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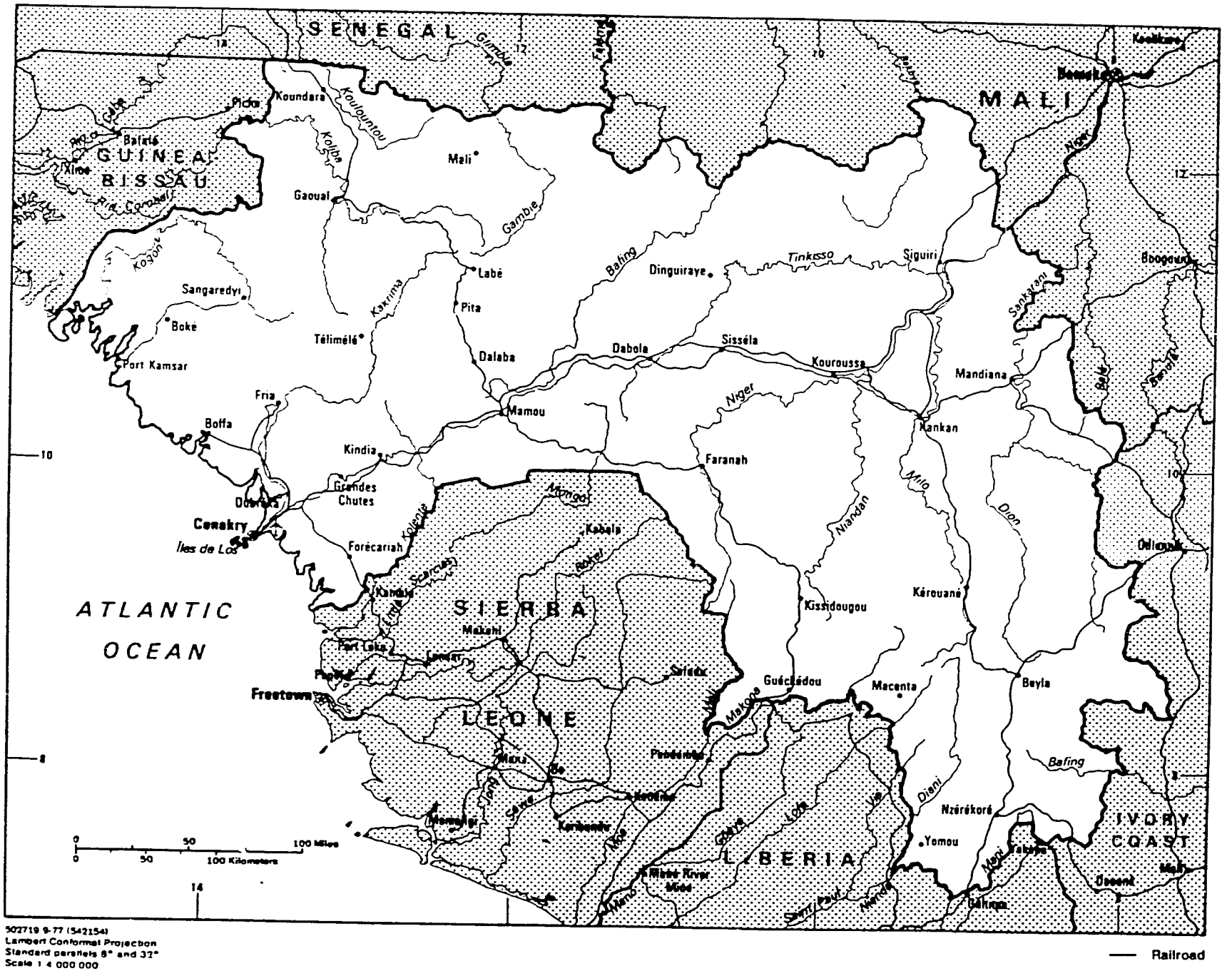
INVESTMENT OPPORTUNITIES IN THE GUINEAN TROPICAL FRUIT INDUSTRY

Guinea


SENEGAL
MALI
GUINEA BISSAU
SIERRA LEONE
LIBERIA
IVORY COAST
ATLANTIC OCEAN
Koundara
Picka
Bafata
Gaoual
Mali
Labé
Pita
Dinguiraye
Siguiri
Sangaredyi
Boké
Télimélé
Dalaba
Dabola
Sisséla
Kouroussa
Mandiana
Port Kamsar
Fria
Boffa
Mamou
Kindia
Kankan
Faranah
Grandes Chutes
Conakry
Iles de Los
Forécariah
Kabala
Kissidougou
Kérouané
Makeni
Freetown
Guéckédou
Macenta
Beyla
Bo
Kenema
Nzérékoré
Yomou
Bafing
Tinkisso
Niger
Gambie
Kolima
Kakrima
Kolente
Mongo
Niandan
Milo
Dion
Diani
Sankarani
Bani
Bandama
Makona
Sewa
Moa
Lofa
Cavally
Saint Paul
Mano
Mesurado
Mine River
Mine
Bogouni
Odienne
Tabou
Grand Lahou
Gagnoa
Daloa
Bouaké
Kouliou
Koulountou
Kolba
Gambie
Rio Cacheu
Rio Geba
Xinca
Koundara
Picka
Bafata
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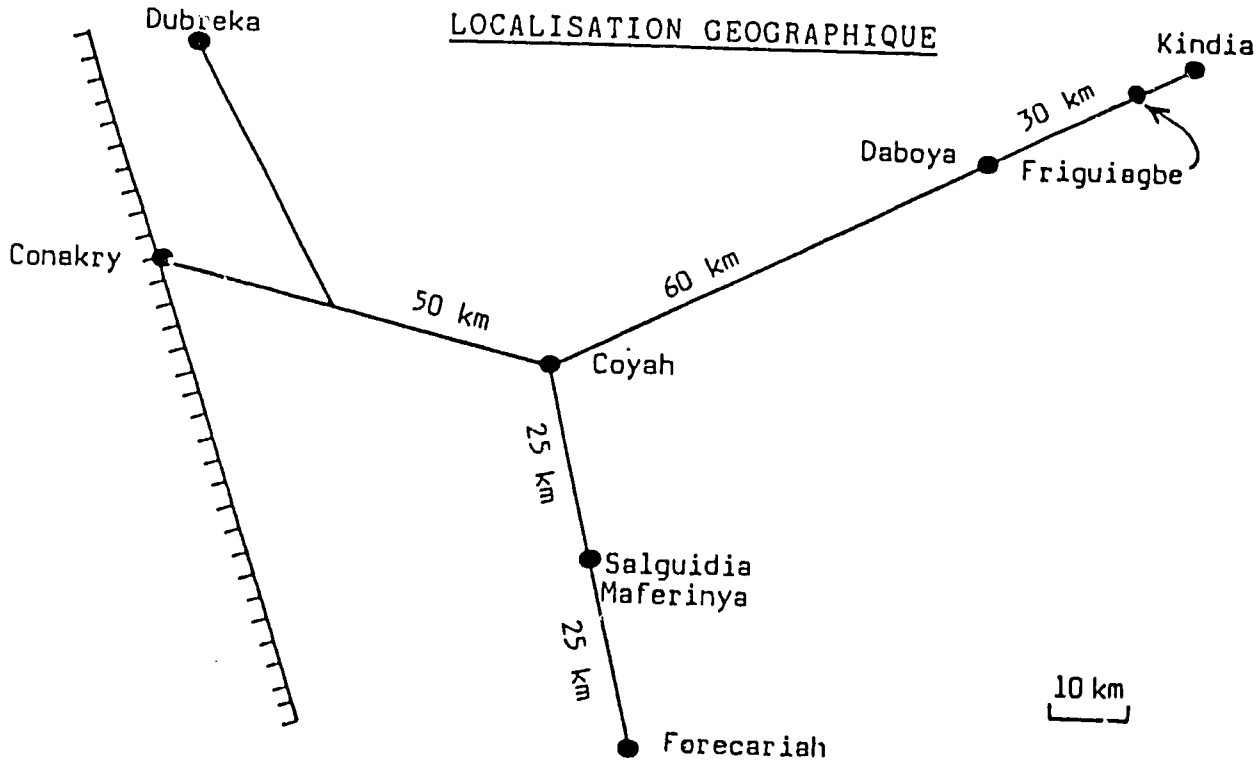
Mine
0 50 100 Miles
0 50 100 Kilometers
502719 9-77 (542154)
Lambert Conformal Projection
Standard parallels 8° and 32°
Scale 1 4 000 000
Railroad
Road

MAP 1

CHART 1

GEOGRAPHIC RELATIONSHIP OF MAJOR
MANGO PRODUCTION AREAS IN GUINEA



Source: COLEACP Report, page 4

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I. EXECUTIVE SUMMARY

A. Fresh Fruit for Export

Several tropical fruit export options for Guinea have been considered in this study. The four fruits selected for analysis are: mango, papaya, guava, and passion fruit. The first two were analysed as to their suitability for the West European produce market. All four fruits were considered for pureed frozen tropical fruit now utilized in drinks and food flavors in most western countries.

At present there appears to be a limited market in Western Europe for papaya, guava and passion fruit. If market trends in Western Europe are similar to recent experience in the United States, these tropical fruits should soon find increasing demand. However, no market data for processed tropical fruit were found for EEC countries so the potential market volume remains unsubstantiated.

This report recommends increasing fresh mango exports by utilizing existing orchards of grafted trees, and taking advantage of the rapidly improving transport capability in Guinea to supply markets in Western Europe.

Established mango production, most of which is presently left to rot on the ground, offers the most feasible investment opportunity for immediately expanding exports and generating hard currency for the investor and the agricultural sector. Mango production estimates indicate that between 30 and 50,000 MT of grafted mango fruit is wasted annually. (Table 2 details a current estimate of Guinean mango production).

This option minimizes capital investment for fresh mango export and proposes a pilot program in order to first learn more about Guinean conditions for mango production, handling and marketing before making a major investment.

The pilot program could continue for several years as required information is assembled. Fairly modest mango exports to the EEC (European Economic Community) are anticipated. In the first campaign at approximately the 300 ton level the pilot program would break even and then drops to 200 tons or less in succeeding years when the initial heavy cost of expatriate salaries is greatly reduced. The success of this scenario depends upon the involvement of a produce marketing firm active in the West European produce industry.

The European produce market offers the most favorable opportunity for profitably expanding Guinean tropical fruit exports. Compared with food processing operations, capital investment is low for fresh produce exports while market prices are relatively high, providing that quality product can be assured. Once regular market shipments of mangoes are established during the April through July season, other fruits could be added during the balance of the year in order to utilize the established farm-to-market system more fully. It is anticipated that several years hence the bulk of produce would move by ocean in refrigerated containers. Fresh pineapple exports would fit naturally into this flow although pineapple was purposely omitted from this analysis as explained below.

B. Background

1. Multiple Tropical Fruit Studies

An earlier study in 1985, also sanctioned by USAID/CNPIP (Centre National pour la Promotion des Investissements Privés), examined

the favorable economic export potential for fresh pineapple into Western Europe 1/. A second 1985 study financed by the EEC and conducted by COLEACP (Comité de Liaison des Etats Afrique, Caraibes, Pacifique) consulting group of Brussels detailed the favorable economic potential for both fresh pineapple and mango exports to Europe 2/.

In early 1988, the CCCE (Caisse Centrale de Coopération Economique, a French financial assistance group similar to USAID) will conduct a study with emphasis on fresh tropical fruit exports to Europe. A news item in the November 9, '87 issue of the journal, La Lettre Des Marchés AFRIQUE, states that a joint venture between an Italian private group and the Government of Guinea has been organized to export fresh tropical fruits and vegetables and to construct a processing facility to be supplied by small growers. This report likewise emphasizes the opportunity for Guinean export of tropical fruit to Europe. To iniate action, there only awaits the interest of a large international produce marketing firm of either European or American origin.

2. History of Guinean Fruit Production

During the late colonial period, "French Guinea" received special attention for tropical fruit production from IFAC (Institute Francais d'Afrique Coloniale). Starting in 1946 ,a French government tropical crops

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1/ _____. "A Preliminary Evaluation of the Profitable Export Potential for Guinea Fresh Pineapple Sold in Europe", USAID/CNPIP contract, Nov. 1985, p.107

2/ _____. "Guinea Conditions Relevant to Tropical Fruit Destined for Export", Mission of COLEACP (Comité de liaison des états africains, caraïbes, pacifiques) for the Promotion of Tropial Fruits and Out-of-Season Vegetables, COLEACP, Brussels, June, 1985, p. 114.

research institute was established at Fulaya near Kindia and beginning in the early nineteen fifties a collection of 71 mango varieties was assembled there. Most of those selected can be classed as "Florida" varieties. The best of these were grafted for propagation and spread throughout lower Guinea, a region that has elevations of 50 meters or less, and to the Kindia and Friguiagbe areas that rise to over 400 meters.
(See Map 1 and Geographic Location chart for the mango production areas).

Pineapple production was also emphasized by the Fulaya Institute.The agricultural technology for this complex crop in Guinea was developed by Claude Py and several associates. Unfortunately, at the time of independance in 1958, the institute was left without qualified technical staff; and research data and proven cultural practices for most crops were lost or forgotten.

The export banana industry in Guinea had been well established prior to World War II. In the period between 1955 and 1958 annual exports of bananas and pineapple averaged 82,000 and 2,000 MT respectively. During this period select grafted mango varieties were being vigorously expanded to private growers throughout lower Guinea. Following independence, fresh tropical fruit exports deteriorated with export banana production falling to zero in 1978. Pineapple and mango exports, however, peaked at 10,300 MT in 1972 and 1,500 MT in 1977, respectively. Since then, these two export crops have continued to decline, reaching an annual average of 600 and 200 MT respectively for the period 1980-85. Exports of other tropical fruit are insignificant at this time.

Historical Tropical Fruit Decline in MT

(000)

							Fruitex Data *		
	1960	1972	1974	1976	1978	1980	1982	1984	1986
Pineapple	5.5	10.3	9.3	3.1	2.2	0.9	0.61	0.31	0.16
Mango	-	0.5	0.8	1.5	1.2	0.5	0.27	0.19	-
Bananas	54.7	10.0	5.0	0.1	0.0	0.0	0.0	0.0	0.0

*Fruitex may not include exports by other brokers to neighboring countries.

Source: COLEACP Report, Table 1, page

C. Other Options

1. Processed Tropical Fruit

The international market for canned hot pack tropical fruit is very small when pineapple products are excluded. Conceptually, it appears that Guinea could become established as a primary source for tropical fruit flavors by supplying a broad spectrum of frozen tropical fruit purees in bulk cartons. These products are being consumed by the EEC and US in reconstituted juice and other products. If good quality, constant supply, and a low C&F price could be maintained, Guinea should be able to capture a sizeable share of the EEC tropical fruit puree market.

At the present time, the excess volume and low cost of mango raw product make the economics of frozen mango puree appear feasible in Guinea. A sliced mango pack could be added to the product line, but the world consumption of both mango items is relatively small and competition from India, Pakistan, and the Philippines is fierce. It would be difficult to market a single juice product effectively and impossible to justify the heavy capital investment for processing, concentrating, freezing and cold storage facilities needed to prepare it. There is currently insufficient raw product of guava, passion fruit or papaya in Guinea to launch a multi-

product juice freezing operation. (Domestic varieties of papaya are available but fruit quality is inconsistent and current domestic prices are above the range for processing into puree).

2. SALGUIDIA Mixed Exports Alternatives

In order to avoid a large capital investment and still enter the market with several tropical fruit purees and concentrates, a prudent scenario would be to utilize the established SALGUIDIA (Societé Arabe Libyo-Guineenne Pour Le Developpement Agricole et Agro-Industriel) facilities for juice processing, concentration and freezing. Capital requirements for additional specialized equipment to prepare different tropical fruit would be small compared with the cost of building new facilities in another location.

SALGUIDIA is owned 50/50 by the Governments of Guinea (GOG) and Libya and is reported to be searching seriously for equity partners. If equity participation is not feasible, then a co-packing agreement or processing fee to manufacture a line of bulk frozen tropical purees might be negotiated with the appropriate government ministry.

The SALGUIDIA operation is the largest agro-industrial fruit growing and processing facility in Guinea. It lies near Mafreniya within 75 km of Conakry along the road to Forecariah. The enterprise specializes in pineapple production and processing, but has suffered economically for years from an insufficient volume of pineapple and antiquated pineapple processing equipment. Plans are underway to increase annual pineapple production from the current 4,000 MT to an estimated 8,000 MT within two years.

SALGUIDIA'S projected production of 8,000 MT of pineapple for canning in 1989 is uneconomical by any known accounting criteria for pineapple processing. The processing operation cannot continue without heavy government subsidies. It is very likely that this volume of production would be profitable only if the majority of the fruit were exported fresh to Europe. The economic viability of similar fresh fruit export operations is confirmed by both the COLEACP and USAID/CNPIP studies of 1985 (1, 2).

Consequently, it is proposed that the existing and relatively well-maintained juice processing facilities at SALGUIDIA be utilized in conjunction with a fresh fruit export operation that could be installed in surplus warehouse space at the cannery. Pineapples, mangoes and papaya, discarded because they do not meet the stringent fresh pack requirements, would be processed into juice.

A preliminary financial projection for this proposal, based on estimated pineapple production costs prepared in 1985 and current operating costs for packing fresh fruit, is shown in Table 1 following. The figures indicate that fresh fruit exports of 1,000, 2,000 or 3,000 tons would generate a gross margin in US dollars of .5, 1.0 and 1.5 million, respectively. The balance of the fruit, sold as concentrated juice, would improve the margin at each export level to over one million dollars. This cost projection does not take into account the overhead and indirect costs of the SALGUIDIA operation.

Table 1

The Financial Implications of Exporting SLAGUIDIA Pineapple as Fresh Fruit to Europe

(Assume annual production of 4,000 MT Pineapple at SALGUIDIA)

Fresh Fruit Export Tons:		1,000	2,000	3,000
FOB Price Airport US$ 650/MT (000)		650	1,300	1,950
(3.5 FF or US$ .65/kg)				
Direct Operating Expenses US$/MT				
Fruit growing costs	65.60			
Harvt. Haul & Pack	5.50			
Commercial carton	36.66			
Truck transp. Conakry	7.92			
Coldstore 2 dy@Airpt.	12.99			
Transp. Formal., Fees	22.27			
Phytosan. Certif.	27.73			
Total Directs- FOB Airport	178.67			
Direct Operating Costs		(178.7)	(357.4)	(536.1)
Gross Margin on FOB Fresh Fruit		471.3	942.6	1,413.9

It is proposed that the balance of the tonnage would be sold fresh domestically or converted to frozen pineapple juice concentrate at 55^0 brix as is done now. Assuming a brix of 12 in raw fruit juice there would be a conversion of juice to concentrate at a ratio of 4.58 (55/12 = 4.58). The evaporation capacity of the present equipment, which is assumed to be a single effect unit, is not known; thus, three alternative processing volumes to balance the export portion of the 4,000 tons are shown as follows:

Table 2

Proposed SALGUIDIA Tonnage Processed to Concentrated Juice
At Three Production Levels

Tons of raw fruit	3,000	2,000	1,000
Recovery 65% as juice	1,950	1,300	650
Tons 55^{0}CJ (Conversion of 4.58/1)	425	284	142
Tons of water to evaporate	1,525	1016	508
5 mo. season Nov-March			
20d/mo.=100d, 20 hr/d=			
Required Evaporate kg/hr	760	508	254
Gross Income on CJ 55^{0}Brix			
SALGUIDIA's price-$1720/MT* (000)	731	488	244
Gross Income from Fresh Fruit & CJ 55^0	1,202	1,431	1,658

*SALGUIDIA's price for 55^0 concentrate is almost US$300 over the current price paid for 70o in Los Angeles.

3. Market Limitations for Tropical Juice

Since no European demand figures were obtained for frozen tropical purees and the US market is well supplied from Brazil, Hawaii and other tropical areas, it is deemed imprudent to recommend a juice processing operation based on such limited knowledge of the European market. Under the best circumstances, tropical fruit purees are low cost products packed in 15 to 20kg bulk plastic lined cartons that are primarily used for reconstitution into retail juice items, themselves low-cost products.

Lacking an established market outlet and reliable consumption data in the EEC, it appears unlikely that sales volume from four fruit purees (mango, papaya, guava, and passion fruit) could support the capital investment for a new frozen juice facility. Even by utilizing SALGUIDIA juice equipment and adding frozen pineapple juice concentrate as the market volume leader, a

tropical juice program alone may not be economically feasible without combined fresh export operations.

The grade-offs (culls) from fresh export operations could be the essential low-cost raw material source for tropical juices. Juice processing could function as a by-product operation to the fresh export segment which would carry a significant portion of indirect costs. A tropical fruit project that encompassed both fresh fruit exports and juice processing might be the economically strongest option.

There will be no attempt to reevaluate the profitability of exporting fresh pineapple.This study concurs with the conclusions of the COLEACP study that fresh exports of mango and pineapple are synergistic. It should be noted that the proposed frozen products would be transported in refrigerated containers to Europe because air freight costs are three times higher than refrigerated ocean rates.

II. OVERVIEW OF CURRENT MANGO PRODUCTION AND SALES

A. Mango Varieties Available

The high quality of Guinea mangoes is a matter of consensus among numerous mango cooperative planters, the Fulaya Institute technicians, and the findings of several research reports on mango varieties. A recent discussion with Dr. Richard A. Hamilton, horticulturist emeritus from the University of Hawaii and world-recognized mango expert, confirms that many of the grafted "Florida"varieties growing in Guinea rate well for fresh fruit.

He verifies that Keitt, Kent, Palmer, Irwin, and Ruby are good candidates for fresh fruit export. Zill is perhaps too fragile and Eldon is not exportable after rains begin. Haden and Keitt constitute over 50% of Mexican production and are both brightly colored fruits that command top prices in the EEC. Fortunately, the proven varieties compose a significant share of established Guinea cultivars (cvs) as shown below. In the mid-fifties, a pomology table by Guinean Tropical Fruit Research/IFAC listed many varieties by fruit characteristics and disease tolerance, as exemplified in Exhibit I.

COLEACP Summary of Variety Predominance

	Regions				
Varieties	Kindia	Friguiagbe	Forecariah	Dubreka	Coyah
Zill					
Haden					
Eldon			)		)
Irwin		)	)	)10%	)
Smith	)	)	)75%	)40%	)75%
Palmer	)	)50%	)	)10%	)
Kent	)50%	)			
Keith	)				
Springfil					
Ruby					
Miami late					

Source: COLEACP Report, Table 5, page 13.

It appears that the variety distribution program promulgated by IFAC selected fruit characteristics for the fresh market, i.e., cvs with excellent flavor, lack of fruit fiber, good fruit size and a brightly colored skin when mature. They also selected varieties that cover as broad a harvest period as possible under the prevailing climate. It seems that no emphasis was placed on selecting fruits that would keep well in cold storage.

The variety distribution pattern assembled for the COLEACP report varies somewhat from information requested for this study and supplied by mango cooperative officials in the Kindia and Forecariah regions. Disagreements were found in data on variety production. These need verification before an accurate tonnage by variety can be forecast. No physical inspection of the fruit was possible because the designated study period fell outside the mango season.

B. Mango Production Season

There is also a lack of agreement between the COLEACP information and cooperative officials concerning the primary harvest date. The officials concur that Ruby is the latest variety and can often be found on trees into mid-August, while Miami late, Palmer, Keitt and Kent harvests extend into early August. In normal years the officials expect harvest campaigns to reach from mid April into early August. There is a two week additional spread for some varieties due to climatic variation between Lower Guinea and the Kindia/Friguiagbe region with elevations over 400 meters.

The normal ripening period by variety is summarized below in Table 3. Fruit requires 97 to 117 days from inflorescence to full maturity, but varies by cv and temperature. There is a second period called softening that takes place after the mature fruit is harvested. Softening can be extended by cold storage to two to three weeks but lasts 8 to 12 days at ambient temperature and varies by variety and preharvest conditions.

Table 3

COLEACP Data on Normal Harvest Spread by Varieties

Varieties	Aver.Frt Wt. gm*	Primary Harvest Period: April	May	June	July
Zill	350	x----------x			
Haden	400	x----------x			
Ruby	200	x----------x			
Irwin	350	x----------x			
Eldon	500	x----------x			
Smith	600		x----------x		
Palmer	350			x----------x	
Keitt	600			x----------x	
Kent	450			x----------x	
Springfil	1,000	(very poor shipper)			
Miami late	500			x----------x	

*Average fruit weight was estimated by cooperative officials.

C. Growing Conditions

Throughout Guinea there is a wet and dry season. The latter starts in November and often lasts into May. The rainy season follwos and extends into October. Three years of monthly rainfall data from three regions illustrates this dual seasonal pattern (see Table 4). The heavy rainfall in the wet season fosters fruit fungus diseases. These can be dealt with either through fungus control measures or by chemically induced early flowering to bring fruit to harvest before the rainy season.

1. Fungus Disease Treatment

Fungus disease control measures are possible but none is presently used in Guinea because of the tremendous waste of raw fruit and lack of income from the crop. Beginning in May and progressing into the heavy rain period, anthracnose (Colletotrichum glasporioides), a fungus disease that can attack leaves, trees and maturing fruit, proliferates under favorable

Table 4

National Weather Bureau Data from Kindia 1982-'84

STATION : Kindia Températures (Max. Min. Moyenne)

Années	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Somme Annuelle
1982	31.6	33.8	34.9	33.4	32.0	28.5	27.5	26.2	28.2	28.6	29.8	30.3	
	18.4	19.7	20.9	21.7	21.4	20.8	20.5	20.5	20.9	20.0	20.5	18.7	
1983	31.7	34.0	35.2	34.9	31.8	28.2	27.8	27.0	28.2	29.2	30.1	30.5	
	19.2	20.6	21.6	22.1	22.9	21.4	21.1	20.6	20.3	20.4	20.5	19.2	
1984	31.5	33.9	35.4	34.6	30.9	28.9	27.9	28.5	28.2	29.3	30.7	30.5	
	18.4	19.0	21.0	21.6	21.5	20.7	20.4	20.5	20.2	20.4	20.4	19.1	
	Station de Kindia Pluviométrie mensuelle en mm entiers et nombre de jours												
1982	0	0	1	85	150	246	285	528	351	190	7	0	
	0	0	1	8	11	14	25	28	19	17	4	0	
1983	0	11	10	24	139	315	334	427	307	189	32	0	
	0	1	1	2	12	22	23	29	22	15	5	0	
1984	0	0	4	38	177	274	310	322	333	259	14	0	
	0	0	1	4	17	17	25	22	19	16	1	0	
	Station de Dubréka : pluviométrie mensuelle en mm et nombre de jours de pluie												
1982	0	0	0	28	147	231	447	1246	451	548		0	
	0	0	0	2	7	14	21	28	15	13		0	
1983	0	4	0	26	87	473	506	946	913	246			
	0	1	0	2	5	15	11	21	17	6			
1984	0	0	0	27	165	524	374	605	513	204	55	0	
	0	0	0	3	10	11	13	15	14	10	4	0	
	Station de Forécariah. pluviométrie mensuelle en mm et nombre jours												
1982	0	0	34	44	200	374	367	804	424	354	10	0	
	0	0	2	4	11	16	15	24	19	13	1	0	
1983	0	3	6	15	256	420	634	869	463	155	36	0	
	0	1	1	2	12	14	20	22	18	5	2	0	
1984	0	0	0	27	118	240	454	540	324	161	10	0	
	0	0	0	3	6	11	13	19	14	8	2	0	

moisture and temperature conditions. Another fungus disease called stem-end rot (Diplodia natelensis) can be a problem on fruit that has been in shipment or stored and is left to ripen eventually on the retail shelf.

Anthracnose is especially debilitating if it strikes during the flowering period. Flowers can be wiped out and the crop lost - an especial threat for heavy crops on a biennial bearing cycle. A scheduled spray program over the trees is a costly but necessary measure to assure good-quality product. Such a program should begin at flowering and include alternating application sprays, two of Benlate and two of Difolitan at monthly intervals. Application rates should be one liter per tree (100 liters/hc) of solution mixed at the rate of 40 gr in 35 liters for Benlate and 200 gr in 35 liters for Difolitan for a total in double applications of 2.8 and 14.0 kg per hectare respectively. The material cost would amount to US$130 to $150 per hectare. It is possible that flowering during the dry period would make early sprays unnecessary but confirmation is needed.

After the fruit is picked, another fungicide treatment must be made before it is packed or cold-stored in order to extend retail shelf life and eliminate rot losses. There are two post-harvest treatment possibilities:

(1) Mangoes can be bagged in perforated plastic sacks and submerged for five minutes in a bath made up of 200 gr Benlate per 100 liters for three tons of fruit per day with 10 gr additional Benlate for each ton of fruit thereafter. Fruit must be left to dry before packing;

(2) Fruit can be passed under a (52^{0}C) shower for three minutes then packed for export after drying. Either treatment should control anthracnose and/or stem-end rot until full ripening at retail 1/2/.

2. Chemical Flower Induction

Prolonging the mango harvest period into the wet season may be more difficult than advancing harvest by using chemical flower induction to bring fruit in earlier than normal ripening. The flower induction technique of using potassium nitrate (KNO_3) spray was initiated in the Philippines and first used commercially in 1973. It now predominates as the induction method throughout that country and is also used in parts of Mexico. Through this method, flowering can be induced as much as six weeks earlier than normal inflorescence. (Prolonged smudging with dense smoke is no longer practiced since it is a difficult technique that produces dubious results).

The primary chemical agent is KNO_3 sprayed onto and under the entire tree canopy. A precise single application of 1% KNO_3 solution is required to avoid leaf burn, defoliation and yield loss. The tree must be physiologically ready for the treatment which will be effective only if the "critical state" has been reached. Those knowledgeable in the art of properly selecting trees

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1/____. "A Preliminary Evaluation of the Profitable Export Potential for Guinea Fresh Pinapple Sold in Europe," USAID/CNPIP Contract, Nov. 1985, p.107.

2/____. "Fruit and Vegetable Processing Study for the Singatoka Valley", Fiji Hawaiian Agronomics International/Asian Development Bank, July, 1984.

for KNO_3 application must check the leaves for a certain crunchy sound when crushed by hand. Flaccid leaves that do not crunch indicate that the tree is not yet ready for flower induction. An application at this time would be wasted.

During the initial induction period, careful tree-by-tree examination of the same variety in the same area during the initial induction period may reveal that only five to ten percent of the trees are ready for induction. A follow-up examination the next week may show that additional trees are ready. As the orchard approaches its normal flowering date, a larger percentage of the trees will have reached the "critical state", and if more early fruit is desired, the remaining orchard may be induced to flower.

Some growers in the Philippines induce flowering on half their orchard each year and thereby avoid the biennial production cycle and increase crop yield considerably. A warning has been sounded that flower induction must not be used to deplete the tree. Fertilizers, fungicides, and irrigation, when possible, should be employed to support the extra yield 1/.

By applying the KNO_3 induction technique successfully in Guinea, mature fruit could be brought to market by late February or early March. This would have the dual advantage of marketing fruit in the higher price period (in both domestic and export markets) and harvesting more fruit during the dry season with a greatly reduced threat of anthracnose.

1/____. "Tentative Fertilizer Guide for Mango," Philippine Council for Agriculture and Resources Research (PCARR) misc. publications.

Because potassium nitrate, as a dry compound, can be explosive and dangerous to handle under certain conditions, the prepared liquid forcing mixture, which includes spreaders, stickers and wetting agents, is safer and should not face regulatory import barriers. Mango flower inducers are produced by several chemical companies: Dupont, Bayer, Shell Philippines and others. The chemical is sold under such trade names as Mango Bloom, Agriblum, Miraclebloom, etc. as a concentrate and is diluted before spraying.

Two technical bulletins, on the subject of flower induction and recommended fertilization rates are available from the College of Agriculture, University of the Philippines at Los Banos 2/1/.

D. Current Mango Production Estimates

Guinean mango production estimates are summarized in Table 2. The wide variation from low to high yield (60 to 300 kg per tree) results from average fruit size differences between varieties as well as a lack of consensus on average number of fruit per tree among cooperative planters. This results in a conservative production range for Guinea of 13,000 to 63,000 MT annually with a median figure of 38,000 tons the most likely.

1/____. "Tentative Fertilizer Guide for Mango," Philippine Council for Agriculture and Resources Research (PCARR) misc. publications.

2/____. "Chemical Induction of FLowering in Mango", Technology, PCARR, College of Agriculture, University of the Philippines, 1980, vol.11, pp.1-12.

TABLE 5

SURVEY OF GRAFTED MANGO PRODUCTION IN LOWER GUINEA - 1987

Region	Distance from Conakry/Kindia km	Cooperative Identification	No. of Mango Producers	Area in Production-ha
CONAKRY	<50	COGIFRUIT	34	272
COYAH	50	na	38	108
DUBREKA	47	"	na	75
FORECARIAH GROUP 65-140 km				
FORECARIAH	89		23	117
MAFERINYA	65		-	15(e)
ALASSOYAH			23	15(e)
SIKOUROU			52	15(e)
MOUSSAYAH	125		na	150
FARMORIAH 1	139	TAIGBE	"	500
FARMORIAH 2	"	AKATANTO	"	200
FANJIE			"	6
FRIGUIABE 1	120	CPF	117	219
FRIGUIABE 2	"	GBASSA	61	95
KINDIA 1	137	COPRAFAG	42	225
KINDIA 2	"	CPK	67	98
KINDIA 3	"	SAMUKIRI	15	10(e)
		Estimated Area Total		2105

At 100 Trees/ha=210,000 trees in production

		No. of fruit /tree	Aver. Wt/ Fruit-gm	Aver. Wt/ Tree-kg
Yield Estimate:	Low	300	200	60.0
	Medium	450	350	158.0
	High	600	500	300.0

Estimated Mango Production for Guinea	Low	12,600MT
Most likely production (450 x 350 x 210m trees)	Medium	33,180MT
	High	63,000MT

Source: Survey of Mango cooperatives growers and discussion with Kalil Zayatt, President Federation of Guinean Fruit Growers.

Cooperative planters universally concur that the majority of fruit is left on the ground to rot. Estimated percentages of waste vary between 75% and 95%. There is general agreement that an additional 20% of grafted mango production by non cooperative members remains unreported in their estimate used here. (All these estimates exclude the production of common wild mangoes which are prevalent throughout lower Guinea).

This relatively large number of planters who grow mangoes outside the cooperative probably results from the fact that no fertilizers or pesticides are presently used on the crop. There is therefore no incentive to purchase these agricultural supplies at the very favorable prices subsidized by SEMAPE, the government agricultural materials purchasing agency. Planter prices for imported supplies are summarized in Table 6. Fertilizer costs in Guinea are 70% of volume discount rates paid in Hawaii and agricultural chemicals are discounted even further. Logically, there appears to be no need for fertilizer under present conditions because 85% of the crop is left where it falls to be recycled into the soil. A fully harvested crop would require replenishment of the nutrients and mandate fertilizer applications which could amount to US$150 per hectare.

To recapitulate the production estimate, an additional 20 percent unreported tonnage would generate an adjusted median figure of 45,600 MT; with only 15% of the crop utilized there would be approximately 39,000 tons wasted production each year.

(33,000 MT x 1.20% unreported = 45,600 MT x .85 = 38,760 MT wasted)

Several mango planters stated that the bulk of their export deliveries are made by truck to neighboring countries. Senegal is a large buyer. Sales are not reported to the government for various reasons. The quantity flowing

Table 6

SEMAPE National Purchasing Enterprise Price List
for Imported Argricultual Materials

Fertilizer Materials	Planters Price GF/MT	Planters Price US$ /MT	Hawaii Price * Quantity Disct.
17-17-17	101,516	230.00	
15-15-15	100,105	227.51	
21-21-21	117,098	266.13	
Sul. of Potash	129,505	294.00	385
Superphos 46%	104,630	238.00	297
Urea 46%	68,460	155.50	286
Ammoium Nitrate	68,040	154.64	
Phytosanitary/Pesticides			
Diazinon 60EC	1,140/L	9.82/gal.	34.00/gal
Parathione	1,750/L	3.98/L	
Karmax (25kg/sac)	9,850/sac	.90/kg	5.50/kg
Gesatop	1,655/L	3.76/L	
Basudine (10g en de 5kg)	1,530/kg	3.48/kg	
Carbure de Calcium	195/kg	.44/kg	
Manebe 25kg/sac	12,790/sac	1.16/kg	

*Priced 5/25/87 Brewer Chemical, Honolulu, HI

Table 7

Source of Monthly Mango Supplies to the EEC

NORTHERN HEMISPHERE	J	F	M	A	M	J	J	A	S	O	N	D
Mali												
Burki./Faso												
Ivory Coast												
Senegal												
Antilles												
Egypt												
Israel												
India												
Pakistan												
Cent. Am.												
Venezuela												
Mexico												
USA												
SOUTHERN HEMISPHERE												
Kenya												
Madagascar												
Congo												
South Africa												
Peru												
Brazil												
% Imports By Months	5	4	5	12	17	17	15	11	3	2	3	5
1983 M'thly Imp'rt - MT (000)	.6	.5	.6	1.4	2	2	1.8	1.3	.3	.2	.4	.6

Source: COLEACP Report on Guinea Tropical Fruit Export Potential to the EEC-1985, Table 20, page 43

TABLE 8

Summary of European Economic Community Countries of Importing and Exporting Supplies of Mangos - 1983

Consumption of Imports		MT	% of Total	Exporting Countries		MT	% of Total
United Kingdom		4,483	37	Guinea		190	1
				Mali		1,845	16
				Mexico		1,806	16
France		4,189	35	Burkina Fasso		982	8
				Brazil		937	8
				South Africa		841	7
Holland		1,509	12	Pakistan		755	6
				Kenya		545	4
Germany		1,096	9	India		542	4
Sub-total	4	11,277	96	Sub-total	9	8,443	70
All others	5	567	4	All others	14	2,737	30
(1)G.TOTAL	9	11,844	100		23	11,180	100

(1) Higher tonnage consumption than export tonnage reflects the double counting of some imports/exports between EEC countries.

Source: Guinea Conditions Relevant to the Export Production of Tropical Fruits by COLEACP, Brussels, Report of June 1985, EEC Letter of command No. 00830 14/0185, 142 pages. (Source: Eurostat - EEC Analytical Tables of External Trade).

over the border by truck and the amount consumed or sold domestically by street vendors are not known, but figured at 15% of the median production estimate these would amount to 6,800 MT annually.

1. Air Transport Capacity

Mango air shipments to Europe make up a small part of sales totaling under 200 MT for May through July '87. Currently there are three airlines making regular weekly flights to Europe: UTA/Air Afrique into Paris; KLM into northern European cities via transfer at Amsterdam; and SABENA with limited air freight capacity into Belgium. UTA cargo flights and full plane charters to Europe can be arranged. Present air lift capacity on scheduled passenger aircraft would amount to approximately 15 MT/week.

It was reported that a private group, Union Guineenne des Transports, is planning to launch an air freight company in 1988. Consequently, both KLM and UTA will be adding wide-bodied cargo aircraft during the spring of '88 which will increase the weekly UTA cargo capacity 4 to 6 MT on passenger aircraft to at least 25. If other African countries book less than 25 tons on these proposed weekly cargo flights, cargo capacity would mount to 50 MT. KLM predicts a similar level of expansion in 1988 and, with larger aircraft plans to be rate competitive with UTA.

E. Cost Considerations

1. Direct Cost of Mango Exports (Table 12)

Planter prices for mangoes vary widely from the official rate of 45 GF/kg for export fruit paid by Fruitex, the government fruit export and marketing agency. This price is condemned as inadequate by the planters who are paid 8.5 GF/kg by brokers for export to neighboring countries and 5

GF/kg for processing fruit bought by SALGUIDIA. For this proposal, it is planned to offer 1.5 times the Fruitex price (67.5 GF/kg) as a planter incentive to deliver only quality fruit, harvest and handle carefully and use necessary fertilizers and phytosanitary sprays.

Summary of Mango Price Options for Planters

	GF/kg	US$/MT
SALGUIDIA processing	5	11.36
Border Broker price	8.5	19.32
Fruitex Official rate	45	102.27
Proposed Pilot Project	67.5	153.53

The proposed increase would amount to US$51 per ton. An average planter should receive approximately US$510 more per hectare assuming 10MT per hectare yields.

All mango exports by air are reported to the GOG in order for the planters to purchase subsidized shipping cartons through Fruitex. These 6 kg capacity cartons are priced at 395 GF, (US$.90) each and require 167 per MT of export fruit. This agency also regulates fruit quality and is responsible for the phytosanitary certificates required on all fresh fruit exports by ocean or air.

Packaging operation costs were estimated by assuming that the cost of packing a 6 kg carton of mangoes would be 2.5 times (15/6) the cost for pineapple determined in the USAID/CNPIP study 1/. The packing cost

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1/____. "A Preliminary Evaluation of the Profitable Export Potential for Guinea Fresh Pineapple Sold in Europe," USAID/CNPIP Contract, Nov. 1985, p.107

increase would allow for a fungicide dip treatment using Benlate and for more careful handling and assembling of smaller units per carton.

There are several shipping agents in Conakry willing to carry out all the necessary functions required to transport, pack, load, hold in storage, clear the port authorities and customs, pay taxes, administer paper work, etc. Two firms, SATA and G.E.T.M.A, both quoted approximately the same rate to handle the entire export of produce to Europe. Their equivalent charges, detailed in Table 12, are practically the same for air or sea shipments.

The cold storage cost is a port charge for operating a refrigerated container unit on full power plugged into the port system. Mangoes will require less than maximum refrigeration so the cost is somewhat overstated. In theory, no cold storage is required at the airport, however since delays can be expected or time needed to assemble a load, a conservative approach has charged five days of cold storage were charged to both air and sea shipments.

UTA currently quotes 220 CFA per kg for a minimum 2300 kg load and 235 CFA for a 500 kg minimum shipment of fresh mango. This converts into 4.05 French francs or US$.81 per kg at the lowest rate. KLM is charging US$.90 per kg into Amsterdam and quotes somewhat higher rates into the cities summarized below.

Minimum KLM Cargo Rates on Passenger Aircraft

Destination	FF/kg	US$/kg
Amsterdam	4.86	.90
Brussels	5.13	.95
Frankfurt, London, Paris	6.48	1.20
Athens, Rome, Madrid, Vienna	7.83	1.45

2. Indirect Costs

Once an export operation is installed, indirect costs would include: building and equipment amortization, overhead, general administration, taxes, office expenses and social benefit costs. Indirect costs in the pilot program are skewed higher by establishing the export operation during the learning curve of the first campaign, assigning four expatriate technical personnel from the marketing firm and possible outside consultants. The expatriates would reside in Guinea for intermittent periods during the first season. (personnel cost estimates are detailed in Table 13).

The operating margin between estimated C&F costs and EEC wholesale prices is estimated to be US$ 1233 per ton, sufficient margin to cover indirect costs, sales commission, and profit for an ongoing operation. Even with the higher indirect cost burden of the pilot program, the first campaign would reach breakeven at sales of approximately 300 tons.

III. MARKETING CONSIDERATIONS

A. The EEC Fresh Mango Market

Western Europe is supplied with mangoes from countries in both the northern and southern hemispheres; together these can deliver some fresh fruit each month of the year. A summary of source countries and their harvest periods is shown in Table 7. The latest EEC fresh mango import

figures available show a consumption growth rate averaging 10% annually from 1976 to 1983 when imports reached 11,800 MT (Table 8) 1/. By rank order primary suppliers in 1983 were Mali, Mexico, Burkina Fasso and Brazil. By 1985, Burkina Fasso had replaced Mali and Mexico as the major supplier for France, capturing 24% of the market 2/.

The lower wholesale price for Burkina Fasso mangoes may be the reason for their increased volume. This can be inferred from the only data available on EEC prices which cover the period from April 9 - May 25, 1984. Wholesale prices charged in Europe for mangoes from the three primary source countries are compared with wholesale prices paid in the four major importing countries (Great Britain, France, Holland and Germany) and are summarized below.

1/____. Guinea Conditions Relevant to the Production of Tropical Fruit Destined for Export," Mission of Comité de liaison des etats africains, caraïbes, pacifique (COLEACP) for the Promotion of Tropical Fruits and Out-of-Season Vegetables, Brussels, Belgium, June, 1985, p.114.

2/____. "Mango Profile," Jamaica Agro-industrial Development Project, Agro 21/Hawaiian Agronomics International, Kingston, Jamaica, Final Report, vol. vi, Jan. 1986.

Table 9

Wholesale Market Prices of Mangoes by Air
in French Francs per Kg (5.4 FF/US$)*

1984	Major Suppliers			Major Wholesale Markets			
Price Date	Mexico	Mali	Burkina	Great Br.	Germany	France	Holland
4/9-15	17.0	11.4	10.7	12.7	14.2	10.0	12.6
4/23-27	16.4	13.0	10.0	13.4	13.6	13.8	11.0
5/7-11	18.0	12.1	9.9	16.3	14.9	12.3	11.2
5/21-25	18.6	11.5	9.4	16.3	14.4	12.3	12.2
Price Aver.	17.5	12.0	10.0	14.7	14.3	12.1	11.8
Price Ratio	175	120	100	125	121	103	100
Prices US$/kg	3.24	2.22	1.85	2.72	2.65	2.24	2.19

*Source: Extracted from COLEACP Report, Annex 15, page 118.

With this limited data, one is not able to identify whether country of origin, fruit quality, or cost of delivery affects the wholesale mango price. The higher cost of air freight to Europe from Mexico versus West Africa may be the reason for the difference. It is also possible that the Mexican volume, composed primarily of two varieties with brightly colored skin, Haden and Keitt, commands better prices than the green-skin-ripe varieties from Mali and Burkina Fasso. Price is also affected by delivery date as indicated by FOB mango prices paid in 1985 at the Bamako Airport, Mali.

Variable FOB Mango Prices at Mali Airport

Date*	CFA/Kg	FF/kg	US$/kg
Begin-3/29	370	6.10	1.13
3/30-4/23	315	5.78	1.07
4/24-5/30	260	4.75	.88
6/1-6/30	290	5.29	.98

*Source: COLEACP Report, Table 22, page 46.

Table 10

Total U.S. Mango Consumption 1981-86
in Metric Tons

IMPORTS	1981	1982	1983	1984	1985	1986
Mexico	15,727	27,046	36,046	31,728	31,637	41,455
Cent. Am.	-	-	91	182	272	91
W. Indies	-	-	818	545	-	-
Haiti	4,455	4,955	6,227	6,864	7,909	7,409
Brazil	-	-	182	227	227	-
Subtotal Impt	20,182	32,006	43,182	39,500	40,046	49,410
Florida	4,000	3,364	3,682	3,364	4,046	3,364
GRAND TOT'L	24,182	35,365	46,864	42,864	44,092	52,774
U.S. Consp'tn	=======	=======	=======	=======	=======	=======
Prepared or Preserved Not airtight containers				1,320	1,240	1,830

Source: U.S.D.A. Fresh Fruit and Vegetable Shipments by Origins, Months, (Converted from 1,000 Cwt to MT) FVAS-4 1981-86

To keep the mango market in proper perspective, it should be noted that annual imports of fresh pineapple to the EEC have remained fairly constant at 85 to 90,000 MT between 1980-'85 compared with approximately 12,000 MT of fresh mangoes to the EEC in 1983 1/. If the seven years of 10 percent annual growth rate for mango consumption in the EEC continued into 1987, 17,000 tons of fruit would be imported that year with Guinea supplying approximately 1% of the volume.

B. The U.S.Fresh Fruit Market

The U.S. fresh market for tropical fruits is considerably larger than the EEC, with pineapple reaching 200,000 MT and mangoes 53,000 MT in 1986. Table 11 summarizes the U.S. fresh mango supply sources and consumption from 1981-'86. Much higher prices in Europe than in the U.S. may be one reason for the lower EEC mango consumption. Since almost 80% of U.S. mangoes are trucked in from Mexico at low cost, lower U.S. wholesale prices are to be expected, but not less than half the European price as shown in Table 11.

1/____. "Guinea Conditions Relevant to the Production of Tropical Fruit Destined for Export," Mission of Comité de liaison des etats africains, caraïbes, pacifiques (COLEACP) for the Promotion of Tropical Fruits and Out-of-Season Vegetables, Brussels, Belgium, June 1985.

Table 11

1984 New York Wholesale Mango Price in $ per Carton
(Carton Weight of Approx. 14 Pounds)

Size	Ctr. Wt.	Jan.	Mar.	May	Jul.	Sep.	Dec.
10-20	14						
Low		7.00	7.00	6.00	5.00	--	7.00
High		9.00	8.00	8.00	7.50	--	9.00
8-14	14						
Low		--	--	6.00	4.00	6.50	--
High		--	--	10.00	6.00	8.00	--
Price range $/pound		.50-.64	.50-.57	.43-.57	.36-.57	--	.50-.64
				.43-.71	.29-.43	.46-.57	--
EEC price $/pound				1.21-1.37			

Source: New York City Fresh Fruit and Vegetable Wholesale Prices-1984, Market News Service, Agricultural Marketing Service, USDA, February 1985.

While both UTA and KLM predict that within two years they will have air cargo capacity between West Africa and New York via a European connection, no freight rates were quoted. They are expected to be at least double the rate between Africa and Europe or approximately US$.70 per pound -- too high for air freighted African mangoes to compete against the US market prices shown above.

C. The Potential For Ocean Shipments via Refrigerated Containers

There are currently five established shipping companies operating regular schedules between Europe and Guinea and several of them are interested in developing African exports to help fill their empty refrigerated containers returning to Europe. The marine companies include: Delmas Vieljeux and SOGUICOM, the latter functioning as a Guinean shipping group and includes: Deep Sea Shipping, Linea Treans Mare, Grimaldi Sioasa and Rhein Mass und See. Still other shipping lines stop regularly or

Table 12

Estimated Direct Costs for Packing and Shipping Fresh Mangoes from Guinea to Western Europe by Air or by Refrigerated Ocean Containers

	GF/MT*	FF/MT*	US$/MT
Mango purchase Fruitex rate @ 45 GF per kg x 1.5-careful slec't & hand'l	67,500	828	153.41
Packaging material costs			
Cost of 6 kg carton @395 GF ea. x 167/MT	65,965	810	149.92
Packing operations 15/6kg pine packing costs @$1.91/MT x 2.5	2,103	26	4.78
Trucking Cost up-country to Conakry @88 GF/MT-km (aver.dist.=75km)	6,600		
Delivery Container to shipper	4,500		
" " " Airport or Harbor (60,000GF) / 7MT/Cnt.	8,570		
Cold Storage Cost at Airport/Harbor (5 days @ 20,000/day= 100,000 / 7MT/cnt.	14,300	176	32.50
Transport formalities, transfer fee, Airport fees, storing, loading	9,800		
	43,770	537	99.48
Plus 15% Taxes on agent invoice	6,570	81	14.93
Phytosanitary certificate	12,200	150	27.73
Subtotal FOB Cost @ Airport	198,108	2431	450.25
UTA Air Freight Cost to Paris	330,000	4050	750.00
GRAND TOTAL C&F Cost Europe by Air	528,108	6481	1200.19
Ocean Freight to Europe 10,000FF / 7MT	116,400	1429	264.55
Less Air Freight	(330,000)	(4050)	(750.00)
GRAND TOTAL C&F Cost Europe by Ref.Cnt.	314,508	3860	714.74
Total Diff. C&F (Air verses Ref. Cnt.)		2621	485.45

*440 Guinea Francs and 5.4 French Francs per US$ on 12/30/87

Table 13

Estimated Indirect Costs
Proposed Pilot Operation for Mango Exports
Expate Personnel Manning and Costs in US$

Position Occupied	Air trips	Monthly Salary	Months Incountry	Salary or Cost Total
(1) Agronomist	2	4,000	5	20,000
(2) Storage Pomologist	2	5,000	2	10,000
(3) Fruit Pathologist	1	5,000	2	10,000
(4)Packaging technician	2	4,000	3	12,000
(5)Marketing/Quality Contr	3	6,000	2	12,000
(6) Other Executives (2)	4	8,000	1	16,000
Subtotal Salaries	14		16	80,000

Airfares	3,000 X 14 mo.		42,000
Board & Lodging CNPIP @	1,650 X 16 "		26,400
Two veh'ls $120/dX30d	3,600 X 10"		36,000
CNPIP office rent	2,000. X 4"	8,000	
Telex,Tele, Post, etc	1,000 X 4"	4,000	
Officies	500 X 4"	2,000	
Rest & Recreation, Entertn.		4,000	
Refrigerated ctr. rent	1,365 X 4"	5,460	
Wharehouse rental	2,000 X 4"	8,000	
			31,460

Local Personnel	US$/Mo.		
(1) Agriculturalist	340		
(2) Ship. Expid't	300		
(3) Sec./Adm. (Parttime)	300		
2 Chauffeurs	150		
3 Guards	180		
3 Clerk, cleaner, etc.	150		
	1420x12 mo.	17,040	
Social costs @21%		3,580	
			20,620
Outside consultants: time and charges			20,000
Setup packing operation			15,000
Miscel. &10% Contingency			30,200
			301,680

intermittently at Conakry. The different lines schedule return voyages to all major ports in Western Europe with one or another ship departing every 6 to 14 days. The voyages take between 9 and 18 days depending on ports of call before final destination.

Within several years there may be direct ocean freight services between Conakry and the U.S. East Coast. The steady increase in ocean cargo capacity to and from Guinea is expected to continue and encourages future consideration of refrigerated fresh fruit and frozen cargos. In 1983 the port of Conakry handled 5,000 cargo containers of mostly dry content while estimates for 1987 indicate a flow of 27,000. The upsurge is a result of the recently completed container handling operations at Conakry harbor.

Fresh pineapple shipments by refrigerated container were tried successfully by Delmas several months ago on an 11-day voyage from Cameroon. Container temperature was held at 8 to 9 ^{0}C and the 7MT of fruit arrived in good condition. Francis Duffau, Delmas Administrative Manager in Conakry, is interested in trial shipments of mangoes but lacks technical experience with this product. Nor was anyone else in Guinea found to have experience in handling refrigerated mangoes. Duffau estimates that a refrigerated container load from Conakry to Europe would cost 12,000 FF as from Abidjan, but with a possible 20% reduction for regular scheduled shipments.

1. Mango Refrigeration and Storage Techniques

There are several articles in the literature that describe successful refrigerated storage trials of two to three weeks for certain varieties of mangoes. The subject is complicated by varietal differences in rate of maturity, effects of too cold temperature on fruit scalding (< 45^{0}F),

and time of fruit softening after cold storage. One documented source reports that certain cultivars of mango can be held succesfully under refrigeration for two to four weeks with optimum storage temperature at 8-9^0 C (37^{0}F) 1/. Other studies at the University of Hawaii and in Florida determined the ideal storage temperature to be 13^{0}C (55.4^{0}F), (10). This reported discrepancy and several others need verification under Guinean conditions.

2. Cost Differentials

The possibility of refrigerated container shipments of mangoes to Europe is still tentative. Table 8 illustrates the freight cost difference of $485 a ton between air and sea. If ocean transport of mangoes is feasible, the reduced transport cost should allow for price savings in the European retail market which could in turn increase export volume.

IV. PROPOSED PILOT MANGO EXPORT PROJECT

A pilot study in Guinea is needed to develop answers for questions such as: variety selection, agricultural practices, phytosanitary treatment, packing standards, and storage and shipping technologies. These questions require answers before Guinea is recommeded as a project site for a fresh fruit export project. Therefore, a phased low investment start is proposed that offers the possibility of financing itself during the learning period.

1/____. J.W. Purseglove, "Mangoes," Tropical Crops Dicotyledons, Longman Group Ltd., London, Reprinted 1977, pp.24-32.

A. Rationale

West African mango exports to Europe now solely depend on air shipments. Partially ripe fruit can be packed and ripens fully during its five to ten days in the retail trade. This proposed pilot project would also use air shipments for all exports during the pilot phase while the problems of refrigerated storage and ocean shipment would be studied.

Reestablishing Guinean mangoes in Europe will require a firm commitment from a European produce marketing group. Anything less would not improve the present status of small periodic shipments from Guinea now taking place to various retail and wholesale brokers. The pilot project will need to supply consistent quality fruit throughout the April-July season to achieve the tonnage goals proposed here.

With this pilot project, Guinea could offer a group interested in expanding its tropical fruit line a low-cost investment opportunity to develop a reliable supply of quality mangoes. If the pilot experience shows that operating and political problems become too complicated for a profitable venture, these would be apparent in the first season. The marketing firm could cut its losses accordingly with no long-term damage or residual investment concern. It could also reinforce the point that the major limitation for tropical fruit expansion from Guinea is marketing not production.

To provide for the European marketing program, the pilot project in Guinea would entail activities such as: identifing planters and variety sources, selecting varieties, proposing new agricultural methods, establishing packing standards and phytosanitary procedures, and

commencing refrigeration trials as well as ensuring the timely export of quality fruit.

It is proposed that rented or leased structures and equipment be used wherever possible. Warehouse space adjacent to the airport is available for short-term (4-6 months) rental. This is proposed as a packing site to receive fruit, grade, treat and assemble the cartons for export. A total of $15,000 has been estimated to set up a packing line in the short-term rented space.

For insurance against fruit losses, a refrigerated container could be placed nearby in the event of unforeseen flight or fruit assembly delays. A refrigerated container could probably be subleased from Delmas for US$45 per day, the same daily rate charged at the port. Alternatively, a six-month minimum rental is available from Sea Containers, Inc. of New York at US$16 per day. An additional $7.50 daily covers a clip-on diesel generator as insurance against a power shortage at the pilot packing location. Even with present agricultural constraints and lack of an organized packing system in Guinea, a much larger volume of mangoes could be moved to Europe by air during the 1988 season.

B. Pilot Program Support Facilities

For a company showing interest in a Guinean tropical fruit project, it is proposed that the established CNPIP facilities in Conakry be utilized as a headquarters base. In the CNPIP adjoining building there are excellent quarters available at reasonable rates to house and board at least four expatriate personnel. Offices and secretarial services can be rented downstairs, telephone communications are installed and vehicles can be

leased from commercial agents in Conakry. Minimum operating expenses and no capital investment would be required during the four to five month pilot phase.

It would be feasible to rent and place a refrigerated container in the CNPIP compound parking area where an 85 KVA generator is available as stand-by backup for the Conakry power system. Continuous refrigeration and storage trials could be carried out adjacent to the expatriates' living quarters in the center of Conakry.

C. Manning the Pilot Project

Developing these diverse activities would require several trained and experienced expatriate personnel of various disciplines. The expatriate positions suggested include: an agricultural expert; a plant pathologist and quality expert; a fresh fruit storage pomologist; and a packaging technician; a marketing expert as well as visits by corporate executives to negotiate the protocol with the various ministers. Estimated personnel costs, airfares, board and lodging, and transportation costs total approximately US$ 200,000 and are detailed in Table 13.

Guinean government ministries and the appropriate export agencies are located in Conakry. The government apparatus will require high-level personal contact and continuous project liaison. This effort could be assisted by CNPIP staff members.

D. Pilot Project Financial Estimates

Assuming that an association can be arranged with an established produce marketing firm in Europe, a preliminary economic estimate for this pilot phase would depend on sales volume and price. For the sake of

simplicity in estimating financial feasibility, a wholesale price averaged for the season from the four major importing countries has been used to adjust for vagaries in the pricing system. One EEC average wholesale price of 13.23 French Francs/kg for mangoes has been used - slightly higher than Mali and Burkina Fasso fruit but lower than the Mexican wholesale price. It is considered a reasonable market price estimate for Guinea mangoes.

Export volume projections for the pilot phase were set at 250, 500 and 1,000 MT. The range is expected to bracket first year exports. Even at 250MT there would be a need to schedule air cargo flights because of other exporter demands during the same period. The 1000 MT does seem high for the first campaign. All three volume projections presume availability of select varieties and an established marketing staff in Europe.

A 20 percent price discount has been used at the marketing end, ten percent for broker's commission and ten percent lost sales to allow for diseased fruit, poor handling and market promotion. With this added discount, estimated operating margins for the three volumes 250, 500 and 1,000 MT in US$ show, respectively, a loss of $54,900 and positive margins of $191,890 and $820,440. Estimated breakeven for the pilot project would be reached at sales of under 300MT.

$$\text{Operating Margin} = \frac{\$308,480}{250\text{MT}} = \frac{\$1233}{\text{MT}} \quad :: \quad \text{Margin Loss } \frac{\$54,900}{\$1233} = 44.5\text{MT}$$

If the pilot project were extended to a second campaign, breakeven could be reduced by 100MT by cutting back almost $150,000 through expatriate and consultant salaries and much of the investigative expense.

Detailed operating estimates and margin projection are shown in Tables 13 and 14.

Operating techniques could also be supplied by short term consultants. Expertise could be retained to develop flower induction methods by working with interested planters. Organizing phytosanitary programs might need experienced advisors. Consultant expenses have been estimated at $20,000 during the pilot year.

If flower induction is successful in Guinea, it could fill the early March-April production low point when better prices prevail domestically and in Europe. However, once the method becomes known in Guinea, it will probably not be long before the practice spreads to other countries and the low production cycle could disappear. Therefore, it behooves the operators to establish themselves with a quality image during the pilot phase; the momentum should carry them through future market surpluses.

V. OTHER TROPICAL FRUITS

The three other fruits selected for consideration -- papaya, passion fruit and guava -- are less known to international markets and are sold in much smaller volume than mango. Interest in fresh papaya may be growing in Europe and has resumed expansion on the U.S. West and East Coasts. The export market for guava and passion fruit is limited to processed frozen puree exported in bulk cartons for reprocessing into juices or baked goods and confections. As discussed earlier, the unknown market volume for these processed tropical fruits in Europe makes it impossible to recommend an investment strategy to launch a processing operation in Guinea. The most prudent economic start-up for such a project would include an arrangement

Table 14

Estimated Pilot Phase Operating Margin Comparisons
at Three Volumes 250, 500 & 1,000 MT

Est.Sales Volume in MT		250	500	1000
All $ Calculations (000)				
REVENUES in $/ MT	2.45	612.5	1225.00	2450.00
DIRECT COSTS	1000			
Fruit Purchas$153.41/MT	153.4	42.19	84.37	168.74
(Assume 10% Discard)	1.1			
Cartons $.90x167	150.3	37.58	75.15	150.30
Packing Costs	4.87	1.22	2.44	4.87
Trans.Stor'g, Etc.	99.50	24.88	49.75	99.50
15% Tax on agent invoice	0.15	3.73	7.46	14.93
Phytosan.Crtf.	27.75	6.94	13.88	27.75
Subtotal FOB AIRPORT		116.52	148.67	297.35
Air Freight-$/MT	750.00	187.50	375.00	750.00
GRAND TOTAL C&F Europe		304.02	523.67	1216.09
OPERATING MARGIN		308.48	616.96	7233.91
Europe Mark't Exps.&Costs	0.2			
Less20%,Comm,Frt.Loss,Prmo't		61.70	123.39	246.78
INDIRECTS				
Expat&Consul.Salaries	100.00			
Airfares,T&E	42.00			
Local Salaries&Bene.	20.62			
Persn'l Expen.Lodg.Car	62.40			
Office Exp. & Ref.Ctr.	31.46			
Setup Packing Opt.	15.00			
Miscl.& Cont'gn @ 10%	30.20	301.68	301.68	301.68
NET AFTER. Comm.Frt Loss, Indir's.		-54.90	191.89	685.45
		======	======	=======

with SALGUIDIA in a joint venture or as a hired packing agent once the market dimensions are known. Of the three, papaya has the best possibility for economic expansion because of its proven fresh market appeal and use as a by-product puree from off-grade export fruit.

A. The Papaya Export Potential

1. The U.S. Market

Fresh Hawaiian solo papaya has been widely accepted for years in certain regions. Sales are concentrated in major cities and on both East and West coasts with little sales volume in the central and midwestern states. In these markets, the fruit is still unfamiliar. Similarly in Europe, some fruit is being flown in from Brazil and elsewhere, but no import import figures were available.

After 1984 the US Food and Drug Administration banned ethylene dibromide as a fumigant used to control fruit fly larvae found in some fruit. The fumigation treatment was replaced with a double hot water dip treatment to kill fly larvae as well as control fungus problems on the fruit. It proved inadequate, causing reduction in fruit quality and pest survivors and prompting a ban on some shipments to California. (Shipments to Europe do not face as stringent insect control because the flies are already present in the Mediterranean). The double hot dip method has now been improved and the industry is expected to resume its export expansion.

Table 15

Fresh Papaya Imports to the U.S. Market in MT*

	1981	1982	1983	1984	1985	1986
Foreign Imports						
Mexico	681	1,227	2,364	1,500	1,909	809
Bahamas	-	-	45	717	701	363
All others	45	90	-	158	109	21
Domestic Production						
Hawaii	20,521	15,141	16,200	24,005	15,023	15,466
Grand Total Fresh F.	21,247	16,458	18,609	26,380	17,316	16,659
Prepared & Preserved						
Hawaii		3,630	6,910	6,140	5,070	4,950
Foreign Imports		-	-	1,954	2,014	2,054
Grand Total Prep. & Pres.				8,094	7,084	7,004

*Figures exclude papaya produced and consumed in Hawaii

(The prepared and preserved tonnage is composed mainly of frozen puree).

It is not clear whether any of the troublesome fruit fly species exist in Guinea. None were seen on ripe guava or papaya - two common host fruits in Hawaii for the three species of pest: Melon Fly (Dacus cucurbitae), Oriental Fruit Fly (Dacus dorsalis); and Mediterranean Fruit Fly (Ceratitis capitata).

2. The European Market

Brazil continues to be the dominant world supplier of papaya to Europe in both fresh and processed form. Ivory Coast dispatched 76 MT of fresh papaya by air to Europe during the first 10 months of 1987. (The variety was also Hawaiian solo Sunrise, a red flesh variety exported by Brazil). The European market is small, but a continuous supply of papaya can be produced year-round in Guinea if the crop is irrigated during the dry season

and receives proper fertilization. Some pesticide sprays may be necessary during the rainy season.

3. Varieties Available for Production

An interest in diversifying its product line prompted SALGUIDIA management to initiated a trial planting of Hawaiian solo Sunrise papaya two years ago close to Mafreniya. That the variety is suited to this area is demonstrated by the excellent fruit now being produced and sold as speciality papaya by SALGUIDIA to domestic hotels and restaurants at 200 GF per fruit of less than .5 kilos. SALGUIDIA and others have ordered additional Solo variety seed from the University of Hawaii via CNPIP.

Trial plantings of several varieties should be made in each proposed production location when papayas are first introduced. A good producing variety in one area may do poorly under different conditions. Both the Sunrise and a yellow-fleshed Waimanalo variety selection X-77 should be tried initially. Seed of both will be planted in several locations in Guinea early in 1988. Within one year fresh Sunrise or Waimanalo solo papaya should be ready for export to Europe.

4. Crop Yields and Requirements

Yields of solo can excede 20 MT per hectare per year for a three year harvest cycle but only under ideal growing conditions with irrigation, complete fertilizers, good pesticides and weed control. Plants cannot be expected to produce without irrigation or fertilizer and the crop may barely survive when subjected to five or six months of drought. Several University

of Hawaii publications on cultural recommendations for papaya are included in the publication annex.

5. Fruit Selection for Export

In an Hawaiian orchard under full production only half the papaya crop may be selected for fresh exports. The remaining fruit may show small blemishes, be over or under weight, or too ripe for export. Such fruit can, however, enter the domestic market where these aberations are accepted. Only the very small or fully ripe fruit is processed into puree while some excess fruit is dispatched to hog farmers who carry the material away as a mutual service. Fruit for processing can be procured from any packer for two or three cents a pound; some fruit is always in surplus. The U.S. puree market could be saturated by the surplus papayas in Hawaii that are now discarded; the EEC demand for puree is not known.

6. Marketing

A similar marketing procedure as described above is anticipated for Guinea where domestic market consumption would take most of the fresh fruit. Very little would meet the export standard and less would be converted to puree. The long range economic potential for fresh papaya from Guinea to Europe appears more cost-effective than from Brazil, currently the dominant supplier of solo papaya. If mango shipments can be organized by a European produce group, solo papaya would be an easy extension of the packing process. Marketing the product would be the difficult part of the equation.

B. Guava and Passion Fruit Export Potentials

Neither of these fruits has much potential as a fresh fruit export, so we will consider them together as future potential crops for processing into

frozen tropical purees. In Guinea both fruits can be found on the domestic produce market in certain seasons with passion fruit (Passiflora flavicarpa) a recent import to Guinea.

1. Guava

a. Availability of Guava

Guava has been well known in Guinea for years but is not often cultivated. Scattered wild fruit is harvested while cultivation has been limited to a few household trees and scattered plantings usually as an inter-crop with bananas and papaya. The wild fruit is very flavorful and dark reddish flesh varieties abound. If guava were needed for processing, a limited amount of wild fruit could be harvested from nearby bush areas in lower Guinea. This activity could be sponsored by promoting an assured outlet at a realistic price.

SALGUIDIA management believes that only 100 to 150 tons would be available from wild harvest at the present time. Eventually cultivation of guava orchards by planters could be aided financially using selected varieties or imported scion material (seed does not reproduce true) and a guaranteed processing outlet. The basic cultivation methodology for this crop can be found in "Miscellaneous Publication 111" (October 1973) published by the Cooperative Extension Service and Hawaii Agricultural Experiment Station, the University of Hawaii.

b. Marketing of Guava Juice

Marketing of guava juice has only recently become significant in the U.S. due to promotion by Ocean Spray® that has a production agreement with C. Brewer and Company in Hawaii to supply guava puree. Brewer plans to meet its increasing sales projection to 1995 calling for an estimate to require 10,000 MT of fruit annually. Brewer's production should continue to

compose more than 50% of the Hawaiian crop. (Extraction of guava puree is approximately 65% of raw product weight).

The guava increase portends renewed U.S. interest in tropical fruit bases and purees which are reconsituted into single strength juice near the major markets on the mainland ~roduction figures below are from Hawaiian State statistics and from C. Brewer Today the company newspaper, (Volume 16 No.4, 1987).

Production of Fruit for Guava Processing in MT

	1982	1983	1984	1985	1986	1987
State Total Guava	3,245	4,023	3,184	4,334	7,786	-
C.Brewer Guava	-	-	1,140	2,230	4,410	5,000
Processor Price $/MT	216	200	216	227	231	

C. Brewer reports that in 1985 the company was not able to grow enough fruit to meet its market commitment and resorted to purchasing frozen puree from Brazil and Australia. The company does not plan on using outside sources again. It has approximately 500 bearing acres, enough to fill its 5,000 MT demand in 1987 and another 150 planted acres are close to harvest maturity for their continued expansion. This example reemphasizes the point that production expansion generally follows market expansion and is the easiest segment to fulfill.

2. Passion Fruit

a. International Availability & Prices

Passion fruit production in Hawaii has declined in recent years because of the high cost of cultivation and poor economic return. Hawaiian crop statistics for this tropical fruit are recorded in the islands but its

identity is lost in the US Government data when combined with other imports of minor fruits and vegetables. The same loss of identity occurs in the EEC statistics on minor fruits.

Hawaii Passion Fruit Production and
Processor Price for Fruit $/MT

	1982	1983	1984	1985	1986
Raw Fruit Tonnage	1,250	809	357	373	250
Processor Price	266	222	266	271	271

Major competition for tropical juice products comes from Brazil although many countries; Australia, New Zealand, South Africa, Central America, the Caribbean and the Pacific Basin countries now produce or plan expansion projects for the same line of products. The world market for these tropical purees and concentrates is relatively small. In Hawaii, several dairy companies produce tropical drinks made from a variety of fruit flavors for the grocery chill shelf. Most fruit purees are available from Los Angeles wholesalers who recently quoted the following price schedule:

Frozen Puree	US$/Pound	Average $/MT
Passion fruit	.36-.41	847
Mango	.50-.54	1144
Guava	.34-.38	792
Papaya	.28-.31	660
Banana	.39-.42	902
Pineapple*	.65-.70	1485

*Limited availability for high quality product in the US.

The two direct comparisons of concentrate pineapple juice and mango puree with the SALGUIDIA wholesale price list in Table 16 shows that they are not competitive with U.S. prices.

b. SALGUIDIA Passion Fruit Trial

In 1985 SALGUIDIA planted 1.4 hectares of passion fruit on fence-type trellis. Plans are to expand this to 10 hectares in 1988. This planting has given limited production for unknown reasons. Reported yields to date have been extremely low at two tons per hectare. Most commercial productions in other countries achieve between 15 and 20 MT per hectare, enough difference to make frozen passion fruit juice from SALGUIDIA noncompetitive.

Part of the yield problem may be attributed to the five-to-six month annual dry season, lack of irrigation, improper nutrition, or unknown fungus and insect pests that eliminate flowers or fruit prematurely. The problem may also stem from a lack of fruit set (poor pollination) resulting from an absence of insects moving among flowers on different vines. A single vine is self-sterile and cannot pollinate its own flowers. Wind is a poor substitute for the proper species of insect that must be active on the flowers. Hand pollination is the only other remedy. Hand pollination is well adapted to a family operation and can be carried out by all family members as is done in Fiji. Annual yields there will average 25 to 30MT per hectare on a three year crop although each family plot is usually .05 to .1 hectare in size.

A technical report from the University of Hawaii discusses the insect species that make good pollinators and the flower characteristics that aid insect pollination, e.g.,. anthers that bend down. When anthers extend up or

TABLE 16

In-Country and Export Wholesale Prices for SALGUIDIA Product Items

IN-COUNTRY

Item	Can size	/Carton	GF/Carton	$/Carton
Pineapple Juice	6 Oz.	48	2,700	6.13
Orange Juice	"	"	2,600	5.90
Pamplemousse Juice	"	"	1,500	3.40
Mango Juice	"	"	1,500	3.40
Pineapple Juice	No. 2	24	3,500	7.95
Plums	"	"	6,000	13.03
Plums	No. 10 -	6	2,500	5.68
(1) Fruit cocktail	" "	6	3,000	6.81
Pineapple slices	No. 2	24	10,000	22.72
Pineapple Juice	"	"	1,750	3.97
" " + sugar	" "	"	2,000	4.54

EXPORT ITEMS

Packed in 25L Alum.
Container with Plastic Liner

			FF/kg	$/kg	$/lbs
20 kg Pineapple frozen concentrate		55^0 Brix	10	1.72	.78
20 kg Mango puree	frozen		8	1.37	.62
20 kg Orange Juice	"	55^0 Brix	NA		
20 kg Pamplemousse	"	" "	NA		

(1) 50/50 Pineapple tidbits and plum halves

Source: SALGUIDIA, The Director General Adjoint, N'Famoussa Kaba

straight out, insects cannot rub pollen onto them 1/. Certain seedling selections that are better able to cross pollinate than others may be missing from the SALGUIDIA planting. The problem needs analysis and correction before recommending expansion of passion fruit in Guinea.

C. Dried Fruit Option

There is a small but growing demand for dried tropical fruit products that may in time absorb significant quantities of several fruit varieties. At present, dried pineapple, banana, mango and papaya are becoming better known in western block countries although they are still novelty food items outside the Asian communities in most cities. Once a better understanding of the EEC market for these dried products is known a pilot fruit drier could be developed as a means of preparing high-quality dried fruit products that could be market tested and readily expanded if proven economically feasible.

Dried papaya usage is even smaller than for prepared and preserved forms although some is being used in packaged snack foods. An example is included in Exhibits II and III along with an example package of dried mango pieces from the Philippines. The dried Tropical Medley pack includes pineapple, coconut and papaya along with several temperate fruits. The Philippines have a long history of dried mango consumption; the fruit sells there in retail for P$18.00 per 200 grams or US$ 4.70 per kg. Wet to dry conversion is five to one. The product is quite good but has small market acceptance in the U.S.

1/ ____. "Papayas in Hawaii," University of Hawaii Cooperative Extension Service Circular 436, Honolulu, Hawaii, September 1970, pp.46-53

Carabao is the only mango variety used for drying in tne Philippines and is a Southeast Asia variety, not mentioned in the catalogue of Guinean varieties. In most processes the dried fruit is treated with preservatives, sugar and salt. A synopsis of the mango drying procedure has been included in the publication annex.

D. Omitted Fruits

1. Citrus.

It is acknowledged that Guinea produces a variety of citrus fruits including orange, lemon, grapefruit, pomelo, lime and tangerine which are grown in relatively small amounts throughout the country. Fresh citrus export to Europe is believed limited because of established production and availability of high-quality fruit from the Mediterranean countries.

The huge established production of concentrated orange juice from Brazil and the U.S. makes the small orange production in Guinea more profitable when sold domestically as fresh fruit. Domestic fresh fruit commands higher prices than if sold for frozen concentrate on the competitive international market. Some Guinean citrus is currently being canned by SALGUIDIA for single strength juice for domestic sales, but the high price limits demand. Most oranges are sold domestically by street venders who peel the outer green skin leaving a white under-layer that serves as a low cost "convenience carton" for juice that is sucked from the fruit. The wholesale price list of SALGUIDIA products is shown in Table 1.

2. Banana Production:

Current world banana production and exports are dominated by several large international produce marketing groups with sources of production well established in other African and Central American countries. It is probable that a sizeable increase in Guinean banana exports would need a commitment and significant investment from one of the international produce corporations. For this reason fresh banana export expansion will not be pursued in this report. The large domestic market for banana continues to grow with no apparent limit to the existing production capability in supplying the market with a multitude of banana varieties.

3. Avocado:

There might be a short period of time each season when avocadoes could be exported competitively to Western Europe if Israeli fruit is in short supply. However, the lack of quality grafted avocado varieties in Guinea is a major problem.

VI. CONCLUSIONS

A. Fresh Mango Exports

At this time fresh mango export to the EEC appears to be the most economically viable tropical fruit crop for Guinea. It appears lucrative because a large number of grafted trees are at maximum production and fruit only needs to be harvested, treated and handled properly, packed and shipped to a known market. All the required project pieces are on hand, lacking only system coordination in Guinea and marketing coordination in Europe.

Therefore, it is suggested that a large produce marketing firm already organized in the European market be recruited to assign four or five

experienced personnel to Guinea for several months. These expatriates would organize the operations and leave behind trained local cadre to carry out the procurement and dispatch of mango shipments in succeeding campaigns. Planters would be used for the entire future crop as well as the pilot supply. Any volume limit for mango export would probably be imposed from marketing and not at the production end.

B. Alternative Options

There is potential for developing other tropical fruit products, but it would take some time to increase crop production. This makes it difficult for private industry to justify the investment in the development phase of other tropical fruit options to supply an unknown quantity for market.

One project exception that may justify closer analysis is the possibility of becoming an equity partner in the SALGUIDIA operation. If this pineapple growing and processing operation could incorporate fresh fruit export and allocate all prime pineapple production toward this end while processing off-grade fruit not sold domestically into frozen juice concentrate, overall profitability of the company could be enhanced measurably.

Supplying a spectrum of frozen tropical fruit bases and concentrates to the export market could not be justified without using SALGUIDIA facilities and pineapple juice concentrate as the nucleus of a multiple juice product line. Such a project would be of questionable profitability without the fresh fruit segment as proposed.

EXHIBIT I

Source : Centre Guinéen de Recherches fruitières/IFAC)

ZILL

Arbre.
Vigueur : vigoureux.
Forme : arrondie.
Feuillage : dense.
Fruits.
Forme : ovoïde oblongue

Couleur : écarlate sur fond jaune abricot.
Goût : excellent.
Fibres : sans
Résistance au transport : bonne.
Poids moyen : 325 g.
Date récolte : 22 avril au 30 mai.
Production. Très abondante et régulière, assez étalée, pointe début mai.
Exportation. 69 % exportables.
Résistance aux maladies. Fruits très sains sauf en fin de récolte où apparaissent quelques taches d'Anthracnose. Variété facile à surveiller, étant en partie récoltée avant les fortes pluies.

IRWIN

Arbres.
Vigueur : vigoureux.
Forme : élancée.
Feuillage : peu dense.
Fruit.
Forme : oblongue.
Couleur : 3/4 rouge violacé, rouge vif à maturité.
Goût : excellent.
Fibres : sans.
Résistance transport : très bonne.
Poids moyen : 325 g.
Production. Très productive et régulière. Récolte : 15 mai/1er juin.
Exportation. 93 % exportables.
Résistance aux maladies. Bonne, quelques taches en fin de récolte.

PALMER

Arbre.
Vigueur : vigoureux.
Forme : élancée.
Feuillage : peu dense.
Fruit.
Forme : oblongue elliptique.
Couleur : pourpre, reflets violets à maturité.
Goût : très bon.
Fibres : sans .
Résistance transport : très bonne, peau épaisse.
Poids moyen : 360 g.
Production. Très bonne et régulière. Pourcentage exporté très important. Récolte non calculée pour 1960
Résistance aux maladies. Très resistante, quelques taches en fin de récolte.

SMITH

Arbre
Vigueur : vigoureux.
Forme : élancée.
Feuillage : peu dense.
Fruit.
Forme : oblongue ovoïde.
Couleur : écarlate sur fond jaune dégradé.
Goût : très bon.
Fibres : traces.
Résistance transport : moyenne, cueillir assez vert.
Poids moyen : 550 g sur arbres âgés, 800 g à 1 kg sur jeunes arbres.
Production. Étalée, très abondante en tonnage échelonné sur juin et quelquefois début juillet. Récolte non calculée.
Résistance aux maladies. Sensible à l'Anthracnose et Scab, souvent atteine de « Soft Nose ». Répond bien au traitement. Études phytosanitaires en cours.

VALENCIA

Arbre.
Vigueur : très vigoureux.
Forme : largement arrondie, très haute.
Feuillage : assez dense.
Fruit.
Forme : elliptique oblongue.
Couleur : rouge groseille sur fond jaune verdâtre.
Goût : bon.
Fibres : sans.
Résistance transport : très bonne.
Poids moyen : 450/500 g.
Production. Irrégulière, très bonne en 1960. Variété appréciée pour sa coloration claire. Récolte début juin.
Résistance aux maladies. Très bonne en 1960. Fruits très sains.

RUBY

Arbre.
Vigueur : très vigoureux.
Forme : très arrondie.
Feuillage : très dense.
Fruit.
Forme : oblongue.
Couleur : rouge rubis avec traces jaune orangé.
Goût : excellent.
Fibres : sans.

Résistance transport : bonne.
Poids moyen : 150/180 g.
Production. Bonne, serait toutefois insuffisante par rapport au développement de l'arbre. Envisager réduction engrais. Variété à suivre en raison : qualité, grosseur, coloration. Recolte fin juin-début juillet.
Résistance aux maladies. Tres bonne

KEITT

Arbre.
Vigueur : moyenne.
Forme : écrasée.
Feuillage : peu dense.
Fruit.
Forme : arrondie.
Couleur : fond jaune, lavé de rose carminé soutenu, très joli fruit.
Goût : bon.
Fibres : sans.
Résistance transport : bonne.
Poids moyen : 500 à 800 g sur jeunes arbres.
Production. Abondante et régulière. Récolte entre le 1er et 15 juillet.
Résistance aux maladies. Très bonne si l'on tient compte de la date à laquelle on récolte. Il est nécessaire de faire 2 traitements supplémentaires en juin. Opération payante en raison du prix de vente des fruits ; répond bien aux traitements.

KENT

Arbre.
Vigueur : moyenne.
Forme : élancée.
Feuillage : moyennement dense.
Fruit.
Forme : oblongue ovoïde.
Couleur : rouge carthane clair sur fond jaune-or teinté de vert.
Goût : excellent.
Fibres : sans.
Résistance transport : bonne mais à surveiller.
Poids moyen : 450 g.
Production. Abondante. Du 15 à fin juin.
Résistance aux maladies. Traitement à surveiller, assez sensible à l'Anthracnose si le fruit est cueilli trop avancé. Sensible au Soft Nose. Mérite d'être suivie en raison de sa qualité excellente.

DIXON

Arbre.
Vigueur : moyenne.
Forme : arrondie étalée.
Feuillage : peu dense.
Fruit.
Forme : oblongue, homogène.
Couleur : rouge foncé sur fond jaune dégradé.

Goût : moyen.
Fibres : assez noir breuses au noyau.
Resistance transport : bonne.
Poids moyen : 350 g.
Production. Abondante, soutenir à l'engrais. Récolte entre le 1er et 20 juin.
Résistance aux maladies. Bonne, quelques traces d'Anthracnose en fin de récolte.

BIBLIOGRAPHY

"A Preliminary Evaluation of the Profitable Export Potential for Guinea Fresh Pineapple Sold in Europe", CNPIP Contract, USAID, 1985.

"Chemical Induction of Flowering in Mango", Technology!, PCARR, College of Agriculture, University of the Philippines, 1980, vol.2, no, 11, pp.1-12.

Fruit and Vegetable Processing Study for the Singatoka Valley", Fiji Hawaiian Agronomics International/Asian Development Bank, July 1984.

GUINEE Conditions Relevant to the Production of Tropical Fruit Destined for Export, Mission of COLEACP (Comité de liaison des etats africains, caraïbes, pacifiques) For the Promotion of Tropical Fruits and Out-of-Season Vegetables, Brussels, June, 1985.

"Mango Fertilization, Philippine Council of Agriculture and Resources Research, no date.

"Mango Profile, Final Report Vol. V!," Jamaica Agro-Industrial Development Project, Agro 21/Hawaiian Agronomics International Kingston, Jamaica, 1986.

Purseglove, J.W., "Mangoes" in Tropical Crops Dicotyledons, Longman Group Ltd. , London, 1977, pp. 24-32.

"Reconnaissance Survey Report Agribusiness Investment Opportunities in Haiti", ASAC International/U.S. TDP, Oct.1987.

Statistics of Hawaiian Agriculture 1986, Cooperative Function of Hawaii Department of Agriculture Marketing Division, USDA, August, 1986.

"1981-1986 U.S. Imports for Consumption and General Imports TSUS Commodity by Country", FTS 246.