - US/CANADA

COMPANY	CITY	ST	TELEPHONE	FAX
Acme Preserve Co.	Adrian	MI	517-265-7222	NA
Arkell Foods, Ltd.	Grimsby, ON L3M 4G5	Canada	416-945-5433	416-945-1341
Atwater Canning Co.	Atwater	CA	716-765-2639	NA
B.G.S. Jourdan & Sons	Darlington	MD	301-457-4904	NA
Beach Grove Foods Inc.	Stoney Point, ON N0R 1N0	Canada	519-798-3023	NA
Beatrice/Hunt-Wesson, Inc.	Fullerton	CA	714-680-1000	NA
Blackford County Canning Co.	Hartford City	IN	317-348-3380	NA
Blissfield Canning Co., Inc.	Blissfield	MI	517-486-3521	NA
Brooks Foods	Mt. Summit	IN	317-836-4801	317-836-4528
Bruce Foods Corp.	New Iberia	LA	318-365-8101	318-364-3742
Bryan Canning Co.	Bryan	OH	419-636-5091	419-636-7654
California Vegetable Concentrates	Modesto	CA	209-538-5400	209-538-5430
Cambell Soup Co.	Camden	NJ	609-342-4800	NA
Carnation Co., Culinary Foods Group	Los Angeles	CA	213-932-6000	NA
Char-Wil Canning Co.	Trappe	MD	301-822-5150	NA
Cherokee Products Co.	Haddock	GA	912-932-5211	912-932-5781
Clement Pappas & Co., Inc.	Seabrook	NJ	609-455-1000	609-455-8746
Clifton Canning Co.	Milton	DE	302-684-8332	302-684-3193
Cobi Foods, Inc.	Port Williams, NS B0P 1T0	Canada	902-542-5722	NA
Conserverie Girard Et Beaudin, Inc.	Saint Angele de Monnoir, PQ J0L 1F	Canada	514-460-7568	514-460-7719
Countryside Canners Co., Ltd.	Stoney Point, ON N0R 1N0	Canada	519-798-3025	NA
Da Vinci Food Products Ltd.	Montreal, PQ H1V 1A2	Canada	514-255-3233	514-251-1634
Del Monte Foods	San Francisco	CA	415-442-4000	NA
E.D. Smith	Winona, ON L0R 2L0	Canada	416-643-1211	416-643-3328
Earle LeGates Co., Inc.	Preston	MD	301-673-2465	NA
Escalon Packers, Inc.	Escalon	CA	209-838-7341	NA
Fiesta Canning Co., Inc.	Phoenix	AZ	602-241-4315	602-277-1795
Florida City Canning Co., Inc.	Florida City	FL	305-248-2849	NA
Foster Canning, Inc.	Napoleon	OH	419-592-7015	NA

SOURCE: Directory of the Canning, Freezing, Preserving Industries 1990-91

SELECTED MANUFACTURERS OF TOMATOES - US/CANADA

COMPANY	CITY	ST	TELEPHONE	FAX
Furman Foods, Inc.	Northumberland	PA	717-473-3516	717-473-7367
Gangi Bros. Packing Co.	Santa Clara	CA	408-727-6252	NA
Garcia Canning Co.	Tampa	FL	813-876-0674	NA
Garden Valley Foods, Inc.	Gilroy	CA	408-847-1212	NA
Genesse Foods, Inc.	Welland, ON L3B 5R4	Canada	416-892-3631	416-892-0742
Gibonburg Canning Co., Inc.	Gibonsburg	OH	419-637-2221	NA
Gilroy Canning Co.	Gilroy	CA	408-842-2148	NA
Glazier Canning Co., Ltd.	Blenheim, ON N0P 1A0	Canada	519-676-5392	NA
Harter Pik'dRite, Inc.	Yuba City	CA	916-673-8330	916-673-5170
Hartford Packing Co., Inc.	Hartford City	IN	317-348-3404	317-348-4025
Hillside Canning Ltd.	Leamington	Canada	519-326-2613	519-326-2794
Hirzel Canning Co.	Toledo	OH	419-693-0531	419-693-4859
Hunt-Wesson	Don Mills, ON M3C 3N6	Canada	519-682-1331	NA
Hurlock Food Processors, Inc.	Hurlock	MD	301-943-4501	301-943-0048
King Canning, Inc.	Pain Court, ON N0P 1Z0	Canada	519-352-7214	NA
Knapp-Sherrill Co.	Donna	TX	512-464-7843	NA
La Victoria Foods, Inc.	City of Industry	CA	818-333-0787	NA
Lake Packing Co., Inc.	Lottsburg	VA	804-529-6101	NA
Leroux Creek Food Corp.	Hotchkiss	CO	303-872-2256	NA
McCall Farms, Inc.	Effingham	SC	803-662-2223	803-665-5234
Milroy Canning Co., Inc.	Milroy	IN	317-629-2645	NA
Mrs. Whyte's Products, Inc.	St. Louis de Richelieu, PQ J0G 1K0	Canada	514-788-2754	514-788-2287
Naas Food Inc.	Portland	IN	219-726-8155	NA
Nabisco Brands Ltd., Grocery Div.	Etobicoke, ON M8Y 3H8	Canada	416-253-3200	NA
Nationwide Canning Ltd.	Cottam, ON N0R 1B0	Canada	519-839-4831	NA
Olinda Foods, Inc.	Ruthven, ON N0P 2G0	Canada	519-322-2881	519-326-7737
P.M.C. Co., Inc.	Swedesboro	NJ	609-467-0174	NA
Pacific Coast Producers	Santa Clara	CA	408-249-1262	408-249-1340
Paradise Products Corp.	Hollis	NY	718-464-9800	NA

SOURCE: Directory of the Canning, Freezing, Preserving Industries 1990-91

SELECTED MANUFACTURERS OF TOMATOES - US/CANADA

COMPANY	CITY	ST	TELEPHONE	FAX
Porino's Spaghetti Sauce	West Warwick	RI	401-822-0160	401-823-0160
Primo Foods Ltd.	Woodbridge, ON L4L 8M4	Canada	416-850-4100	NA
Quality Assured Packing Inc.	Stockton	CA	209-931-6700	209-931-0286
Ragu Foods Co.	Trumbull	CT	203-381-3500	NA
Ray Bros. & Noble Canning Co., Inc.	Hobbs	IN	317-675-7451	317-675-7452
Red Giant Foods, Inc.	Elwood	ID	317-552-3386	317-552-7945
Red Gold, Inc.	Elwood	IN	317-754-7527	317-754-7456
Rising Sun Canning Corp.	Rising Sun	IN	812-438-3271	NA
Riverbend Products, Inc.	Sanger	CA	209-787-2570	209-787-2200
Roberto's Italian Foods	Lindale	TX	214-882-7571	214-882-4476
Roberts Bros., Inc.	Winter Haven	FL	813-294-4291	NA
Ron-Son Mushroom Products	Glassboro	NJ	609-881-2924	NA
San Benito Foods	Hollister	CA	408-637-4434	408-637-7890
Sierra Quality Canners	Sacramento	CA	916-442-4144	916-442-8056
Snyder & Sons, Inc.	Bedford, PQ J0J 1A0	Canada	514-861-6056	514-248-3175
Somerset Packing Co., Inc.	Pocomoke City	MD	301-957-3440	NA
Sorrell Ridge Farms	Port Reading	NJ	201-636-2060	NA
Southern Frozen Foods	Montezuma	GA	912-472-8101	912-472-6351
Speaco Foods, Inc.	Dansas City	MO	816-483-1700	816-483-7448
Stanislaus Food Products Co.	Modesto	CA	209-522-7201	NA
Stemley Canning Co.	New Weston	OH	513-338-3311	NA
Stokely USA Inc.	Oconomowoc	WI	414-567-1731	414-567-1079
Sun Garden Packing Co.	San Jose	CA	408-297-1185	408-995-0455
Sun-Brite Canning, Ltd.	Ruthven, ON N0P 2G0	Canada	519-326-9033	NA
Swayzee Packing Co., Inc.	Swayzee	IN	317-922-7996	NA
The Beckman & Gast Co.	St. Henry	OH	419-678-4195	NA
The Diven Packing Co.	Fowler	CO	719-263-4256	NA
The Fremont Co.	Fremont	OH	419-334-8895	419-334-8120
The Home Canning Co.	Blissfield	MI	517-486-2700	NA

SOURCE: Directory of the Canning, Freezing, Preserving Industries 1990-91

SELECTED MANUFACTURERS OF TOMATOES - US/CANADA

COMPANY	CITY	ST	TELEPHONE	FAX
Thomas Canning Ltd.	Maidstone, ON N0R 1K0	Canada	519-737-1531	519-737-7003
Tip Top Canning Co.	Tipp City	OH	513-667-3713	NA
Tri/Valley Growers	San Francisco	CA	415-445-1600	NA
Unico Group	Concord, ON L4K 2A4	Canada	416-669-9633	NA
Vanderhorst Cannery, Inc.	St. Marys	OH	419-394-5236	NA
Vino's Farm	Paval, PQ H7W 3S6	Canada	514-681-3650	NA
Walnut Acres, Inc.	Penns Creek	PA	717-837-0601	NA
Weil's Food Processing	Wheatley, ON N0P 2P0	Canada	519-825-4572	519-825-7437
Wes' ı, Inc.	Omaha	NE	402-553-3363	NA
Williamsburg Canning Co., Inc.	Rhodesdale	MD	301-943-4756	301-943-4758

SOURCE: Directory of the Canning, Freezing, Preserving Industries 1990-91

SELECTED BROKERS AND IMPORTERS OF TOMATOS - US

COMPANY	CITY	STATE	TELEPHONE	FAX
Able Sales	Caparra Heights Station	Puerto Rico	NA	809-788-4141
Camerican	Teaneck	NJ	NA	201-833-9511
Daystar International	Lake Success	NY	NA	516-358-0508
Hartog	New York	NY	212-687-2000	NA
John Stanley Horne Co.	San Francisco	CA	415-781-6789	NA

TOMATO PRODUCTS - JAPAN

COMPANY	CITY	COUNTRY	TELEPHONE	FAX
Nisshin Trading Co., Ltd.	Tokyo	Japan	03-431-2333	03-432-1002
Shoei Foods Corporation	Tokyo	Japan	03-253-1241	03-253-0063

SOURCE: JETRO (Japanese External Trade Organization)

APPENDIX V - DRIED TROPICAL FRUITS

V - 1. US Imports of Dried Fruit

V - 2. Dried Fruit Specifications

V - 3. Dehydration Equipment

V - 4. Survey Results: Tropical Dried Fruits

V - 5. Selected Trade Contacts

REPORT IM146 U.S. IMPORTS FOR CONSUMPTION (CUSTOMS VALUE)
PERIOD 12-90 CURRENT MONTH AND CUMULATIVE, JANUARY TO DATE

		CURRENT MONTH						CUMMULATIVE, JANUARY TO DATE				
COUNTRY	CSC	COUNT	QTY-1	QTY-2	CUSTOM VAL	CAL DUTY	RP	COUNT	QTY-1	QTY-2	CUSTOM VAL	CAL DUTY
0813401000PAPAYAS, DRIED												
C RICA	CBA		KG				18		1798 KG		1987	
C RICA			KG						1798 KG		1987	
BAHAMAS	OGN		12500 KG		9000	360	61		12500 KG		9000	360
BAHAMAS			12500 KG		9000	360			12500 KG		9000	360
THAILND	OGN		KG				61		44278 KG		75436	3017
THAILND	GSP		64995 KG		89263		18		550450 KG		830305	
THAILND			64995 KG		89263				594728 KG		905741	3017
CHINA T	OGN		KG				61		11784 KG		42481	1699
CHINA T			KG						11784 KG		42481	1699
0813401000		10	77495		98263	360		85	620810		959209	5076
0804508000GUAVAS, MANGOES AND MANGOSTEENS, DRIED												
KOR REP			KG						1088 KG		6313	36
CHINA T	OGN		KG				61		1660 KG		8107	55
CHINA T			KG						1660 KG		8107	55
0804508000		1	1497		6816			93	168924		686293	611

Packaging specifications vary according to each buyers requirements as shown in the following chart:

1. General Foods.

   Pineapple Dices - 4 11/lb poly bags in a 250# test carton
   Banana Chips - 1 double poly bag holding 20/lbs in a 250# test carton.

2. Bonner Packing Company.

   Papaya Dices - 10/lb poly bag in a carton
   Papaya Dices - 30/lb poly bag in a carton
   Papaya Chunks - 25/lb poly bag in a carton
   Papaya Chunks - 44/lb poly bag in a carton
   Pineapple Chunks- 25/lb poly bag in a carton

3. Cade-Grayson.

   Papaya - 50/lb poly bag in a carton
   Pineapple - 50/lb poly bag in a carton

4. Nabisco Brands.

A. PAPAYA.

Description	General Foods	Nabisco	Bonner	Cade Grayson
1. Original Moisture		88.7%	88.7%	88.7%
2. Particle Size		8-10 mm	1/2" Screen	10-14 mm
3. Final Moisture		12.5% +/- 1.5%	5 - 10%	16% +/- 4%
4. Sulpher Dioxide PPM		Less Than 500	1,500/ 2,000	100/ 500
5. Sugar Content		Free flowing, sugar(dextrose) dusting permitted.		
6. Color		Golden yellow/ Light orange	Bright typical color	Red -- yellow, typical color

B. PINEAPPLE.

1. Original Moisture	85.0%	85.0%	85.0%	85.0%
2. Particle Size	8 mm Range 6-10 mm	8 -10 mm	1/2" Screen	10 - 14 mm
3. Final Moisture	9 - 15%	12.5% +/- 1.5%	5 - 10%	14.0% +/- 4.0%
4. Sulpher Dioxide PPM	Less than 500	Less than 500	1,500/ 2,000	100/ 500
5. Sugar Content	65 - 88% Total sugars	Free flowing, sugar (dextrose) dusting permitted.		60 -70% Natural & added sugars
6. Color	Typical	Light yellow, bright appearance	Typical	Yellow to amber

DEHYDRATION EQUIPMENT

1. 1 - Robins Soak Tank Washer.....$ 12,000.00

2. 1 - Robins Peeling and Trimming Conveyor, 30" wide x 12' long.....$ 12,500.00

3. 1 - Robins Waste Conveyor, 24" wide x 30' long.$ 13,500.00

4. 1 - Robins Bucket Waste Elevator.....$ 12,000.00

5. 1 - Waste Bin with Gate Dumper - BY OTHERS

6. 1 - Robins Inspection Conveyor, 24" wide x 6' long.....$ 6,500.00

7. 1 - Robins Style "F" Rotary Hot Water Blancher.$ 42,156.00

7A. 1 - Robins Junior Rod Reel Washer.....$ 9,416.00

8. 1 - Fam Model 7499 Dicer.....$ 29,000.00

9. 2 - Lee Stainless Steel Mixing Tanks.....$ 26,000.00 total

10. 2 - Lee Syrup Stainless Steel Mixing Tanks.....$ 26,200.00 total

11. 1 - Elliott Semi-Automatic Pineapple Sizer and Corer.....$ 20,400.00

12. 1 - Elliott Manual Tidbit and Spear Cutter.....$ 11,700.00

13. 1 - Robins Steel Roller Conveyor, 30" wide x 18' long.....$ 5,500.00

14. 1 - Sargent Nine Truck Cabinet Drier.....$104,000.00

15. 9 - Additional Trucks with 360 Product Trays...$ 58,000.00 total

16. 1 - Robins Inspection Conveyor, 24" wide x 12' long.....$ 8,196.00

17. 2 - Scales.....$ 4,600.00 total

18. 1 - Clamco Bag Sealer.....$ 1,600.00

19. 1 - Manual Carton Sealer.....$ 700.00

20. 1 - Cleaver Brooks Model CB-100 High Pressure Steam Boiler.....$ 48,000.00

21. 2 - Waukesha Stainless Steel Centrifugal Pumps.$ 9,000.00 total

SURVEY OF DRIED TROPICAL FRUITS - THE % OF SHELF SPACE ALLOCATED TO DRIED TROPICAL FRUITS AND TO MIXES CONTAINING SOME DRIED TROPICAL FRUITS (IN SELECTED SUPERMARKETS)

	NEW ENG	NEW YORK	BALTIMORE	SO FLORIDA	LAS VEGAS	TOTAL
NO. OF STORES	8	12	1	6	5	32
TOTAL DRIED FRUIT SHELF SPACE	100%	100%	100%	100%	100%	100%
DRIED TROP FRUIT *ALL TROP BLENDS	--	.9%	1.2%	.8%	1.3%	2.0%
PINEAPPLE	.3%	.9%	--	6.7%	--	2.0%
BANANA	.3%	3.0%	3.6%	1.3%	--	2 0%
PAPAYA	--	1.0%	--	--	.7%	.5%
CARAMBOLA	--	.4%	--	--	.3%	.2%
JACK FRUIT	.3%	--	--	--	--	--
TAMARIND	.3%	--	--	--	--	--
TOTAL	1.2%	6.2%	4.8%	8.8%	2.3%	5.5%
*MIXES CONTAINING SOME TROP. FRUITS	3.0%	4.0%	2.4%	2.8%	2.3%	3.4%

*Contained either Banana, Pineapple, or Papaya almost exclusively

SURVEY OF DRIED TROPICAL FRUITS (THE % of Shelf Space Allocated to Dried Tropical Fruits & Mixes containing some Dried Trop Fruits in Selected Health Food & Specialty Stores)

REGION	NEW ENGLAND	NEW YORK	SO FLORIDA	LAS VEGAS	TOTAL
NUMBER OF STORES	3	4	11	4	22
TOTAL DRIED FRUIT SHELF SPACE	100	100	100	100	100
DRIED TROP FRUITS:					
*ALL TROPICAL BLENDS	--	1.6	8.7	--	4.4
PINEAPPLE	5.1	2.7	2.8	3.1	3
BANANA	2.6	2.7	2.1	4.1	2.7
CARAMBOLA	--	--	--	--	--
MANGO	--	--	--	2.6	0.6
APPLE-BANANA	--	--	1.9	--	0.6
PLANTAIN	--	2.7	--	--	0.6
PAPAYA	5.2	0.5	1.9	2.6	1.9
TOTAL	12.9	10.2	17.4	12.4	13.8
*DRIED FRUIT MIXES CONTAINING SOME TROP. FRUIT					
TOTAL	--	4.4	5.4	4.6	4.7

* Contained either Pineapple, Banana or Papaya almost exclusively

Appendix V - 5

SELECTED TRADE CONTACTS

- Selected Importers and Distributors of Dried Tropical Fruit - US
- Selected Importers and Distributors of Dried Tropical Fruit - Europe

SELECTED IMPORTERS AND DISTRIBUTORS OF DRIED TROPICAL FRUIT - US

COMPANY	CITY	STATE	TELEPHONE
A.L. Bazzini Co. Inc.	New York	NY	212-334-1280
Del Monte	Miami	FL	305-520-8349
Farley Candy Co.	Skokie	IL	708-673-7200
Garry Packing Inc.	Del Rey	CA	209-838-2126
Glico Harmony	Santa Cruz	CA	408-429-1336
Hershey Import Co. Inc.	Rahway	NJ	908-388-9000
John Stanley Horne Co.	San Francisco	CA	415-781-6789
Mariani Packing Co.	San Jose	CA	408-288-8300
Melissa's World Variety Produce	Los Angeles	CA	213-588-0151
Natural Commodities Inc.	Pembroke Pines	FL	407-966-6887
Natural Food Market	Miami	FL	305-691-6513
Natural Foods Corp.	Philadelphia	PA	215-464-1066
Neshaminy Valley Natural Foods	Ivy Land	PA	213-443-5545
Newton's Naturals	Deer Park	NY	516-242-2342
Oak Feed	Coconut Grove	FL	305-448-7595
Plantains Produce Co.	Tampa	FL	813-626-9486
Sathers	Round Lake	MN	507-945-8181
Sea Wind Trading	Carlsbad	CA	619-438-5600
Timber Creek Farms	Healdsburg	CA	707-433-8251
Timber Crest	Sonoma	CA	707-433-8251
Top Foods	Miami	FL	305-592-6502
Tropical Nut & Fruit	Orlando	FL	407-843-8141

SOURCE: Various

SELECTED IMPORTERS AND DISTRIBUTORS OF DRIED TROPICAL FRUITS - EUROPE

COMPANY	COUNTRY	TELEPHONE	FAX
Agro-10 S.A.	France	33-25-21-4511	(33) 25 21 4511
Bredif-28, S.A.	France	33-37-98-3320	(33) 37 98 3320
Bredif-ETS, S.A.	France	NA	(33) 47 44 55 43
Coprodix	France	(33) 93 29 0191	(33) 93 29 0191
DacoFrance	France	(33) 1/42 37 5037	(33) 1/42 37 5037
Exadome Sa	France	(33) 54 23 82 91	NA
Favols	France	53 40 15 15	53 40 25 50
Fetaya Albert	France	(33)1/46 86 05 94	(33) 1/46 87 47 59
France Arachides	France	(33) 51 46 0784	(33) 51 46 0784
Gyfteas Andreas Sa	Greece	(30) 0721 24100 87970	(30) 0721 27737
H.J. Uren & Sons Limited	UK	051 342 6276	051 342 8604
Haudecoeur	France	(33) 1/48 39 39 50	(33) 1/48 39 93 27
Industrias Rodriguez Sa	Spain	(34) 77/31 04 58	(34) 77/32 21 00
John Stanley Horne Co.	USA	415 781 6789	NA
Laco Its	France	(33) 91 43 11 43	(33) 91 27 07 72
Laparre Sa	France	(33) 53 01 67 32	(33) 53 01 74 30
Lheritier Ste	France	43 68 00 86	43 96 47 96
Narexim AG	Switzerland	042 216664	042 217464
Peltier et Cie	France	(33) 46 48 19 81	(33) 46 48 28 48
Rue GG Willy	France	(33) 66 26 1844	(33) 66 26 1844
Sodifrut Sa	Suisse	(56) 2/821 13 93	(56) 2/821 16 05

SOURCE: Various

APPENDIX VI - PICKLES

VI - 1. Major Company Rankings in the European Community

VI - 2. Pickling Cucumber Cultural Practices

VI - 3. Floor Plan - Bulk Packing

VI - 4. Selected Trade Contacts

MAJOR COMPANY RANKINGS IN THE EUROPEAN COMMUNITY

Major Companies	France	Germany	Italy	Spain	U.K.	Belg/ Lux.	Denmark	Greece	Ireland/ Eire	Netherlands	Portugal	EC-12
Kühne		1		1							3	14%
Hengsten-berg		2							2	3	1	13%
BSN	1	3										11%
Unilever					1							4%
Develey		5										3%
Grand Met.					2				1			3%
Distributors' own label	1	4	3		4	1				1		14%
												48% (Total)
Other Companies (country rankings provided where feasible)	Christ 3	Appel & Franzel	Sacta 1		Hazelwood Foods 3	Campbell Soup 2	Danisco 1	Euro Foods		Rutten Troel 2	Guloso 2	Other 52% frag-mented
			Polli 2			Continental Foods Co. 3		Sevath SA		Hak 4	Contazzi 4	
			Ponti 4			L'étoile 4						

Source: Food for Thought

MAJOR EUROPEAN COMMUNITY MARKET TRENDS

- Germany and the UK account for two thirds of the EC market between them. Sales have almost reached saturation in many countries, but are still dynamic in the UK, Ireland and the Netherland
- The two German and the one French supplier are the EC market leaders, with a presence in two or three countries. Other producers are small and/or national.
- Own label has a high share in the major countries, a sign of market maturity.
- There are opportunities for introducing or promoting mixed vegetables, or novelties such as baby sweet corn, etc.
- These products fit in well with the current health trends, being both low in calories and tasty. Marketing efforts along those lines should be beneficial to them.

April 20, 1990 Edition

PICKLING CUCUMBERS
(cucumis sativus)

1. General

The pickling cucumber belongs to the cucurbitaceae, just as cucumbers, melons, squashs, pumpkins and watermelons. There are two types:

- smooth: - hybrids parthenocarpes (± 35 seeds per gram)
  - hybrids predominantly female (± 30 seeds per gram)
- spined: - hybrids parthenocarpes (± 35 seeds per gram)
  - hybrids predominantly female (± 30 seeds per gram)

Having a much higher level of growing hormons (auxine) than the hybrids predominantly female, the hybrids parthenocarpes can let their fruits grow without fructification of the flowers.

This has much advantages:

- higher and earlier production
- quality and shape of the fruit
- uniformity of the size and of the product
- more grouped harvests

But there are also some disadvantages:

- the cultivation of all cucurbitaceae sorts have to be isolated for at least 500 m
- an early harvest of the first three of four fruits which appear in the heart of the plant
- a regular treatment of irrigation and nutrition

The hybrids predominantly female are delivered under the name MIXTE.
This means that 15 % of the seed of a monoecious parent are mixed in the seed in order to guarantee a good pollinisation.
So there will be no fructification until the insects (bees) are active.

2. Soil

The pickling cucumber can be cultivated in all kinds of soil if only the water supply and the drainage are good. But one prefers most the soils which are pervious to water, warm and rich in humus. One has to prepare the soil for a depth of about 30 cm. In spring no ground works must be engineered on soils,

that are too humid. You have to watch the Ph; below 6, there is a blockade of Magnesium.

3. Crop Rotation

The advise for crop rotation is 1 to 4. At plots where often cereals are cultivated, is the risk of NEMATODES (Dithylenchus dipsaci). The ground has to be treated with DICHLOROPROPANE + DICHLOROPROPENE (Shell DD) in equal proportions, with regard to the problems of phytotoxity.
Beet, peas, beans, tabacco and onion are very good proceeding crops.

4. Fertilizing

One starts from the needs of the plant under normal circumstances. The pickling cucumber does not tolerate chlorine, so you better use fertilizers without chlorine. Dung gives good results. You need 20 à 30 tons per ha. This must be on the ground before the winter.
In spring one uses a fertilizer of the sort 10-10-25, 700 kg/ha and 100 kg/ha.
This means a total supply of:
N = 70 U - P2O5 = 70 U - K2O = 175 U - MgO = 48 U. So a ratio of:
1 - 1 - 2,5 - 0,7
This figures are calculated for a population of 26.000/ha.
In the cultivation you can apply 100 kg/ha nitrate of lime, when the plant development is bad; this means 15 U d'N.

5. Irrigation

Too little or too much water can have serious consequences for the succeeding of the cultivation. When the plants are young, they need pretty much water for a good start.
During the flowering, water is less indispensable. When the fruits start to grow, the need for water increases much. In the morning the irrigation is depending on radiation giving small amounts of about 2 mm, in order to avoid burning and to permit a good drying of the plant, especially when it is through aspersion.

6. Seed-bed

The pickling cucumbers do not tolerate frost and cold. When the temperature of the soil or of the air is too low during the germination, the plants may get weak for the rest of the cultivation.

They advise no to sow when the temperature of the ground is below 12 ^{0}C and there is still a risk of frost during the night.

* Direct

When the cultivation is in open air, the seeds are sown in good prepared soil in a seed-bed, of which the surface is finely crumbled, sufficiently cleaned, at a depth of 1 à 2 cm.
The seed is sown on the basis of 40 à 50 seeds or 1,4 kg till 18 à 20.000 seeds or 0,6 kg per hectare, 3-4 seeds together, on a distance of 0,50 à 1 m in a row, and with 1,50 à 1,80 m between the rows.
When the plants have a real leaf, they have to be thinned. Only the two best plants per hole are preserved; so there will be 26.000 à 11.000 real plants/ha.

* Plant

In certain regions, they sow the seed first in blocks of 4x4, in order to get a good start of all plants (this substratum consists of a mixture of brown and blond peat which is good moisturized) in proportion to 2 till 3 seeds per block, in order to preserve only two plants.
Also the technique of the mini-block seems to have success with pickling cucumbers. The procedure is the same as with the block of 4x4; there are only 1 or 2 seeds sown per mini-block.
The sowing and the cultivation of the plant can in glasshouses or in tunnels. You have to keep a temperature of 20^0 C during the germination (about three days), then a maximum of 25^0 C by day and a minimum of 14^0 C by night during the cultivation, which lasts for 12 à 20 days.
You have to look after a regular irrigation in order to keep the humus moisty. Take care of a good ventilation 3 à 4 days before the planting to harden the plant.

7. Planting

The plants are planted in a soil which is good prepared (fresh and loose) by preference at night. When the soil is dry, irrigate it after the planting. The plants are planted when they have two leaves. Take care that the clods are totally burried. The soil must just reach the stem of the cotyledon. The distances between the plants are the same as with seeds sown together (see seeds direct).

8. Cultivation

When the branches have a length of 40 à 50 cm, they are moved to one side of the

bed to avoid damage and facilitate picking.
When the ground is not yet covered with foliage, it is necessary to keep away the weeds through mechanic weeding and weeding by hand. There is still no reliable chemical treatment against weeds on pickling cucumbers.

9. Treatment

* Weeding

However, in order to limit the weed, you can apply the "technique of false seed". This means that you prepare the soil at random, leave the adventitious plants come up, treat the planlets with PARAQUAT or DIQUAT, 800 gr/ha of M.A., (Gramoxone-reglone), and than plant the seed.
During the cultivation the weed in the paths can be treated with the same chemicals, above all prevent contact with the plants.

* Insecticides

Before the sowing (preparation of the ground) treatment against the fly with CHLORPYRIFOS, 400 gr/ha of M.A. (Furlane G 10 S).
Treatment against insects and mites, at least 15 days before the beginning of the harvest, with METHIDATHION, 30 gr/hl of M.A. (Ultracide).
Treatment against aphid, during the cultivation, with DELTAMETHRINE + HEPTENOPHOS, 0,05 l/hl of M.A. (Decis B).

* Fungicides

Two treatments against downy mildew, anthrachose, rust with MANEB, 160 gr/hl of M.A., with 15 days between them, before the beginning of the harvest (Dithane M45 etc .....).

10. Covering of the soil

The soil is covered with a black plastic, 0,03 mm thick and 1,20 m long.
They make openings in it at the spots of the plants.

The advantages of the black plastic are:
- a harvest of clean fruits
- holding of the humidity under the plastic
- better drying of the plant and so less problems with Botrytis
- and above all things, effective fight against the weed

You can also use transparant plastic (type EVA). It has the same advantages as the black plastic (except for the weed) but favors a better heating of the soil. This improves an early yield and make a later sowing possible. So you can prolongate the harvest planning.

11. Harvest and yield

The picking has to be done in time and regularly.
Generally they pick 3 à 6 times a week in order to get a large percentage of the fine calibre (> 80%). How often they pick, depends on the weather at that time and the varieties they grow.

During the harvest the plants must be treated with care.

The yields are very variable. A yield of a very fine calibre of our parthenocarpic varieties can exceed the 20 tons/ha (grade Ø 19 mm). But in France the yield of our parthenocarpic varieties are mostly about 11 à 12 tons/ha and the yields of our predominantly female varieties are mostly about 6 à 7 tons/ha.

It is obvious that the heigth of the yield depends on the success, surface and health condition of the cultivation, on the weather, on the rhytm and quality of the picking.

12. Diseases and most important parasites

* Angular spots (Pseudomonas Lacrymans)

At the leaves appear angular spots which are first somewhat transparant. The spots become brown quickly and the leaves can fall.

Treatment: apply crop rotation, avoid irrigation through aspersion, use plastic cover.

* Anthracnose (Collectotrichum Lagenarium)

The leaves show large, bright brown spots. At the ripe fruits you can see some overripe spots, which are covered with an accumulation of small rose spores.

Treatment: MANEB every 10-15 days.

* Cladosporium

Glassy spots on the leaves changing into blackish necroses. And at the fruit there are deep spots, covered with olive coloured grey down.

Treatment: our varieties are resistant.

However, you can treat it with:
- Dithane
- Saprol M
- Daconil

* Brotytis and Sclerotinia

Preventive treatment when it is cold and humid, with different products:
- Pholtane, Captafol, Rovral, etc .....

* Downy Mildew and Alternaria

Preventive treatment with Dithane, Daconil and healing treatment with Pulsan, Remiltine.

* Oidium (Sphaerotheca Fuliginea)

Appearance of white spots at the leaves, the stems and the fruits.

Treatment: our varieties are resistant.

* CMV I

Conveyed through aphids, it causes great damage when the weather is cold and damp.

Treatment: our varieties are resistant.

* Aphids

Treatment: before the beginning of the harvest with Pirimor
during the harvest with Decis B

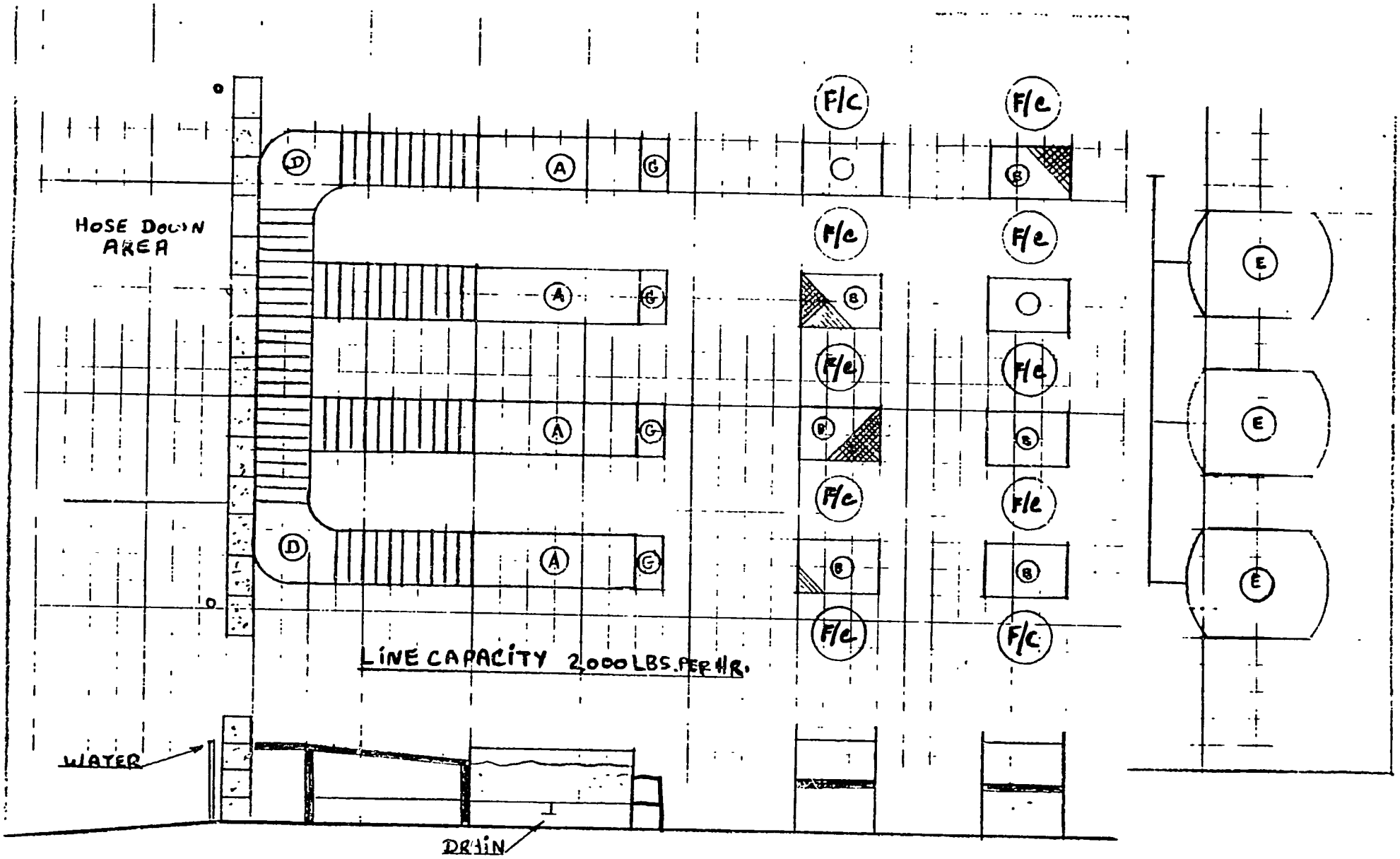
* Red Spider (Tetranychus Urticae)

Do especially appear when the weather is warm; you can find them under the leaves.

Treatment: Kelthane (15 days before the harvest)
Plictran (7 days before the harvest)
and Moresran (0 days before the harvest)

* Bitterness

Our varieties are bitterfree.


HOSE DOWN AREA
LINE CAPACITY 2000 LBS. PER HR.
WATER
DRAIN
F/C
A
B
C
D
E

SELECTED TRADE CONTACTS

- Selected Manufacturers & Distributors of Pickles & Cucumbers - US/Canada (May or May not Handle Gherkins and Cornichones)
- Selected Manufacturers & Distributors of Pickles & Cucumbers - US/Canada (Purveyors of Gherkins and Cornichones)
- Selected Manufacturers & Distributors of Gherkins & Cornichones - Europe

SELECTED MANUFACTURERS AND DISTRIBUTORS OF PICKLES AND CUCUMBERS - US/ CANADA
(PURVEYORS OF GHERKINS AND CORNICHONES)

COMPANY	CITY	STATE	TELEPHONE	FAX
Campbell Soup Co. Ltd.	Toronto, ON M8V 2B8	Canada	416-251-1131	416-255-6392
Romanoff International, Inc.	Charlotte	NC	704-543-7500	NA
H.J. Heinz Co. of Canada Ltd.	North York, ON M2M 4G3	Canada	416-226-5757	NA
Heinz U.S.A.	Pittsburgh	PA	NA	412-456-5700
John Stanley Horne Co.	San Francisco	CA	415-781-6789	

SELECTED MANUFACTURERS AND DISTRIBUTORS OF PICKLES AND CUCUMBERS - US/CANADA

(MAY OR MAY NOT HANDLE GHERKINS AND CORNICHONES)

COMPANY	CITY	STATE	TELEPHONE	FAX
Aliments Putter's Inc.	Ste. Sophie, PQ J0R 1S0	Canada	514-438-4664	NA
Allen Pickle Works	Glen Head	NY	516-676-0640	NA
Arnold Pickle & Olive Co.	Phoenix	AZ	602-257-1915	NA
G.E. Barbour Inc.	Sussex, NB E0E 1P0	Canada	506-432-2300	506-432-2323
Berger Foods, Inc.	St. Louis	MO	314-652-7810	NA
Bick's Division, Multifoods, Inc.	Scarborough, ON M1P 2Z7	Canada	416-293-4105	NA
Bloch & Guggenheimer, Inc.	Hurlock	MD	301-943-4933	NA
Bond Food Products Co. Inc.	Oconto	WI	414-834-4433	414-834-2598
Cajun Chef Products, Inc.	St. Martinville	LA	318-394-7112	NA
Casadian Farm, Inc.	Concrete	WA	206-853-8175	206-853-8353
Chas. F. Cates & Sons, Inc.	Faison	NC	919-267-4711	NA
Cherry Hill Cannery, Inc.	Barre	VT	802-479-2558	NA
Claussen Pickle Co.	Woodstock	IL	815-338-7000	NA
Cobi Foods, Inc.	Port Williams, NS B0P 1T0	Canada	902-542-5722	NA
Comstock Michigan Fruit	Rochester	NY	716-388-1070	716-383-8689
Cristle Foods, Inc.	Towson	MD	301-339-7428	NA
Dalton's Best Maid Products, Inc.	Fort Worth	TX	817-335-5494	NA
Dykhouse Pickle Co.	Vassar	MI	517-823-8575	517-823-7871
Erbrich Products Co.	Indianapolis	IN	317-925-6433	NA
Farman Bros. Pickle Co.	Enumclaw	WA	206-825-2481	206-825-6962
FMWH Foods, Inc., dba Wellworth	Paterson	NJ	201-279-1878	NA
Food City Pickle Co., Inc.	Battle Creek	MI	616-781-9135	616-781-3244
H.W. Freestone Pickle Co.	Bangor	MI	616-427-7702	NA
M.A. Gedney Co.	Chaska	MN	612-448-2612	NA
Gielow Pickles, Inc.	Lexington	MI	313-359-7680	NA
Goldin Pickle Co., Inc.	Dallas	TX	214-638-0271	NA
Grantham Foods Ltd.	Vancouver, BC V5M 2E4	Canada	604-438-1962	604-438-0557

SOURCE: The Directory of the Canning, Freezing, Preserving Industries 1990-91

SELECTED MANUFACTURERS AND DISTRIBUTORS OF GHERKINS AND CORNICHONES - EUROPE

COMAPNY	COUNTRY	FAX	TELEPHONE
Appel & Frenzel GmbH	West Germany	(0211) 4159-107	(0211) 4159-0
BSN Group	France	(1) 42991475	(1) 42991010
Campbell's Ltd.	United Kingdom	NA	(0553) 775051
Cemaco Sa	France	(33) 1/42 82 14 64	(33) 1/42 85 03 30
Continental Foods NV	Belgium	(03) 8893219	(03) 8893200
Devely Feinkostfabrik	West Germany	(089) 61102-127	(089) 611 020
Grand Metropolitan Foods Europe	United Kingdom	(081) 842 0842	(081) 842-5000
Hak Conserven BV	Netherlands	NA	(01832)1541
Hazelwood Foods Pic	United Kingdom	(0332) 292300	(0332) 295295
Hengstenberg GmbH & Co.	West Germany	(0711) 392-230	(0711) 392-0
Internacional Olivarera Sa	Spain	(34) 954/72 57 26	(34) 954/72 04 00
Julio Jauregui	Spain	(34) 43 42 15 39	(34) 43 42 06 30
Kuhne KG	West Germany	(040) 85305-235	(040)85305-0
La Vannoise	France	(33) 86 97 25 71	(33)86 97 22 08
Nico Breuers	The Netherlands	(31) 77 82 34 69	(31) 77 82 31 31
Noel & Sons Ltd	Great Britain	(44) 254/385 357	(44) 254/301 024
Recorbet Marcel	France	(33) 76 77 34 13	(33) 76 77 38 38
Ruiten Troef Conservenfabriek BV	Netherlands	NA	(01713) 9011/2307
Societe Nouvelle La Tahitienne	France	(33) 90 58 06 48	(33) 90 58 16 72
Sopal	France	(33) 1/90 95 88 76	(33) 1/66 64 04 31
SVZ France	France	(33) 1/40 96 10 15	(33) 1/40 96 10 20
Thalassinos Aristotle J Sa	Greece	(30) 01 3618926	(30) 01 3616936
Unilever France	France	(1) 42997333	(1) 42997272
Unimark	France	(33) 142 08 6629	(33) 142 08 0584

SOURCE: Various