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A SURVEY OF TRADITIONAL AND NONTRADITIONAL FRUITS AND SPICES FOR POTENTIAL COMMERCIALIZATION IN PERU

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United States Agency for International Development
and the
Postharvest Institute for Perishables

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TABLE OF CONTENTS

PAGE

I. INTRODUCTION....1
  A. Geography of the Selva....1
  B. General Observations....2
II. CONSTRAINTS AND PROBLEM AREAS....3
  A. Distribution Systems....3
  B. Quality Control and Postharvest Practices....4
  C. Marketing....5
  D. Infrastructure and Technical Personnel....5
  E. Financing....6
III. CROPS - GENERAL COMMENTS....7
  A. Traditional....7
  B. Potential for Export....12
  C. Native Crops....15
IV. TIME-PHASED PROGRAM FOR RESEARCH, DEVELOPMENT AND PERSONNEL TRAINING....18
  A. Personnel Training....18
  B. Crops Development....20
    1. Guarana, araza, lucumo, aguaje....20
    2. Palmito....22
    3. Camu Camu....23
    4. Poma rosa....25
    5. Black pepper....26
    6. Annato (achiote)....27
    7. Cacao....29
    8. Guanabana....31
    9. Guayaba....33
    10. Passion fruit....35

11. Citrus....36
12. Mango....37
13. Papaya....39
C. Some Sources of Plant Germ Plasm....43

V. GENERAL OVERVIEW OF INTERNATIONAL MARKET FOR FRESH FRUIT, PROCESSED FRUIT PRODUCTS AND SPICES....46
A. Fruit Prices Paid per Kilogram to Producer-Wholesaler-Retailer, 1980 and 1984, High Jungle....46
B. Freight Rates for Fruit Transportation, 1984....47
C. Seasonality in the Supply of Fresh Fruit....47
D. International Market Demand for Fruit Juice....47
E. International Market Demand for Spices....48
F. Export of Fresh Fruit, Processed Fruit Products and Spices from Peru, Totals....48
G. Export of Fresh Fruit, Processed Fruit Products and Spices by Country....48

VI. SUGGESTIONS FOR EXPANDING POTENTIAL....50
A. Distribution Systems....50
B. Quality Control and Postharvest Practices....50
C. Marketing....51
D. Infrastructure and Technical Personnel....53
E. Financing....53
F. Recommendations on Crops....54
1. Traditional crops....54
2. Potential crops....54
3. Native group of crops....55

VII. SUMMARY....57

VIII. ACKNOWLEDGEMENTS....58

IX. BIBLIOGRAPHY....59

X. APPENDICES

1. List of Fruits and Spices in the Selva Region of Peru.....62
2. Statistics of Agricultural Production for Selected Fruits, Table No. 1.....64
3. Statistics of Agricultural Production for Selected Fruits, Table No. 2.....66
4. Some Peruvian Crops Listed in Three Categories.....68
5. Brief Comments on Some Exotic Fruits and Spices.....69
6. History of Research Carried Out on Native Fruit Trees of the Amazon Area.....72
7. Suggestion for Pilot Project - Wholesale Market to Improve the Distribution System for International Marketing of Peru's Crops....73
8. Fruit Prices Paid per Kilogram to Producer - Middleman - Vendor, 1980, High Jungle.....77
9. Fruit Prices Paid per Kilogram to Producer - Wholesaler - Retailer, 1984, High Jungle.....78
10. Freight Rates for Fruit Transportation (1984).....79
11. Seasonality in the Supply of Fresh Fruit.....80
12. Seasonality in the Supply of Spices.....81
13. Seasonality of U.S. Demand for Fresh Fruit and Spices.....82
14. Characteristics of the Demand in the U.S.A. for Imported Fruit Juice.....83
15. Charcteristics of the Demand in Japan for Imported Fruit Juice.....85
16. Characteristics of the Demand in Saudi Arabia for Imported Fruit Juice.....87
17. Characteristics of the Demand in West Germany for Imported Fruit Juice.....89
18. Characteristics of the Demand in the United Kingdom for Imported Fruit Juice.....93
19. Characteristics of the Demand in France for Imported Fruit 95
20. Characteristics of the Demand in The Netherlands for Imported Fruit Juice.....97
21. Characteristics of Pepper Demand in the World Market.....100
22. Characteristics of Capsicum and Chillies Demand in the World Market.....101

23. Characteristics of the Ginger Demand in the World Market.....102
24. Characteristics of Turmeric Demand in the World Market.....103
25. Export of Fresh Fruit, Processed Fruit Products and Spices, $ Value Totals by Year.....104
26. Export of Fresh Fruit & Value by Destination.....106
27. Export of Processed Fruit Products: Canned Fruit and Preserves, $ Value by Destination.....109
28. Export of Processed Fruit Products: Canned Fruit and Preserves, $ Value by Destination.....110
29. Export of Processed Fruit Products: Unmixed Fruit Juices With and Without Sugar, $ Value by Destination.....112
30. Export of Spices, $ Value by Destination.....115

I. Introduction

A. Historical Background.

The U.S. Presidential Agricultural Mission (PAM) to Peru identified marketing as a complex problem impeding expansion of the agricultural sector. The agricultural and rural development diagnosis concluded that a variety of chronic problems continue in the marketing system, including poor and inadequate storage facilities, high product losses in the marketing chain, limited information about processing, production, supply and demand, few and marginally enforced grades and standards, absence of marketing credit, inadequate wholesale market facilities and lack of trained manpower qualified to do marketing policy analysis and to manage the various public and private marketing system activities.

The GOP made a major investment in high jungle development. Over $500 million of GOP and foreign donor resources have been invested in 8 area development projects. All of the projects have potential to produce tropical fruits and spices for processing and/or export.

Given the tremendous complexity associated with marketing and agro-industry, USAID was interested in studying the development of production and marketing capabilities with crops which can have a Peruvian competitive advantage: exotic fruits and spices. In this regard, and in conjuction with INADE, a prefeasibility study was prepared to examine production, processing and marketing potentials of exotic fruits and spices from the Peruvian Selva. This region was selected as the target area for the prefeasibility survey by the USAID/Peru Mission people and the internal itinerary for visits and travel was prepared by them.

We believe this survey can provide guidance to GOP and USAID/Peru in support of immediate project concerns in the Selva and establishes a basis for a possibly borader agricultural marketing sector study in the future.

A. Geography of the Selva

The Selva comprises approximately 63.0% of the total area of Peru, 82 million hectares. It is the tropical region of the country and is crossed by large rivers, principally the Amazon River. It is possible to distinguish two sub-regions, differentiated by the amount of rainfall. The High Jungle, situated between 800 and 1500 meters above sea level, where it rains 4 months

of the year, with periods of little or no rainfall. The Low Jungle or Humid Tropics, less than 800 meters above sea level, has rainfall throughout the year. This region produces a wide variety of products, such as coffee, cacao, tropical fruits (mango, papaya, pineapple, bananas, and citrus fruits). The local people also gather plant products such as rubber, curare, barbasco, Brazil nuts, heart-of-palm, and native fruits such as camu camu, araza and pijayo.

B. General Observations

The lower Selva has the lowest population density and is the least developed region of Peru. Much of the population subsists on the food it can hunt, fish, or gather and remains isolated from the market economy. The roads are poor or non-existent, and no electricity or telephones exist outside of the major population centers. The region has been receiving considerable attention from the Peruvian Government.

Most land clearing is done by hand, using the traditional slash and burn method. Small farmers who produce cash crops sell them to middlemen at the farmgate or at the market gate. The paperwork required by banks to procure agricultural loans is complicated and time consuming, and interest rates are high. The few food processing industries in the area provide some credit, usually buy directly from the producers, and use their own trucks to transport to the processing plants.

The discovery of oil in the Selva has triggered a rapid increase in the cost of living in Iquitos. According to the Iquitos Chamber of Commerce, approximately 9% of the population is working for the oil companies.

Illegal narcotic activities occupy an unknown segment of the Selva population, and contribute generally to the isolation and underdevelopment of the local population.

The Central Selva, or High Jungle, is somewhat more developed that the Low Jungle but is still part of this least developed region of Peru. The slightly richer soil and slightly drier conditions are more conducive to the cultivation of a wider variety of crops than in the Low Jungle. There exist several larger farms which have exported crops such as coffee, oranges and black pepper.

The Selva's lack of infrastructure, its isolation from the rest of Peru and the world, and its acid, humid soils are serious hindrances to development of the region. However, certain exotic fruits and spices have been produced for export in the past, and these and others have a potential international market.

Two fruit processing companies, INDDA and the University of La Molina have been investigating the cultural aspects of some native fruits and have expermited in developing preserves and canned products from them. At this point, little cultural or processing data exists, and the private sector cannot be expected solely to provide enough resources for the systematic and sustained research needed to develop the export production of Peru's exotic fruits and spices.

II. CONSTRAINTS AND PROBLEM AREAS

A. Distribution Systems

In the isolated area of Iquitos, a marketing/distribution infrastructure is very inefficient. Farmers and middlemen bring local produce, such as fish, root and nut crops, and some fruits and spices, to the central Iquitos market by river boat, raft, and truck. The market is located on the banks of the Amazon river. Also, vegetables, grains, other dry goods, and fruits and spices arrive daily at Iquitos airport from Lima. At least four middlemen are involved with air freight, ground freight, and related handlings of both local produce and the produce brought from Lima. Prices rise and quality deteriorates at each middleman level.

In the Iquitos area, few if any crops are cultivated/produced on a commercial scale. Due primarily to numerous handlings, involving at least four middlemen in both transport systems mentioned, produce prices skyrocket and quality deteriorates at each middleman level.

The distribution system in the Pucallpa area is similar to that for Iquitos with three principal exceptions: first, the central market building, design and accessibility, although lacking much, is far superior to the garbage-littered, open-air insect chambers referred to as a central market in Iquitos; second, in the Pucallpa area there is some small scale commercial

fruit and spice production; and think, third, the Pucallpa area produces vegetables for local consumption. (See III. "Crops - General Comments"). Additionally, truck freight rates from Lima to Pucallpa are approximately one third of aircargo rates from Lima to Iquitos (US$0.25 to .30 per kg vs. 0.07 to 0.08 per kg). Freight rates from San Ramon to Lima are equal to some US$ 0.02 to 0.025 per kg.

The dire need of an improved distribution system is obvious. Changes in such an old established system are difficult.

Freight rates, whether for land, water or air transport vary considerably. Example, air cargo rates from Lima to Iquitos varied from 600 to 1000 soles per kg. Truck rates in some areas are by load while in others area rates are per kg and also vary widely.

B. Quality Control and Postharvest Practices

No quality control system was observed in Iquitos, Pucallpa and Palcazu areas and only a very rudimentary semblance to such a program was seen in San Ramon. As most of the major constraints are intertwined, quality control and postharvest handling problems are multiplied by administrative and technical personnel shortages (undertrained personnel) at most levels, little to no grading/sizing standards, improper packaging and packaging material and a general lack of continuity of programs and projects. More serious and yet very basic problems observed were inadequate financing to agricultural universities, to research departments and stations plus the incomplete curriculum offered. The lack of and/or limited research facilities is only surpassed by the nonavailability of research data in the form of published reports. The obvious problem of virtually no quality control programs or proper postharvest procedure is also very interwined with marketing (see below). Yet another accepted but horrible postharvest practice is that of the wholesaler insisting on over-packed crates (crude wooden). The reason is obvious: he buys crate, not by weight.

If Peru is to export any of the non-traditional and more of some traditional fruits, the general lack of importance placed on quality controls and proper postharvest procedures must be changed.

C. Marketing

Can Peru export quality produce from the Selva at the required time and at a competitive price? Can Peru take advantage of some marketing windows in the US, Canadian and European markets? The answers to these and other questions revert back to the universities and the research needed in marketing and related areas. Almost no data were available at any of the experiment stations and pilot projects visited. (See list of those visited in Appendix).

Fields of export quality fruit per ha may be a limiting factor, along with packaging and shelf life.

At the La Francia orange farm in the La Merced area, the owner had records reflecting previous annual yields per tree of 400 to 480 kg with a fertilizer rate of 12 kg per tree. Although a progressive producer, his yields have recently dropped from the above figures to 300 to 350 kg per tree. Although he previously took advantage of market windows during March, April and May in Holland and Germany, he is not able to export at this time as quality has declined. (See III Crops-General Comments). The reasons given for his yield and quality reductions were 1) drastic increases in fertilizer cost, 2) inferior quality of mechanically mixed fertilizer as compared to chemically mixed, 3) diluted fertilizer mixtures and 4) uncertain fertilizer availability.

Little market information is available to producers in the Selva. For the export markets, particularly those in the US and Europe, inexperience on the part of exporters, fears of the unknown market and lack of contact with international broker/buyers are only some of the marketing constraints. These constraints are multiplied by the present inferior quality of produce, inappropriate packaging, and generally inadequate postharvest handling.

D. Infrastructure and Technical Personnel

The agricultural universities and research stations must become major contributing sources for the development of Peru's agro-industry and agribusiness. Assistance is urgently needed to alleviate the problems of undertrained technicians and limited departments and staff at agricultural universities and to encourage professional initiative through additional professional training. Undertrained personnel are also constrained by the physical restrictions observed at the universities and research stations. Two

research stations observed had virtually no laboratory equipment. The INIPA Project of Native and Non-Traditional Crops, Iquitos Experiment Station has no telephone, radio or electrical facilities. A Crysper grain cleaner/selector was observed still boxed in the crate it was shipped in over two years ago. A used generator was also observed in its packing crate. All seed selection is done by hand at this station.

The principal highways for movement of product in parts of the Iquitos and Central Selva areas are no more than dirt roads. Furthermore, the very few farm to market roads are little more than improved mule paths. Basly bruised fruit, observed in numerous markets, is damaged even more during transport over such roads. No cold storage facilities for perishable fruits were observed in the area covered.

Inadequate communication facilities severely hamper management and technical personnel. Crops are not prioritized according to their potential economic value for research. In the Pucallpa and other areas, extension programs are fairly well organized with good staffs, yet extension agents have little to extend due to the lack of adequate information flow from research.

Wholesale market buildings observed in the Selva are poorly designed, poorly located and managed to the detriment of the producers. There appeared to be little control over middlemen and wholesaler activities, and little attention paid to weights, sanitation or grades. Farmers are not allowed to enter the markets with their produce.

The lack of infrastructure and the problems related to undertrained personnel and underequipped universities in the Selva will be serious constraints to the development of export production in the area.

E. Financing

Production financing available to the average producer is most limited and costly. Interest rates mentioned varied from 55% to 68% with the Banco Agrario being virtually the only source for agricultural production credit. Application requests are extremely time consuming and approvals even more so. Guarantees/collateral required by the bank are beyond the capacity of the producers.

III. Crops - General Comments

Visits were made during May 30 to June 5, 1984 to four different areas in the humid tropics of eastern Peru to observe fruit and spice production. Specific crops were viewed in terms of production capabilities for national, regional (adjacent countries), and/or international market potentials. Crops were considered for their potential value as fresh and processed products and are listed under the following three groups: Group I - Traditional Crops, Group II - Potential for Export, and Group III - Native Crops (Table I).

A major factor in Peru's favor is the seasonal difference from the northern hemisphere where most of the major international markets are located. Peru has taken some advantage of this major factor. Consideration of crops with fresh fruit marketing potential is based on the premise of off-season (for the northern hemisphere) production. For example, marketing windows for mangoes, November through February, can only be exploited when quality and grade standards as well as packaging and other pre-requisites established by international buyers are strictly observed.

Development of commercial fruit and spice production, whether targeted for regional, national or international markets, requires a basic infrastructure financed by the public and private sectors. It is acknowledged that in other parts of the country, such as the coast, considerable investment and development have been achieved. Comments on lack of necessary infrastructure and supporting elements are restricted to the humid tropics observed during this study, specifically in the Iquitos and Central Selva areas. Discussion and comments on crop potentials are given under crops subheadings.

A. Traditional Crops:

1. Citrus - Citrus observed in the field included Valencia oranges, mandarins, limes and grapefruit, more or less in that order of magnitude. In the Iquitos area, production is limited to small multiple cropping farms. Some citrus cultivars are maintained at the CIPA Experimental Station at San Roque, Iquitos. There is no commercial production in the Iquitos area, with perhaps the 5 ha of Sr. Demetrio Beuzeville being a small exception. This farmer had the largest number of trees of Valencia, mandarin, grapefruit and

lime. In the Iquitos area, soil is a relatively heavy clay type with low pH levels, which are very unfavorable for fruit production. Much liming is necessary to raise the pH, provide adequate levels of calcium and generally improve quality of production.

Citrus in the Pucallpa area is only slightly more developed, as orchards are more in the range of a few hectares in size, although much of the citrus comes from multiple cropping farms. Cultivars are generally of the same type as observed in Iquitos. Soil conditions are slightly better than those of the Iquitos area but pH still ranges around 4.0 - 4.8, much too low for most cultivated crops. Drainage is also better. In this region, lime and grapefruit production on a commercial scale appears possible. Land is available for utilization.

The highest level of development in citrus production is seen in the San Ramon - La Merced area of the Central Selva region. Production is largely focussed on Valencia, with some mandarin. The Regional Institute Jungle Development, UNA - La Molina operates a farm with controlled and scheduled fertilizer programs. The university is attempting to utilize scientific principles in management as a model for commercial development.

Fundo La Francia is a 188 ha farm operating adjacent to the university farm. This private farm grows mostly Valencias and mandarin. Some Tahitian lime trees were also observed. Fruits are packed on the farm for marketing. Formerly, production was approximately 400 - 480 kilos/tree/yr for Valencias. The grower used to export Valencias to Europe, but in recent years his fruits have failed to meet foreign market standards in fruit size, brix and other factors due to drastic reductions in fertilizer application. The major reason stated for reducing fertilizer inputs has been their increasing cost. Because of the experience of the Managing Director, Mario Jeri Lopez, this farm could be used as a model for citrus production directed towards international marketing of fresh and processed fruits. Government assistance in providing lower cost fertilizers and other operational items appears absolutely necessary for this farm to regain export capabilities and to encourage other growers to follow suit.

This producer also complained of the poor quality of currently available fertilizers produced by mechanical blending of the elements. The elements

separate in mechanically blended fertilizers resulting in uneven distribution of the elemental fertilizers to the trees. He stated that chemically blended fertilizers do not separate, allowing equal distribution of NPK and other elements.

Because of the generally unfavorable soil conditions (low pH, poor to fair drainage) in the Central Selva Area, experiment stations should investigats: (a) rootstock studies (disease resistance and stock/scion relationship), (b) introduction and evaluation of cultivars and (c) nutritional needs of cultivars under existing soil conditions.

With appropriate atention given to the various constraints mentioned in this report and to technical support by research agencies, old citrus orchards can be revived and new ones established in the Central Selva Region.

2. Mango - Mango cultivation in the Iquitos area is also confined to backyard and subsistence farms. No one had convincing knowledge of the cultivars in this region, but we suspect that trees are composed of polyembryonic cultivars. High rainfall and poor soil conditions (low pH) are generally unfavorable for mangoes. Rains during flowering period will cause excessive anthracnose disease (*Colletotrichum gloeosporioides*) of flowers.

In Pucallpa eighteen cultivars of mango, including the major Florida cultivars, have been collected at the Research and Extension Farm of CIPA XVIII. Trees have been neglected periodically and yield records are generally unavailable. Other small orchards were observed along the highway. Climatic conditions, although not highly favorable, will allow the cultivation of selected cultivars, provided soil pH is raised and other nutritional ammendments made.

Small scale mango plantings were also observed in the San Ramon/La Merced areas but again cultivars were unknown. Climatic and soil conditions appear more favorable in this region but there seems to be a lack of level or gently sloping land. Extremely steep slopes are now under cultivation. The Pucallpa region, on the other hand, has huge tracts of jungle land that can be used for commercial orchard development. Mango appears suitable for the international markets, as Peruvian production comes during the winter season in the northern hemisphere. Selection of proper cultivars for export is also a major consideration. It is possible that cultivar evaluation has been conducted in

the Coastal areas (Piura) but no such studies have been carried out in the Central Selva zone. Internationally, markets are familiar with the Florida cultivars, which are all monoembryonic, Indian types. Polyembryonic cultivars of Indo-China and Philippines have not shown the qualities desired in international markets, except for the 'Carabao' (Philippines) or 'Manila', as it is known in Mexico. Because postharvest and shipping studies have been concentrated on Floridian cultivars, it is suggested that emphasis be placed in these cultivars for export considerations.

3. Papaya, plantain, and bananas - These crops are presently part of the multiple cropping system in Iquitos and other areas. Small plantings were observed in Pucallpa and larger ones in La Merced. The university farm in La Merced had the largest planting of papayas. Observations in these regions indicate that without changes these three crops will be limited to local and regional markets due to lack of agronomic and postharvest handling knowledge. The fruits observed in the markets were of extremely inferior quality, due largely to mishandling and poor packaging. For export of papaya, large-fruited cultivars are absolutely unfeasible. This is one of the major reasons Hawaii has emphasized small, Solo type fruits. For export production of bananas, adequate quantities of single crop cultivars must produce fruit almost throughout the year.

Papaya production could probably be expanded in the Pucallpa area with proper soil inputs. pH must be raised to a level of 5.5 - 6.0 or higher for papayas. Because the soil drainage in the Pucallpa area is less than favorable for papayas, the raised bed system used in Southeast Asia is recommended. This was described and explained to technicians accompanying us in the field.

At the university farm in La Merced, the papaya ringspot virus disease is the major problem. As evident from experiences in Hawaii, Mexico, Venezuela, Taiwan and other areas, papaya production will decline where this disease is prevalent. No resistant cultivars are currently available. The virus is not seed-transmitted, so seedling plantings may be done in areas free from this virus.

The plantings observed did not generally show healthy growth and production, primarily because of very low soil pH and lack of available

nutrients. Papaya trees require adequate amounts of phosphorous (.45 kg per plant) at planting time plus potassium and nitrogen. Growth of stem diameter requires phosphorus and potassium at an early seedling stage. Thereafter, 0.12 kg of a complete fertilizer (14-14-14) or similar formulation should be applied monthly or at least bimonthly. When flowering occurs, amounts should be increased to 0.45 kg/bimonthly. Giving 0.225 kg/month is better than giving 0.45 kg/bimonthly.

Plantain and banana production could be increased through orchard development, with a few selected cultivars. The major problem appears more in postharvest handling of the fruits than in cultivation. Postharvest handling is discussed in Section II of this report.

An insect problem of bananas in the San Ramon/La Merced area is the stem borer, which limits the life of the mats. Research in plantain and bananas should include cultivar evaluation, fertilizer practices, disease and insect control, postharvest handling and transportation methods.

4. Avocado - Very few avocado trees were observed and only in the Pucallpa and San Ramon/La Merced areas. Fruiots observed in packing houses and local markets showed a wide array of types, appearing mostly to be from seedling trees. It is doubtful whether cultivar evaluation and other studies have ever been done in the Selva region. For regional markets, selection of cultivars and standardization of fruit are desirable, and for international markets absolutely imperative. Cultivar selection should consider harvest period as one of the criteria, in order to lengthen the season.

Considerable research is needed in the Central Selva zone if avocado is going to assume an export status. Cultivar evaluation, nutrition, disease control and postharvest handling are important areas of research. In orchard development, type A and B cultivars must be considered for maximum pollination and fruit set.

5. Pineapple - Cultivation of pineapple in the region visited is extremely limited. Generally, soil type and climate are not conducive to pineapple cultivation. Pineapples are susceptible to root diseases in soils with extremely low or high pH and with excess soil moisture conditions. However, if soil amendments and raised bed system are introduced, considerable cultivation can be maintained in the Central Selva region. The cultivar currently grown is inferior to the 'Smooth Cayenne'. Strains of 'Smooth

Cayenne' as well as the 'Red Spanish' should be introduced for trials in this area. The plantings observed showed wide spacing. Increasing the density/ha by planting closer (25 - 30 cm) within the rows would greatly increase yields, if appropriate fertilization practices are followed.

In order for the humid tropics to produce pineapples for the international market, considerable research input is necessary. Little information is presently available in cultivar, fertilization, disease control, forcing of flowering to obtain fruits at different periods, propagation of planting materials and other aspects of production.

6. Cacao - Cacao plants were not observed but are planted in the Central Selva region. Production is at a low level but there appears to be a potential for increased production if economic trends warrant this increase. A pod disease called Monilia pod rot (*Monilia rorori*) has devastated the industry in Costa Rica as well as elsewhere. The disease has drastically reduced production in the cacao producing areas and has driven prices up. The humid tropics can be ideal for cacao if soil amendments are made and other cultural technology can be produced through research.

B. Crops with Potential for Export

1. Passion Fruit - Most of the passion fruit production is in the coastal area of Peru, where the climate is more suitable. In the humid tropics disease problems increase. A small planting was observed in La Merced at the INDALSA factory. The vines looked good. A different type of trellis called the T-type was described to the managing director. This trellis type has given better yields than the traditional grape trellis type used in most places. Fruits of both *Passiflora edulis* var. *flavicarpa* (yellow passion fruit) and *P. ligularis* were seen in the markets. The flavicarpa is more suited for processing while ligularis is definitely a table type. Soil pH should be above 5.0. The most important factors affecting yields are diseases and the type of trellis for the vine, in that order. Research must be intensified if passion fruit is to assume export status in theCentral Selva region.

2. Palmito (Pijuayo - *Bactris gasipaes*) - Palmito or heart-of-palm as it is known elsewhere appears to be a crop with good potential for the international market. CAMSA presently operates a palmito canning factory in

Iquitos and markets the canned palmito internationally. All fresh palmito bought by this factory comes from wild jungle plants in the Iquitos regions. Cultivation under orchard conditions appears very desirable if the canning industry is to expand. The Iquitos area would be a natural for orchard development, as would the area of Iscozacin. Under Proyecto Palcazu, hillsides and pasture lands could be planted with this crop. Due to lack of roads into the project area, the raw palmito would have to be transported by air. However, road construcion may be cmpleted to San Ramon in the next year or two, and it will take that long to establish the crop. It is advisable that factories be located as close as possible to areas of production, to avoid deterioration of quality of the raw product.

3. Cocona - Cocona is native to the Amazon region and grows well in the jungle areas around Iquitos. It is placed in this group because its processed products, such as nectars, juices, jams and jellies, now produced at home, appear to have national and even international potential. For commercial processing, orchards must be developed to produce an adequate supply of fruit. The Iquitos, Pucallpa and Iscozacin areas should be considered for production.

4. Guayaba - Very little guayaba was observed in the entire region. There appears to be little interest in this crop and hardly any field research has been done. It could be grown in the Tingo Maria area but some disease problems would exist. This fruit is largely considered a processed product and, as such, could be developed into an exportable item. Experiment stations should consider appropriate cultivars for this purpose. Clonal plants may be propagated by green stem cuttings, using rooting compound and mist propagation or by grafting.

In Hawaii, cycling research is being done so that different sections of the field may be brought into production at different times in order to spread the harvest season and to utilize labor more efficiently. Low rainfall, irrigated areas are more conducive to cycling as moisture stress and defoliation can be achieved.

5. Guanábana and Chirimoya - At the outset it may be said that chirimoya is not a crop for the Tingo Maria region due to lack of appropriate temperatures for flowering. Small production can be achieved in the higher elevations of La Merced area, but, by and large, it should not be considered a crop of importance in that region.

Guanábana is a tropical lowland crop and can be grown well in the Tingo Maria region. The Pucallpa area should be especially suited because of land availability. Observations were confined to a few trees so definite statements cannot be made. Trees were growing well but nothing is known of production. In most areas where guanábana is produced (Mexico, Venezuela, Caribbean Islands and in India) fruit set has been reported to be a problem. Flowers show dichogamy (stigmas and stamens being functional at different time). Stigmas are receptive first, and, just about the time they lose their receptivity, the stamens become functional. In India, where flowers appear in the spring and summer, better sets are obtained from the summer flowering, when high humidity prevails. Flowers coming out in the dry season (spring), dessiccate rapidly, while stigmas remain functional longer under high humidity. The humid tropics of the Selva region should be an advantage, given this consideration.

We have been informed of the presence of several insect problems. However, there is no evidence available that research on control of these specific pests has been conducted. Mexico has seed and tree borers, and attempts are being made to control them.

Guanabana is a fruit which can be processed into a puree which can be used to make sherberts, ice cream and bakery products. In the US, current use of this product is limited by its scarcity. Venezuela was producing guanabana puree under several brand names, but current status of production is unknown. Mexico had substantial plantings of young trees several years ago, but current status of production is unknown. Research is necessary in order to establish this crop for commercial purposes.

6. Black Pepper - Black pepper is now being grown by the Agrarian Cooperative "El Pimental". The cooperative used to produce 400 MT/yr, or 66 percent of total national consumption of 600 MT per year (in 1975), but production has been reduced to 50 MT, due to a Fusarium disease. Peppers require a soil pH of 6 to 6.5, but the soils are now at approximately 4.5. Low pH, combined with high temperatures and humidity, are ideal conditions for Fusarium. Use of TECTO (systematic fungicide 2 - 4 thiozolil-benzimidazole thiobenzole) and introduction of a resistant cultivar from India have recently begun to increase production. Black pepper is an international item of trade, and the technology is available for expanded production. Further expansion

will depend upon international markets and prices. Production in this region has good potential for expansion.

7. Annato (Achiote)- Annato is currently grown in the San Ramon area and is exported for coloring use. Further expansion of plantings will depend upon market demand. Research results on strain differences in coloring quality are not available. Growth appeared good in a small planting observed in a jungle clearing in the project area of Iscozacin. Annato could be another hillside planting and cash crop for Proyecto Palcazu.

8. Poma Rosa- This Southeast Asian plant is grown in small subsistence farms, in yards and along roadsides in Iquitos. Apparently, it is well adapted. Trees are flowering profusely now (June). The pilot processing plant at the Universidad de Amazonia in Iquitos has processed canned halves of the fruit and jam made of pulp with skin, giving a deep cherry color. The fruit halves were good and the jam had an excellent flavor, resembling cranberry sauce. These are clearly national and exportable products not now found in the markets. However, commercial processing can only be started when large scale orchard production begins. The extent of agronomic research done so far is unknown. No evidence of Poma Rosa research was noticed at the San Roque Station. If this is selected as a commercial crop, considerable research in spacing, nutrition, propagation, and pest control would be necessary.

C. Native Group

The fruits included in the native group are found naturally in the jungles of the Amazon in the Iquitos area, and as such, are well adapted to the area's level of rainfall and low pH soils. Fruits of these species are rapidly perishable and are used in processed products produced locally for local consumption. Cultivation and processing of these native species seem appealing and would contribute greatly to the economic development of the entire area.

This group of plants also appears to be adaptable to the Iscozacin area of Proyecto Palcazu, where rainfall is high and soils are very low in pH. Inasmuch as lack of transportation into the area prohibits introduction of lime for soil ammendment, plants adapted to low pH should be considered. A principal problem in both the Iquitos and Iscozacin area is transport of the fruits to processing plants.

1. Guaraná (Paullinia cupana)- "El Pimental" in Pucallpa conducts a two ha commercial production. The fruits are transported to Lima, where they are processed into powdered form. some of the fruits are exported to Japan for use in nectars. Guarana is also used in carbonated drinks in Lima, but the flavoring is imported from Japan. With only two ha. of production, guaraná can hardly be called a commercial crop. Information available indicates that small trials were conducted in thepast in the Iquitos area but were unsuccessful, due to root diseases and insect pests. These past failures indicate the need to obtain information on cultural practices. Native species are maintained at the San Roque station, but the consultants were unable to determine if any kind of research is being conducted. The marketability and economic value of the crop should be the basis of any effort in commercial production.

2. Camu Camu (Myrciaria paraensis) - Camu camu has perhaps the greatest commercial development potential among native fruits, because of the high ascorbic acid content of the fruits. Figures available indicate ascorbic acid content of 2700 mg/100 gm, which compares well with good selections of acerola (Malpighia glabra). Currently, fruits are harvested from the wild and at small farms.

There is a growing market demand for vitamins and other nutritional supplements from natural sources, and pharmaceutical and food industries would be highly interested in this fruit. In the US, rose hip and acerola are used to provide vitamin C for pills from natural sources. The Nutrilite Products, Inc. of California has a 600 acre acerola planting in Puerto Rico. Fruits are shipped frozen from Puerto Rico to California for processing. While some studies have been conducted in camu camu by Marco Antonio Alvarado Vertiz in 1969 (Posibilidades del Cultivo del Camu-Camu en el Peru, Myrciaria dubia) for a thesis at thePontificia Universidad Catolica del Peru, more research is needed.

Postharvest handling of fruits to minimize vitamin C losses is strongly advised. Research in Hawaii on acerola has shown that vitamin C content decreases as fruits ripen, and that vitamin C losses occur after harvesting. The best method of preventing loss is to freeze the fruits, if they are to be stored for any length of time. Similar biochemical activities probably

operate with camu camu fruits. Vitamin C is also used to prevent oxidation in canned fruit products. Much research needs to be done if this fruit is to expand its international market. Investigation of potential markets would determine the extens of commercial production.

3. Araza (Eugenia stipitata) - This fruit is native to the Amazon and is known locally rather than in the rest of Peru. The fruit is large and highly perishable, with a shelf life of approximately 72 hours. It is processed into juices, jams and jellies and is used in fresh drinks. The processing laboratory at the Universidad de Amazonia is currently doing experimental processing.

The plant produces fruits in eighteen months after planting and continues to produce throughout the year. Because of its acidity, it is not considered as a fruit for fresh consumption. Its use will, in all probability, be confined to national consumption. Cultivation of this fruit in expanded hectares will depend upon consumer demand in Peru. Considerable research in agronomic technology is still required for commercial production.

4. Lucumo (Lucuma obovata)- This is not a native to the Amazon region but indigenous to Peru. The fruits, which are rather large, are processed into concentrates, ice cream and nectar. Presently, this fruit is available only from home production. It may be popular fruit in the localities where it is grown, and may even have some regional potential, but its international potential is probably limited. The level of future research will depend upon market demand.

5. Aguaje (Mauritia flexsuasa) - This is in the Palmaceae family and production begins 10 - 12 years after planting. The fresh nut is used in fresh beverage and as an ice cream flavor. Extraction is all-year long for immediate use. No research has been done on the production of concentrates for extended transport. The nut is known for its high vitamin A value but unless processing techniques to preserve the vitamin A and its flavor are developed, it will remain strictly a local product. The level of research will depend upon its growth potential as a national and as an exportable product.

IV. Time-phased Program for Research, Development, and Personnel Training

An attempt is made here to provide an estimated time-phase program for personnel training, research, extension, and commercial development of some potential crops discussed in this report. Some estimates of time may not be accurate but can be corrected by Peruvian horticulturists. Past research information was generally not available at the time of this report. Therefore, items for research may be suggested here which have been investigated in the past and adequate information is already available.

The ultimate number of hectares to plant commercially for each of these crops is difficult to determine without sufficient research and economic and marketing studies. Expansion will depend upon market studies and intensity of promotion.

For research purposes 2 to 4 ha plantings of each crop should be adequate. Whenever orchards of any of these crops exist, utilize them for research as this will accelerate the program.

The native crops, including palmito, are not found under jungle conditions. These crops can be expanded by clearing the jungle floor without too much cutting of forest trees. This will satisfy the governments desire to preserve the forest. A model for this type of farming is the Fundo Romero Pampatigre coffee plantation of La Merced. 'Slash and burn' system of agriculture was avoided.

A. Personnel Training

1. Field days - lectures and demonstrations on propagation, field preparation, planting, fertilizing, pest control methods, harvesting and handling of fruits and delivery to collection points. Two or three times a year (1-day duration) for farmers, field foremen, farm owners.
2. Semiprofessional personnel training of a few days to a week (twice/year) for field supervisors of large farms, experimental farms, etc. on more technical aspects of fruit culture: plant propagation, fertilizer requirements through soil and foliar analysis; pest management (insects, disease, weed) methods; pesticide

formulations, dilution, safety, calibration, application; and postharvest handling and storage of fruits. Each year the workshop can feature one or two or several major topics.

3. Professional personnel training by university professors to technical personnel of research farms, companies, extension agents, etc. Duration: 1 to 2 weeks annually. This will be refresher instructions in the technology of soil science, entomology, pathology, horticulture, agricultural engineering (machinery, drip irrigation, etc), postharvest physiology, packaging, storage and quality control. Several main topics can be fetured each year.
4. M.S. degree program (long term) for professional personnel involved in agricultural development programs in rural areas. Advance studies may be done in Peru or at some selected universities in the U.S. The M.S. degree level can probably be completed in 2 years.

Year 1

One student each in:

Horticulture-production physiology
Horticulture - weed science
Seed Science (soil fertility)
Plant Pathology (general plant pathology)
Entomology (general)
Food Technology - processing
Postharvest physiology
Agricultural Economics - Marketing
Agricultural Engineering (emphasis on irrigation systems)

Year 2

One student each in

Horticulture - genetics/breeding
Plant Pathology (emphasis on postharvest diseases)
Entomology
Food Technology (processing with emphasis on sensory evaluation)
Postharvest Physiology

Projections beyond this will be based upon additional needs of the area. Also, emphasis on major areas of study may be changed or new ones added as needs are perceived. A third group of graduate students could begin at year 5. This arrangement will supply well-trained staff in specific fields every two years.

B. Crops Development

Crops	Activity
1. Guarana, araza, lucumo, aguaje	These crops are presently found in jungle conditions and used largely for processing. They seem to grow well and fruit under jungle shade. Year 1: (1) accumulate seeds and begin seedling production for 20-40 ha plantings under the jungle floor system at Iquitos, Pucallpa and Palcazu areas. Conditional orchard system should also be considered. (2) Plant 2-4 ha of each in conventional orchard system at the experimental farm at Iquitos and Pucallpa for research purposes. Year 2: (1) continue collecting seeds and seedling production for commercial jungle plantings; expand the number of hectares up to 60-80 ha (expansion will depend upon seedling availability at this point). (2) begin research on asexual propagation - cutting and grafting. (3) set up fertilizer plot tests. (4) research on pruning, pest

control. (5) Weed control using herbicides. (6) Set up plots under low, medium and high soil pH levels (in conjunction with fertilizer tests.

Year 3: (1) Begin fruit quality analysis of individual seedling trees for selection purpose: test for fruit size, yield, total soluble solids, total titratable acidity, and processing (2) Expand commercial plantings in the jungle. (3) At this point infrastructure for processing capabilities must be developed and expanded; (4) market research and promotion must be expanded. (5) research results from year 1 to now may be extended through workshops. Information on propagation, pest management, weed control and fruit quality should be available.

Year 4: (1) results on fertilizer research, soil pH studies should be available (2) feasibility of developing superior clonal cultivars should become known at this point. If seedling variations show seedling potential, select and propagate selections by vegetative means. Develop a collection of superior clones on the experimental farms. (3) begin commercial propagation of selected clones. Seedling plantings in the jungle floor may be top worked with scions of good clones or any more expansion of commercial acreage should utilize clonal plants.

Year 5: (1) Workshops on cultivation, harvesting and postharvest handling of fruits. (2) Develop and publish bulletins on cultivation of these crops for growers. (3) Review of field expansion in terms of market potential.
Year 6: (1) Expand plantings if marketing shows the need. (2) Conduct basic research on flower biology: pollination regime, stress physiology and pruning to control time of flowering, ripening of fruits; storage tests.

2. Palmito

Palmito is also grown in the jungle and acreage can be expanded by jungle floor planting system. Product of this crop is better known to consumers in other market countries and has great market potential.
Year 1: Begin propagation and increasing of planting material as rapidly as possible. (2) Research on propagation: is tissue or meristem culture feasible? (3) Also, establish 2-4 ha of experimental orchard for fertilizer research. (4) Commercial plantings can be expanded in Iquitos area and also initiated in Palcazu and Pulcallpa areas. This would be a good project for the Palcazu area if a canning factory can be developed.

Year 2: (1) Continue propagation and commercial expansion. (2) Establish experimental plantings for research on fertility, pest control.

Year 3: (1) Expand; begin research. Determine if there is a precise age of the plant when maximum length of high quality heart is obtainable. If this is not known, research should be done. (2) Start space planting trials; tree growth observed indicated that spacing between trees can be as close as 1.5 m. (3) Postharvest handling of the palm hearts (to prevent deterioration of the heart) before reaching the factory should be investigated.

Year 4: (1) Some experimental results should be available for workshops and extension. (2) Continue fertilizer studies. (3) Expand commercial plantings. Because of the market potential for this crop, conventional orchard system of 1000 ha could be developed over a period of about 8 years, state of expansion probably dependent upon rapidity of propagation. (4) Continue processing research for quality control and expand market research

3. Camu camu

Year 1: (1) Establish 2-4 ha experimental orchard of seedlings under different spacing systems. (2)

Research on vegetative propagation - cuttings, grafting upon seedling rootstocks. (3) Begin tree training and pruning research to maximize flowering and fruiting. (4) Study flowering behavior.

Year 3: Notes indicate these trees will begin to fruit in approximately 18 months to 2 years. (1) If so, begin ascorbic acid (Vitamin C) assays on fruits of seedling populations to determine range of variability. If variations in ascorbic acid control are evident, assay fruits from trees with high fruit production and develop clonal cultivars. (2) Begin research on preservation of ascorbic acid under different storage conditions. (3) Market studies could begin in year 3. Will Peruvian biological laboratories extract and manufacture Vitamin C pills for an international pharmaceutical market? Vitamin C is also used as an antioxidation agent in the processing industry. How much can they utilize? Can frozen puree be marketed in the U.S. pharmaceutical and food industries? These marketing factors will determine the scope of expansion.

Year 4: (1) Propagate clonal cultivars vegetatively for commercial plantings in conventional orchards in Iquitos and Pucallpa areas. Establish about 200 ha over the next 2-3 years.

(2) Continue research on preventing ascorbic acid losses after harvest. In acerolas, freezing immediately after harvest will prevent ascorbic acid losses.

4. Poma Rosa

Several years of processing studies have already been conducted and some basic processing technology has been developed. Further expansion of processing will depend upon orchard development, and infrastructural development. Iquitos and Pucallpa are likely areas to begin commercial production.

Year 1: (1) Collect seeds, grow seedlings to plant 2 ha of experimental orchards. (2) If cutting materials are available, conduct propagation experiments. (3) Depending upon availability of seeds, begin establishing seedling orchards for commercial processing. (4) Weed control experiments initiated in young orchard.

Year 2: (1) Establish orchard with spacing test and with fertilizer test superimposed. (2) Determine kinds of disease and insect pests and control methods. (3) Continue expanding commercial acreage for a total of 50 ha in the next 4 years (15 ha per year or more if possible).

Year 3: (1) Continue spacing, fertilizer experiments. (2) Initiate pruning research. (3) If seedlings begin to fruit in the third year, begin fruit analysis: fruit size, total soluble solids. (4) Look for variations on growth characteristics and fruit quality among seedling population; if variations exist, can clonal cultivars be established? (5) Expand commercial cultivation.

Year 4: (1) Conduct workshops on cultivation, disease control, etc. (2) Study market potentials. This could start earlier if enough fruits are available from dooryard and street plantings in Iquitos for promotional work. (3) Expand commercial plantings if market demands are met.

Year 5: (1) Develop a bulletin on guidelines for cultivation from results of experiments conducted during the past 4 years.

5. Black Pepper

Experience in black pepper production exists in the Agrarian Cooperative "El Pimental". Therefore, national production should be concentrated in the Pucallpa area with "El Pimental" forming the basis for expansion.

Year 1: (1) Increase plantings to produce national requirements. (2) Research on "El Pimental" farm:

establish replicated plots with different soil pH levels by use of lime (4.5, 5.0, 5.5, 6.0, 6.5 pH), using Furarium resistant cultivar from India. Establish yield records.

Year 2: (1) Continue expanding plantings to reach national consumption requirements. (2) Market studies to determine international markets and potential needs beyond national requirement. (3) Experiment station in Pucallpa should establish plots for spacing, fertilizer and pest studies to assist private growers. Find out the major disease and insect pest problems and control measures.

Year 3: (1) Continue expansion if market situation indicates need for increased production. (2) Prepare and publish an information guideline bulletin for potential commercial growers by experiment station staff.

6. Annato (Achiote)

Small plots observed in Iscozacin indicate that Achiote grows well even under very low soil pH. The economic potential of this crop is not known, so the extent of future production cannot be estimated. However, commercial production can begin immediately and simultaneously with some research.

Year 1: (1) Collect, germinate and produce seedlings for commercial

production in Iquitos, Pucallpa and Pulcaza areas. This is a versatile plant and should grow anywhere in those regions. (2) Research: establish a 2 ha plot with different spacing to determine optimum plant density; fertilizer requirements for best production under severe soil pH conditions; and determine types of insect and disease pests and their control methods. Pruning should also be a part of the fertilizer test. Initiate herbicide tests.

Year 2: (1) Continue commercial expansion on initial total area of approximately 5 ha. Conventional orchard system may be preferred but jungle floor planting is possible with this crop. (2) Continue research established during year 1. (3) Determine degree of variability among seedlings for yields. If there is variability, selections should be made and attempts to propagate them vegetatively should be investigated. Experiments on rooting of cuttings should be conducted. (4) Marketing studies should be conducted to determine in-country usage and potential export of product. This will be the basis to determine required production acreage.

Year 3: (1) Extend results of research completed; continue unfinished

research. (2) Expand plantings if so indicated by market studies.

Year 4 and beyond: (1) Research: new problem areas may emerge with expanded production. Problems in product development and marketing may also emerge. (2) Continue extension of research results through publications, workshops and other means.

7. Cacao

The humid tropics is ideal for cacao production and commercial development can be developed simultaneously with a strong research program.

Year 1: (1) Research: evaluate existing trees in the Selva region to determine variability if these are seedling plantings. Select superior types, if found, and propagate them clonally. Cacao seedlings have shown wide variations and there are three major types or groups differing in characteristics. Hybrids among these groups have been recognized and superior types selected in countries such as Brazil, Trinidad and other areas. Introduce superior clones from other countries actively conducting cacao research. Contacts for introduction should be made with Brazil, Costa Rica (IICA), Mexico and Trinidad. Set up evaluation plots in the experimental farms of Iquitos,

Pucallpa and Tingo Maria if this has not been done. (2) If good clones exist, begin vegetative propagation for commercial expansion. (3) Diseases and insect pests are strong limiting factors in most cacao growing areas of the world. The Amazon region, being the home of cacao, may have predators that can keep damaging insects under control but this has to be substantiated by research. There are several virus diseases and fungal diseases such as the monilia pod rot, mealy pod, anthracnose and others. If diseases are present, determine control methods. Unknown diseases must be identified and control methods worked out. Much of this research can be done in existing plantings but may require several years to complete.

Years 2 and 3: Experimental orchards, use of existing orchards, or newly established orchards, should be used to determine optimum soil pH and fertilizer requirements. Best ecological conditions are well-distributed, medium to high rainfall with soil providing good drainage. The Selva region should provide these conditions. The need for shade is recognized but very little is known of the degree of shading needed for optimum protection. This research should be done. Continue research on insect and disease control.

Year 4: (1) Newly established orchards should begin producing by year 3 or 4. Evaluate all cultivars and clones established during year 1 for pod production and seed/pod production. (2) Competition for world market is highly intensive and there are many tropical areas growing cacao. The number of hectares necessary to meet domestic and export requirements would have to be determined by marketing studies. In many production areas of the tropics poor management practices have not permitted optimum yields. In some areas diseases have taken drastic toll. If the research indicated above has been done and extended to growers, there is no reason why optimum production to meet domestic and export requirements cannot be met with minimum hectarage. (3) Study the floral biology of the best clones to determine pollination systems and nature of compatibility. Self incompatible clones should be planted with other compatible clones for optimum fruit set. Year 5 and beyond: Expand plantings of best clones to reach established requirement.

8. Guanabana

Year 1: (1) Collect seeds and produce enough seedlings to develop a 2-4 ha experimental planting. This planting

will be used for the following research:

(a) soil pH and fertilizer studies

(b) spacing studies (3.6 x 6M; 4.6 x 6M; 6x6M)

(c) Identification and control studies of insect and diseases

(d) weed control studies

(e) determine variations among seedlings

Years 2 and 3: (1) continue developing experimental orchards and some experiments such as soil pH, fertilizer, spacing, weed control should have been started and continued. (2) Initiate market studies for exporting processed juice or frozen puree.

Year 4: Production begins. (1) Evaluate fruits from seedling population for selection purposes. (2) Begin taking yield records from experimental plots for fertilizer - soil pH trials and spacing tests. (3) Use all fruits harvested for storage test and processing. (4) Begin product marketing studies in Lima and determine potential requirements.

Year 5: (1) Continue research begun in year 1. (2) Continue to accumulate yield records. (3) Evaluate fruit and yield variability for selection purposes. (4) Increase product development and market studies in-country and abroad.

Year 6 and beyond: (1) If consumer acceptance in Peru is good, begin commercial development. (2) If superior clones become available, begin seedling production for grafting or try rooting of cuttings. This has been reported as successful in Florida. (3) Results of U.S. market studies would be used as a basis to determine extent of field expansion. (4) Extend all information from research to growers or potential growers through publications and workshops. (5) Develop necessary infrastructure to handle raw and processed products.

9. Guayaba

Year 1: (Iquitos, Pucallpa areas) (1) collecting superior germ plasm within Peru and establish a clonal field of cultivars (1-2 ha). (2) Introduce superior cultivars from other areas such as Hawaii, Florida, Puerto Rico, Australia and establish in clonal field. (3) Grow seedlings for rootstocks to graft scions received from other areas.

Year 2: (1) Conduct rooting tests and grafting techniques. Rooting of greenwood stem cuttings will eliminate the need for growing rootstocks. (2) Survey insect and disease problems. (3) Construct criteria for desirable guayaba cultivars in accordance with potential usage. In other words,

what are the desirable characteristics of a guava to serve your purpose? Some major characteristics:

(a) Fruit size

(b) Fruit color (the darker the pink color, the better)

(c) Total soluble solids (should be above 10%)

(d) Total titratable acidity (acidity depends upon use)

(e) Tree yields

Year 3: (1) Those cultivars established during year 1 should begin to fruit. Evaluate the fruits in accordance with criteria established in year 2. (2) Begin propagation of the best cultivars that fit the purpose.

Year 4: (1) Evaluate cultivars that were not evaluated previously. (2) Propagate best ones. (3) Begin commercial planting of good clones, using spaced plantings and orchard systems used in other guava producing areas. (4) Using fruits from experimental plantings, conduct processing tests for various products. (5) Determine market demands in Peru and in market countries. Total of 150 ha should be developed during the first 5-6 years.

Year 5: Expand commercial plantings to meet market demands.

10. Passion Fruit

Passion fruit is already being grown in small scale with processing technology in San Ramon - La Merced area so immediate expansion should be concentrated here.

Year 1: For processing the yellow passion fruit (*Passiflora edulis* var. *flavicarpa*) is the best suited. Hybrids between *edulis* and *flavicarpa* are also good. Seeds of acceptable fruits are available there. (1) Begin trellis test - currently used trellis is not conducive to high production. Compare this type with the cross-type trellis demonstrated to the technicians. Establish a 0.5 ha experimental planting using trellis type now in use and the type suggested.

Year 2: (1) Begin gathering yield data. (2) Study insect and disease problems. (3) Begin passion fruit experiments in Pucallpa. (4) Tests to include soil pH, fertilizer test, spacing between plants within rows and between rows. (5) Weed control tests. (6) Insect and disease studies based on technology now available from other producing areas of Peru, begin commercial production in Pucallpa region; develop processing capabilities.

Year 3: (1) Continue research to help

growers. (2) Commercial production should begin one year after planting. (3) Domestic and foreign market studies to determine potential hectarage requirments. (4) Develop various sector combinations with other juices. Market tests to determine which combinations are most preferred.

Year 4: Expand as deemed necessary.

11. Citrus

Citrus considered here are mandarins, limes and grapefruit. Mandarins can be grown throughout the Selva region but best quality fruits will probably be produced in San Ramon-La Merced area, being somewhat drier and lower temperatures.

Limes and grapefruits are recommended mostly for Iquitos and Pucallpa regions due to high temperatures. The higher rainfall may reduce quality somewhat in grapefruits.

Year 1: Experimental plots can be established in San Ramon-La Merced and at Pucallpa area. (1) Introduce seeds of rootstocks resistant to phytophthora, tristeza and other diseases from USDA, Orlando, Florida. (2) Establish seedlings for rootstock purposes.

Year 2: (1) Collect scion wood of most promising cultivars in Peru and establish varietal collection.

(2) Introduce disease-free scionwood of mandarin, limes and grapefruit from Riverside, California and Florida. (3) Determine insect and disease problems. (4) Set up plots for soil pH-fertilizer tests. Note: much of the research can be conducted on the farm of National Agrarian University.

Year 3: Continue what has been started in Year 2.

Year 4: (1) Evaluate cultivars of mandarin, limes and grapefruit.

Year 5: (1) Propagate or make available rootstocks and scion wood of best cultivars for commercial plantings. (2) Since tahitian limes and mandarins are already grown in San Ramon-La Merced area commercial plantings can be expanded during year 1. In other areas some trials would be necessary to determine quality. (3) Expansion will depend upon market studies in Peru and abroad for export.

12. Mango

Year 1: (1) Rejuvenate the old mango collection at the Research and Extension farm of CIPA XVIII (Pucallpa) by pruning and fertilizing. There are 18 cultivars in the collection which need to be evaluated for yield and quality. (2) Evaluate all other private orchards in the Pucallpa and San Ramon-La Merced areas. In the San

Ramon-La Merced area there is a polyembryonic Indochinese race of mangos. These mangos lend themselves to canning if the quality is good. (3) Assemble germ plasm of the best cultivars from the Puira region of Peru and from Florida, Brazil, etc., if these cultivars are not already in the collection. (4) Establish a 2 ha clonal orchard with adjusted soil pH, spacing and fertilizer tests. This orchard can be used for identification of insect and disease problems. Test fungicides on old orchards for anthracnose control during harvesting season. Pucallpa and San Ramon-La Merced areas appear to have potential for mango production.

Years 2 and 3: (1) Evaluate fruits from available orchards for fruit size, soluble solids, skin blemishes (anthracnose), texture, skin and flesh color. (2) If the old orchard is pruned in year 1, chances are there will be no fruiting until the third year for evaluation purposes. (3) If fruits become available in year 3, research should be initiated on time of harvest, treatments (for prevention of fungal diseases and fruit fly larvae if fruit flies are a problem), storage conditions and temperatures, packing methods for transport.

Years 4 and 5: (1) Continue cultural research on the newly developed 2 ha orchard. (2) Research on postharvest handling and shipping. (3) If good shipping cultivars are identified, begin commercial plantings by grafting them to seedling rootstocks.

Years 6 and 7: (1) Extension of information derived from research to growers through workshops and bulletins. (2) Evaluate germ plasm collection started during year 1. (3) Continue expansion of commercial orchards. (4) Visit by 2 or 3 production and postharvest technologists to Mexico and Florida during the mango season to observe harvesting, treatment, packing and shipping operations. (5) Continue clonal propagation of good cultivars. (6) Peru being an off-season producer when market potential is good, 500 to 1000 ha of orchard could be developed over a 10-year period for export purposes. (7) Processed products such as canned slices, puree, chutneys, jams and jellies could be developed and market studies conducted.

13. Papaya

Year 1: (1) Develop a set of selection criteria

(a) fruit size desired for export; domestic fresh fruit market; processing

(b) flesh color - red or yellow fleshed types

(c) Fruit shape - pyriform, round

(d) other characteristics

(2) Assemble best types from within country and set up a cultivar evaluation plot. (3) Introduce seeds from other countries for testing and plant. Evaluation plot of 2-3 ha should be developed in Pucallpa and Tingo Maria areas. (4) Develop a 2 ha plot of a single cultivar with different spacing (1.8 x 2.4M; 1.8 x 3.05M), different soil pH (control-natural pH; pH 5.5; pH 6.5), and fertilizer trials. (5) Same orchard to be used to study insect and disease problems and control methods. (6) Experiment on raised bed techniques in high rainfall areas

Year 2: (1) Continue all trials started in year 1. (2) Study fruit quality - fruit size, soluble solids, color, flesh thickness, shelf life, fruit firmness. (3) If hermaphrodite population is planted, record the presence of carpellodic flowers (catfaced fruits during periods of cool night temperature) and female sterile flowers (male flowers) during warm nights periods. (4) Decision should be made as to what race of papayas (hermaphroditic or dioecious) to plant for commercial purposes. For domestic

use female fruits of the Solo type and large fruited cultivars may suffice. However, for international markets preference is for pyriform or oval, .45kg, hermaphroditic Solo type. (5) Seed increase: self pollinate by covering flowers for hermaphroditic trees to prevent out-crossing. For dioecious types, pollinate good female flowers with pollen from male trees. In areas with many types of papayas it is difficult to maintain pure lines without controlled pollination as papayas are wind pollinated.

Year 3: (1) Continue seed production by controlled methods for commercial plantings. Experiment station has to be the source of seed if cultivars are to be maintained pure. (2) Information from research should be extended to growers and potential growers. (3) Fruit should be available to conduct postharvest study: time to harvest for shipment; prevention of postharvest diseases and insects by such means as hot water treatment, storage temperatures, packing methods, transportation methods. (4) Evaluation of new germ plasm, progenies of various crosses and selections must constantly be made. This is a long range program. Look for individual trees or lines showing high degree of tolerance to various diseases. (5) The plantings in the University farm at La Merced were infected with the papaya ringspot

virus so this area should not be planted to papayas until all virus infected plants are removed for a year or so.

Year 4: Review emerging problems affecting commercial cultivation. (1) Universal field problems:

(a) Papaya ringspot virus. Develop a program of eradication and preventing virus spread to virus-free areas.

(b) *Phytophthora* rootrot (replant problem) Hawaii is developing high tolerance lines

(c) *Phytophthora* stem and fruit rot

(d) Pythium root rot - both root rots occur heavily under high rainfall in soils with poor drainage.

(2) Postharvest problems

(a) Standardizing stage of maturity for harvesting.

(b) Continue evaluation methods of reducing field diseases

(c) Continue improving treatment methods for export papayas.

Year 5 and Beyond: Commercial cultivation can be continued successfully only if substantial input in research and extension continues. The number of hectares to plant will depend upon market requirements. Two hundred hectares should be planted during a period of 4-5 years to gain

experience in cultivation, postharvest handling, marketing, transportation, etc.

C. Some sources of plant germ plasm

1. U.S. Department of Agriculture

a. Dr. Robert Knight, Jr., Research Horticulturist
USDA, ARS, 13601 Old Cutler Road
Miami, Florida 33158
Collection of many tropical and subtropical fruit crops

b. Dr. Franklin W. Martin, Research Horticulturist
MITA, Agricultural Research Service, USDA
Mayaguez, P.R. 00708
Mango, annonas, pineapple, other tropical fruits

c. Dr. Heinz Wutscher, Research Horticulturist
USDA, ARS, Horticultural Research Lab
2120 Camden Rd.
Orlando, Fl. 32803
Citrus cultivars, especially citrus rootstock seeds

2. U.S. Universities

a. Dr. Carl Campbell
University of Florida
IFAS, Agric. Research and Education Center
18905 SW 280th Street
Homestead, Fl. 33030
Lychee, cherimoya varieties, avocado, mango, other tropical fruits

b. Dr. C. Ling Chia or Dr. Henry Y. Nakasone (Retired)
University of Hawaii
Department of Horticulture

3190 Maile Way
Honolulu, HI 96822
Papaya, mango, guava

c. Dr. Philip Ito, Horticulturist
University of Hawaii
Beaumont Research Laboratory
461 W. Lanikaula Street
Hilo, HI 96720
Macademia, avocado

Dr. Joe Amador
1400 Yucca
McAllen, Texas 78501
citrus

3. Other Countries or Contacts

a. Dr. Carlos Ruggierro
Depto de Fitotecnia
UNESP, Jaboticabal Campus
Sao Paulo, Brazil
Passion fruit, avocado, jaboticaba

b. Dr. Eloys Jacshomolley Giaumelli
Instituto Agronomico
Caixa Postal 28
Campinas, Brazil

c. Dr. Raul Mosqueda Vazguez, Sub-Director
INIA, Campo Agric. Exp. Cotaztla
Apartado Postal No. 429
91700 Veracruz, VER.
Mexico
Avocado, papaya, soursop

e. Mr. B.K. Matlick
Director of Agribusiness
Hershey Food Corporation
Hershey, Pennsylania 17033
cacao, chocolate market

V. GENERAL OVERVIEW OF INTERNATIONAL MARKET FOR FRESH FRUIT, PROCESSED FRUIT PRODUCTS AND SPICES

The data in Appendices 8-31 are presented with both this report and any follow-up studies in mind. They have been gathered from Peruvian, U.S. and other international sources and give a general overview of the current prices per kilo in Peru for some exotic fruits and spices; transportation rates within Peru; the potential market windows for fresh fruits and spices in the northern hemisphere and the current international demand for fresh fruit, processed fruit products and spices; and the current Peruvian export levels of fresh fruit, processed fruit products and spices.

A. Fruit Prices Paid Per Kilogram to Producer-Wholesaler-Retailer, 1980 and 1984, High Jungle

It is difficult to compare the prices on the two graphs for bananas, grapefruit, oranges and mandarines, because the 1984 graph lists varieties while the 1980 one does not. Another obstacle to accurate comparison is that fruit prices vary depending on the season. The 1984 graph is specific to June, while the 1980 graph is general.

In general, farmers are receiving lower prices per kilogram for their fruit in 1984 than 1980. The middleman's gross profit has jumped considerably between 1980 and 1984, between 30% and 47% in dollar terms, and the vendor's gross profit doubled for some fruits and stayed the same for others.

Prices paid for limes and avocadoes are particularly interesting. The 1984 $ price to the farmer for a kilo of limes was lower than the 1980 price. In 1980 the middleman made a gross profit of 5% on the limes, while the vendor made 26%. In 1984, the middleman's gross profit jumped to 36% and the vendor's price doubled the middleman's price.

In the case of avocadoes, the farmer receives a slightly higher price in 1984 than in 1980. The middleman gross profit jumped from 21% to 68% between 1980 and 1984. The vendor made a gross profit of 54% in 1980 and over 100% in 1984.

B. Freight Rates for Fruit Transportation, 1984

First, transport from Iquitos or Pucallpa to Lima is expensive and, as has been discussed in Section II and III of this report, contributes to the damaged condition of fruit seen in the markets.

C. Seasonality in the Supply of Fresh Fruit from Peru and in the Demand in the U.S.A.

According to these graphs, there is a clear window in the U.S. market for Peruvian mangoes in January, February, March and April, when the U.S. supply has dribbled to little or nothing. Tangerines and grapefruit may also have a window during Peru's productive months of May through October, when the U.S. is not producing any. Peruvian avocadoes may be able to fill the U.S. supply gap from February through June for the Florida avocado market. The California avocado supply seems to change little year round.

The Peruvian market in the U.S. is clearly predicated upon the shipment of products that meet U.S. quality standards and that are competitively priced.

D. International Market Demand for Fruit Juice

The world market for fruit juice increased substantially from 1977 to 1982, both in quantity (about 30%) and value (about 80%). In 1982, the total dollar value of the fruit juice market was over U.S. $2 million for 1 million tons of fruit juice. Developing countries presently fill aproximately 50% of fruit juice imports in the world market.

Per capita fruit juice consumption is still low in a great number of markets. Per capita consumption is less than 10 liters in such countries as Belgium, Luxembourg, France and the United Kingdom, while other countries, such as Switzerland, Sweden, West Germany, Canada and the U.S.A. consume more than 20 liters annually per capita. Some markets have considerable potential for growth; Japan, for example, as well as the industrialized nations listed above with lower per capita consumption at present. Saudi Arabia is an example of a market where consumption per capita has exceeded 20 liters per year.

E. International Market Demand for Spices

The international market demand for the spices listed in Appendices 21-24 changed little between 1978 and 1981. Spices have always been a valuable international item of trade and will undoubtedly continue as such.

F. Export of Fresh Fruit, Processed Fruit Products and Spices from Peru

As shown in Appendix 25, the dollar value of Peru's fresh fruit exports increased 18% from 1979 to 1982. However, export dollar value levels exhibited a peak and valley syndrome, with a 17% increase between 1979 and 1980, a 20% decrease in 1981, and a 26% increase again in 1982.

Brazil nuts hold by far the largest segment of Peru's export market, at 73% in 1982. Mangoes and avocadoes follow, with mangoes holding 22% of the total fresh fruit export value in 1981 and 11% in 1982. Avocadoes were 18.5% of the total fresh fruit export in 1981 and 12% in 1982.

The dollar value of processed fruit product exports actually decreased between 1979 and 1982. Export levels increased 110% between 1979 and 1980, fell 70% to below 1979 levels, in 1981, and then increased 50% in 1982 to a level almost equal that of 1979. Unmixed fruit juices are by far Peru's greatest processed fruit export, over 80% of the 1982 total.

Spice exports also decreased between 1979 and 1982: a 25% decrease between 1979 and 1980, a 23% decrease between 1980 and 1981, and a 20% increase between 1981 and 1982. Marjoram (also considered to be oregano on the world market) exports decreased dramatically in the years listed. No ginger exports were recorded until 1983, which is incomplete on the graph. Garlic is by far the largest spice export, at almost 50% of total dollar value for spice exports in 1982.

G. Export of Fresh Fruit, Processed Fruit Products and Spices, Appendices 26-31

Chile is by far Peru's largest fresh fruit export market, consuming 68% of all Peruvian citrus exports and almost 100% of avocado, pineapple and coconut exports. France is the major market for Peruvian mangoes, buying 77% of total mango exports in 1981 and 62% in 1982. The United Kingdom is the second largest market for mangoes at 18% in 1981 and 22% in 1982.

The 90% increase in Brazil nut exports between 1981 and 1982 is directly attributable to the 333% increase in Brazil nut exports to the U.S. In 1982, the U.S. bought 46% of total Brazil nut exports, West Germany bought 18%, and Australia bought 17%.

The Netherlands is the largest market for Peruvian fruit juice, buying 52% of total Peruvian juice exports in 1982. Venezuela is the second largest market at almost 30%. Venezuela is also the greatest consumer of Peruvian canned palmito, buying almost 100% of 1982 exports.

Colombia, Venezuela and Argentina are by far the largest consumers of Peru's spice exports, among them buying almost 61% of Peru's total spice exports for 1982. Colombia bought 31% of the exports, Venezuela 20%, and Argentina 12% in 1982. Turmeric has the widest market, with 22 different countries buying Peruvian turmeric between 1979 and 1983.

VI. SUGGESTIONS FOR EXPANDING POTENTIAL

A. Distribution Systems

The distribution system elements illuminated in Section II, A, concern the present distribution system in the Selva for marketing crops grown primarily in Peru for Peruvian consumption. A suggested Pilot Project - Wholesale Market to improve this internal distribution system is offered in Appendix 7.

The distribution system which would be developed by industries which plan to export fresh fruit, processed fruit products and/or spices would probably differ greatly from the present system for the internal market.

For example, Frutos del Pais presently runs a processing plant in Lima capable of processing 2-4 tons of fruit every hour. The plant produces juice from passion fruit, peaches, apples, pineapples, and mangoes for internal and export markets. Frutos del Pais has some land of its own where fruit is grown, and it contracts directly with farmers for the remainder of its fruit needs. Frutos del Pais owns a fleet of trucks to haul the fruit to the factory, and its personnel supervise the packing and loading of the fruit.

Frutos del Pais exports frozen passion fruit juice in metal drums to Europe. The fresh frozen juice is used primarily in fruit punch combinations. International brokers based in Europe secure the orders.

As a side note, the factory often does not receive enough of any one kind of fruit to sustain operations for an entire day. It therefore has the capacity to process one kind of fruit for as little as 2 hours and change to another kind of fruit right away, after a thorough cleaning and a quick change of some of the machinery.

The differences between the distribution system presently used in the Selva and the system which would likely be used by processing industries are very great. To assure itself of a steady supply of raw material, any processing industry will probably have to develop a system similar to the one used by Frutos del Pais on the coast now.

B. Quality Control and Postharvest Practices

One cannot overemphasize the importance of a quality control education for all persons involved in the handling of perishable produce. All agricultural universities, all research and extension personnel, all producers and, ultimately, the consumer must be made aware of quality, and of quality maintenance through proper postharvest practices.

Training in the USA for food science, horticulture and plant physiology post graduates as well as for staff members of national universities and research agencies can be arranged through the Postharvest Institute for Perishables (PIP). Such training should be through a rotating program for at least three years. Hopefully, as many as fifty to sixty total people could participate. This well-trained cadre could return and conduct local classes at all possible levels. An intensive series of courses should be conducted throughout Peru, with agricultural extension agents among the leaders.

Alternative packaging/boxing material research is a must. Wooden crates just should not be used for perishable produce. Packing technique, virtually unheard of in areas visited, will have to be taught to above suggested cadre. Wooden boxes, used in export of oranges, are costly, heavy (increase freight cost) and result in excessive claims for bruised/damaged produce. Research and investigations into cardboard boxes in place of wood, plastic and other types of boxes/baskets for field-to-market transport are also direly needed. It is suggested that universities and research stations all expand their present programs to include packaging materials and packaging techniques as priority courses. PIP can also give assistance in this field.

Transporters clearly add greatly to the damaged condition of the fruit observed in the markets. An effort to change their practices could be inititated at suggested pilot wholesale market. Assistance from the GOP is direly needed in the form of regulations regarding transport and trading of agricultural products. For example, freight rates standarized by weight rather than by number of crates would benefit the farmer and the consumer. Again, training is necessary for those involved in the loading and unloading of perishables. The private sector should also assist and promote all of these efforts.

C. Marketing

International promotion of non-traditional fruits and spices or native fruits (See Section III, B and C) is felt to be premature at this time. As research data exists for these crops, it is felt that aid should be confined primarily to the promotion of research on these crops at the local universities and research stations, and to the expansion and improvement of the local universities, research stations and extension services.

As mentioned under the previous section of constraints, problems are often intertwined, and so the solutions are also intertwined. Peru has several advantages such as marketing windows for off-season crops in the North, if the Peruvian Selva can produce a quantity of quality fruit at a competitive price. Once a market is opened, quality has to be maintained or improved if markets are to be maintained and expanded. It is even more difficult to re-establish a lost market than to open a new one.

Foreign capital, preferably in the form of joint ventures, should be encouraged as an additional source of technical and marketing assistance. Where and when a quality product exists at a competitive price, marketing windows should be exploited by bringing international brokers/jobbers to Peru. Although GOP subsidizing of marketing promotional efforts is not discouraged, anything approaching the Brazilian system is felt not to be recommendable.

Only a very few cost/production figures were collected during the trip around the Central Selva Area. One set of data indicated a lucrative return on papaya:

PAPAYA	Soles per Ha
Production cost	2,300,000
Administrative cost	250,000
Estimated interest	350,000
TOTAL	2,900,000

	Kg per Ha
1st Harvest (8-9th mo)	15,000
2nd. Harvest	8,000

Total Harvest		
during life of plants	20,000	
Average price (S/kg)	500	
	10,000,000	
Net before taxes		7,100,000
or land use		

Source:
Agrarian University
"La Molina" - Instituto
Regional de Desarrollo de
la Selva - Fundo Genoa

D. Infrastructure and Technical Personnel

Solutions for many infrastructure shortcomings, such as highways, farm-to-market roads, electrical and telephone services, cold storage facilities and educational programs have been mentioned previously. Of all of these, the most important priority must be to improve and expand the staff and facilities of the local agricultural universities and research stations. Only then can other steps be realized. Academic and technical administrators and staff will have to be given the opportunity to acquire needed additional skills and to study outside of Peru. University curricula must be strengthened. Communication systems, such as audio/visual facilities, computers and reference libraries are additional areas for improvement.

However, from the standpoint of priorities for agricultural university and research station personnel, nothing supersedes the most obvious need for salary increases for administrators, professors and technicians. In most LDC's, a graduate agronomist will earn more than U.S. dollars 100 per month. Yet, in the Iquitos area, a salary equivalent to approx. U.S. dollars 80.00 per month for the same position was quoted as 'more of less' standard.

E. Financing

One of the glaring shortcomings in the commercialization of agricultural produce in Peru is the enormous spread between farmgate and consumer prices. Some agricultural inputs, such as fertilizers, are already semi-controlled by

the GOP, and it is suggested that a support or subsidy program be initiated as soon as possible to allow farmers a reasonable return on their produce. Reasons for this suggestion are obvious and have been stated above.

A graphic example observed first hand of the discrepancy between farmgate and consumer prices was the price paid to orange producers by Indalsa at La Merced of 250 soles per kg, while oranges were selling in Lima markets at 1,750 to 2,500 soles per kg, and in the Iquitos market at 4,000 to 4,500 soles per kg. Indalsa is the only processor in the area. It does make some advances to producers and does conduct investigations of various crops for their account. However, competition and additional market outlets are needed.

A program whereby producer associations or any private sector entity could obtain financing at rates and terms more favorable than those mentioned in Section II is an obvious need.

F. Recommendations on Crops

1. Traditional Crops

a. Priority should be given to exportable crops which can be produced during off-season periods in the northern hemisphere, where the potential markets are located. This is in reference to fresh fruit, such as mango and grapefruit, in particular. Good quality grapefruit were seen in the market in Pucallpa. Attempts should be made to recapture the European market for Valencias.

b. Processed products of traditional crops must compete with other products already well known in the northern markets. Intensive promotion and desirable price structure are necessary to break into the markets.

c. Whether it be fresh or processed products, there must be production capacity of quality fruits to sustain market supply.

d. Intensive research on cultivar evaluation, agronomic practices and postharvest handling must be conducted to initiate and sustain a viable industry.

2. Potential Crops

a. The crops listed under Group II can be developed at the national level, and the extent of development will depend upon marketing potential within the country.

b. Among these crops, palmito, achiote, black pepper and poma rosa appear to have potential as export crops in processed forms. Some canned palmito is already exported in very limited quantities, even without a production industry.

c. Black pepper is traditionally an international crop and must compete with other producing countries. In order to achieve export level, production must increase beyond in-country requirements. This appears very feasible if research results are available to the grower.

d. Products of poma rosa were considered very favorable, but marketing studies of quality products must be made in the potential export market countries. Currently, commercial production of this fruit is necessary if processed products are to be made available. Acceptance of the products in Peru must be established before export can be considered.

e. Crops listed in this group require strong research and extension inputs. Research in propagation, spacing, fertilizing, disease and insect control, yielding ability, postharvest handling are basic to the development of any crop.

3. Native Group of Crops

a. By and large, fruits of these native species are highly perishable, and economic exploitacion must rely on processed products.

b. These spices seem to grow and thrive under soil and climatic conditions found in the Iquitos area, and initial production could begin here, as the people are familiar with the crops. It is anticipated that improved agronomic practices will increase yields.

c. The spices with highest potential for development appears to be camu camu, because of its high vitamin C content. The consuming public in the U.S. and Japan is demanding vitamin C pills made from natural sources. Needs of pharmaceutical and food industry companies in the major market countries should be investigated. An intensive research program in all aspects of agronomic practices, disease and insect control and postharvest handling as related to vitamin C retention is needed in order to develop this crop.

d. Other fruits used primarily for beverages and preserves will most likely remain products limited to local consumption.

e. Palmito is better known than the other native species and appears to have international potential, particularly in Europe. However, an industry dependent upon wild population as a source of raw material has little growth potential.

f. Processing plants for any fruit should be located as close as possible to the source of materials in order to minimize quality losses.

Significant production of Caturra coffee is found in the higher elevations of La Merced. Fundo Romero Pampatigre, owned and operated by Lorenzo Romero, was one of the highlights of the visit to the Selva region. He began the cultivation of steep hillsides at approximately 1,250 m elevation 30 years ago by cutting some native trees, leaving leguminous trees for shade and planting the coffee, without following the traditional "slash and burn" agriculture. He interplanted bananas and mandarin oranges as intercrops for shade as well as for production.

Caturra coffee is dwarfish. He has planted between 3,500 - 6,000 plants per hectare, depending upon soil type and steepness of the hills. He has contributed 6,000 cwt of coffee bean out of a total of 1,000,000 cwt of Peruvian export. He practices pruning of verticals to maintain specific ages of verticals for maximum production.

This farm should be designated as a model farm for training of extension agents and even researchers. The system used in developing the land, cultural practices, pruning, intercropping and other phases of coffee culture are quite advanced. Over the years, almost no extension agents have visited, probably because of the farm's out-of-the-way location in the mountains.

VII. SUMMARY

Infrastructure deficiencies, the lack of concern for and knowledge of quality control and maintenance, and inadequate training and education at all levels are considered to be serious constraints to the development of export markets for the Peruvian Selva's crops. All programs suggested in this survey require concerted effort and integration between govenment agencies and between the same government agencies and the private sector. Currently, the research and investigative basis for the commercial development of most traditional, exotic and native fruits is notably deficient. It is suggested that priorities for assistance be targetted more toward the improvement and expansion of educational and research facilities and personnel. Emphasis should be placed on proper data collection and, most importantly, on the publication and extension of research results.

Improvement of all elements of the agricultural production, transport and marketing chain, and increased awareness of quality grades and standards must be achieved before large promotional and financial efforts directed toward external markets can be justified.

Crops emphasized here are those which have "off season" potential in the northern markets and those, including native species, which have shown special characteristics attractive to international markets.

Even for the domestic market, per capita purchasing power must improve for most of the above suggestions to become realities.

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Ing. Daniel Balarezo	Manager, Agrarian Promotion, INIPA - Pucallpa
Ing. Antonio Polo	Manager of the Experimental Station, INIPA - Pucallpa
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Ing. Walter Macher	Director of 'San Juan' Brewery - Pucallpa, "El Pimental" Cooperative - Pucallpa
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APPENDIX 1

LIST OF FRUITS AND SPICES IN THE SELVA REGION OF PERU

I. TRADITIONAL TROPICAL AND SUBTROPICAL FRUITS:

Mango	(Mangifera indica)	Mango
Papaya	(Carica papaya)	Papaya
Piña	(Ananas comusus)	Pineapple
Palta	(Persea americana)	Avocado
Citricos	(Citrus spp)	Citrus
Plátano	(Musa spp)	Banana
Coco	(Cocus nucifera)	Coconut

II. EXOTIC TROPICAL FRUITS:

(Fruits introduced into Peru and not well known in other regions of the world.)

Mamey	(Mammea americana)
Lucumo	(Lucuma Obovata)
Guayaba	(Psidium guajava)
Chirimoya	(Annona chirimola)
Guanabana	(Annona muricata)
Carambola	(Averrhoa carambola)
Sapota	(Acharas sapota)
Taperiba	(Spondias dulcis)
Poma rosa	(Syzygium malaccensis)
Marañon	(Anacardium Occidental)

III. NATIVE FRUITS

(Fruits which have not been genetically and agronomically improved, and which have not been grown throughout the world.)

Pijuayo	(Bactris gasipaes)	(fruta y palmito, palm hearts)
Cocona	(Solanum sessilifflorum)	
Guaraná	(Paulinia cupana)	

Copoazu	(Theobroma grandiflorum)	
Camu camu	(Myrciaria dubia)	
Arazá	(Eugenia stipitata)	
Uvilla	(Pourouma cecropiaefolia)	

IV. SPICES (Spices used as dyes and flavorings.)

Achiote	(Bixa orellana)	
Vainilla	(Vanilla fragram)	Vanilla
Palillo	(Curcuma doméstica)	
Anis	(Pimpinella anisum)	Anis
Orégano	(Origanum vulgare)	Oregano and Marjoram
Tamarindo	(Tamarindus indica)	Tamarind
Jingibre	(Zingiber officinale)	Ginger
Canela	(Cinnamomum zeylanicum)	Cinnamon
Pimienta del Reino	(Piper nigrum)	Black pepper

V. VEGETABLES:

Ajo	(Allium satirum)	Garlic
Aji panca	(Capsium spp)	Hot pepper
Esparragos	(Asparagus officinalis)	Asparagus

VI. INDUSTRIAL CROPS:

Café	(Cofea arábica)	Coffee
Cacao	(Theobroma cacao)	Cocoa
Palma Aceitera	(Elacis guinensus)	Oil palm
Te	(Canellia sinensis)	Tea

APPENDIX 2

STATISTICS OF AGRICULTURAL PRODUCTION FOR SELECTED FRUITS

Table No. 1

Fruits & Spices	Years	Varieties[1]	Seasons[1]	Yields[2] Kg/Ha	Total Area (Ha)	Total Production (TM)
CITRUS FRUITS	1977	Juice Oranges	January	11,070	14,196	157,156
- Orange	1978	(With seed 9%	to June	10,829	14,007	151,688
	79	Without seed 3%)		10,358	13,935	144,334
				8,000 30.000 (Central Selva)		
- Mandarin	1977	Tangerines 70%	March to	11,572	1,660	19,210
	1978	Tangelos 20%	June	11,610	1,687	19,587
	1979	Mandarins 10%	(Central Selva)	11,203	1,753	19,640
				8,000 30,000 (Central Selva)		
- Lime	1977	Local Variety	Throughout	11,323	7,740	87,636
	78	similar to	the year	11,487	7,592	87,217
	79	Mexican Lime (Acid. Lime)		9,466	7,872	74,522
- Grapefruit	1977			12,726	324	4,125
	78			12,631	336	4,245
	79					
- Mango	1977	Haden	Dec. to April	11,411	7,617	86,921
	78	Kent	peak in	10,466	7,585	79,386
	79	Davis Kent	January	10,451	7,645	79,899
	80	Criollo 70%		4,000 17,000 (Central Selva)		
- Papaya	1977	Criolla de Chan-Chamayo	Throughout the year	14,259	3,420	48,768
	78	(yellow)		13,408	3,343	44,824
	79	Maradol Rojo		12,886	3,320	42,784
	80	Pauna		12,000 30,000 (Central Selva)		
- Pijuayo	1977		Dec to April	10,301	704	7,252
	78			10,281	754	7,752
	79			10,264	804	8,252
- Passion Fruit	1977	Yellow	Central Cost Jan	8,304	270	2,246
	78	purple	to July-Piura	8,072	295	2,381
	79	Maruna 4-5	(North) all	7,925	306	2,427
			the year-Chanchamayo (Selva) Rainy Season	(Max 26,000)		

Fruits & Spices	Years	Varieties[1]	Seasons[1]	Yields[2] Kg/Ha	Total Area (Ha)	Total Production (TM)
- Pineapple	1977	Not classified Officially	Throughout the year, especially	14,183	3,568	50,607
	78	Roja Trujillo	Dec. to March	13,142	3,547	46,616
	79	most common in North Coast	in the north coast	12,814	3,596	45,734
				6,000 20,000 (Central Selva)		
- Cocona	1977		April to June	6,361	173	1,101
	78			6,109	183	1,118
	79			5,725	193	1,105
				5,000 15,000 (Central Selva)		
- Guayaba	1977		April to August	5,856	345	2,021
	78			6,069	345	2,095
	79					
- Black Pepper	1977			2,000	100	200
	78			2,000	130	260
	79					
- Achiote	1977		Throughout the year	555	1,554	862
	78			553	1,552	860
	79			555	1,547	860
	80					
	81					
- Cacao	1977		Throughout the year	512	7,805	3,988
	78			49[illegible]	8,147	4,039
	79			500	8,532	4,262
	80					
	81					
- Lucumo	1977		Nov to March	7,594	221	1,680
	78			7,616	221	1,609
	79			7,462	210	1,569
- Aguaje	1977		Throughout the year	18,667	450	8,400
	78			18,667	450	8,400
	79			21,000	100	2,100
- Guaraná						
- Camu camu						
- Copoazú						

[1]Benza, José Calzada. Frutales Nativos 1980
TOPEX, INDAA
Morin, Charles. 143 Frutales Nativos 980
[2]Oficina Sectorial de Estadística (OSE), Ministerio de Agricultura, Lima

Appendix 3

STATISTICS OF AGRICULTURAL PRODUCTION FOR SELECTED FRUITS

TABLE No. 2

FRUITS	YEARS	Regional Production 1/			National Consumption 2/	Post Harvest Duration 3/
		COSTA	SIERRA	SELVA	(TM)-1984	
CITRUS	1977	55,107	14,598	87,451	117,000	10 - 15 Days
- Orange	78	52,168	14,450	85,070		
	79	46,633	15,602	82,099		
- Mandarin	1977	7,976	8	11,226	25,000	10 - 12 Days
	78	8,323	8	11,256		
	79	8,524	8	11,108		
- Grapefruit	1977	65,962	5,765	15,909	Around	10 - 12 Days
	78	66,305	5,348	15,564	60,000/year	
	79	53,657	5,192	15,673	(FOPEX)	
- Grapefruit	1977	2,031	91	2,003		10 - 12 Days
	78	2,090	91	2,064		
	79	2,121	91	2,121		
- Mango	1977	73,235	3,757	9,929	38,000	8 Days
	78	66,038	3,362	9,986		
	79	66,539	3,311	10,049		
- Papaya	1977	3,769	1,992	43,007	50,000	3 - 5 Days
	78	3,576	2,113	39,135		
	79	3,813	1,997	36,974		
- Avocado	1977	22,915	9,357	31,439		5 - 7 Days
	78	22,810	8,419	30,694		
	79	22,511	8,034	29,916		
- Pijuayo	1977	—	—	7,252		6 Days
	78	—	—	7,752		
	79	—	—	8,252		
	80					
- Passion Fruit	1977	1,209	120	913	2,300 TM	4 - 7 Days
- Pineapple	1977	12,424	184	37,999	35,000	5 - 7 Days
	78	10,958	176	35,482	(Estimated 1983)	
	79	10,830	176	34,728		
- Cocona	1977	—	—	1,101		4 - 5 Days
	78	—	—	1,118		
	79	—	—	1,105		

FRUITS	YEARS	Regional Production[1] COSTA	SIERRA	SELVA	National Consumption[2] (TM)-1984	Post Harvest Duration[3]
- Guayaba	1977	205	441	1,375		5 - 6 Days
	78	284	436	1,375		
	79	45	154	55		
- Guanabana	1977	272	39	314		
	78	274	39	314		3 - 4 Days
	79	266	39	314		
- Black Pepper	1977	—	—	200		
	78	—	—	260		
	79	—	—	300		
- Achiote	1977	1	31	830		
	78	1	31	828		
	79	1	35	824		
- Poma Rosa	1977	60	—	770		3 Days
	78	62	—	725		
	79	55		680		
- Cocoa	1977	153	150	3,695		
	78	162	136	3,741		
	79	166	156	3,940		
- Lucuma	1977	437	1,231	12		5 - 8 Days
	78	337	1,260	12		
	79	292	1,265	12		
- Aguaje	1977	—	—	2,100	100%	8 - 10 Days
	78	—	—	2,100		
	79	—	—	2,100		
- Guaraná						
- Canu Canu						3 Days

1/Oficina Sectorial de Estadística (OSE), Ministerio de Agricultura, Lima

2/Hoja de Balance de Alimentos, Ministerio de Agricultura y Alimentación, 1980 -rough estimate

3/Estimation of Hernan Chavez. Consultant and Contributor for Survey

SOME PERUVIAN CROPS LISTED IN THREE CATEGORIES

Group I Traditional Crops	Group II Potential for Export	Group III Native Crops
1. Citrus species	1. Passion fruits - (Passiflora sp)	1. Guaraná - (Paullina cupana)
2. Mango - (Mangifera indica)	2. Heart of Palm - Huasaí (Euterpes sp) Pijuayo (Bactris gasipaes)	2. Camu Camu - (Myrciaria dubia)
3. Papaya - (Carica papaya)	3. Cocona - (Solanum sessiliflorum)	3. Copoazú (Theobroma grandiflorum)
4. Avocado palta (Persea americana	4. Guayaba - (Psidium guajava)	4. Lucumo (Lucuma obovata)
5. Pineapple - (Ananas comosus)	5. Chirimoya - (Annona chirimola)	5. Aguaje - (Mauritia flexsuosa)
6. Cacao - (Theobroma cacao)	6. Guanabana - (A. muricata)	
	7. Annato (Achiote) - (Bixa orellana)	
	8. Black Pepper - (Piper nigrum)	
	9. Poma Rosa - (Syzygium malaccense)	

BRIEF COMMENTS ON SOME EXOTIC FRUITS AND SPICES

FRUIT/SPICE	COMMENTS	AREAS FOR RESEARCH
Citrus	- L[illegible] and heavy clay conditions of Selva [illegible] will be a problem. Soil will need l[illegible] to raise pH and provide calcium. - C[illegible] quality grapefruit seen in Pucallpa m[illegible]. - Or[illegible] farmer used to export Valencias to F[illegible].	Rootstock studies, introduction and evaluation of cultivars, nutritional needs of cultivars under existing soil conditions.
Mango	- [illegible] rainfall and low pH soil conditions c[illegible] [illegible]tos cause excessive athracnose di[illegible]e in flowers. - [illegible] of level or sloping land for cultivation in [illegible]. Ramon	Introduction and evaluation of cultivars.
Papaya	- T[illegible] large fruits of the present cultivars cr[illegible]e handling and packaging problems. - N[illegible] a single cultivar which must produce [illegible] throughout the year. - [illegible] must be raised. - D[illegible] must be improved; raised bed system re[illegible]ended. - D[illegible] virus disease a major problem; no r[illegible]t cultivars are currently available.	Introduction and evaluation of cultivars.
Banana	- Cur[illegible]nt postharvest handling practices cause damaged fruit. - St[illegible]rer insect is a problem in San Ramon/ L[illegible]ed area.	Cultivar introduction and evaluation, fertilizer requirements, disease and insect control, postharvest handling and transportation methods.
Avocado	- V[illegible]iety of cultivars present in area.	

FRUIT/SPICE	COMMENTS	AREAS FOR RESEARCH
Pineapple	- Soil type unfavorable because of low pH and excessive soil moisture conditions. - Cultivar currently grown is inferior to the 'Smooth Cayenne' and 'Red Spanish'. These strains should be introduced for trials.	Introduction and evaluation of cultivars, forcing of flowering to obtain fruits and propagation of planting materials.
Passion Fruit	- Disease problems increase in humid tropics. - Low pH soil is a problem.	Introduction of T-type trellis for vines, disease control.
Heart of Palm	- Need factories as close as possible to production areas to avoid deterioration of quality of raw product. - Present practice of chopping down trees without replacing them will create supply problems.	
Cocona	- Local population presently processes fruit into nectar, juice, jam and jelly for home consumption.	
Guayaba	- Disease problems. - Low rainfall, irrigated areas are best for commercial production.	Cultivar evaluation; disease control.
Chirimoya	- Low temperatures inappropriate for flowering.	
Guanabana	- Humid conditions in Selva favor fruit production. - Insect problems exist.	Insect control; market research and promotion for processed products.
Black Pepper	- Soil pH is too low. - Fusarium a problem because of low pH and humid conditions.	

Best Available Document

FRUIT/SPICE	COMENTS	AREAS FOR RESEARCH
Anona	- Good potential for hillside planting and cash crop for Proyecto Palcazu.	Cultivar evaluation.
Poma Rosa	- Canned fruit halves and jelly may have international market potential.	Spacing, nutritional needs, propagation, pest control and market potential.
Guaraná	- Root diseases and insect pests are problems in the humid tropics.	Cultural practices.
Camu Camu	- Fruits have very high ascorbic acid content. - International market potential is very good.	Ascorbic acid levels of fruits of varying maturity; storage and processing to retain ascorbic acid content.
Araza	- Large perishable fruits.	Cultural practices.
Lucumo	- Large fruits. - Fruits are processed into concentrate, ice cream and nectar. - Market potential is probably limited.	
Aguaje	- Fresh nut is used in beverages and to flavor ice cream. - Produces fruit all year. - Fruit has high Vitamin A content.	Vitamin content and processing practices to retain vitamin content.

Appendix 6

HISTORY OF RESEARCH CARRIED OUT ON NATIVE FRUIT TREES OF THE AMAZON AREA

During the 1960's and 70's, Eng. José Calzada Benza, with a team of engineers Vidal Bautista, Jorge Bermúdez and Miguel Morán of the National Agrarian University La Molina established the Native Fruit Trees Program to study native species of fruit trees in the coast, sierra and selva. These activities covered field trips to different areas of the country to collect genetic material of the following species: chirimoya, papaya, lucumo, tuna, maracuya, camu-camu, etc.

In 1972, Eng. José del Carmen Muro, Manuel Llaveria (General Supervision Chief of Research of the then Agrarian Zone VIII of the Amazon Native Fruit Trees Program established the Germ Plasm Bank in San Roque. The planted species included Aguaje (Mauritia flexuosa); Araza (Eugenia stipitata); Caimito (Pouteria caimito); Lucumo (Lucuma Oborata); Porinari (Porinarium pachyphyllum) and Pijuayo (Bactris gasipaes). During 1973, Eng. Wanders Chavez Flores (E.E. Director in San Roque) - Nursery III continued the program.

From 1975 through 1979, the Andean Region-IICA participated in program activities by expanding the collection program, giving priority to fruit trees and studying the production systems.

In 1980 Eng. Mario Pinedo directed the program. More specific studies were initiated principally for the Araza (Eugenia stipitata) and camu camu (Myrciaria dubia) species.

From 1982, engineers of the EE San Roque and the UNA La Molina Native Fruit Trees Program also have collaborated with Eng. Calzada Burga, who initiated a native fruit trees program with Cerveceria San Juan (Pucallpa).

Since its inception in 1980, the Instituto Nacional de Investigación y Promoción Agropecuaria (INIPA) has conducted various investigative activities on fruit trees and in 1981 started a Native Fruit Trees program with the support of EE San Roque, Iquitos.

In 1982 in Yurimaguas, North Carolina State University started investigating Pijuayo by conducting fertilization and separation tests and initiating collections of this specie.

[illegible] far [illegible] fruit [illegible] germination. [illegible] of [illegible] [illegible] nological [illegible] and crops evaluation, evaluation of plagues, planting separations, and production systems of araza, camu camu and other species. Genetic material is still being collected and a germ plasm bank of these species has been established in Iquitos.

APPENDIX 7

SUGGESTION FOR PILOT PROJECT - WHOLESALE MARKET TO IMPROVE THE DISTRIBUTION SYSTEM FOR INTERNAL MARKETING OF PERU'S CROPS

In Peru, as elsewhere, the "middlemen" are blamed for most of the problems experienced in marketing produce. Some of these allegations are undoubtedly justified; however, there is often a tendency to overlook or minimize the services performed by these intermediaries. At each stage from farmgate to consumer, necessary services are performed by each handler; the real question is not how many or who may be involved but rather how well they are performing and at what cost. Although it has been strongly suggested by a number of sources, the elimination of middlemen, wholesalers or others in any appreciable quantity, is not considered feasible or desirable.

Suggestions which should assist in correcting some of the major distribution problems are as follows:

In regard to improving wholesale market facilities, one approach would be the improvement of existing facilities. This is not given priority [illegible]

1. Present small size and design as well as location would not permit

reduction of congestion, proper weighing, improved sanitation and hygenic conditions nor storage for carry-over produce.

2. Wholesale market management by wholesalers would only perpetuate the practices of little to no documentation of transactions and collusion on prices.

3. The present environment of organized confusion in the wholesale market place obviously works against the unorganized producers and to the advantage of market middlemen.

4. Attempts to improve described deficiencies in present wholesale market facilities would be merely cosmetic and would leave the root problem untouched.

Another approach and the one suggested for consideration is a Pilot Project-Wholesale Market. This should be handled as a demonstration market which should not initially compete with the existing system of marketing. The city of Pucallpa is suggested as the site for this project--reason being impact potential. The GOP could build the market and then lease it to a private association which would initially also be the minority equity party. However, t' GOP woul promote and encourage total priv[illegible] year [illegible] project. The private association would manage the market center, which should be self sustaining. The organization/association would consist of

producers, transporters, wholesalers, commission agents, entrepeneurs and others, such as processors.

Location of this pilot wholesale market is important -- it could be placed on the outskirts of Pucallpa close to the Huanuco/Pucallpahighway. There is land available (owned by government - Ganadera San Jorge) in this area. Market design would provide ample and well drained asphalted areas for loading/unloading, display, weighing, storage and other facilities, such as water and electricity. Through such an organization, grades and standards set by the government could be enforced. In addition, and of particular importance, wholesalers' activities could be monitored and better controlled, by the administrative board, which should have a selected wholesaler. Only licensed wholesalers could participate in the market, and all buying/selling practices, such as weighing, commissions, and contracting procedures should be controlled. Other advantages of such a wholesale market would be (1) collection of data; (2) improved sanitation (market washed down with high pressure hose every day and fumigated - Clorox readily available); (3) reduction of waste (cold storage chambers for unsold perishable produce; (4) fair prices to producers - a simple receipt for each transaction; and (5) quality improvement.

At this [illegible] pilot project, more [illegible] producers and representatives of producer associations should have easy access from one side while wholesalers operate with their trucks at the opposite side.

Small cold storage chambers and dry goods storage can be rented by the market association to both producers and wholesalers.

This pilot project should assist in correcting/improving many of the shortcomings throughout the distribution system. GOP has to assist, the private sector must assist and the public in general can assist.

Appendix 8

FRUIT PRICES PAID PER KILOGRAM TO PRODUCER - MIDDLEMAN - VENDOR
1980
(HIGH JUNGLE)

FRUIT	PRICE PAID TO PRODUCER		PRICE PAID TO MIDDLEMAN		PRICE PAID TO VENDOR	
	US$	S/.	US$	S/.	US$	S/.
C[illegible]	0.17	50	0.21	60	0.29	85
MANDARIN	0.19	55	0.24	70	0.34	100
GRAPEFRUIT	0.19	55	0.20	58	0.27	80
L[illegible]	0.18	53	0.19	56	0.24	70
A[illegible]	0.19	55	0.22	65	0.34	100
BANANA	0.14	40	0.17	50	0.27	80
GUA[illegible]	0.17	50	0.22	65	0.48	140
[illegible]LE	0.17	50	0.21	60	0.31	90
[illegible]	0.13	37	0.14	40	0.17	50
P[illegible] FRUIT	0.19	55	0.24	70	0.38	110
CO[illegible]	0.15	45	0.19	55	0.31	90

SOURCE: INDDA
B.C.R. 1980 exchange rate S/.290 = US$1.00

Appendix 9

FRUIT PRICES PAID PER KILOGRAM TO PRODUCER-WHOLESALER-RETAILER
JUNIE 1 9 8 4
(HIGH JUNGLE)

Fruits & Varieties	Producer Prices U.S.$	Producer Prices S/.	Wholesaler Prices U.S.$	Wholesaler Prices S/.	Retailer Prices U.S.$	Retailer Prices S/.	Supplies
Orange:							
Valencia SP	0.11	375.	0.15	500.	0.23	800.	
Valencia P	0.16	556.	0.23	800.	0.35	1,200.	Abundant
Mandarin:							
Dancy	0.06	200.	0.15	500.	0.16	550.	
Tangarine	0.15	500.	0.20	700.	0.23	800.	
Tangelo	0.23	800.	0.38	1,300.	0.44	1,550.	Abundant
Grapefruit:							
Selva SP	0.12	400.	0.18	600	0.23	800.	
Selva P	0.20	667.	0.23	800	0.35	1,200.	Normal
Keen Lemon	0.11	375.	0.15	500.	0.29	1,000.	Normal
Avocado	0.22	750.	0.37	1,250.	0.29 1/	1,000.	Normal
Banana							
Island	0.23	800.	0.28	950	0.59 2/	2,000.	
Manzano	0.12	400.	0.18	625.	0.44	1,500.	
Palillo	0.91	650.	0.22	750	0.53	1,800.	
Seda	0.10	350.	0.15	500.	0.29	1,000.	Normal
Papaya	0.24	820.	0.29	1,000.	0.44	1,500.	Rare
Pineapple	0.13	430.	0.23	800.	0.35	1,200.	Rare
Mango							Not recorded
Maracuya	0.15	500.	0.19	650.	0.23	800.	Rare
Grape	0.1[illegible]	400.	0.15	550.	0.[illegible]	[illegible]	

1/ Unit price
2/ Mano price (5 bananas - 1 mano)

SP - without seeds
P - with seeds

SOURCE: Empresa de Mercados Mayoristas - Dpto. de Estadisticas y Procesamiento
Exchange rate S/.3,400 = US$1.00, June 1984

FREIGHT RATES FOR FRUIT TRANSPORTATION

June 1984

POINT OF OF ORIGIN	DESTINATION	VIA	US$ COST VALUE/KG	S/. COST VALUE/KG	US$ COST/CRATE 1/	S/. COST/CRATE 1/
IQUITOS	LIMA	AIR	0.30	1,000		
IQUITOS	PUCALLPA	RIVER	0.03	103		
PUCALLPA	LIMA	AIR	0.19	620		
PUCALLPA	LIMA	LAND	0.06	207		
CHANCHAMAYO 2/	LIMA	LAND			1.06	3,500 3/

1/ Crate: [illegible] approximately 39 decimeter to 31 decimeter in volume and 2.5 kg. to 3.0 kg. in weight

2/ Including: San Ramón - La Merced

3/ Increases [illegible] the raining season

SOURCE: Líneas Aéreas - Agencias de Transporte
Lima - Chanchamayo 6/84

SEASONALITY IN THE SUPPLY OF FRESH FRUIT

=====: Abundant Production
-----: Low Production

FRUIT	MONTHS											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ORANGE	-	-	=	=	=	=	=	=				
MANDARIN ORANGE					=	=	=	=	=	=	=	
GRAPEFRUIT					=	=	=	=				
BANANAS	-	-	-	-	-	-	-	-	-	-	-	-
PINEAPPLE	-	-	-	-	-	-	=	=	=	=	=	=
AVOCADOS		=	=	=	=	=	=					
MANGOS		-	-	-	-	-						
GUAVAS						=	=	=	=	=		
LEMON			=	=	=	=	=	=				
MARACUYA	=	=	=	=	=	=	=					
COCONA				=	=	=	=	=				

SOURCE: FOPEX Advisor of the Agrarian Sector
1984

Appendix 12

SEASONALITY IN THE SUPPLY OF SPICES

=====: Abundant Production
-----: Low Production

SPICES	MONTHS											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
GARLIC	----	=========										
CHILI PEPPER	----------	----------	----------	----------	----------	----------	----------	==========	==========	==========	==========	==========
ANNATO	----------	----------	----------	----------	----------	----------	----------	==========	==========	==========	==========	==========
TURMERIC	====							==========	==========	==========	==========	==========
ANISE							==========	==========				
MARJORAM				==========	==========	==========			==========	==========	==========	
GINGER	==========	==========	==========	==========	==========	==========	==========	==========	==========	==========	==========	==========

SOURCE: FOPEX
1984

SEASONALITY OF U.S. DEMAND FOR FRESH FRUIT AND SPICES
MONTHLY AVAILABILITY EXPRESSED AS PERCENTAGE OF TOTAL ANNUAL SUPPLY

COMMODITY	JAN %	FEB %	MAR %	APR %	MAY %	JUN %	JUL %	AUG %	SEP %	OCT %	NOV %	DEC %	ANNUAL TOTAL million lb's
AVOCADOS, all	9	7	8	8	9	8	8	8	7	8	10	10	240
California	8	8	10	9	10	10	8	7	6	6	8	10	190
Florida	9	2					4	12	14	22	25	12	50
BANANAS	8	7	9	8	9	9	8	8	8	9	8	9	4,500
GARLIC	8	8	10	8	8	9	9	9	8	7	9	7	20
GRAPEFRUIT, all	12	12	15	12	11	6	4	3	2	7	9	9	1,800
Florida	12	12	15	13	11	6	2			8	11	10	1,200
Texas	19	19	17	10	4					4	12	15	315
California & Arizona	4	4	5	7	12	15	16	16	12	4	3	2	285
LIMES	6	5	5	6	8	10	11	13	11	8	7	10	60
MANGOS		1	4	6	12	25	28	19	4	1			45
ORANGES, all	11	110	12	12	11	7	5	4	4	5	7	11	3,100
California & Arizona	9	10	12	12	11	8	6	5	6	6	5	10	2,100
Florida	15	13	11	10	10	7	3	1		3	11	15	770
GUAVAS, Hawaii	[illegible]	7	7	6	7	10	9	9	9	10	10	9	50
PEPPER, BELL, all	[illegible]	7	7	7	10	10	9	8	9	9	9	7	750
Florida	[illegible]	8	8	14	24	13	1				6	13	230
California	[illegible]				2	6	14	17	21	25	13	1	140
Mexico		24	25	15	5							7	139
PINEAPPLES	[illegible]	7	11	11	12	11	10	6	5	6	6	8	300
TANGERINES	[illegible]	12	10	6	2					5	20	27	380
WATERMELONS		1	1	3	11	28	29	19	6	1			2,800

SOURCE: USDA
1982

CHARACTERISTICS OF ~~THE EXTERNAL~~ DEMAND ~~FROM THE~~ U.S.A. FOR imported FRUIT JUICE

Quantity (c): Thousand of Liters

Value: (v): Thousand of dollars

PRODUCT	1977			1978			1979			1980			1981		
	C	V	% V	C	V	% V	C	V	% V	C	V	%	C	V	% V
Pineapple Juice	81,011	13,065	100.0	101,396	17,591		125,946	25,672		152,038	35,[illegible]		140,874	34,711	100.0
FROM:															
Philippines	72,926	12,027	92.1	67,617	11,925		82,780	18,568		94,720	25,7[illegible]		77,474	24,254	69.9
Thailand	7,881	964	7.6	16,741	2,390		33,010	4,626		40,031	5,366		55,371	8,808	25.4
Honduras	-	-	-	-	-		851	227		4,05[illegible]	757		5,598	971	2.8
Mexico	-	-	-	16,676	3,207		9,038	2,197		13,040	3,58[illegible]		1,696	513	1.5
Lime Juice	2,643	814	100.0	4,780	1,780		7,460	1,967		2,507	77[illegible]		1,988	710	100.0
FROM:															
Mexico	1,880		63.9	2,891	1,191		2,382	723		1,231	3[illegible]7		1,875	511	72.0
Italy	95		17.2	104	189		114	218		165	15[illegible]		100	181	25.5
Brazil	646		17.0	1,587	243		4,884	942		1,072	25[illegible]				
Canada				180	147										
Orange Juice (concentrated)	285,396	50,[illegible]	100.0	701,533	146,827		703,408	141,436		345,699	69,3[illegible]		1'225,754	285,202	100.0
FROM:															
Brazil	197,569	35,839	70.9	637,747	131,694		545,819	128,518		311,842	62,27[illegible]		1'184,505	275,465	96.6
Mexico	86,568	14,471	28.6	56,408	13,443		57,285	12,785		27,250	4,940		27,275	6,091	2.1
Belize				689	140					6,201	1,821		13,752	3,520	1.2
Canada				913	261								85	79	
West Germany										406	3[illegible]				
The Netherlands				3,272	784		286	64							
Argentine				2,502	504										
Honduras	689	113	0.2												
Panama	400	103	0.2												

PRODUCT	1977 C	1977 V	1977 % V	1978 C	1978 V	1978 % V	1979 C	1979 V	1979 % V	1980 C	1980 V	1981 C	1981 V	1981 % V
Other Juices Citrus (concentrated)	4,361	647	100.0	2,788	395		11,640	2,524		9,255	[illegible]	9,891	3,334	100.0
FROM:														
Mexico	2,435	379	58.6	2,781	389		7,434	1,470		1,748	[illegible]	4,771	1,188	35.6
Australia							628	147			[illegible]	1,785	1,118	33.5
West Germany										143	[illegible]	654	492	14.8
Belize										591	[illegible]	1,181	275	8.2
Argentine	1,735	196	30.3				1,555	415		3,751	1,664	1,406	232	7.0
Brazil							1,991	416		2,796	393			
Denmark										109	126			
Other Juices Citrus (no concentrated)	467	573	100.0	561	645		840	1,035		3,816	2,070	10,532	5,052	100.0
FROM:														
Mexico										3,017	1,103	9,247	3,830	75.8
Italy	358	489	85.3	383	585		601	878		476	768	435	676	13.4
Canada										250	137	825	511	10.1
Other Juices of fruits	13,807	6,370	100.0	20,427	10,921		14,958	9,305		14,040	7,072	18,246	10,190	100.0
FROM:														
Austria	3,091	2,063	32.4	3,151	2,433		2,984	2,428		1,163	[illegible]	2,773	2,358	23.1
Canada	717	170	2.7	1,235	513		2,599	1,080		4,248	1,535	3,553	1,762	17.3
West Germany	875	472	7.4	857	720		863	782		416	[illegible]	1,367	1,175	11.5
The Netherlands	1,859	1,219	19.1	2,538	1,810		1,189	997		729	[illegible]	1,320	1,020	10.0
Argentine	946	199	3.1	1,578	387		597	243		378	[illegible]	1,174	368	3.6
Brazil	1,814	371	5.8	5,512	2,483		2,739	1,522		3,335	[illegible]	1,099	287	2.8
Costa Rica							185	192		520	[illegible]	604	285	2.8
Australia				109	102					177	[illegible]	174	272	2.7
Switzerland	297	241	3.8	420	320		155	146				354	270	2.6
France	372	141	2.2	1,008	294		1,010	356		566	[illegible]	918	[illegible]	2.5
Taiwan				330	181		313	292		284	247	479	240	2.4
Israel	864	240	3.8	371	159		142	85				422	169	1.7
Dominican Republic	96	141	2.2	57	85		64	94		106	[illegible]	520	160	1.6
Mexico	682	293	4.6	846	323		248	149		264	[illegible]	216	149	1.5
Singapur												1,289	130	1.3
Spain							243	180						
Irak				1,231	187									
PERU				148	180									

SOURCE: WORLD MARKET OF FRUITS
Center of International Commerce
UNCTAD GATT

CHARACTERISTICS OF ~~THE EXTERNAL~~ DEMAND ~~FROM~~ IMPORTED JAPAN FOR FRUIT JUICE

Quantity (c): Thousand of Liters
Value: (v): Thousand of Yens

1977 to 1981

PRODUCT	1977 C	1977 V	1977 % V	1978 C	1978 V	1978 % V	1979 C	1979 V	1979 % V	1980 C	1980 V	1980 % V	1981 C	1981 V	1981 % V
Orange Juice	[illegible]	416	100.0	1,581	557		3,430	1,267		2,781	1,036		3,810	1,495	100.0
FROM:															
Brazil	[illegible]	63	15.1	463	194		1,902	764		1,462	610		2,867	1,257	84.1
USA	1,2[illegible]	352	84.6	1,116	363		1,525	502		1,024	302		941	238	15.9
Australia										4	1		3	1	0.1
Colombia										285	121				
Italy										3	1				
Belgium										3	1				
Grapefruit Juice	1,102	193	100.0	1,344	288		1,767	471		1,941	746		3,329	1,552	100.0
FROM:															
USA	[illegible]	161	83.4	1,238	271		1,683	447		1,864	707		3,121	1,449	93.4
Israel	[illegible]	29	15.0	51	15		62	20		77	38		181	90	5.8
The Netherlands													25	13	0.8
Australia	13	3	1.6	10	2		21	4							
Lemon Juice	[illegible]	420	100.0	1,419	472		1,537	612		1,622	905		1,412	712	100.0
FROM:															
USA	[illegible]	312	74.3	884	305		963	397		572	392		554	320	44.9
Argentine	[illegible]	12	2.8	198	26		122	37		415	212		290	124	17.4
Israel	[illegible]	86	20.4	251	72		348	107		409	161		327	120	16.8
Australia							41	23		188	107		128	68	9.5
West Germany										25	24		66	54	7.6
Italy		7	1.6	21	10		23	13		13	9		46	25	3.5
Mexico		1	0.2				1	1		1	1		1	2	0.3
Switzerland		2	0.4					1			1				
France		1	0.2	65	58		27	25							
Lime Juice		7	100.0	8	5		45	28		18	10		9	5	100.0
FROM:															
Mexico	[illegible]	7	100.0	8	5		23	16		4	3		8	5	100.0
Singapur													1		
USA							13	7		13	7				
Italy							9	5							

PRODUCT	1977 C	1977 V	1977 % V	1978 C	1978 V	1978 % V	1979 C	1979 V	1979 % V	1980 C	1980 V	1980 % V	1981 C	1981 V	1981 % V
Other Sour Juices							4	1		17	10		4	4	100.0
FROM:															
Mexico										2	1		3	3	75.0
Korea													1	1	25.0
Argentine							4	1		15	9				
Pineapple Juice	274	29	100.0	210	18		280	30		320	37		303	34	100.0
FROM:															
Philippines	225	23	79.3	210	18		266	27		305	35		271	29	85.3
USA	47	5	17.2				14	2		15	2		32	5	14.7
China	2														
Mixture of Fruit Juices							103	41		139	52		262	92	100.0
FROM:															
USA							103	41		139	52		262	92	100.0
Other Fruit Juices	[illegible]	271	100.0	204	211		2,615	1,562		3,453	1,867		784	599	100.0
FROM:															
USA	173	258	95.2	181	192		127	182		465	338		238	306	51.1
Brazil					1		38	22		19	11		383	224	37.4
Hungary													111	31	5.2
West Germany	[illegible]	4	1.5	16	13		26	22		39	15		27	17	2.8
Austria								1		2	4		10	9	1.5
East Germany										5	7		8	8	1.1
France		1	0.4		2		1			28	18		1	3	0.5
New Zealand										3	1		4	1	0.2
Australia							691	390		197	99		1		
United Kingdom	1	5	1.8					1		1	6				
The Netherlands							1,279	727		1,479	933				
South Africa	[illegible]	1	0.4				125	48		715	211				
Argentine							114	59		331	149				
Israel							110	63		169	75				
Chile							104	47							
Taiwan		2	0.7	5	2										

SOURCE: WORLD MARKET OF FRUITS
Center of International Commerce
UNCTAD GATT
1982

CHARACTERISTICS OF ~~THE~~ EXTERNAL DEMAND ~~FROM~~ SAUDI ARABIA FOR FRUIT JUICE

Quantity (c): Tons

Value: (v): Thousand of Rials

imported

Appendix 16

1977 to 1981

PRODUCT	1977			1978			1979			1980			1981		
	C	V	% V	C	V	% V	C	V	% V	C	V	% V	C	V	% V
Orange and Lemon Juice and Other Citrus	[illegible]	159,544	100.0	89,659	194,231		101,253	228,907		100,717	229,819		83,470	208,435	100.0
FROM:															
Japan	34,504	81,595	51.1	41,416	89,110		42,559	99,313		43,713	99,007		50,082	127,524	61.2
Denmark	[illegible]	7,127	4.5	9,481	19,209		22,961	53,174		26,200	63,163		10,474	25,181	12.1
USA	[illegible]	4,102	2.6	6,252	14,644		5,800	13,627		9,319	20,942		7,264	21,125	10.1
Greece	[illegible]	2,143	1.3	1,825	3,605		6,339	11,234		6,681	11,483		5,241	10,665	5.1
The Netherlands	363	950	0.6	149	301		780	1,512		450	1,398		1,496	3,242	1.6
West Germany	[illegible]	417	0.3	3,811	9,639		1,278	3,275		3,482	7,368		1,467	3,162	1.5
Austria	347	1,041	0.7	1,738	3,755		1,513	3,565		1,829	2,726		1,514	2,567	1.2
Taiwan	[illegible]	4,261	2.7	5,805	11,259		6,780	13,493		987	1,945		1,155	2,454	1.2
Chipre	83	182	0.1	1,132	2,251		256	504		385	750		1,017	2,230	1.1
United Kingdom	1,492	3,944	2.5	2,431	6,099		3,812	8,340		924	2,504		755	1,961	0.9
Singapur	[illegible]	818	0.5	280	528		1,161	2,446		481	940		228	548	0.3
Switzerland				84	160		42	104		655	1,450		177	521	0.2
India	[illegible]	560	0.4	651	1,416		235	467		42	92		163	471	0.2
China	[illegible]	631	0.4	1,115	2,304		1,132	2,071		218	455		182	423	0.2
Lebanon	346	668	0.4	465	1,031		611	1,407		434	1,085		132	341	0.2
Spain	[illegible]	14,491	9.1	509	1,139		45	87		55	144		119	337	0.2
France	[illegible]	5,277	3.3	1,698	4,171		755	2,189		539	3,326		137	274	0.1
Norway				22	38		279	583		979	2,469		103	173	0.1
Italy	2,880	6,515	4.1	3,941	8,575		2,813	6,581		1,541	3,891		74	169	0.1
Kuwait	2,571	6,256	3.9	91	197		39	109		206	447				0.1
Jordania	366	858	0.5	69	157		52	124		120	245				0.1
Egypt	19	44		996	2,219		31	64		88	227				
United Arab Emirats	[illegible]	1,359	0.9	24	54					41	88				
Bahreim		750	0.5												
Mango and Guava Juice (tropical	18,7[illegible]	42,899	100.0	22,237	50,548		26,443	62,164		15,975	43,030		16,127	50,600	100.0
FROM:															
Egypt	[illegible]	6,708	15.6	3,226	8,393		5,809	15,333		7,069	21,008		6,555	25,748	50.9
Cuba		42	0.1	2,936	8,665		6,777	16,950		2,107	6,706		3,588	10,988	21.7
Taiwan	[illegible]	9,201	21.4	7,472	15,148		7,816	16,289		3,673	7,639		2,232	4,995	9.9
India	[illegible]	3,885	9.1	1,423	3,201		1,374	3,952		1,116	3,148		891	2,904	5.7
China	[illegible]	1,496	3.5	1,112	2,243		899	1,873		615	1,297		799	1,786	3.5

PRODUCT	1977 C	1977 V	1977 % V	1978 C	1978 V	1978 % V	1979 C	1979 V	1979 % V	1980 C	1980 V	1980 % V	1981 C	1981 V	1981 % V
Mango and Guava Juice (tropical (cont'd)															
FROM:															
Japan	796	1,740	4.1	1,734	3,731		775	1,676		649	1,492		572	1,327	2.6
Denmark				226	420		932	1,877		6	45		88	342	0.7
USA	2,368	5,216	12.2	1,517	3,111		215	432		64	163		123	296	0.6
Hong Kong	647	1,539	3.6				129	220		72	180				
Kuwait	812	1,937	4.5				23	47		43	168				
Brazil	1,342	2,955	6.9				128	249							
The Netherlands							40	74							
Korea				773	1,985										
Jordania	167	516	1.2	42	105										
United Arab Emirats	488	961	2.2												
Other Fruit Juices	33,477	80,620	100.0	88,986	204,601		81,427	191,992		87,629	204,141		68,644	170,852	100.0
FROM:															
Japan	10,327	24,181	30.0	33,604	80,813		33,612	85,817		49,456	113,721		42,110	110,211	64.5
USA	4,693	11,521	14.3	9,455	26,709		12,502	28,928		13,723	32,773		5,090	15,337	9.0
Austria	401	763	0.9	2,520	5,773		1,393	2,082		5,509	10,036		5,193	8,358	4.9
Singapur	2,099	4,191	5.2	2,515	4,310		2,155	4,614		2,576	5,476		3,453	7,805	4.6
United Kingdom	2,163	5,168	6.4	11,461	25,483		8,889	23,233		5,659	19,120		1,699	6,075	3.6
Italy	4,462	13,602	16.3	5,627	12,652		3,330	6,609		3,641	6,603		2,718	4,478	2.6
Thailand	182	340	0.4	226	433		1,071	1,929		1,405	2,634		1,274	2,578	1.5
Taiwan	510	1,170	1.5	10,718	20,344		8,019	15,429		1,158	2,199		1,029	2,092	1.2
West Germany	75	235	0.3	817	3,110		510	1,347		929	2,149		574	1,301	0.8
Kuwait	2,[illegible]2	4,676	5.8	119	238		57	162		124	328		502	1,222	0.7
China	65	172	0.2	1,071	2,062		1,115	2,206		211	426		577	1,191	0.7
Greece	979	2,136	2.6	884	1,869		1,545	3,188		687	1,524		292	680	0.4
Spain	362	822	1.0	1,089	2,126		244	672		30	140		449	605	0.4
The Netherlands	314	824	1.0	23	51		942	2,426		162	556		311	605	0.4
Belgium				1,057	2,249		553	1,122		110	386		92	347	0.2
Hong Kong	79	184	0.2	270	484		853	2,144		249	538		77	233	0.1
India	1,110	2,446	3.0	180	397		199	432		38	113		51	149	[illegible]
Chipre	661	1,357	1.7	2,784	5,510		710	1,257		192	387				
Turkey	11	40		714	1,606		21	32		17	54				

SOURCE: WORLD MARKET FOR FRUITS
Center of International Commerce
UNCTAD GATT
1982

CHARACTERISTICS OF ~~THE EXTERNAL~~ DEMAND ~~FROM~~ WEST GERMANY FOR FRUIT JUICE

Quantity (c): Tons

Value: (v): Thousand of Marks

imported

1977 to 1981

PRODUCT	1977 C	1977 V	1977 % V	1978 C	1978 V	1978 % V	1979 C	1979 V	1979 % V	1980 C	1980 V	1980 % V	1981 C	1981 V	1981 % V
A. Of Specific Weight Superior to 1.33 at 15 C															
Orange Juice	1,[illegible]	2,050	100.0	812	1,741		406	769		400	730		679	991	100.0
FROM:															
Italy	1[illegible]	365	17.8	79	228		184	441		86	226		236	554	55.9
Denmark													245	133	13.4
The Netherlands	[illegible]	926	45.2	209	536		62	136		58	141				
Brazil	5[illegible]	89	4.3	193	538					47	121				
Switzerland	12	87	4.2	13	108		11	84							
Belgium-lux	2[illegible]2	134	6.5	108	83										
Greece	[illegible]	123	6.0												
Other Citrus Juices w/o Mixture	7[illegible]	1,967	100.0	448	1,259		180	642		390	1,049		154	541	100.0
FROM:															
Italy	645	1,557	79.2	277	653					70	194		53	138	25.5
Brazil													22	103	19.0
France				47	115		56	167		159	372				
Switzerland		201	10.2	15	170		10	111		12	125				
Belgium-lux							12	91							
The Netherlands	4[illegible]	84	4.3	23	156		35	83							
Other Tropical Juices-Guava-Mango	1,[illegible]	3,610	100.0	1,011	2,565		492	1,641		1,136	3,822		659	2,651	100.0
FROM:															
Italy		2,411	66.8	568	1,509		263	874		395	908		348	977	36.9
The Netherlands		234	6.5	36	172		55	351		22	261		44	488	18.4
Switzerland		150	4.2	14	135					8	93		28	350	13.2
USA		185	5.1	120	257		52	121		87	317		49	340	12.8
Kenya													29	115	4.3
France		225	6.2	32	143		38	174		361	671		12	104	3.9
Austria										138	1,342				
Greece	[illegible]	174	4.8	127	183										

PRODUCT	1977 C	1977 V	1977 % V	1978 C	1978 V	1978 % V	1979 C	1979 V	1979 % V	1980 C	1980 V	1980 % V	1981 C	1981 V	1981 % V
(cont'd)															
B. Of Specific Weight Of 1.33 or less at 15 C															
Orange Juice	123,940	164,525	100.0	99,027	182,468		109,538	206,834		123,588	228,951		141,652	284,171	100.0
FROM:															
Brazil	42,9[illegible]	65,982	40.1	41,790	89,649		61,750	123,899		80,541	146,839		95,070	178,576	62.8
Israel	10,7[illegible]	12,808	7.8	12,399	16,094		9,948	14,589		9,037	13,993		11,945	24,607	8.7
USA	5,82[illegible]	9,979	6.1	3,587	8,442		3,052	6,832		3,728	7,672		9,145	21,473	7.6
Italy	3,81[illegible]	8,194	5.0	6,117	14,570		5,646	13,254		5,030	12,053		5,162	12,815	4.5
The Netherlands	11,[illegible]	21,347	13.0	5,943	12,706		7,680	14,612		8,163	17,181		6,314	12,622	4.4
Spain	3,[illegible]	10,039	6.1	3,675	12,064		3,432	10,357		4,460	14,302		3,719	12,253	4.3
Morocco	3,[illegible]	4,521	2.7	3,445	6,422		2,996	6,912		1,937	4,586		2,448	6,118	2.2
Argentina	1,[illegible]	2,718	1.7	1,755	4,194		2,440	5,115		545	1,178		1,269	3,594	1.3
Chipre							78	82		545	986		912	2,519	0.9
Denmark	23[illegible]	503	0.3	321	741		406	909		537	1,382		1,216	2,098	0.7
Belgium-Lux	37,5[illegible]	23,346	14.2	17,672	14,283		10,545	7,919		7,011	5,456		1,956	2,041	0.7
Greece	1,1[illegible]	2,196	1.3	568	863		497	835		253	609		800	1,871	0.7
Belize	55	97	0.1	65	168					55	121		328	1,014	0.4
South Africa	1,[illegible]	1,714	1.0	241	517		261	589		519	1,109		276	707	0.2
France	[illegible]	336	0.2	664	845		505	609		518	725		448	574	0.2
Grapefruit Juice	9,2[illegible]	13,870	100.0	10,079	16,171		11,400	21,226		11,551	27,222		12,250	30,010	100.0
FROM:															
Israel	3,[illegible]	4,989	36.0	4,791	7,182		5,590	9,659		6,639	15,095		6,472	15,999	53.5
USA	[illegible]	1,406	10.1	1,192	2,096		1,711	3,223		1,284	2,926		1,675	4,401	14.7
Argentine	1,[illegible]	2,423	17.5	2,104	3,407		1,170	2,481		749	2,212		1,121	3,876	12.9
Belgium-Lux	51	88	0.6	179	241		69	104		111	136		1,265	1,063	3.5
Brazil	2[illegible]	356	2.6	324	681		402	817		312	837		271	839	2.8
Mexico							208	479		700	1,784		226	635	2.1
Chipre										74	152		180	553	1.8
Morocco	57	93	0.7	87	185		165	305		96	298		158	527	1.8
The Netherlands	1	[illegible],270	23.6	499	1,024		845	2,170		183	415		182	437	1.5
South Africa							267	488		259	678		63	220	0.7
Australia										160	527		65	193	0.6
Jamaica	2[illegible]	381	2.7	102	209		264	621		236	760				
Swaziland	[illegible]	108	0.8							131	305				

PRODUCT	1977 C	1977 V	1977 % V	1978 C	1978 V	1978 % V	1979 C	1979 V	1979 % V	1980 C	1980 V	1980 % V	1981 C	1981 V	1981 % V
(cont'd)															
Lemon Juice	8,128	15,481	100.0	8,448	16,048		8,409	14,960		8,552	21,693		8,159	22,833	100.0
FROM:															
Argentine	1,896	3,236	20.9	2,809	5,215		3,516	6,372		3,505	9,076		3,203	9,762	[illegible]
Italy	3,017	6,952	44.9	2,319	5,592		1,437	3,444		2,309	6,050		2,036	5,359	[illegible]
USA	1,203	1,841	11.9	1,334	1,950		1,546	2,441		310	925		647	1,747	[illegible]
Israel	279	394	2.5	247	462		338	557		475	1,109		591	1,648	[illegible]
Brazil	[illegible]			231	389		236	455		503	1,047		465	1,226	[illegible]
The Netherlands	1,0[illegible]	1,957	12.8	862	1,536		1,071	1,227		659	1,354		459	1,088	[illegible]
Greece	441	657	4.2	386	488		42	98		514	1,310		363	1,055	[illegible]
France													211	463	[illegible]
Spain	[illegible]	266	1.7	116	239		91	186		48	102		36	103	0.5
Pineapple Juice	7[illegible]	1,189	100.0	578	976		987	2,006		2,034	4,771		2,052	5,418	100.0
FROM:															
Brazil							111	373		587	1,767		438	1,564	28.9
Philippines	254	419	35.2	207	361		187	367		348	722		415	1,006	18.6
Kenya	[illegible]	86	7.2				102	210		364	864		316	950	17.5
The Netherlands	[illegible]	217	18.3	42	121		64	175		95	327		210	685	12.6
Swaziland	208	227	19.1	115	109		95	87		195	264		286	414	7.6
Ivory Coast													113	175	3.2
Switzerland													51	166	3.1
USA	84	144	12.1	86	158		139	283		68	244		58	132	2.4
Mexico													55	132	2.4
Dominican Republic							66	132							
Other Fruit Juices w/sugar (tropical)										3,181	10,555		5,461	21,496	100.0
FROM:															
Brazil										646	2,924		2,343	11,951	55.6
USA										347	1,044		608	1,966	9.1
Italy										946	1,428		1,261	1,772	8.2
Sri Lanka										151	416		385	1,285	6.0
Austria										47	582		43	695	3.2
Yugoslavia										109	1,041		130	549	2.6
PERU										82	314		85	512	2.4
Switzerland										43	187		94	491	2.3
The Netherlands										439	1,141		60	474	2.2
Australia													110	466	2.2
Belgium-Lux										90	262		95	272	1.3
Poland													27	241	1.1
Kenya										72	487				
Denmark										31	355				

PRODUCT	1977			1978			1979			1980			1981		
	C	V	% V	C	V	% V	C	V	% V	C	V	% V	C	V	% V
(cont'd)															
Other Fruit Juices w/o Sugar (tropical)	9,215	24,590	100.0	8,812	25,652		10,997	29,668		9,001	32,457		9,683	35,674	100.0
FROM:															
The Netherlands	3,420	11,433	46.5	2,720	10,516		5,001	11,057		1,908	5,860		2,200	9,006	25.2
Brazil	131	720	2.9	290	1,627		811	3,539		1,658	9,257		1,333	6,906	19.4
Kenya				217	919					597	4,063		831	4,996	14.0
Italy	1,655	3,484	14.2	2,317	4,615		1,866	4,275		2,414	4,671		2,417	4,717	13.2
Austria	107	1,111	4.5	115	1,285		69	738		80	820		209	1,988	5.6
Sri Lanka	314	645	2.6	156	389		216	715		483	2,944		488	1,522	4.3
USA	783	1,993	8.1	667	1,663		728	2,525		67	573		311	1,302	3.6
Switzerland	53	561	2.3	58	288		47	216		65	248		183	1,041	2.9
Poland	1,480	1,879	7.6	1,573	1,943		864	1,027		934	1,092		830	817	2.3
Israel				16	166		94	650		243	1,396		162	754	2.1
Taiwan													81	393	1.1
Chile										24	163		62	339	1.0
Argentine							45	354		104	424		52	234	0.7
PERU				18	112		72	433		35	157		26	170	0.5
Yugoslavia	559	1,673	6.8	208	1,082		291	1,995		103	142		59	147	0.4
South Africa				96	263		186	667		32	138				

SOURCE: WORLD MARKET FOR FRUITS
Center of International Commerce
UNCTAD GATT
1982

CHARACTERISTICS OF THE [redacted] DEMAND FROM THE UNITED KINGDOM FOR FRUIT JUICE

Quantity (c): Tons

Value: (v): Thousand of Pounds Sterling

APPENDIX 18

1977 to 1981

PRODUCT	1977 C	1977 V	1977 % V	1978 C	1978 V	1978 % V	1979 C	1979 V	1979 % V	1980 C	1980 V	1980 % V	1981 C	1981 V	1981 % V
Orange Juice				61,675	27,280		85,711	35,738		87,427	35,182		115,437	52,57[illegible]	[illegible]
FROM:															
Brazil				10,648	6,367		18,260	9,665		19,309	8,873		35,648	19,693	[illegible]
Israel				40,328	14,54		48,814	17,211		46,596	16,785		40.024	16,050	[illegible]
The Netherlands				1,799	1,287		2,442	1,460		6,216	3,221		12,245	5,853	[illegible]
West Germany				806	433		1,579	674		3,684	821		14,146	3,927	[illegible]
USA				2,616	1,776		2,589	1,744		3,153	1,963		3,768	2,513	4.8
Grapefruit Juice				19,070	6,598		25,422	9,008		22,590	11,057		19,338	11,233	100.0
FROM:															
Israel				15,042	4,649		20,393	6,444		16,972	7,232		15,343	8,590	76.5
USA				1,927	1,083		1,495	924		2,520	1,889		1,312	1,136	10.1
The Netherlands				266	1,199		717	1,093		728	1,062		740	900	13.4
Other Citrus				7,435	3,749		10,346	5,231		7,591	4,222		7,124	3,894	100.0
FROM:															
Italy				2,838	1,415		3,401	1,729		2,791	1,451		2,772	1,336	34.3
Greece				572	255		165	69		1,224	647		848	475	12.2
Belgium-Lux				5	4		6	1		4	1		421	401	10.3
Ghana				696	411		1,796	993		814	551		611	358	9.2
USA				836	335		1,021	505		404	226		534	328	8.4
Jamaica				71	45		94	81		64	53		413	198	5.1
Denmark				377	318		581	466		526	516		136	149	3.8
Israel				322	138		588	276		305	178		260	141	3.6
Switzerland				248	201		599	377		16	19		4	3	0.1
Pineapple Juice				11,000	2,305		11,770	2,981		14,552	4,539		12,898	5,614	100.0
FROM:															
The Netherlands				207	128		834	489		1,976	1,207		3,058	1,892	33.7
South Africa				6,830	1,282		5,374	1,157		5,212	1,322		3,448	973	17.3
Brazil				1	1		80	48		726	434		878	650	11.6
Kenya				893	177		718	138		151	40		1,313	517	9.2
Philippines				1,173	302		1,292	358		1,935	501		870	334	5.9
Ivory Coast				674	124		1,370	231		1,797	404		663	132	2.4

PRODUCT		1977		1978			1979			1980			1981		
		V	% V	C	V	% V	C	V	% V	C	V	% V	C	V	% V
(cont'd)															
Other Fruit Juices (tropical)	150,[illegible]	52,289	100.0	25,523	13,329		30,285	14,853		24,341	10,402		33,090	13,850	100.0
FROM:															
West Germany	5,905	2,625	5.0	2,839	1,977		3,662	1,844		5,477	2,363		10,013	3,713	26.8
Italy	[illegible]	3,352	6.4	2,598	1,534		3,668	2,031		2,885	1,071		3,920	1,823	13.2
Chipre	[illegible]	2,106	4.0	3,383	1,206		5,252	1,985		5,959	1,970		5,714	1,721	12.4
France	[illegible]	1,972	3.8	3,028	2,216		7,354	4,239		2,083	1,256		2,419	1,241	9.0
Denmark	[illegible]	1,013	1.9	257	451		352	518		447	493		2,100	1,181	8.5
Belgium-Lux				23	16		1,074	195		1,937	348		3,378	903	6.5
The Netherlands	[illegible]	2,585	4.9	1,071	1,187		801	722		714	634		1,150	888	6.4
Spain	[illegible]	1,485	2.8	1,572	834		954	613		1,080	543		1,104	519	3.7
Austria	[illegible]	1,622	3.1	1,144	608		961	511		1,429	577		1,034	448	3.2
Greece	[illegible]	1,132	2.2	3,535	945		1,692	638					1,002	369	2.7
Brazil	9,[illegible]	4,572	8.7	3	2		56	29		[illegible]	50		190	239	1.7
Israel	66,[illegible]	17,897	34.2	102	51		157	74		242	127		230	141	1.0
South Africa	[illegible]	1,687	3.2	485	222		190	58		272	93		204	81	0.6
USA	[illegible]	3,777	7.2	76	45		150	91		111	81		95	60	0.4
Jamaica	[illegible]	156	0.3	37	13		14	5		40	10		26	11	0.1
Philippines	[illegible]	537	1.0							15	3				
Swaziland	[illegible]	309	0.6							17	12				
Argentine				2,706	646		2,638	683							
Ghana	1,091	899	1.7												
Belize	1,527	620	1.2												
Mexico	[illegible]	260	0.5												

SOURCE: WORLD MARKET OF FRUITS
Center of International Commerce
UNCTAD GATT
1982

CHARACTERISTICS OF THE [redacted]L DEMAND [redacted] FRANCE FOR IMPORTED FRUIT JUICE

Quantity (c): Tons
Value: (v): Thousand of Francs

1977 to 1981

PRODUCT	1977 C	1977 V	1977 % V	1978 C	1978 V	1978 % V	1979 C	1979 V	1979 % V	1980 C	1980 V	1980 % V	1981 C	1981 V	1981 % V
A. Of Specific Weight Superior to 1.33 at 15 C															
Orange Juice	[illegible]	724	100.0	193	902		117	411		263	1,206		919	2,554	100.0
FROM:															
Greece													344	917	35.9
Belgium-Lux										120	457		177	784	30.7
West Germany													303	515	20.2
United Kingdom				69	315										
Other Fruit Juices	[illegible]	1,708	100.0	168	2,707		304	4,039		453	3,122		249	2,309	100.0
FROM:															
The Netherlands	[illegible]	1,494	87.5	38	1,884		130	3,331		45	1,694		32	1,139	49.3
West Germany										148	424				
B. Of Specific Weight of 1.33 or less at 15 C															
Orange Juice	45,[illegible]	104,751	100.0	47,722	147,080		55,728	168,888		60,478	179,985		68,601	273,506	100.0
FROM:															
Brazil	[illegible]	12,768	12.2	4,722	25,591		6,792	33,444		12,591	49,346		15,921	76,264	27.9
Israe	1[illegible]	32,254	33.7	14,439	40,857		16,247	48,038		13,374	39,401		16,086	66,625	24.4
USA	11,	22,689	21.7	11,756	24,912		14,703	33,203		18,590	47,839		16,488	63,131	23.1
Morocco	7,	18,920	18.1	9,686	38,197		8,622	30,308		4,921	15,503		3,840	18,314	6.7
Spain	4,	6,064	5.8	4,446	7,449		5,233	9,382		6,701	11,863		6,682	12,574	4.6
West Germany	3[illegible]	713	0.7				512	827		1,204	2,245		4,078	8,738	3.2
The Netherlands							93	503		209	1,032		,261	8,215	3.0
Belgium-Lux		463	0.4	639	1,959		1,613	4,653		1,201	4,851		2,074	7,773	2.8
Italy		1,555	1.5	581	2,558		676	3,118		598	3,366		872	5,187	1.9
Honduras		1,159	1.1	386	1,988		385	1,754		201	997		332	2,543	0.9
Algeria		260	0.2	315	559		111	468		92	417		245	848	0.3
Argentine				142	674								142	768	0.3
South Africa		1,165	1.1	143	616		187	901		78	421		83	453	0.2
Uruguay				118	513					192	990		91	419	0.2
United Kingdom		417	0.4				214	1,044		124	468				
Greece		2,235	2.1												

(cont'd)													
Grapefruit Juice	[illegible]	22,913	100.0	10,539	20,701	10,768	24,631	9,200	26,694	8,253	31,725	100.0
FROM:												
Israel	5,867	10,045	43.8	4,212	8,548	4,685	10,351	3,999	11,987	4,368	16,640	52.5
USA	2,889	5,015	21.9	2,718	4,819	2,931	5,612	3,060	7,109	2,178	6,722	21.2
Morocco	1,909	4,307	18.8	1,426	3,106	1,592	2,565	813	2,414	458	2,159	6.8
Argentine						310	1,561	218	1,580	213	1,752	5.5
Belgium-lux						244	663	94	448	171	857	2.7
Brazil	132	480	2.1	135	569	172	697	252	937	136	781	2.5
Italy	133	499	2.1	137	442	189	736	133	661	141	739	2.3
The Netherlands										58	493	1.6
Swaziland										52	396	1.2
Lemon Juice	[illegible]	7,520	100.0	1,763	9,362	1,992	11,703	2,609	16,354	3,185	19,576	100.0
FROM:												
Italy	782	5,390	71.7	735	5,398	1,224	8,538	1,359	10,024	1,203	8,818	45.0
Ivory Coast	231	615	8.2	173	463			469	1,714	1,134	4,538	23.2
Argentine				96	378					131	1,132	5.8
Spain				253	858	121	460	211	1,263	130	758	3.9
Brazil						284	1,181	114	787	138	573	2.9
Greece										38	442	2.3
Israel	82	257	3.4	130	423			208	1,180	59	332	1.7
The Netherlands										34	301	1.5
Other Citrus	[illegible]	639	100.0	30	131	143	440	298	1,426	312	1,353	100.0
FROM:												
The Netherlands										37	378	27.9
Italy	[illegible]	438	68.5									
Pineapple Juice	12,[illegible]	24,244	100.0	10,058	23,088	11,410	29,539	9,556	30,014	8,407	32,537	100.0
FROM:												
Philippines	[illegible],214	4,552	18.8	1,515	5,812	1,881	7,883	1,709	7,728	1,728	9,751	30.0
Ivory Coast	[illegible]	12,894	53.2	6,176	9,843	7,252	12,916	5,521	10,993	4,129	9,184	28.2
Kenya								383	2,158	626	4,079	12.5
Italy	[illegible]	687	2.8	274	981	423	1,733	427	2,088	383	2,067	6.4
Belgium-lux	[illegible]	256	1.1	157	445	297	1,028	198	944	322	1,606	4.9
South Africa	[illegible]	441	1.8	463	1,549	164	687	444	1,766	272	1,408	4.3
Brazil						139	768	267	1,632	191	1,404	4.3
The Netherlands										121	822	2.5
USA	[illegible]	3,752	15.5	514	2,291	665	2,973	218	1,145	63	320	1.0
Martinique	[illegible]	447	1.8									

SOURCE: WORLD MARKET FOR FRUITS
Center of International Commerce
UNCTAD GATT
1982

Quantity (c): Tons
Value: (v): Thousand of Florins

IN THE NETHERLANDS FOR IMPORTED FRUIT JUICE

APPENDIX 20

1977 to 1981

PRODUCT	1977 C	1977 V	1977 % V	1978 C	1978 V	1978 % V	1979 C	1979 V	1979 % V	1980 C	1980 V	1980 % V	1981 C	1981 V	1981 % V
A. Of Specific Weight Superior to 1.33 at 154 C															
Orange Juice	533	540	100.0	560	994		435	747		369	887		217	400	100.0
FROM:															
France										30	75		89	190	47.5
West Germany	425	330	61.1	368	690		320	475		182	628		74	146	36.5
Belgium-Lux	[illegible]	85	15.7	47	82					86	62				
Italy	5[illegible]	80	14.8	104	186		77	174							
Other Citrus w/o Mixture	37	66	100.0	101	165		86	243		173	157		324	716	100.0
FROM:															
Belgium-Lux															
Italy															
West Germany				8	70										
Other Fruit Juices (tropical)	364	2,694	100.0	335	3,881		594	4,425		352	3,612		177	1,907	100.0
FROM:															
West Germany	[illegible]	2,243	83.3	131	3,302		183	2,942		164	1,811		72	1,280	67.1
Italy	[illegible]	236	8.8	114	198		152	236		82	810		75	464	24.3
Switzerland	8	165	6.1	6	128		16	331		2	52		5	72	3.8
Belgium-Lux				12	155		199	809		86	818				
Austria										10	98				
B. Of Specific Weight 1.33 or less at 15 C															
Orange Juice	[illegible]	97,472	100.0	55,558	89,823		68,695	101,211		85,794	116,652		124,132	188,057	100.0
FROM:															
Brazil	[illegible]	38,770	39.8	15,800	38,624		20,231	44,713		29,729	59,384		44,618	100,692	53.5
West Germany	13,[illegible]3	11,644	11.9	12,088	13,714		22,141	22,428		32,783	27,744		46,208	41,505	22.1
Belgium-Lux	2[illegible]	16,328	16.8	18,424	17,248		17,720	15,524		15,145	12,986		22,453	19,454	10.4
USA	[illegible]	19,665	20.2	5,279	1,581		4,846	10,608		4,744	9,614		7,553	18,524	9.9
Israel	[illegible]	980	1.0	1,017	1,490		1,308	2,249		1,178	2,098		986	2,191	1.2
Italy	[illegible]	3,192	3.3	1,596	4,117		1,095	2,962		537	1,405		763	2,082	1.1
Jamaica	[illegible]	325	0.3							117	207		318	896	0.5
Argentina	[illegible]	934	1.0	302	798		70	156		380	819		197	629	0.3

PRODUCT (cont'd)	C	V	% V	C	V	% V	C	V	% V	C	V	% V	C	V	% V
Chipre										115	211		190	629	0.3
France				28	78					81	194		210	464	0.2
Spain	[illegible]	159	0.2	210	338		180	291		190	331		178	330	0.2
United Kingdom	89	314	0.3	11	62		32	86		270	728				
South Africa	1,[illegible]	2,487	2.6	414	883		881	1,933		318	668				
Mexico	[illegible]	1,338	1.4	123	366										
Belize	[illegible]	545	0.6												
Grapefruit Juice	4,817	6,898	100.0	3,824	5,336		4,976	8,139		4,995	9,226		5,005	12,243	100.0
FROM:															
USA	886	1,692	24.5	753	1,417		1,[illegible]	2,513		1,182	3,251		642	2,247	18.4
Argentine	[illegible]	1,599	23.2	896	1,696		568	1,101		299	876		652	2,222	18.1
Jamaica	[illegible]	582	8.4	189	416		175	471		221	661		407	1,695	13.8
Israel	[illegible]	1,472	21.3	106	214		211	483		345	638		532	1,629	13.3
Belgium-lux	1,[illegible]	1,036	15.0	1,545	1,128		1,814	1,267		1,727	1,346		1,666	1,432	11.7
Mexico							43	100		225	662		306	1,110	9.1
Chipre										182	562		191	704	5.8
West Germany	[illegible]	339	4.9	177	200		346	429		546	559		396	649	5.3
Brazil				58	104		214	533		160	483				
Morocco							222	423							
United Kingdom							181	569							
Lemon Juice and Other Citrus	4,035	7,548	100.0	3,817	7,599		5,001	9,790		5,545	11,259		2,528	6,571	100.0
FROM:															
Italy	[illegible]	1,923	25.5	496	1,163		681	1,444		752	1,933		598	1,828	27.8
Brazil	[illegible]	994	13.2	1,274	3,207		2,156	4,964		2,439	5,271		673	1,737	26.4
USA	1,03[illegible]	2,145	28.4	324	592		143	367		47	175		181	695	10.6
Argentine	22[illegible]	502	6.7	177	406		313	609		431	976		216	626	9.5
West Germany	21[illegible]	462	6.1	95	268		150	349		220	480		227	624	9.5
Belgium-lux	877	1,063	14.1	1,230	1,515		1,449	1,786		1,501	2,011		417	533	8.2
Israel	[illegible]	254	3.4	66	179		60	165		43	124		58	185	2.8
Pineapple Juice	[illegible]	1,111	100.0	698	1,599		1,472	3,300		2,331	5,605		3,687	10,317	100.0
FROM:															
Kenya	[illegible]	407	36.6				154	396		631	1,714		1,256	4,254	41.2
Brazil				202	570		594	1,321		628	1,574		1,137	3,390	32.9
Philippines	[illegible]	371	33.4	133	254		143	332		420	996		956	2,016	19.5
South Africa							32	68		138	259		180	404	3.9
USA							36	83		26	62		24	75	0.7
Mexico							261	576		222	548				
West Germany	[illegible]	92	8.3				53	148		87	281				
Venezuela	[illegible]	62	5.6	206	499		64	166							

PRODUCT	1977			1978			1979			1980			1981		
	C	V	% V	C	V	% V	C	V	% V	C	V	% V	C	V	% V
(cont'd)															
Other Fruit Juices (tropical)	4,[illegible]	22,796	100.0	4,763	22,786		6,370	26,900		8,350	38,360		9,077	40,308	100.0
FROM:															
West Germany	1,[illegible]	14,294	62.7	1,438	12,441		1,632	12,231		1,484	9,405		1,816	10,735	26.6
Brazil	193	1,850	8.1	287	3,046		610	4,259		2,366	13,545		888	6,033	15.0
Sri Lanka	134	255	1.1	134	371		492	1,332		794	2,045		1,432	4,163	10.3
Belgium-Lux	999	1,188	5.2	1,103	1,491		1,979	2,212		935	1,313		1,446	2,673	6.6
PERU				52	133		80	249		262	1,054		599	2,524	6.3
Kenya	179	677	3.0	168	728		166	1,064		461	3,534		298	2,385	5.9
Colombia	28	59	0.3				61	108		220	620		402	2,157	5.4
USA										26	191		417	1,712	4.2
Austria	[illegible]	1,062	4.7	29	465		67	1,113		64	1,064		109	1,274	3.2
Argentine				367	693		201	421		158	386		312	992	2.5
Australia													124	983	2.4
Italy	533	1,828	8.0	495	1,329		298	1,117		457	2,151		336	980	2.4
Taiwan										62	144		236	749	1.9
Yugoslavia	[illegible]	460	2.0	142	922		161	1,392		163	1,054		103	688	1.7
United Kingdom													54	573	1.4
France	63	182	0.8	70	258		191	560		131	468		59	437	1.1
Denmark													26	404	1.0
Malaysia										68	184		113	305	0.8
Poland	[illegible]	357	1.6	304	469		215	302		324	362		231	271	0.7
Venezuela	[illegible]	94	0.4	68	118		27	51		95	171				

SOURCE: WORLD MARKET FOR FRUITS
Center of International Commerce
UNCTAD GATT
1983

Appendix 21

CHARACTERISTICS OF PEPPER DEMAND IN THE WORLD MARKET
(tons)

SPICE	1978	1979	1980	1981
PEPPER				
Imports				
Hong Kong	537	502	1,327	3,400
Singapore	31,543	33,826	24,277	21,970
Australia	932	1,231	922	945
New Zealand	235	238	227	207
Canada	2,539	2,260	2,135	2,624
Jamaica	230	236	235	250
United Kingdom	3,546	4,503	3,560	3,672
Belgium-Lux	1,584	1,775	1,534	1,972
Denmark	636	733	620	601
France	7,094	7,302	7,246	8,246
West Germany	9,653	11,661	10,847	11,432
Irish Republic	208	231	193	297
Italy	3,105	3,524	3,623	2,636
Netherlands	1,962	1848	1,801	1,960
Austria	900	931	1,056	965
Finland	125	220	174	271
Norway	300	296	303	268
Portugal	237	323	239	733
Spain	1,375	1,449	1,476	1,264
Sweden	735	746	794	719
Switzerland	753	910	901	825
Yugoslavia	781	1,133	1,365	2,089
Bulgaria	300	734	1,021	1,075
Czechoslovakia	1,100	1,100	800	810
Soviet Union	10,885	11,604	11,572	14,126
China Taiwan	299	284	379	368
Iran	1,255	700	1,300	1,800
Japan	4,194	4,242	4,632	5,186
South Korea	728	641	1,005	955
Philippines	367	238	173	
Saudi Arabia	3,266	3,572	5,247	3,931
Egypt	1,653	1,267	1,540	2,700
Morocco	[illegible],667	3,504	4,[illegible]	3,[illegible]
South Africa	[illegible],24[illegible]	[illegible]	[illegible]	[illegible]
Tunisia	[illegible],06[illegible]	[illegible]	1,3[illegible]	
USA	[illegible],552	27,248	32,849	3[illegible]

SOURCE: "FRUIT AND TROPICAL PRODUCTS"
DEC. 1983

Appendix 22

CHARACTERISTICS OF CAPSICUM AND CHILLIES DEMAND IN THE WORLD MARKET
(tonnes)

SPICE	1978	1979	1980	1981
CAPSICUM AND CHILLIES				
Imports				
Canada	1,869	1,738	1,867	1,880
Singapore	11,714	14,447	15,714	17,396
United Kingdom	2,930	2,774	2,591	2,633
Belgium-Lux	402	590	852	893
Denmark	117	119	209	288
France	2,772	2,800	2,716	3,058
West Germany	12,072	13,510	13,842	14,316
Italy	256	259	208	120
Netherlands	1,702	2,031	1,846	1,692
Austria	3,269	2,105	2,885	3,313
Finland	80	116	122	137
Norway	80	100	97	100
Sweden	441	519	446	455
Switzerland	404	464	486	448
Soviet Union	1,300	2,354	1,698	2,713
United States	9,469	10,791	8,725	9,819
Japan	4,671	3,773	3,437	3,609
South Korea	4,071	33,557	5,665	537

SOURCE: FRUIT AND TROPICAL PRODUCTS
SPICES
DEC. 1983

Appendix 23

CHARACTERISTICS OF GINGER DEMAND IN THE WORLD MARKET
(tonnes)

SPICE	1978	1979	1980	1981
GINGER				
Imports				
Australia	56	196	53	90
New Zealand	210	271	212	182
Canada	873	637	758	1,018
Hong Kong	62	247	25	12
Singapore	4,145	3,394	3,271	3,231
United Kingdom	3,039	3,802	2,734	2,946
Belgium-Lux	42	55	61	62
Denmark	49	36	41	55
France	160	232	314	428
West Germany	1,002	1,230	867	849
Italy	16	14	11	7
Netherlands	486	618	505	449
Austria	47	51	58	49
Sweden	128	154	150	156
Soviet Union	225	155	233	278
Japan	5,337	2,980	2,407	2,030
South Korea	12	163	34	
Saudi Arabia	2,340	3,949	1,594	1,920
United States	3,592	4,301	4,170	4,379

SOURCE: FRUIT AND TROPICAL PRODUCTS
SPICES
DEC. 1983

Appendix 24

CHARACTERISTICS OF TURMERIC DEMAND IN THE WORLD MARKET
(tonnes)

SPICE	1978	1979	1980	1981
TURMERIC				
Imports				
Singapore		1,223	1,033	979
United Kingdom	1,961	2,410	1,360	1,763
West Germany	616	822	577	524
Netherlands	316	379	312	396
Iran	2,569			
Japan	1,789	2,429	2,564	2,560
Saudi Arabia	386	925	382	506
United States	1,839	1,540	1,549	1,863

SOURCE: FRUIT AND TROPICAL PRODUCTS
SPICES
DEC. 1983

Appendix 25

EXPORT OF FRESH FRUIT (PROCESSED FRUIT PRODUCTS AND SPICES)
TOTAL U.S. $ VALUE BY YEAR

1979 to 1983

FRESH FRUITS		1979	1980	1981	1982	1983 1/
Oranges		134,328	232,370	281,918	163,498	20
Mandarines		3,107	1,674	17,430	4,252	
Lemons		8,000	52,731	96,228	13,385	
Grapefruit					69,048	
Other Citrus						4,234
Sub-Totals		154,435	286,775	395,576	250,183	4,254
Mangos		106,092	304,512	686,559	479,571	118,836
Avocados		262,507	968,241	343,748	521,180	632
Pineapples		50,423	35,698	46,468	33,168	
Bananas		250,652	18,006	1,750	9,256	
Coconuts		34,862	48,669	100,501	56,798	
Brazil Nuts		2,476,810	2,686,129	1,598,685	3,023,547	2,824,888
Sub-Totals		3,549,945	4,061,255	3,077,711	4,123,520	2,944,356
TOTALS		3,704,380	4,348,030	3,473,287	4,373,703	2,948,610
PROCESSED FRUITS 2/						
Pineapple	1	1,729,535	2,117,447	2,432	135,000	
	2	627,265	3,328,531	159,056	78,602	32,212
	3	347,772	575,620	235,552	160,374	61,152
Mango	1	1,875			135,000	
	2		7,993	38,989	12,040	6,659
Papaya	2		3,122	13,917		8,120
	3	1,059	28,156	16,561	8,731	13,014
Other Fruits	2	1,546,165	1,136,195	65,942	56,798	
	3		1,671,121	48,295	2,457,908	785,769
Sub-Totals		4,253,671	8,868,185	437,593	3,044,453	906,926
Oranges	2			734		38,747
Oranges	3	9,297	245,425	74,812		38,747
Grapefruits	3		469,044	651,976	187,831	
Other Citrus		525,225	[illegible] 358	1,842,674	1,278,749	[illegible] 051
[illegible]		[illegible]	[illegible]	[illegible] 570	[illegible] 466,749	
TOTALS		4,788,293	10,056,012	3,007,769	4,511,202	1,027,977

SPICES					
Garlic	2,384,737	920,861	889,417	2,067,130	996,136
Anise	151,362	353,315	169,510	396,389	50,027
Turmeric	512,415	323,396	273,900	300,480	288,980
Ginger					4,950
Marjoram	1,075,281	493,067	809,388	183,178	168,003
Annato	1,946,642	1,526,059	1,334,091	1,240,020	461,897
Chili Pepper	15,879	91,000	820		
Other Spices	1,489	827,640	20,049		770,302
TOTALS	6,085,805	4,535,345	3,497,175	4,187,197	2,740,295

1/ 4th Quarter not included.

2/ 1 Purée and Paste.
2 With and without sugar
3 Canned unmixed Juices with and without Sugar

SOURCE: FOPEX Documentation Center.

Appendix 26

EXPORT OF FRESH FRUIT

1979 to 1983

Shipment Tariffs: 0802.00.00 Value FOB U.S.$

Fruit	Destination	1979	1980	1981	1982	1983 1/
Orange	Bolivia		6,000			
00.01	Colombia	285				
	Chile	132,690	226,370	317,860	163,498	
	French Guyana	103		436		
	Others	1,250				
	Belgium					20
	Totals	134,328	232,370	318,296	163,498	20
Mandarin	Colombia	240				
00.02	Chile	1,650	168	15,422	3,660	
	Dominica		25			
	French Guayana		1,217	1,481	1,983	465
	Ireland			25		
	Antilles				127	
	Totals	3,107	1,674	17,430	4,252	
Lime	Chile	5,000	50,967	95,[illegible]19	13,385	
00.03	Equador	3,000				
	France		1,347	624		
	French Guyana	8,000	52,731	96,228	13,385	
	Totals	8,000	52,731	96,228	26,770	
Grapefruit	France				48,529	
00.04	Netherlands				8,000	
	United Kingdom				12,519	
	Totals				69,048	
Other Citrus	Netherlands					2,907
00.00	United Kingdom					1,327
	Totals					4,234

1/ [illegible]

(SOURCE: [illegible]PEX, [illegible] [illegible]ional E[illegible]t. [illegible])

see appendix 27 for "source"

EXPORT OF FRESH FRUIT

1979 to 1983

FOB Value U.S.$

Shipment Tariffs: 0801.00.00

Fruit	Destination	1979	1980	1981	1982	1983 1/
Mango	West Germany			1,540	13,057	4,212
00.004	Belgium - Luxemburg				5,328	1,700
	Bolivia	899	69,200			
	Canada	25,196		5,811	1,650	300
	Spain		2,764			
	France	79,221	197,157	531,130	297,020	79,977
	French Guyana	776	677	8,463	66	
	Italy				2,520	
	Netherlands			11,197	55,588	10,900
	United Kingdom		24,514	125,178	104,342	20,547
	Switzerland		10,200	3,240		1,200
	Totals	106,092	304,512	686,559	479,571	118,836
Banana	Costa Rica				7,200	
00.01	Chile	249,490	18,006	1,750	1,900	
	France				7,356	
	Netherlands	42				
	Other Countries	1,120				
	Totals	250,652	18,006	1,750	16,456	
Avocado	Bolivia		15,000			
00.03	Brazil	1,250				
	Colombia				2,500	
	Chile	246,292	942,639	640,445	502,231	
	Ecuador	14,600				
	France		9,674	9,114	3,827	
	French Guyana	365	928	5,354	1,800	
	Ireland		40			
	Netherlands					632
	United Kingdom				1,372	
	Venezuela				9,450	
	Totals	262,507	968,281	654,913	521,180	632
Pineapple	Argentine	116				
[illegible].02	Bolivia	[illegible],000				
	Chile	[illegible]	[illegible]	46,44[illegible]	[illegible]	
	French Guyana					
	Netherland	[illegible]24				
	Other Countries	380				
	Totals	50,423	35,698	46,468	33,168	
Coconut	Chile	34,572	48,669	100,501	56,798	
00.05	Ecuador	100				
	Other Countries	190				
	Totals	34,862	48,669	100,501	[illegible]	

1/ 4th quarter not included

SOURCE: FOPEX, Agrarian Sector Description of Non-traditional exports, 1983

EXPORT OF FRESH FRUIT

1979 to 1983

FOB Value U.S.$

Shipment Tariffs: 0801.00.06

Fruit	Destination	1979	1980	1981	1982	1983 1/
Brazil Nuts	W. Germany	503,631	877,212	478,393	544,598	267,397
	Argentine	9,500	33,430			
	Australia	212,940	331,560	305,294	517,148	679,395
	Belgium-Luxembourg		8,257	4,320		
	Brussel			14,190		
	Canada	8,157			36,860	
	Colombia	41,610	19,212	21,450	33,299	70,830
	Chile	4,860	4,860	2,115		
	China-Taiwan	5,550	7,342	3,000	7,147	6,231
	Spain	125,647	105,387	49,931	53,950	
	United States	1,206,387	900,216	326,155	1,413,965	1,500,121
	France	21,000				13,467
	Israel			2,325		
	Italy		11,580	24,262		30,225
	Japan	112,632	181,201	125,069	33,825	
	New Zealand	27,870	29,784	42,102	21,485	
	Netherlands	54,000	147,825	54,415	134,087	92,902
	United Kingdom	16,678	1,650		25,845	10,350
	Singapur	32,591	22,293	18,240	58,455	12,975
	South Africa					38,475
	Switzerland	93,757	4,320	113,624	142,882	102,442
	Tanzania					78
	Totals	2,476,810	2,686,129	1,584,885	3,023,546	2,824,888

1/ 4th quarter not included.

SOURCE: FOPEX, Agrarian Sector Description of Non-traditional Exports, 1983

Appendix 27

EXPORT OF PROCESSED FRUIT PRODUCTS: FRUIT PUREE AND PASTE

1979 to 1983

FOB Value U.S.$

Shipment Tariffs: 2005.00.00 Fruit Puree and Paste

Fruit 1/	Destination	1979	1980	1981	1982	1983 2/
10.99	West Germany	3,597				
10.01	Bolivia	1,495,198				
01.00	Bolivia		1,916,174	595		
89.00	Bolivia		1,633,756	7,775		
10.01	Chile	982				
00.00	Chile		1,155			
01.00	Chile		273	1,837	135,000	
02.00	Chile		1,875		135,000	
89.00	Chile		1,173	40,520		
10.01	Ecuador	24,239				
01.00	Ecuador		201,000			
89.00	Ecuador		36,192			
10.01	USA	201,000				
10.99	USA		3,205			
10.01	Venezuela	159				
	TOTALS	1,725,175	3,794,803	50,727	270,000	

1/ S.T. 2005.00.00 In General
S.T. 2005.01.00 Of Pineapple
S.T. 2005.02.00 Of Mango, Tropical Papaya and Mamey
S.T. 2005.10.01 Puree and Jam
S.T. 2005.10.99 Others
S.T. 2005.89.00 Others

2/ 4th Trimester not included.

SOURCE: FOPEX Agrarian Sector Description of Non-Traditional Exports, 1983

Appendix 28

EXPORT OF PROCESSED FRUIT PRODUCTS: CANNED FRUIT AND PRESERVES

1979 to 1983

FOB Value U.S.$

Shipment Tariffs: 2006.00.00

Fruit	Destination	1979	1980	1981	1982	1983 1/
Pineapple	Antilles		240			
	Argentine	138,225	62,726		11,745	
01.01	Bolivia	219,825	2,882,125		2,000	
	Chile	199,786	273,277	159,056	60,296	32,213
	Ecuador	32,990	81,830			
	Spain		40			
	France	8,400	7,800		4,560	
	Ghana	520				
	New Zealand	9,899	19,200			
	Uruguay	5,763				
	Venezuela	11,857	1,742			
	Totals	627,265	3,328,980	159,056	78,601	32,213
Papaya	Belgium-Luxembourg		475	4,792		
	Chile		1,695			
01.09	France		952	6,325		1,197
	Italy			2,800		6,923
	Totals		3,122	13,917		8,120

1/ 4th Trimester not included.

SOURCE: FOPEX, Agrarian Sector Description of Non-traditional Exports, 1983

EXPORT OF PROCESSED FRUIT PRODUCTS

1979 to 1983

FOB Value U.S.$

Shipment Tariffs: 2006.00.00 Canned Fruit and Preserves

Fruit	Destination	1979	1980	1981	1982	1983 1/
Mango	Antilles		687			309
	Belgium-Luxembourg			11,454		
01.10	Chile		2,500	4,580	4,500	2,250
	Ecuador		116			
	Spain		40			
	France		4,650	9,405	6,840	
	Italy			13,550	700	4,025
	Sweden					75
	Totals		7,993	38,989	12,040	6,659
01.99 2/	West Germany	2,183				
	Antilles		456			
	Belgium-Luxembourg	6,025	36,695	40,901		
	Bolivia	1,205,673	972,500			
	Brazil	511				163
	Canada					
	Chile	22,274	40,652	6,719		
	Ecuador	123,471	12,000			
	USA	75,000		110		
	France	27,838	21,240	8,480		26,067
	Italy	3,946	3,402			7,567
	New Zealand	1,717				
	Netherlands		4,060			4,950
	United Kingdom			6,330		
	Switzerland	26,552				
	Venezuela	54,921	44,646			
	Totals	1,550,111	1,135,651	62,540		38,747

1/ 4th Trimester not included.

2/ 2006.01.99 Other canned or preserved fruits of Papaya and Orange.

SOURCE: FOPEX, Agrarian Sector Description of Non-traditional Exports. 1983

Appendix 29

EXPORT OF PROCESSED FRUIT PRODUCTS: UNMIXED FRUIT JUICES WITH AND WITHOUT SUGAR

1979 to 1983

FOB Value U.S.$

Shipment Tariffs: 2007.00.00

Fruit	Destination	1979	1980	1981	1982	1983 1/
Grapefruit	West Germany		8,471	22,275		
	Belgium-Luxembourg		1,128			
01.02	Colombia		7,600			
	Chile		18,839	1,635		
	Spain		4,517			
	USA			21,715		
	Finland		19,536			
	France		35,150	36,346		
	Italy		9,022			
	Netherlands		94,660	475,825	17,046	
	Sweden		6,919			
	Switzerland		232,772	90,358		
	Venezuela		30,420	3,822	170,785	
	Totals		469,044	651,976	187,831	
Orange	Argentine		80,974	26,730		
	Brazil	708				
01.01	Chile	8,567	122,525	1,750		
	Spain		40			
	The Netherlands			41,886	46,332	
	Venezuela	22				
	Totals	9,297	245,425	74,812		

1/ 4th Trimester not included

SOURCE: FOPEX, Agrarian Sector Description of Non-traditional Exports, 1983

EXPORT OF PROCESSED FRUIT PRODUCTS

1979 to 1983

FOB Value U.S.$

Shipment Tariffs: 2007.00.00 Unmixed Fruit Juices with and without sugar

Fruit	Destination	1979	1980	1981	1982	1983 1/
	West Germany	128,537	78,417	172,722	60,915	15,348
	Belgium-Luxembourg	6,661	2,792	26,261		
01.99 2/	Bolivia	10,338				
	Brazil	2,390				
	Canada	2,807				
	Costa Rica	25,047				
	Chile	38,710	4,888	18,979		
	Denmark	1,009				
	USA	18,153	45,089	36,647		
	France	47,480	33,134	79,082	30,498	12,150
	French Guyana			2,800		
	Haity			24,641		
	Italy	22,809		9,547	14,525	
	Japan				11,265	
	Netherlands	60,138	57,728	1,357,832	767,246	17,163
	Puerto Rico				15,906	37,643
	United Kingdom			3,250	12	
	Switzerland	135,153	241,198			
	Spain				47	
	Venezuela	26,093	473,358	1,842,674	1,278,918	82,304
	Totals	525,325	473,358	1,842,674	2,179,313	82,304

1/ 4th Trimester not included.

2/ 2007.01.99 Other sour-fruits, with and without sugar.

SOURCE: FOPEX, Agrarian Sector Description of Non-traditional Exports, 1983

EXPORT OF PROCESSED FRUIT PRODUCTS

1979 to 1983 — FOB Value U.S.$

ipment Tariffs: 2007.00.00 Unmixed Fruit Juices with and without sugar

Fruit	Destination	1979	1980	1981	1982	1983 1/
ineapple	West Germany		12,846			
	Argentine	76,070	30,601	118,332		
	Bolivia	4,910	6,000			
)9.01	Brazil	464				
	Chile	266,044	446,923	67,833	76,387	52,586
	Denmark	252				
	Spain		40			
	USA		13,090			
	France			6,692	370	1,110
	Italy		955	8,341	1,190	7,456
	Netherlands		29,568	16,836	63,613	
	Uruguay		35,395	17,488	18,814	
	Venezuela		202			
	Totals	347,740	575,620	235,522	160,374	61,152
Papaya	Belgium-Luxemb.	79	752	3,927		426
	Brazil	708			474	289
09.02	Canada		576	1,669		
	Chile	252				
	Denmark		40			
	Spain			6,652	2,590	1,850
	France		26,788	3,165	3,777	10,449
	Italy			498	1,890	
	Netherlands			650		
	United Kingdom					
	Venezuela	20				
	Totals	1,059	28,156	16,561	8,731	13,014
2/	West Germany				327,249	9,054
	Canada				280	1,361
09.99	USA				8,077	61,314
	France				178,148	263,862
	Italy				35,386	33,042
	Netherlands				1,543,615	386,514
	Paname				[illegible]	
	Puerto Rico				[illegible]	
	Switzerland				12[illegible]	
	Venezuela				203,411	
	Belgium					3,620
	TOTALS				2,457,908	785,769

1/ 4th Trimester not included.

2/ S.T. 2007.09.00 Other fruit juices with or without sugar.

SOURCE: FOPEX, Agrarian Sector Description of Non-traditional Exports, 1983

Appendix 30

EXPORT OF SPICES
1979 to 1983

FOB Value U.S.$

Shipment Tariff: 0701.89.02

Spice	Destination	1979	1980	1981	1982	1983 1/
Garlic	Antilles					6,500
	Belgium		16,600			
0701.8902	Brazil	265,908	185,590		213,050	
	Colombia	516,100	271,933	647,857	1,268,152	796,551
	Ecuador	343,515				
	U.S.A.	239,235	36,629		68,151	3,600
	Francia				69	
	French Guyana	2,960	3,602	4,617	926	
	Haiti		24,478			14,785
	Panama					
	Netherlands	44,626	31,792			
	Puerto Rico	970,393	350,239	223,880	104,080	57,700
	United Kingdom			13,063	24,537	
	Venezuela				387,765	117,000
	TOTALS	2,382,737	920,868	889,417	2,066,730	989,636
Annato	West Germany	68,555	37,451	73,942	111,347	34,644
	Argentina	56,520	25,100	47,457	152,790	37,965
1405.01.01.	Belgium-Lux					38,740
	Brazil			282,582	75,273	
	Canada	47,965	40,794	25,204		
	Denmark	41,500	36,750			
	Egypt				7,500	
	Spain			731	1,447	
	U.S.A.	936,481	856,534	561,018	350,179	111,889
	France	7,903	27,402	14,739	27,463	6,363
	French Guyana					
	Italy					23,250
	Japan	46,708	52,060	19,267	23,817	7,565
	Mexico	39,519				
	Netherlands	83,648	61,978	51,125	39,660	46,172
	Puerto Rico	160,358	93,469	79,413	91,999	49,341
	United Kingdom	254,704	155,258	52,620	39,300	25,800
	South Africa	7,174				
	Sweden	240		240		
	Switzerland					8
	Uruguay	3,718			647	[illegible]
	Venezuela	[illegible]	[illegible]	366,573	[illegible]	[illegible]
	TOTALS	[illegible]	[illegible]	1,[illegible]4,911	[illegible]	46[illegible]
Anise	Argentina	24,084	14,000	53,600	125,200	28,315
	Brazil	127,278	339,315	86,250	253,174	15,456
0909.01.00	U.S.A.			28,660		
	Sweden			1,000		
	Venezuela				18,015	6,256
	TOTALS	151,362	353,315	169,510	396,389	50,027

(1) 2nd Quarterly included

Source: FOPEX Description of the None Export Agrarian Sector - 1983

EXPORT OF SPICES
1979 to 1983

FOB Value U.S.$

Shipment Tariff: 0910.05.00

Spice	Destination	1979	1980	1981	1982	1983 1/
Turmeric	[illegible] Germany	25,541	13,040	3,000		77
	A[illegible]ina	310,173	105,835	86,906	134,957	92,751
	F[illegible]um-Lux	10,250				
	I[illegible]l			1,377		
	Co[illegible]mbia	4,500	6,650	5,580	16,740	5,580
	C[illegible]	31,021	20,377	12,363	7,663	18,480
	[illegible]	3,988	52,641			
	[illegible]	12,630	3,300	2,592	6,935	40,033
	[illegible]	591			7,006	4,632
	I[illegible]y	4,697				
	[illegible]	16,500				
	[illegible]	53,134	52,788	99,937	54,995	20,800
	[illegible]rlands	9,000	7,450	24,003	12,000	12,000
	F[illegible]			3,268		
	P[illegible]gal				3,660	7,260
	[illegible]d Kingdom		22,350	4,075	14,476	29,771
	[illegible]nican Rep.					6,160
	Sc[illegible]h Africa					7,257
	[illegible]	340				
	[illegible]rland				37	314
	[illegible]ruguay	4,468	3,400	988	1,700	
	Venezuela	25,582	35,565	29,811	43,790	43,865
	[illegible]	512,415	323,396	273,900	303,959	288,980

1/ Second S[illegible] included

SOURCE: FOP[illegible] [illegible]arian Sector Description of Non-traditional Exports, 1983

EXPORT OF SPICES
1979 to 1983

FOB Value U.S.$

Spice	Destination	1979	1980	1981	1982	1983 1/
Ginger	[illegible]ina					4,950
0910.04.00	[illegible]LS					4,950
Chili Pepper	[illegible]ria		90,000			
	[illegible]		1,000	800		
0904.02.00	[illegible]ch Guyana	1,168		20		
	[illegible]uela	14,711				
	[illegible]ALS	15,879	91,000	820		
Marjoram	[illegible] Germany	14,456	10,648			3,546
	[illegible]entine	87,355	413,413	452,791	76,468	164,051
1207.00.03	[illegible]a		6,930	15,665		
	[illegible]	19,090	49,100	328,413	24,600	
	[illegible]				925	
	C[illegible]mbia	16,250				
	[illegible]rk		1,865			
	[illegible]or		6,950			
	[illegible]		24,261	454	53,250	
	[illegible]	15,033			12,800	
	[illegible]	14,600			2,607	
	N[illegible]erlands		4,700	5		
	P[illegible]guay	864,000				
	[illegible]zerland			14	75	406
	[illegible]y			12,500		
	[illegible]la	13,286	5,957		12,453	
	[illegible]ALS	1,044,070	523,284	809,842	183,178	168,003

1/ 2nd Quart[illegible]uded

Source: FOPE [illegible]rian Sector Description of Non-traditional Exports, 1983