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Fruits Program Area Research Planning and Prioritization: Background Analysis

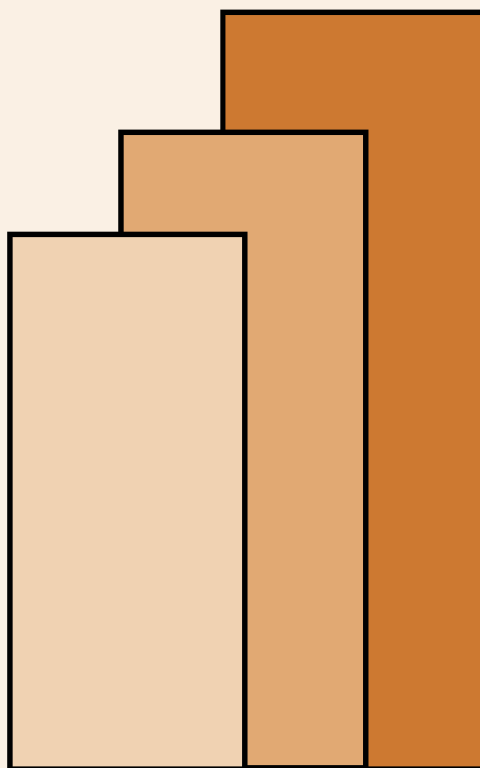
Isabelita M. Pabuayon

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FRUITS PROGRAM AREA RESEARCH PLANNING AND PRIORITIZATION: BACKGROUND ANALYSIS

**A Draft Report Submitted to the Philippine Institute for
Development Studies (PIDS)**

June 30, 1999

**Isabelita M. Pabuayon
Consultant**

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Abstract

This study addresses the Fruits Program Area research allocation concerns. It provides a background analysis focusing on the fruits industry profile, domestic and export potentials, supply constraints, role of public and private sector R&D, review of past agricultural research, technologies generated by the R&D program, constraints to and consequences of technology adoption, and the strengths and weaknesses in the institutional structure of research and extension linkage. Additionally, it provides suggestions on socio-economics research areas for integration in the overall fruits R&D agenda.

The study involved (1) gathering and analysis of secondary (time-series) data from various sources (BAS, NSO, DTI) to come up with a profile of the fruit crops sector which covered the sector's economic contribution, production and yield performance, market potential, and constraints/problems affecting the industry; (2) extensive review of the literature on fruits in terms of research priorities by commodity (mango, banana, pineapple, citrus, durian, papaya, etc.), research area (varietal improvement, pest and disease control, cultural management, postharvest, socio-economics), institutions (SCUs, line agencies), budget, and current priorities; (3) examination of the national agricultural research system, the institutions involved in fruits RDE, networking mechanisms, and strengths and weaknesses of the RDE structure; and (4) consultations with informants from PCARRD, STARRDEC and STIARC, researchers, and a number of farmers.

The list of researches on fruits obtained from DOST and reviewed in this study is certainly not complete but analysis have revealed important trends in fruits research priorities and budgetary allocation. Additional information obtained from PCARRD, UPLB and USM showed similar trends.

FRUITS PROGRAM AREA RESEARCH PLANNING AND PRIORITIZATION: BACKGROUND ANALYSIS

By

Isabelita M. Pabuayon

1. Background

With Research, Development and Extension (RDE) as a major provision of the 1997 Agricultural and Fisheries Modernization Act (RA 8435), the Department of Agriculture (DA) through the Bureau of Agricultural Research (BAR) is called upon to develop and implement an efficient and workable system of prioritization of national agricultural RDE programs. As provided for, the agriculture and fishery R&D budget shall be at least 1% of the GVA by year 2001 of which at least 1% shall be allocated in 1999. The allocation shall be 20% basic research and 80% applied research and technology development of which 10% will be for technology packaging and transfer activities (Sec. 83).

The recent study by David et al (1998) highlighted the inadequacy of the present system of allocating research resources, underfunding of agricultural research, misallocation of the limited public sector budgetary resources, and the institutional weaknesses of the agricultural research system. All these have contributed to our inability to maximize the net social benefits of research investments.

Such study focused on research allocation and priorities at a strategic level across commodities and/or broad program areas. The present effort is an extension of such study and is part of a larger research program entitled "Economic Methodology for the Prioritization and Allocation of National Research, Development and Extension Programs for Corn and Other Major Commodities: Objectives, Research Activities, and Budget" which emphasizes research prioritization within each commodity (or across-commodity) program area.

2. Objectives

Specifically, this study addresses the Fruits Program Area research allocation concerns. It provides a background analysis focusing on the fruits industry profile, domestic and export potentials, supply constraints, role of public and private sector R&D, review of past agricultural research, technologies generated by the R&D program, constraints to and consequences of technology adoption, and the strengths and weaknesses in the institutional structure of research and extension linkage. Additionally, it provides suggestions on socio-economics research areas for integration in the overall fruits R&D agenda.

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The list of researches on fruits obtained from DOST and reviewed in this study is certainly not complete but analysis have revealed important trends in fruits research priorities and budgetary allocation. Additional information obtained from PCARRD, UPLB and USM showed similar trends.

3. Industry Profile

3.1 Contributions to Agricultural Production, GVA and Exports

The fruits mainly considered here are banana, pineapple, mango, papaya, citrus, and durian as initially identified by the National Fruits R&D Team. In its statistical publications, BAS classifies banana, pineapple, mango and citrus under "major crops" while all other fruits are grouped under "other crops".

Fruits contribute significantly to the economy in terms of employment, income and foreign exchange generated through the various production, processing and marketing activities in the fruit industry. Estimates of DA indicate at least 10.03 million (M) people dependent on the mango, banana, papaya, pineapple and cashew industries alone. Many of the fruit species are classified as multipurpose tree species that provide important ecological/environmental functions such as biodiversity, soil erosion control and greening effect in both upland and lowland areas.

Table 1 presents the relative importance of fruits in the country's agricultural GVA, production value and volume, harvest area and exports. During the 1993-1997 period, fruits covered 6.59% of the 12.79 M hectares (ha) of total crop area harvested, comprised 14.35% of the 66.79 M metric tons (mt) of total volume of crops produced with a share of 19.90% in the total value of production of P230.81 M, contributed 13.34% to the GVA in agriculture which averaged P172.58 B, and generated 20.36% of the total annual agricultural exports of US\$2.30 B (FOB). Except for export, these shares exhibited upward trends with annual growth rates as follows: production value, 1.23%; production

volume, 2.74%; harvest area, 0.93%, agricultural GVA, 39.62%; and export, -0.80%.

For 1997, banana comprised about 1/3 of the total volume of all fruits harvested (Figure 1). The shares of mango and pineapple in total fruit production were 9% and 15%, respectively, while papaya, citrus and durian altogether had a share of only 2%. All other fruit crops had an aggregate share of 40%.

Likewise, banana topped all other fruit crops in harvest area with 39% of total harvest area for fruits. It was followed by mango with 10% and then by pineapple with 5%. Papaya, citrus and durian also comprised 5% of total fruit crop harvest area while the rest had 41%.

Banana, mango and pineapple are also the major contributors in fruit exports and GVA (Figure 2). Banana led all fruits with 40% and 51% shares in GVA and export value, respectively. Mango was a close 2nd in GVA share with 38% while pineapple came in 3rd with 21%. In export value, pineapple ranked 2nd to banana with 32% share while mango was 3rd with a share of 11%. Other fruits registered quite insignificant GVA and export contributions.

3.1.1 Banana

Banana leads all fruits in production value, volume, harvest area, and agricultural GVA and export. The respective shares relative to all agricultural crops are 5.55%, 5.07%, 2.57%, 6.58% and 10.59%. GVA and export shares comprised about half of all fruits' aggregate contribution. While GVA and production volume shares increased at 5.10% and 1.77% per year, respectively, production value, harvest area and agricultural export shares slightly declined at -0.54%, -0.01% and -2.03% per year, respectively.

3.1.2 Pineapple

Ranking second in production value, volume, and export is pineapple with shares relative to all crops of 4.01%, 2.40% and 6.42%, respectively. However, it ranks third in harvest area (0.31% share) and agricultural GVA contribution (3.82%). Its shares in harvest area and export decreased at -2.56% and -1.58% per year, respectively, while exhibiting positive annual growth in production value (5.77%), volume (2.82%) and GVA contribution (9.86%).

3.1.3 Mango

The third leading fruit crop in production value, volume and export contribution is mango with shares relative to all crops of 3.81%, 1.51% and 2.27%, respectively. It is the second most important crop in terms of harvest area and GVA contribution. While its share in production value slightly decreased, significant growth is observed for its shares in production volume (20.13%), harvest area (10.12%), agricultural GVA (30.43%) and export (4.81%).

3.1.4 Citrus

Compared to the above crops, the contributions of citrus are relatively small. Its shares in crop production value, volume, harvest area, GVA and export are 0.63%, 0.21%, 0.24%, 0.21% and 0.07%, respectively. Moreover, except for export and harvest area, such shares have trended downward with annual growth rates at -10.36% for production value, -2.98% for volume, and -10.69% for GVA. Share in harvest area grew slightly but its export share, albeit small, increased markedly.

3.1.5 Papaya

The shares of papaya in the agricultural sector are even smaller than that of citrus. These are 0.09% in production value, 0.10% in volume, 0.05% in harvest area and 0.02% in export. These shares have not grown or even declined over the 1993-1997 period at -1.30% for value, -3.06% for volume, 0% for area and -28.15% for export.

3.1.6 Durian

Although classified by DOST as export winner, the relative contribution of durian has remained relatively small. Production value comprised only 0.32% of that of all crops while its shares in volume and harvest area are 0.04% and 0.03%, respectively. These shares have also declined over time at -4.48%, -2.01% and -0.91%, respectively. The values for GVA and export are not available.

3.1.7 Other Fruits

In view of the small individual contributions of all other fruits (cashew, jackfruit, melon, strawberries, caimito, guyabano, chico, etc.), they are all grouped under other fruits. Their aggregate shares are 7.04% for production value, 6.44% for volume, 2.81% for area and 1.24% for export. However, their relative importance seems to be increasing over time as shown in the annual growth rates of such shares: 1.33% for value, 2.31% for volume, 0.50% for area and 10.96% for export.

3.2 Domestic Production: National and Regional

Supply and utilization accounts of BAS show that except for mandarin and watermelon where there were recorded imports in 1997 of about 15,351 mt and 52 mt, respectively, supply mainly comes from domestic production. However, supply figures do not take into account processed fruit products which are imported.

National

3.2.1 Harvest Area

As of 1997, the harvest area for all fruits is estimated at 877,420 ha (Table 2). There are year-to-year variations in area but it generally showed an increasing trend with annual growth rate of about 1.18% per year during the 1990-1997 period (see also Appendix Tables 1a through 1c).

Banana which dominates all other fruit crops area and is a consistent major export earner showed a steady growth in area (1.29% per year) reaching its peak in 1997 at 338,300 ha but declined to 337,100 ha in 1998 (Figure 3). Harvest area for mango grew significantly at 7.06% annually with 92,900 ha in 1998, up from only 53,200 ha in 1990. Mango plantations have recently expanded due to increased government support through the DA-KCCDP. Pineapple showed a positive growth in area until 1996 when it reached 45,050 ha but this declined thereafter with only 40,230 ha in 1998 resulting to -4.84% per year decrease over the 1990-1998 period. Areas for citrus, papaya and durian averaged 30,000 ha, 5,330 ha and 3,740 ha, respectively. Moreover, all showed upward trends at 1.10%, 0.88% and 3.84% per year, respectively. Other fruits covered 347,830 ha, on average, with annual growth of 2.13%.

In the case of durian, BAS' data do not reflect the area expansion that occurred during the last 6 years. Pamplona and Oliva (1999) reported that while the estimated durian area was about 5,000 ha in 1992, the accumulated area by 1998 was about 19,214 ha, indicative of additional plantings of more than 14,000 ha during the 1993-1998 period.

The breakdown for other fruits is not available, except for a few crop-specific studies providing some information which are not updated. For example, it was reported that cashew production which is concentrated in Palawan and Guimaras provinces cover about 22,000 ha and 758 ha, respectively, about half of which are considered area harvested (Bryant 1994). In 1996, total area reported for cashew, jackfruit and rambutan was 30,316 ha, 9,068 ha and 1,126 ha, respectively (Roperos 1998).

3.2.2 Yield

Overall fruit productivity improved from 10.52 mt/ha in 1990 to 12.60 mt/ha in 1997 reflecting annual growth of 2.80%. Yield levels for banana, pineapple and mango are highest in 1997 at 11.11 mt/ha, 40.55 mt/ha and 11.19 mt/ha, respectively, and improvements were achieved in all of them being largest for pineapple at 13% per year (Figure 4). Adverse weather conditions in 1998 resulted to yield reductions for these major fruits from previous year's level. On the other hand, yields of citrus, papaya and durian declined at -1.54%, -0.70% and -2.18% per year, respectively. Yield of other fruits grew at 2.12% per year.

3.2.3 Volume and Value of Production

Except for papaya, the highest production volume was registered in 1997, that is, 3.76 M mt for banana, 1.03 M mt for mango, 1.64 M mt for pineapple, 142,800 mt for citrus, 28,800 mt for durian, 65,410 mt for papaya, 4.40 M mt for other fruits and 11.06 M mt for all fruits combined. Generally, production volume for banana, mango and pineapple showed upward trends during the 1990-1997 period (Figure 5). There was a decline in 1998 due to adverse weather conditions. For papaya, lower production in recent years is attributed to papaya ring spot virus (PRSV) infestation in Luzon and some areas being shifted to either other crops or industrial estates (Lantican *et al* 1996).

Production volume increased for all fruits during the period except for citrus, the highest annual growth rate being for mango, pineapple and other fruits at 8.27%, 5.16% and 4.52%, respectively. The increase for papaya is very minimal. For most fruit crops, such improvement in production is due to area expansion as growth in area generally exceeds that of yield. The exception is for pineapple, other fruits, and fruits as a whole. As noted above, reduction in pineapple area occurred in the last two years.

Production value grew over time due to volume and nominal price increases. The largest growth rates are for durian, pineapple, banana and mango.

Regional

3.2.4 Harvest Area

The top five regions in harvest area covered from 59.76% (banana) to 96.05% (mandarin) of their respective total area indicating that banana is the most widely grown all over the country and mandarin the least (Table 3). For banana, Southern Tagalog ranks first with 16% share with large plantings located in Quezon, Batangas and Oriental Mindoro provinces. Luzon areas are mostly planted with Saba, lakatan and latundan varieties although these are also grown in many parts of the country including Mindanao. In Mindanao, the biggest areas are in Davao del Norte and Agusan del Sur and del Norte provinces. For exportable Cavendish banana, the largest plantations are those of Tagum Agric. Devt. Co., Stanfilco Small Growers, Davao Fruits, Inc. and Marsman Estate Plantations which in 1990 altogether had planted about 62% of the total area of 24,260 ha authorized under LOIs 58 and 790 (ASAP Policy Team n.d.).

Pineapple area is also greatly concentrated (92.83%) particularly in N. and S. Mindanao, primarily in Bukidnon and South Cotabato provinces which comprise the main sources of pineapple for export and processing of the multinational corporations such as DMPI, Dole Philippines and Crown Packing. However, pineapple areas in these regions are smaller now (27,044 ha)

compared to the 32,400 ha average in 1994-1995. On the other hand, area expansion occurred in Cagayan Valley, Bicol and Western Visayas.

In Luzon, the largest mango areas are in Pangasinan, Batangas, Nueva Ecija, Zambales, and Bulacan. In the Visayas, these are Guimaras, Negros Occidental, Iloilo, and Cebu and in Mindanao, Davao del Sur and Agusan del Norte. Among the top five regions, expansion in mango harvest area is largest in Cagayan Valley, from 1,594 ha in 1990 to 9,652 ha in 1998 or 505% increase (Appendix Tables 2a and 3a). The corresponding figures are 148% for Central Luzon, 127% for Southern Tagalog, 61% for Ilocos and 23% for Western Visayas. However, Ilocos has maintained the largest mango area over the years comprising 20% of the total in 1998.

In 1998, the largest harvest area for papaya are in Western Visayas, Central Luzon, Cagayan Valley, Southern Tagalog and Southern Mindanao whose overall share is 63.54% of total papaya area. Between 1990 and 1998, Central Luzon, Western Visayas and Southern Tagalog experienced decline in papaya area in contrast to Cagayan Valley and Southern Mindanao which registered significant growth of 262.13% and 53.06%, respectively, during this period. PRSV infestation and conversion of agricultural areas to industrial sites have contributed to the decline in papaya area in Central Luzon and Southern Tagalog.

Durian is mainly cultivated in Mindanao, particularly in Southern Mindanao, CARAGA and ARMM. Durian production has recently expanded from Davao City and vicinity to the provinces of Cotabato, Maguindanao, Sultan Kudarat, Lanao del Sur, Lanao del Norte and Sulu (Pamplona and Oliva 1999). For citrus, the leading regions are mostly in Luzon and Mindanao. Southern Tagalog has 46.29%, 32.02% and 22.41% of total area for calamansi, mandarin and orange, respectively. For pomelo, the largest area is in Central Mindanao with 39.41%. For lemon and lime, these are Bicol (24.78%) and Cagayan Valley (74.56%), respectively.

3.2.5 Yield

Banana yields are highest for C. Mindanao and S. Mindanao at 38.42 mt/ha and 35.10 mt/ha, respectively, where climate is favorable, land is fertile and commercial farms apply the latest banana production technologies. These are close to 40 mt/ha which can be realized in banana plantations using a high yielding cultivar and provided with adequate cultural management program (PCARRD 1992). The average yield for the top five regions is 26.11 mt/ha and 11.11 mt/ha for the country. Other regions had lower yields, even as low as 2.30 mt/ha for Bicol.

For pineapple, the yields of N. Mindanao (53.97 mt/ha) and S. Mindanao (53.64 mt/ha) where commercial farms also abound are markedly higher than for other regions which range from 2.80 mt/ha for C. Mindanao to 21.54 mt/ha for

CARAGA. N. and S. Mindanao have thus exceeded the experimental yield of 42 mt/ha reported by Librero (1996) as cited by Dar (1997). The national yield level of 40.52 mt/ha has also moved closer to this experimental yield level.

The highest yielders for mango are Cagayan Valley (23.81 mt/ha) and W. Mindanao (23.77 mt/ha). Again, producers in these regions have exceeded the experimental yield of 21 mt/ha reported by Librero (1996). Ilocos producers yield 15.82 mt/ha with Bicol having the lowest yield at 1.40 mt/ha.

CARAGA durian farms are the most productive at 21.76 mt/ha. Yields of other Mindanao farms vary from 1.21 mt/ha in ARMM to 4.22 mt/ha in W. Mindanao. For papaya, productivity is also highest in Mindanao, 31.80 mt/ha for W. Mindanao, 30.20 mt/ha for ARMM and 22.20 mt/ha for S. Mindanao. In Luzon, the highest yielders are Ilocos (20.70 mt/ha) and S. Tagalog (15.30 mt/ha). However, these are all way below the reported experimental yield of 60 mt/ha.

Cagayan Valley is consistently one among the top five regions in yields for all types of citrus, being the leader for calamansi, pomelo and lime (Appendix Table 3b). Its yield for calamansi is 38.88 mt/ha and for pomelo, 31.84 mt/ha, which are much higher than the country's average of 9.46 mt/ha and 11.14 mt/ha, respectively.

3.2.6 Production Volume

The five leading regions in production contribute significantly to total output with share ranging from 71.64% for papaya to 99.65% for durian which are all recorded for Mindanao. Except for S. Mindanao where Cavendish comprised more than $\frac{3}{4}$ of the regional production and 98% of the country's Cavendish production in 1998, Saba is the primary variety produced. Other exceptions are CAR and Ilocos where the leading variety is bungulan and latundan, respectively (Table 4a). S. Mindanao's share for banana is 44.95% and 36.87% for pineapple. The largest producer of pineapple is N. Mindanao with share of 53%. Ilocos and Cagayan Valley which are the leading mango producers have a combined share of 51.12%. The largest producing provinces are Pangasinan, Isabela and Batangas. The Carabao variety comprised $\frac{3}{4}$ of total mango output although in ARMM and Cagayan Valley, other varieties are produced in greater quantity (Table 4b).

For citrus, the top-producing region is S. Tagalog for calamansi (43.90%), orange (40.16%) and mandarin (26.68%), Cagayan Valley for pomelo (56.65%) and lime (88.82%) and Bicol for lemon (26.56%).

3.3 Domestic Consumption

Two consumption figures are available. One is based on the supply and utilization accounts of BAS using the disappearance method which are updated

annually and the other is based on the Food and Nutrition Research Institute (FNRI) consumption surveys which have been conducted in 1978, 1982, 1987 and 1993.

By deducting exports, seed use, feed and waste and processing from total supply (which includes domestic production and imports), the balance is net food disposable which is the basis for estimating per capita consumption. For 1997, net food disposable volume comprised 45.53% of total supply of banana, 87.68% of mango and 45.56% of pineapple. Estimates for 1994-1997 show that, except for mangosteen and watermelon, per capita consumption of the various fruit items has shown a generally increasing trend. Per capita consumption is 123.18 grams/day in 1997 compared to 110.18 grams/day in 1994. Almost 82% of the 1997 level is for the major items such as banana (59.12 grams/day), mango (22.49 grams/day) and pineapple (28.46 grams/day). Although consumed in relatively smaller amounts, pomelo and mandarin reflected higher growth rates in per capita consumption.

Aside from direct food consumption, the major uses of fruits are for processing and feed and waste. Processing use is quite significant for banana and pineapple, about 16.5% and 40.10% of total supply, respectively, in 1997. Export in fresh form was 34% for banana, 8.87% for pineapple and 6.72% for mango.

The 1993 FNRI estimates are lower at 77 grams/day (raw as purchased) which is 9.6% of total food consumption (Table 5). Moreover, per capita fruit consumption has declined by 28% since 1978. Much of the decline is for "other fruits" (young coconut, watermelon, pineapple, caimito, jackfruit, melon, etc.) rather than for mango and papaya which are the more heavily consumed fruit items. There are no other available FNRI figures for comparison with the annual estimates of BAS until 1997.

Generally, fruit consumption is positively related to income level, education of meal planner and degree of urbanization. It is negatively related to household size. This implies expanding demand for fruits with improvement in economic condition and education as well as increasing urban population. It is also a well-known fact that fruits are considered healthy foods and are consumed more heavily by health- and diet-conscious individuals. Under favorable conditions of the above factors, fruit consumption is expected to grow considering that the 1993 FNRI estimates are below the recommended amount of 115 grams/day. Fruit consumption must be increased by 33% more or 38 grams/day (29 grams for Vitamin C-rich fruits and 9 grams for other fruits) in order for Filipinos to meet the recommended daily requirement.

Availability and affordability are major determinants of fruit consumption. The leading regions in per capita consumption are Central Luzon, NCR, S. Tagalog, Ilocos and Western Visayas (Table 6). Except for NCR, these are also the major producers of mango, the most heavily consumed fruit. NCR

consumers, aside from having higher income, benefit from large supplies coming from various sources. Papaya consumption is also relatively higher in S. Tagalog and S. Mindanao which comprise two of the leading papaya producing regions. Among “other fruits”, banana is the major fruit consumed. Banana consumption is highest in C. and S. Mindanao and ARMM which produce large amounts of bananas. Bicol and Eastern Visayas which are relatively poor regions also exhibit high banana consumption which points to the importance of banana especially the Saba variety (cooking banana) in the diet of low-income households. Considering all other fruits, per capita consumption is highest in S. Tagalog at 87 grams/day, followed by C. Mindanao at 77 grams/day which are both large producers of many kinds of fruits.

3.4 External Trade

Banana, pineapple and mango are the major fruits traditionally exported by the Philippines. Banana and pineapple (in syrup) are consistent top dollar earners being 3rd and 4th in the ten principal agricultural exports. Banana ranks 19th among the country’s top 20 exports which are dominated by non-agricultural items. Fruits are exported in both fresh and processed forms. Likewise, the country imports fruits especially the non-tropical ones. During the period 1994-1998, exports have exceeded imports with trade balance rising from US\$375.89 M in 1994 to US\$416.69 M in 1998 (Tables 7a and 7b). Export value grew by 1.45% per year, import value by 0.84% per year. However, there is a reduction in export volume and value between 1997 and 1998 which stemmed from the combined effects of the Asian financial crisis that affected the purchasing power of importers and decline in domestic production of major fruits such as banana (-5.58%), mango (-7.59%) and pineapple (-8.77%).

Export value of banana increased steadily during the 1994-1996 period but showed a downward trend thereafter (Figure 7). Similarly, export value of pineapple in 1997 and 1998 was lower than in 1996. In the case of mango, export value was highest in 1995 with lower values during the 1996-1998 period.

3.4.1 Volume and Value of Exports

Tables 7a and 7b summarize the quantity and value of exports by type of fruit exported. Banana ranks 1st (with 51.82% value share) followed by pineapple (31.73%), and then by mango (10.79%) (Figure 6). Papaya, citrus, jackfruit, and guyabano each has less than 1% share while those under “others” comprised 5.09% of value of fruit exports.

Banana. Banana is exported primarily as fresh and chips/crackers. The fresh form comprises more than 90% of export (Tables 8a and 8b and Figure 8) amounting to 1.15 M mt and valued at US\$217.04 M in 1998. However, although export of chips/crackers is considerably smaller at 16,957 mt valued at US\$18.76 M, export demand for it registered a modest annual growth rate of

5.63% and 2.82%, in value and volume, respectively, during the 1994-1998 period. Comparatively, export volume of fresh bananas declined by -0.03% while value grew only by a mere 0.36%.

Other products being exported but in minimal amounts are banana sauce exports amounting to 1,244 mt valued at US\$1.15 M in 1997, banana blossoms with 0.8 mt and US\$3,800 in 1996 the highest being 4.5 mt and US\$15,000 in 1990, and banana flour with 67 mt and US\$85,000 in 1986 declining to 8.3 mt and US\$17,700 in 1996 (Landasan 1999). Export of these products has been quite erratic through the years.

Pineapple. The country exports many forms of pineapple, with 6 categories listed (Tables 9a and 9b). They are ranked as follows: pineapple in various preparations (54%), juices (27%) and fresh (19%) (Figure 8). Total pineapple export was valued at US\$148.66 M in 1998. Among the various forms, only nata de pina and juice concentrates registered positive growth in export volume, the biggest annual decline being for dried (-11.61%) and fresh (-7.31%).

Mango. Eight categories/forms of mangoes are being exported by the Philippines (Tables 10a and 10b). In 1998, export shipments were worth US\$51.35 M. Fresh mango is the dominant form exported (82% of value) (Figure 9). Others have much smaller shares and show declining (for puree) or very erratic trends.

Unlike banana and pineapple, mango export value exhibited high annual growth rate at 7.14% (overall) and 10.82% for fresh form during the 1994-1998 period. Among the various forms, only mango puree showed a downward trend in export (-12.49%/year).

Papaya. Fresh and dried papayas have almost equal shares in export value during the 1994-1998 period. However, export shipments of fresh papayas have gone down abruptly from 3,426 mt in 1994 to only 60 mt in 1998 with value declining from US\$839,000 to US\$85,000 over the same period (Tables 11a and 11b). Thus the export value share of fresh papayas was only 25% in 1998 (Figure 10). For both forms, export value dropped from US\$1.393 M in 1994 to only US\$338,000 in 1998. As noted above, domestic production of papaya has not improved through the years while aggregate demand is rising due mainly to population growth.

Citrus. Export of citrus comes in numerous forms but the most important ones are the juices including calamansi juices which contributed more than 20% to total citrus export during the 1994-1998 period (Tables 12a and 12b and Figure 10). Export of calamansi in fresh and dried forms is quite small but showing steady growth while export of calamansi juices has increased by 27% between 1994 and 1998. In general, however, export of citrus products has been quite variable through the years and was valued at only US\$152,535 in 1998.

Others. The country exports many other fruits (fresh and processed) but in small individual amounts. These include jackfruit, guyabano, lanzones, santol, melon, watermelon, avocado, mangosteen, chico, guava, tamarind, grapes and others. Mixtures of fruits/other edible plant parts (prepared/preserved) comprised more than half of total value. Total export was worth US\$26.88 M in 1998 (which includes cashew and pili nuts) (Tables 13a and 13b) and this has been rising through the years. Export of cashew nuts was valued at US\$1.43 M in 1998 and much higher than in the previous years. Export of pili nuts is very minimal. Jackfruit export was worth US\$0.50 M in 1998 and was highest in 1996 at US\$0.84 M. Export of guyabano was increasing until 1997 with value of US\$0.88 M but declined to US\$0.64 M in 1998. In general, export of individual fruit items showed large fluctuations through the years which reflects the lack of established markets and year-to-year variations in domestic production.

3.4.2 Export Markets

Philippine fruits are exported to many countries in Asia, Middle East, North America and Europe. Export markets are most diversified for pineapple products ranging from 8 countries for fresh form to 55 for preserved pineapples (Table 14). This is because of the wide marketing networks of major exporters such as Del Monte and Dole. Mango has up to 29 (for dried) country destinations while banana has 20 (for fresh). Although exported in much smaller volumes, jackfruit also has large market coverage of more than 30 countries (Table 15).

Over the years, new markets have emerged while some markets were lost. For example, in the case of fresh banana, Belgium, Costa Rica and Netherlands were included in 1996 but not in 1997 and 1998 (Appendix Tables 4a and 4b). However, 5 additional markets which included Australia, Canada, Germany, UK and USA emerged in 1998 although their respective imports were still quite small. Similar trends are observed for the other fruit exports. Nevertheless, the country is able to maintain many of its long time trading partners although their shares may have declined through the years as a result of the entry of other markets.

Table 14 also reflects the changes in the number of markets for the major fruit exports between 1994 and 1998. Generally, markets are more diversified in 1998 than in 1994 for mango, fresh banana, and pineapple juice concentrates. For other fruits, markets have become less diversified or have remained the same. Moreover, the shares of the top 5 markets have either increased, decreased or stayed constant but has remained large varying from 63.72% for banana chips/crackers to 100% for mango juice concentrates, mango (cooked and uncooked) and fresh papaya. The declining shares of the top 5 markets indicates the growing importance of the other export markets which is true for banana chips/crackers, dried pineapple and juice concentrates, and mango puree. For some products wherein shares of the top 5 markets have increased, the number of markets has also declined or remained constant. This is the case

for pineapple juice other than concentrates, preserved pineapples and mango juices.

Banana. The top 5 markets for fresh banana are Japan, China, UAE, Taiwan and Korea. Although Japan has remained the largest market for Philippine banana, its import from the Philippines has declined in both absolute and relative terms both in quantity and value (Appendix Tables 4a and 4b). Obviously, the number of countries exporting to Japan is increasing and these include other Asian countries like Indonesia, Malaysia, Thailand and Vietnam (although in small quantities) and Latin American countries like Ecuador, Honduras, Costa Rica and Panama. Similarly, imports of Korea, Saudi Arabia and Hong Kong are declining but this situation is offset by increasing shares of China and Taiwan which totaled 22.60% in 1998 compared to only 1.43% in 1994. As noted earlier, developed countries like the USA, Australia, Canada, Germany and UK have already opened up their markets to Philippine bananas.

For banana chips/crackers, the USA remains a stable market but Hong Kong has decreased its import from the Philippines (Appendix Tables 5a and 5b). Taiwan has emerged as a major market in 1998.

Pineapple. Japan is the major market for Philippine fresh pineapple with more than $\frac{3}{4}$ of total export followed by Korea with 13% (Appendix Tables 6a and 6b). Unlike for banana, Japan's share for pineapple has been rising. However, Korea's share is showing a slightly downward trend.

Being the home of multinational pineapple corporations, the USA continues to be the leading destination of preserved pineapples (61.52%) and juice concentrates (53.44%), juice other than concentrates (85.37%) and nata de pina (50.51%). Despite annual variability in volume and value, many markets of these processed products continue to register trade records with the Philippines indicative of its ability to maintain such markets (Appendix Tables 7a through 11b).

Mango. Hong Kong and Japan purchase more than 90% of the country's fresh mangoes (Appendix Tables 12a and 12b). While Hong Kong continues to be a strong market for Philippine mangoes with imports comprising 47.63% of export value in 1994 and 65.78% in 1998, Japan is becoming a relatively less important market as its import dropped from 49.88% to 33.17% during the same period despite the country's adherence to its requirement for vapor heat treatment (VHT) to ensure fruitfly-free mangoes. Such decline is due to increasing competition from Thailand and Taiwan which are now exporting vapor heat-treated mangoes to Japan, clearing of Kensington mangoes from Australia for export to Japan in 1994 as long as VHT is undertaken, and entry of price competitive Mexican-grown Manila mango to the Japanese market (Lizada 1995). On the other hand, Hong Kong's expanding import is attributed to the fact that it re-exports part of this to mainland China which is a growing market with much improved purchasing power in recent years. Singapore's export has

fluctuated much through the years. Two developed countries, namely, UK and Switzerland, are showing upward trends in their mango imports. Also, USA has started buying mangoes from the Philippines in 1997.

Hong Kong, USA and Singapore are the top markets for Philippine dried mangoes. The shares of Hong Kong and Singapore have declined in recent years while that of USA has improved (Appendix Tables 13a and 13b). Other developed countries like Canada, Australia, Germany, Netherlands, UK and Japan are also consistent buyers although in relatively smaller volumes.

The major markets for mango puree are the Netherlands, USA, Hong Kong, New Zealand and Japan (Appendix Tables 14a and 14b). Netherlands is a new market but its 1998 purchase has surpassed all others. Most of these markets have shown highly fluctuating imports of mango puree and as shown above, export of puree has trended downward. Likewise, buyers' purchases of other products such as juices and mangoes preserved in other forms also show great annual variability through time (Appendix Tables 15a through 19b).

Others. The leading importers of Philippine papayas are Hong Kong, Japan, Australia and USA but their imports as well as of other buyers have not been sustained partly due to limited domestic production (Appendix Tables 20a through 21b). For other fruits, the buyers are generally the same as those of the major export commodities (Appendix Tables 22a through 24b). Among these minor export fruit commodities, preserved jackfruit, soursop puree, orange juice other than concentrates, calamansi and other juices registered the largest number of export markets.

3.4.3 Volume and Value of Imports

Imported fruits are in fresh, dried and preserved forms as well as fruit juices comprising 65%, 8%, 13% and 14% of total import value, respectively, in 1998 (Tables 7a and 7b and Figure 6). Imported fruits are worth US\$59.31 M in 1998 and import value has increased at the rate of 1.95% per year during the 1994-1998 period. However, due to foreign exchange problems, import value for most fruit forms was lower in 1998 than in the previous years (Figure 7). Most of the imported fruits are those not produced domestically or produced in insufficient amounts (Tables 16 through 19). Some other locally produced fruits are also imported but in very small volumes for special purposes or due to much better quality.

3.5 World Production and Trade

Among the fruit crops listed by FAO, banana ranks 1st in terms of production, followed by mango, pineapple, citrus and papaya in that order (Table 20). The volumes are 57.69 M mt, 22.86 M mt and 12.50 M mt, for banana, mango and pineapple, respectively. Except for papaya wherein production

declined at -0.66% per year during the 1995-1997 period, all showed positive growth rate, the highest being for mango.

India is the largest producer of mango and banana turning out 51.22% and 16.85% of world production, respectively (Table 21). The Philippines ranks 5th in the production of banana contributing 5.93%, 3rd in pineapple with 11.35%, and 8th in mango with 2.05% (FAO 1997). Its shares in papaya and citrus production are very small.

Fruits trade is also dominated by banana and pineapple (Tables 22a and 22b). Total export and import values are US\$4.59 B and US\$6.83 B, respectively, and trade of all fruits is growing with annual growth rates of export value ranging from 7.00% for citrus to 15.17% for fresh pineapple. In terms of volume, canned pineapple registered a negative annual growth rate of -4.51% but its value nevertheless increased reflecting price improvement over the years. Decline in export of canned pineapple is related to the relatively slow growth of pineapple production compared to mango and banana.

The largest fruit exporters are Ecuador for banana, Costa Rica and Cote Divoire for fresh pineapple, Thailand for canned pineapple, and USA for citrus (Table 23). The Philippines ranks 2nd in the export of canned pineapple, 3rd in fresh pineapple and 4th in banana. For canned pineapple, the Philippines' competitors are Thailand which supplies more than 1/3 of total world export, Indonesia whose share is just half that of the Philippines, and Malaysia whose share is relatively small.

The major fruit importers are the developed countries, mainly USA, Belgium-Luxembourg, Germany, France, Japan, Netherlands, Italy and UK (Table 24). The Philippines exports fruits to all these countries. Belgium-Luxembourg, the Netherlands and France re-exports some of their imports since they are also included among the top world exporters.

3.6 Market Potentials and Strengths of the Fruits Industry

Fruits in general have good market potentials both in domestic and export markets. They have positive income elasticities indicative of demand expansion with improving purchasing power of consumers. Estimates of income elasticities based on the weighted income of importing countries for Philippine fruit exports are as follows: fresh bananas, 0.81; processed banana, 5.04; fresh mango, 0.16; fresh pineapple, 1.37 and processed pineapple, 0.60 (Macabasco 1994). Other estimates are 0.40 for fresh banana (Landasan 1999) and 3.1 for fruits and vegetables based on EU import demand (Alburo 1993 as cited by Lizada 1995). In the domestic market, per capita fruit consumption is increasing as reported by BAS and it is positively related to income, education of the planner, and degree of urbanization based on FNRI surveys. Thus per capita consumption was increasing until the recent Asian financial crisis and decline in production due to adverse weather conditions. Fruits are also considered healthy foods and are

strongly preferred together with vegetables by health- and diet-conscious individuals to high-calorie foods.

In the Philippines, fruits like mango, papaya, banana, pineapple and others are consumed in large quantities as they become more affordable and available particularly during summer months when supplies are relatively abundant and prices are lower. They are eaten as dessert or snack food items. Saba banana is prepared or cooked as snack items but in the rural areas it could substitute as staple food among the poor households who grow banana in their farms or backyard or even buy it cheaply from local farmers and retailers. FNRI surveys show high per capita consumption in regions where income and/or local production is high.

The world market shows expanding production and trade. Imports and exports are rising and developed countries in Asia, the Middle East, North America and Europe continue to maintain high levels of fruit import. In particular, it has been reported that the tropical juice market in the USA which is a major market for fruits is presently favorable with bright prospects in the future (Market Asia Jan./Feb. 1997). It is growing at about 20% annually and includes juices prepared from pineapple, banana, mango, papaya and guava.

The Philippines is one of the major players in the world market for banana, mango and pineapple. However, the changing competitiveness across countries and annual variations in domestic production arising mainly from weather fluctuations bring about changes in the country's export shares for the various fruit commodities. For banana, its export hardly increased during the 1994-1998 period and imports of its major market (Japan) has declined in both absolute and relative terms. Nevertheless, new markets are emerging such as USA, Australia, Canada, Germany and UK as well as Taiwan for banana chips/crackers. Concerted effort is needed to expand export to these new markets. Banana chips/crackers which are produced from the Saba and Cardaba varieties also offer bright opportunities as export has steadily increased and markets have been maintained through the years. For pineapple, the fresh market also remains strong although the country has not been able to take advantage of this favorable situation as its export volume registered negative growth. This may point to the expanding domestic market vis-à-vis the inability to expand plantings.

Markets for Philippine pineapple remain stable with Japan's import rising and USA continuing to be the leading destination of processed pineapple. Mango exports have steadily improved with all forms except puree showing upward trends. This favorable situation is also brought about by the fact that mango plantings have expanded and productivity has improved. The situation for puree is not too alarming since it comprises only 8.69% of total mango export and much of the decline occurred only between 1997 and 1998. In general, yield levels have risen markedly in recent years especially for major producing regions of banana, pineapple and mango which are the main sources of exportable fresh fruits and raw materials for processed fruits.

For other minor export fruit commodities, their potentials must be considered in more detailed market studies. Studies conducted through the Agribusiness Sector Assistance Program (ASAP) funded by USAID in the early 1990s pointed to the fact that there are market opportunities that can be explored for durian, cashew and mangosteen. Roperos (1998) classified durian, cashew, pili and jackfruit as promising fruit crops that can move into the major fruit category in time based on some criteria like diverse uses, high nutritional value, possible domestic and export markets, and potential for primary and secondary processing. However, he noted that the real possibilities for exploiting these crops have yet to be fully tapped. Moreover, RDE for these are much behind other countries and the major fruit crops and much more investments relative to their economic contributions will be needed to catch up with competitor countries.

In general, the strengths of the industry for its major fruit crops lie in the following areas (Lizada 1995, Golez 1999, Lantican 1996 and Pamplona 1999): (1) the country's favorable climatic conditions well suited for fruit growing all year-round; (2) availability of cultivars highly acceptable in the domestic and world market (Cavendish banana for export, Saba and Cardaba for processing, lakatan, bungulan, latundan, and senorita for fresh consumption; Carabao mango and piko for the export and domestic markets; Queen and smooth Cayenne for pineapple); (3) upward trends in domestic consumption brought about by increasing income and health consciousness of people; (4) proximity to large markets in Asia like Japan, Korea, Taiwan and HongKong; (5) marketing linkages with other countries of the world established through various multinational corporations operating in the Philippines; (6) availability of state-of-the-art production and post-production technologies and highly integrated operations for commercial farms which comprise the major players in the export market; (7) availability of farm labor, skilled technicians and technical experts; (8) strong private sector participation through the various grower and trade associations; and (9) renewed support of the public sector through various programs (e.g. KCCDP/Makamasa) and legislations (Export Development Act, High Value Crops Act, AFMA). As world markets open up with the full implementation of the GATT-WTO provisions, the industry should be able to take advantage of new opportunities by capitalizing on the above strengths and addressing the various problems and constraints affecting the different industry sectors.

3.7 Constraints/Problems Affecting the Industry

Although fruits in general have large market potential and there are opportunities which can be explored, the industry is beset by many problems and constraints. These are classified under production, postharvest, processing and utilization, and marketing. They are technological and socio-economic in nature. There are problems that are common to fruits as a whole and even to other non-fruit crops and those which affect specific commodities. Some problems have persisted for a long time and continue to affect the industry while others may

have already been addressed to a certain extent through R&D and extension and/or other forms of government intervention.

Table 25 provides a listing of problems affecting the fruit industry. In general, those which are most adversely affected are the small farmers who are resource-poor and therefore have limited production, processing and marketing options. They have little access to credit, technologies, market information and facilities and have limited participation in value-adding activities for their products much less in export marketing. Failure to adopt technologies due to various reasons has resulted to low farm productivity that limits marketable surplus. They are often dependent on middlemen for marketing their produce who also provide financing for production operations and even to meet their other credit needs. Poor techniques often characterize postharvest and marketing operations exacerbated by inadequacies in postharvest equipment, packaging materials, market infrastructure and information. Postharvest losses are therefore high and marketing bottlenecks prevent the efficient flow of products from producers to end-users/consumers. Such inefficiencies cause distortions in market prices and affect the incentive structure which limits adoption of technologies even if these are available. Commercial/plantation farms especially for banana, pineapple and mango are in a more favorable situation; have access to technologies; are able to adopt integrated production, processing and marketing operations; have higher farm productivity; and are into the export business. However, the large proportion of the output comes from small farms.

There are technology-related problems that need to be addressed by R&D and/or extension (E). For mango, these relate to the need for varietal improvement for the existing variety as to the tree structure, flowering regularity, resistance to insects and diseases, eating quality and shelf life; evaluation of method and distance of plantings; better understanding of flushing and flowering mechanisms, and cultural practices such as fertilization, irrigation, pest control, pruning and cropping systems. On postharvest, the main problems relate to limited adoption of technologies already developed (controlled atmosphere system, proper packaging and postharvest treatments) including the non-implementation of existing national standards for quality control. Inadequate pest control, inability to use appropriate packaging materials, harvesting of immature fruits, poor handling through the various stages of product marketing and distribution and heavy rains during critical periods result to low quality of fruits. The rising cost of production, packaging materials and transport as well as the inadequate market infrastructure are common problems reported by producers. On the other hand, processors complain of the lack of consistent supply of quality raw materials. Also, technologies for processing of dried mango are not well disseminated and commercialization of instant mango powder despite its apparent potential has not taken place. Moreover, there is no uniform application of quality control measures for dried mango among exporters and there is need to refine the identified critical parameters for quality control. The limited technology adoption is partly due to failure of the extension system to successfully bring matured technologies to intended users particularly the small

producers. In addition, financing and credit support is inadequate, the marketing system is defective, and promotion and expansion of potential markets is limited (Roperos 1998).

Production and postproduction technologies and management systems especially for export bananas are well developed and widely adopted by plantation owners including their contract growers. Small producers, however, have problems on bunchy top disease and “bugtok” disease (for Saba) as well as determination of appropriate harvest period resulting to immature fruits being harvested and thus poor quality. There is no sufficient supply of pest-free planting materials although these may be available to commercial farms which have tissue culture laboratories. Harvested fruits are improperly handled with the practice of maximizing use of space in containers and transport vehicles without regard to damages and losses incurred. While banana chips/crackers appear to have good potential in the export market, the industry is much constrained by the limited supply of raw materials, lack of quality assurance as there is no established set of national standards for banana chips, and limited dissemination of production and handling technologies. In marketing and distribution, the usual handling problems and lack of infrastructure apply resulting to high costs of trading. This situation increases trading risks often to the disadvantage of farmers as traders would buy at lower prices to the extent possible. There is also no standard in selling bananas in many areas, usually by bunch or number of fingers instead of weight basis. Although cooperatives or producer groups have potential in improving the bargaining power of farmers, their slow development constrains them from being able to address many of their problems relating to technology adoption, pricing and marketing. In the export market, local producers and exporters have to contend with the stiff competition among Asian and non-Asian participants in world trade. Obviously, they have to compete in terms of price, quality, volume, delivery and service requirements of buyers. The provision of basic infrastructure (roads, bridges, postharvest and port facilities) and support services would go a long way toward helping the export sector achieve a competitive edge in these areas (Sebastian 1998).

For pineapple, the problems also mostly apply to small producers, traders and processors. Farmers catering to the requirements of multinational corporations engaged in agribusiness operations for supplying products to both domestic and international markets are able to adopt state-of-the-art technologies. Those producing and trading products solely for local consumption face the usual problems of lack of adequate capital to modernize their operations, absence of standards and quality control, poor handling, high trading costs, and limited promotional efforts. Their products are less able to compete with those of multinationals whose marketing networks are well in place. At the farm level, inability to adopt technologies is reflected in low yields which could be as low as 2.80 mt/ha and 3.53 mt/ha in two regions compared to the potential of 40 mt/ha in well managed plantation farms. During bumper harvests, farmers have no other option but to sell at very low prices, otherwise, they would suffer heavy losses due to the perishable nature of the product. At the national level,

plantings have not expanded and while export of fresh pineapple increased, that of canned pineapple declined following the trend in world export. During the last two years, import of USA, the major importer, dropped from previous year's level.

Philippine papaya which has made inroads in the world market suffers mainly from low supply. Present hectareage (5,500 ha) is lower than in the 1980s (7,170 ha in 1982). Papaya farms in Luzon are adversely affected by PRSV and some have been shifted to other uses. Specific RDE-related problems concern the lack of certified seeds, unreliable determination of harvest maturity, incidence of deformed fruits during summer months, limited cultivars for orchard establishment, variable planting distances, adoption of blanket recommendations on fertilization, less optimum pre-harvest disease control, and poor quality of fruits. Perennial problems in marketing such as lack of standards, use of inappropriate packaging materials, rough handling, and high cost of trading cause inefficiencies in the distribution system. Plantings of the *Sinta* variety which is moderately resistant to PRSV need to be expanded but the lack of planting materials and information on the required cultural management practices must be addressed.

Other fruits are similarly affected by the above problems. Citrus farms, except the well managed orchards in Mindanao which benefit from modern and intensive production technology, generally exhibit low yields. Without adequate crop protection, crops could easily be damaged by insect pests and a number of bacterial, fungal, virus and virus-like citrus diseases. In marketing, poor handling and packaging practices cause product losses and reduce value to consumers. The citrus industry is also constrained by inadequate postharvest technologies particularly packaging, shortage of disease-free planting materials, lack of market information and promotion, and absence of effective producer groups (Roperos 1998).

Among durian producers in North Cotabato and Davao, the major problems are low production, inadequate infrastructure and transport facilities, and limited financing vis-à-vis high cost of inputs (Callao 1997). The presence of fruit borers was also reported (Boron and Forteza 1997 and Velasco and Guiamal 1997). Another study among fruit producers in S. Mindanao highlighted the following problems: unavailability of capital, planting materials and inputs like fertilizer and chemicals; prevalence of pests and diseases; limited sources of technical information about growing crops; and price fluctuations (Mate 1990).

Based on the study of cashew production and processing in Palawan and Guimaras, the main problems are as follows (Bryant 1994): prevailing lack of interest, direction and focus; absence of productive commercially-managed estates to provide a nucleus; limits on area expansion under the CARP; lack of information dissemination and technology transfer/inadequate extension service; cashew research not being considered a priority; fragmented production areas; specific agronomic problems such as ineffective pest and disease control, too high planting densities, poor tree and ground cover maintenance, limited quality

planting material and high cost of inputs; and nil commercial processing of raw nuts. These problems are illustrative of other commodities wherein RDE is even more neglected.

In the formulation of the Regional R&D/E Agenda conducted in March-April 1999 in Mindanao, similar constraints were reported for the various fruit crops including mango, durian, banana, mangosteen, citrus, lanzones, rambutan, jackfruit, native guava, papaya, strawberry, and fancy natal plum. The reported constraints relate to “zoning, low yields and poor quality, limited technologies and postharvest facilities, poor or weak information dissemination, instability of fruiting ability, weak farmers’ cooperatives, inadequate or limited superior quality of planting materials, nutrients, pests, poor access to credit, lack of government support system (policy and infrastructure), and inadequate technology transfer”.

4. Status of Fruits R&D

4.1 Profile of the National Research System for Fruits

The research system for fruits is part of the National Agricultural Research System (NARS) which was formally put in place in 1972 with the establishment of the Philippine Council for Agricultural Research (PCAR), now changed to Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD). Consequently, the research system is now known as the National Agriculture and Resources Research and Development System (NARRDS). PCARRD is one of the sectoral councils of the Department of Science and Technology (DOST) and is mandated to “(a) formulate policies, plans, strategies, programs and projects for science and technology development; (b) monitor R&D projects, and (c) program and allocate government and external funds, and generate resources for R&D” (Dar 1997).

At present, the DA with its focus on agriculture and DENR on forestry and natural resources have their respective research coordinating units, BAR and the Ecosystems Research and Development Bureau (ERDB), respectively. The role of PCARRD is to provide a mechanism for all R&D programs of the country to be integrated into a comprehensive R&D program in agriculture, forestry and natural resources. PCARRD receives annual budget allocation from the national government and to some extent is able to source from external donors like IDRC, UNDP, ACIAR, etc. Activities funded through PCARRD whether from local or foreign sources are subject to a system of evaluation from the proposal stage to implementation until completion of projects. These include in-house and/or regional monitoring and evaluation.

NARRDS is composed of two basic structures, namely, PCARRD and the National Agriculture and Resources Research and Development Network (NARRDN) which is a network of research centers and stations. PCARRD manages the operation of this network. NARRDN membership consists of 4 national multi-commodity centers, 7 single-commodity centers, 23 regional R&D

centers, 88 cooperating stations, and 9 specialized agencies. These are organized into 14 regional R&D consortia “which were established to build up regional capability for research management... and optimize use of limited resources among research centers at the regional level”. PCARRD’s support for the consortia include infrastructure, equipment and manpower capability buildup, research grants, and budget for operations. Each consortium has a base agency and focuses on what are considered flagship commodities for the region (Table 26). Mango is a flagship commodity in three consortia, durian in two, and cashew and pili in one each. For example, the National Mango Research and Development Center (NMRDC) located in Guimaras is a member of the WESVARRDEC which is based in DA-Region VI. This consortium was established in May 1988 and started with 21 institutions increasing to 26 at present, the largest consortium membership. Within PCARRD, R&D programs are undertaken consistent with the sector and commodity classifications which number 21 starting 1996. Fruits belong to the crops sector together with 7 other commodities. However, they could be integrated in other sectors like agricultural resources management, forestry and environment, and socio-economics depending on the focus of the R&D activity. Assisting PCARRD are the national R&D teams corresponding to the 21 sector/commodity classifications.

PCARRD has recently reoriented its thrusts with increased emphasis on technology transfer and better linkages and participation of the LGUs. Thus, its major programs and activities implemented through the regional consortia now include “(a) the Integrated R&D Program (IRDP) in support of the Medium Term Research and Development Plan (MTRDP) 1995-2000 and other flagship programs, (b) the Comprehensive Technology Promotion and Commercialization Program to hasten technology adoption, (c) the Regional R&D Information Service establishing One-Stop Information Shop, and Farmers’ Information and Technology Service, and (d) the Farmer Scientist Bureau promoting exchange of information and knowledge between farmers and scientists.

There are currently IRDPs for mango, papaya, pineapple, and durian and banana R&D program. Mango IRDP is implemented by UPLB; NMRDC; PCARRD; and other members of the consortia like private groups/cooperatives, DA provincial offices, and BPI research stations. Papaya and pineapple IRDPs are primarily through UPLB while durian IRDP is mainly based in USM with participation from selected DA RIARCs, BPI, selected research consortia, VISCA, UPLB, and private cooperators. Banana R&D is being undertaken by UPLB and BPI Davao. Among the technology promotion and commercialization projects are included (a) enhancing the productivity of the Philippine mango industry: training on nursery operations, production and postproduction being implemented by ICE-UPLB; (b) improved management system for Saba banana by UPLB and DOST-PSTC Camiguin; and (c) durian agribusiness development for domestic and export markets by USM and BPI-DNCRDC (TOPD-PCARRD 1999).

Private sector research is undertaken by private companies and corporations which are instrumental in the development and sourcing of state-of-the-art technologies particularly for banana, pineapple, rubber and chemical inputs. In most cases, research results are used almost exclusively by the company doing the research. Similarly, some development-oriented farmers conduct on-farm research in their farms integrated in their production activities. To the extent that membership of R&D teams extends to the private sector, there is some degree of interaction between researchers in public and private sectors.

With the passage of AFMA, the DA through BAR is taking the lead in preparing the National Research and Development and Extension Agenda (NARDEA) for agriculture and fisheries. Core Planning Teams (CPTs) have been organized to comprise the RDE network (Table 27) and they are tasked to draw up their respective national agenda which will then provide overall framework and direction at the regional level. Many of the RDE areas being considered fit into the existing agenda but it is expected that more focused programs shall evolve. At the same time, a more rational system of research prioritization is being developed to address previous problems in the allocation of research resources. Some CPTs like for fruits, corn, vegetables, coconut, fiber crops, and others have drafted their respective RDE agenda. These are now being presented to various sectors for consultations.

4.2 Review of Past Researches

R&D for fruits is undertaken by various institutions, both public and private. Although PCARRD is tasked to monitor and document public sector research in agriculture, there is much to be desired in its documentation function and in making information available to everyone. Furthermore, researches which are not directly funded through PCARRD may not be captured in its databases. R&D institutions like SCUs often have centralized offices for records of researches funded by different sources but a complete enumeration of these is hardly possible. Likewise, these institutions vary in terms of level of information technology and system hence a full accounting and thorough review of all fruit researches could not be undertaken. Nevertheless, the following review provides important trends in fruits research which could be useful in the research prioritization process.

4.2.1 Past Researches by Research Area, Agency and Budget

National Fruits Research (DOST Database)

Based on the 1996 work and financial plans of fruit researches documented by DOST, there are 413 projects recorded with a total budget for the year of P61.82 M (Table 28). A few of these were started in the 1980s and are still on-going but the bulk began in the 1990s with some to be completed beyond year 2000, a few in 2005.

Categorizing them by fruit crop, mango research leads all others both in number and budget, comprising 30.27% and 24.19% of the total, respectively. Banana is a far 2nd in budget with 13.92% but surprisingly, cashew whose GVA and export contributions are much less turned out 3rd with 11.08%. Cashew is followed by durian with 5.27%. Pineapple which ranks 3rd in GVA and 2nd in export contribution has public budget support of 1.89%. The state-of-the-art technology in pineapple production and processing currently availed of by the large commercial farms points to the importance of private sector research in pineapple. In the case of mango, the relatively large public support seems reasonable considering that the bulk of mango production whether for domestic consumption or export comes from small farms. Partly the attention given to cashew and durian in recent years is due to the various studies undertaken by the DA-ASAP-USAID which showed that these commodities have considerable market potential. It is also noted that cashew is a flagship commodity of one consortium (STARDECC of Region IV) and durian of two consortia (SMARRDEC of Region XI and CEMARRDEC of Region XII). Thus, recent programs include the Cashew IRDP and Durian IRDP. There is also a proposal for the establishment of a Cashew Research and Development Center to be based in Palawan. The budget share of papaya is 3.81%, jackfruit 2.03%, and citrus 1.83%. Altogether, the other fruits (which include unspecified ones) have a budget share of 35.99%.

The 1996 budget varied considerably across projects with the highest at P4.41 M for one pili project (postproduction development program) under the KCCDP and the lowest at P2,000 for a cashew processing study. By commodity, the highest budget for a single project (aside from the pili project mentioned) was for mango, banana and cashew which exceeded P2 M each. Generally, however, the annual budget per project was very low with more than half of them (58%) having less than P50,000 for the year. Many of these have P20,000 or less. Commodities which have the largest proportion of projects with less than P50,000 are citrus (84%), cashew (74%), and mango (70%). Since there is an automatic deduction of 10% for the institution's administrative fee, researchers operate with exceedingly low budget.

When categorized as research, extension, development-oriented or general R&D, the bulk of budget went to direct research (73.46%)(Table 29). The low priority for extension (4.45%) and development (12.63%) is an indication of limited technology transfer if at all research has generated technologies. As shown above, a major problem of farmers is limited technology adoption partly attributed to inadequate dissemination of technologies both in production and processing.

By RDE area, varietal improvement (breeding) has the largest budget share (24.91%), followed by cultural management (16.30%) and then by postharvest (12.02%). The least budgeted research areas are socio-economics (2.51%) and by-products and waste utilization (0.58%). In extension, the lowest priority is the operation of demonstration farms while in development aspect, this

is on the development of tools and component technology and establishment of operational information network. Incidentally, packaging materials particularly at the farm level have remained to be the usual bamboo baskets, sacks and wooden crates while timely market information is oftentimes not available. By crop, the highest allocations are for food processing and cultural management for mango and plant breeding for banana.

By institution, there are slightly more researches conducted or based in government agencies than in SCUs with 52.10% and 47.90% shares of the budget, respectively (Table 30). Of the former, close to one-half is committed to the KCCDP and the rest to various DA regional offices and bureaus with some amount for DENR and DOST (PCARRD and PCASTRD). For the SCUs, UPLB has the biggest allocation with 32.92% of the total fruits research budget (or 68.73% of the total SCU budget for fruits research). For the rest of the SCUs, USM is a far 2nd with 3.03% of the total budget. This is quite small for USM considering that S. Mindanao is a major fruit-producing region. The shares of Mindanao in the total area planted to major fruit crops are 49.8% for banana, 18.3% for mango, 84.5% for pineapple, 34.6% for citrus, and 92.1% for durian (Pamplona and Oliva 1999).

For 259 projects for which the duration of the study is reported, about 42% have duration of 1-2 years (Table 31). About ¼ of the studies are programmed for 5 years or more. Most of those with longer duration involve varietal improvement although this is shorter in the case of banana and pineapple.

Fruits Research at UPLB

In view of the importance of UPLB in fruits research, a profile of its fruits research program is presented here. For the period 1980 up to June 1999, there are 163 projects reported with a total budget of P56,092,580. The list of these projects indicating the title, researcher, funding source, duration, budget and base department/unit is shown in Appendix Table 25. Some of these projects are listed in the DOST database.

There is a total of 109 completed projects and 54 on-going with budget shares of 55.32% and 44.68%, respectively, of the total budget of P56.09 M. Many of the on-going projects started in the mid-1990s and are up for completion in 1999 while others are for year 2000 to 2004. Ten projects are classified as “continuing” and do not show completion dates. Some of these started in 1975, 1981, 1985, 1989, 1990, 1991 and 1995. These include long-term projects like breeding of selected fruits; collection, characterization, conservation and documentation of tree fruits germplasm; establishment of a botanical collection of fruits and nut species; disease resistance in papaya; genome mapping and DNA fingerprinting of priority fruit crops; and asexual propagation of fruit bearing trees.

The largest budget allocations in order of magnitude are for the four major fruit crops: banana, papaya, mango, and pineapple (Table 32). Altogether, they

comprised 56.58% of the budget and 55.22% of the total number of researches. The budget shares of banana and mango are 19.69% and 19.07%, respectively. Papaya whose export share is quite small comes next with 13.23%. To the extent that these crops are also included in multi-crop researches, their importance in the fruits research program is even greater. Cashew and durian which have large budget allocations in the national R&D program (based on the DOST database) are low priority commodities in the UPLB research program. They are more important in Palawan and Mindanao, respectively.

By base unit/department, research allocation has been in favor of Postharvest Horticulture Training and Research Center (PHTRC), Horticulture, and Institute of Plant Breeding (IPB)(Table 33). The apparent smaller budget share of IPB compared with PHTRC is due to fact that the budget of many of its listed projects especially the continuing ones is not reported. On the other hand, PHTRC has provided the most complete list of projects with budgets reported. The National Institute of Molecular Biology and Biotechnology (BIOTECH) also got a little bit more than the remaining units for on-going projects. Except for Horticulture, these are non-teaching units whose staff are expected to have greater time allocation for research compared with those of teaching units. However, many of their staff are not full-time researchers since they are assigned teaching loads in other units.

The units at which researches are based reflects the various RDE areas covered. The detailed classifications by commodity and RDE focus are presented in Tables 34 and 35. Research priorities are in postharvest, varietal improvement, pest management, and cultural management in that order with budget shares of 49.97%, 26.23%, 12.50% and 5.56%, respectively. By crop, emphasis has been on varietal improvement for papaya and banana, pest management for banana, and postharvest for pineapple, banana and papaya. Technology dissemination and assessment of impact rank lowest in priority despite the fact that extension is an equally important function of UPLB. Food processing also ranks low but that is because most of the researches of the Institute of Food Science have unreported budget.

M.S. theses and Ph.D dissertations conducted by students at UPLB also follow the trend for fruits research since students are supervised by teaching and non-teaching staff engaged in research. For the period 1980-1998, there were 53 M.S. theses and 23 Ph.D. dissertations on fruits (Appendix Tables 26a and 26b). Banana and mango are the most studied with 20 theses and 4 dissertations for banana and 12 theses and 7 dissertations for mango. Other fruits with 1-2 studies include papaya, pineapple, durian, cashew, citrus, mangosteen, chico, rambutan, passion fruit, watermelon, and apple. These studies focused mostly on postharvest, pest management, varietal improvement and cultural management. A few were on socio-economics and extension.

Fruits Research at USM

USM is actively involved in fruits research coming in second to UPLB although its share of the fruits research budget is much smaller. It is where CEMARRDEC is based whose flagship commodity is durian. It leads the implementation of Durian IRDP and has other research projects like assessment of losses in durian nursery and fruit production due to various causes and evaluation of the durian promotion/expansion program.

However, its research program covers many other fruits. A listing of 113 undergraduate theses conducted at USM for 1996-1997 shows at least 15 different fruit crops considered (Appendix Table 27). In the Abstract Bibliography, these theses are co-authored by USM staff who provide supervision to students and in some cases some financial support through their projects. In return, students provide research assistance and are able to use the research data for completion of their theses.

Among the fruit crops, the most studied are durian (36.28%), banana (16.81%), mango (11.50%) and rambutan (7.88%). The remaining 27.53% are for lanzones, mabolo, citrus, guyabano, jackfruit, papaya, mangosteen, chico, santol and pineapple. More than 80% of these studies were conducted in the departments of agronomy, horticulture, plant pathology, economics and management, home economics, community broadcasting, and soil science. Few were based in plant/breeding and genetics, biology, entomology, chemistry, and nutrition and dietetics. Consequently, most studies focused on cultural and pest management, marketing and demand/supply studies in the region, and food processing. The least studied are postharvest, varietal improvement, and extension/communication.

A partial list of fruit researches conducted at USM starting 1986 is shown in Appendix Table 28. The 9 completed studies reported have a total budget of only P3.185 M. The studies cover not only durian but other fruits like marang, breadfruit, rambutan, lanzones, avocado, chico, santol, mango and calamansi, reflecting the diversity of fruits produced in Mindanao. Most of the studies are on varietal improvement (germplasm collection, evaluation and maintenance) and cultural management (crop response to fertilizer, high density planting, multiple rootstock planting) with only one on processing and one on the economics of production and marketing.

As of 1999, USM reported 16 on-going research projects on fruits (Appendix Table 28). Two are development programs having a total budget of P10.38 M. One of these is specific to durian. Other studies have annual budget ranging from P51,000 to P200,000 but since the duration was not reported, the total budget cannot be determined. Banana (lakatan) and durian are the priority commodities. Banana studies include cultural and pest/disease management, tissue culture/micropropagation methods for producing disease-free planting materials, postharvest and processing, marketing assessment, and development

and evaluation of communication materials and strategies. There is one study on the characterization of mangoes to be used as basis for accreditation of USM as source of scion. There is none on impact assessment.

DA-BAR Monitored Fruits Research

The list of research projects/programs monitored by BAR with funding from different sources also reveals that banana and mango are the priority commodities with budget shares of 37.56% and 23.12%, respectively, of the total budget of P22.44 M (Table 36). Specific projects cover mostly pest management and cultural management. Others are listed as general R&D which include banana, durian, jackfruit and cashew. Postharvest is also a priority area with 20.79% share of the budget. These projects are conducted at UPLB, DA research stations and regional offices, BSWM and NMRDC. Funding mostly comes from GIA and allocations for high-value crops program.

Biotechnology Fruits Research

For the period 1998-2000, biotechnology research for fruits has a total budget of P47.57 M (Table 37). Banana has more than half of the pie (55.01%), followed by durian with 15.77%, then by papaya with 13.67%, and mango with 11.35%. Pili has an allocation of 4.20%. UPLB is the leading institution for these projects with some participation of BSU for Northern Luzon and DA-CEMIARC and DA-CARAGA for Mindanao. Papaya research is done in collaboration with Cornell and Queensland and MARDI Universities. Research areas cover the development of virus-free planting materials for banana in various regions, breeding, and disease control.

4.2.2 Research Budget Relative to GVA

Based on the research figures from the DOST database, the research intensity ratio (RIR) for fruits as a whole is about 0.34% (Table 38). It means that the budget allocated for fruits research is about 0.34% of fruits' contribution to the agricultural gross value added. Comparatively, the RIRs for other crops are as follows: rice, 0.25; corn, 0.05; coconut, 0.30; and sugar, 0.50 (David, *et al* 1998). RIR for sugar is comparatively large relative to its GVA share of 4.27%. In comparison, fruits have a GVA share of 10.16%. Considering the suggested RIR of 1%, most crops including fruit crops are clearly underfunded in terms of R&D.

Across fruit commodities, mango has the highest RIR of 0.37, more than half that of banana or citrus. RIR for pineapple appears small at 0.05 but this figure excludes private sector support for pineapple R&D which is expected to be substantial. Other fruits reflect a rather high RIR of 0.63. This is explained by the considerable R&D attention that has been given to fruits like cashew, durian, and papaya in recent years as they have been identified as having large market potential. Nevertheless, results reveal some misallocation of public R&D funds within the fruits sector as indicated by the unequal RIR values for the different

fruit crops if the economic contribution (GVA) of the crop is considered the primary criterion.

Consistent with the above trend in research budget allocation, the most number of publications and information materials generated is for mango, banana, papaya, citrus and durian (Table 39). The lists of these materials appear in Appendix Tables 26a (UPLB MS theses), 26b (UPLB Ph.D. dissertations), 27 (USM BS theses), 29 (mango), 30 (banana), 31 (papaya), 32 (citrus) and 33 (IPB publications).

4.2.3 Technologies Generated

For banana and mango, most of the generated technologies are contained in the Philippines Recommends Series (1992 and 1994) published by PCARRD. They are presented in Table 40 including others particularly on postharvest generated in recent years. These technologies were generated through years of intensive and extensive research in various institutions. In recent years, these technologies also include those developed through the Global Technology Search (GTS) program of DOST. In the case of USM, GTS helped much to develop technology packages for durian, lanzones and mangosteen (Pamplona and Oliva 1999).

For mango, these technologies relate to propagation, orchard establishment, cultural management, crop protection, harvesting and postharvest. During the Mango Congress held in Cebu City on June 4-6, 1999, the same were discussed including adoption problems faced by the industry. A major breakthrough in mango research is the use of potassium nitrate in flower induction which corrected the biennial bearing habit of trees and advanced the flowering period. Like IPM, the integrated disease management (IDM) is being introduced. IDM refers to the proper selection and use of suitable disease management measures aimed at reducing disease injury at levels below those causing significant loss. It is intended to increase profit through fruit yield and quality improvement and address sustainability issues by reducing the deleterious effects of fungicides (Opina 1999). Essentially, IDM involves an integration of various management interventions including (a) removal and destruction of infected plant parts through sanitation practices; (b) environmental manipulation to prevent a prolonged favorable condition for disease development through pruning to open up the canopy; (c) breaking the disease cycle through uniform flushing time and protection of flushes from bud break until 15 days after using protectant fungicides if necessary; (d) proper timing of induction to allow flowering during period when diseases are least expected; (e) protection of flowers and fruits via proper fungicide management; (f) protection of fruits by adopting the bagging technology, and (g) proper disease monitoring (*Ibid*). On harvesting and postharvest, technologies relate to determination of fruit maturity, pest control using HWT and VHT, protocol for refrigerated handling, cold treatment, proper handling and use of packaging materials, hastening fruit ripening, and processing methods for various products.

For banana, tissue culture is a mass propagation technique which can effectively produce disease-free planting materials if properly used. The procedure for field planting of tissue-cultured cultivars has already been established. As in mango, there are guidelines regarding fertilization, irrigation, pest control and other cultural practices. However, some of these need to be carefully adopted in the context of local conditions. For example, while there are recommended levels and frequency of application for fertilization, soil analysis must be done first to determine the actual requirements of the plant vis-à-vis the condition of plant growth. On disease control, there are control measures for bunchy top and “bugtok”. For bunchy top, these include use of virus-free planting materials, immediate removal of infected plants, regular spraying of insecticides, and enforcement of quarantine regulations. For bugtok, the control measures are regular stem sanitation and deleafing, early debudding or removal of male bud when the “false hand” appears, and bagging the inflorescence at bending stage and then removing the bag and debudding when the false hand appears. In the use of chemicals, proper care should be taken to avoid health hazards to both man and animals. Proper maturity index needs to be adopted to ensure that only mature fruits are harvested. Fruit quality is also ensured with appropriate handling during various stages from packinghouse operations to sale to final users. The techniques for processing banana into various products have likewise been developed.

There are recommendations regarding planting, fertilization, irrigation, and pest and disease control for pineapple. On postharvest, waxing of pineapple is a technique that can delay ripening, control diseases, and prevent the chilling injury during storage.

Measures to improve papaya production through proper selection of seeds and varieties, propagation and planting, fertilization, pest control, and harvesting are also defined. Although there is no chemical control for PRSV and crown rot, sanitation and removal of diseased plants can help minimize the spread of the disease. After harvest, timely HWT and fungicidal treatment are important for disease control. There are also recommendations on storage temperature and use of packing and transport containers. Recently, a new hybrid, Sinta papaya, has been developed and recommendations on proper management from planting to harvesting are available. Sinta hybrid is recommended for both backyard and plantation areas to rehabilitate PRSV-ravaged areas.

For durian, several technologies have been developed in recent years, primarily at USM. These include multiple rootstock techniques and orchard establishment through modified inarching, intercropping with lakatan banana and coconut, inarched large planting materials, modified budgrafting, single node grafting techniques, and cultural management practices from selection of production site to harvesting including the development of a clone known as *Duyaya*.

Maraguinto, a new marang variety has also been developed. For lanzones, technologies include cultural management for high-yield and off-season production as well as modified crown grafting of *longkong*. Intercropping techniques of mangosteen with banana and coconut and nursery and orchard establishment and management schemes have also been developed.

On food processing, existing technologies include development of flour from jackfruit seed and tiesa fruit as well as extenders for durian jam such as yawtia, sweet potato and Cardaba banana.

A plant diagnostic kit is now available for about P3,000 to positively identify plant, food and feed pathogens and mycotoxins in banana, citrus, papaya, mango and others.

Plant breeding work conducted by both public and private sectors has resulted to the development of various crop varieties. Those which have been released by the Philippine Seed Board during the period 1989-1997 are shown in Table 41. There are 3 for banana, 6 for mango, 4 for cashew, 9 for durian, 10 for rambutan and several for some other fruits.

4.2.4 Extent of Technology Adoption

In general, adoption rate is expected to be higher in large commercial farms than in small backyard farms. Commercial farmers, especially for banana, pineapple and to some extent mango, have greater access to the technologies as many of them have invested in RDE manpower and facilities and the financial resources to apply the required production inputs. Among small farms, some have very limited marketable surplus and have little incentives to improve farm management practices and perform value-adding activities after harvest.

In the case of mango and pineapple, the smallness of farms does not necessarily pose a constraint to technology adoption since contract growing arrangements are widely practiced even in Luzon. Contractors who are usually the buyers of these products have the technical knowledge and the resources for purchasing the required material inputs and hiring labor associated with technology adoption. In mango, for instance, Brown (1992) noted that treeowners in Pangasinan employing the contract scheme have an average of only 12 trees and their reasons for entering such arrangements include lack of technical knowledge, capital and time as well as risk aversion. The usual practice is for the contractor to assume the responsibility from flower induction to pest/disease control until harvesting. Among pineapple growers in Laguna, it is common that a contract-buyer would make an estimate of the potential yield at the onset of flowering and offer the owner a cash advance to commit sale of the harvested fruits to him. An alternative is for the contract-buyer to take care of the plants from thereon to harvest with all responsibilities assumed by him.

The extent of technology adoption among fruit growers based on a limited number of studies is shown in Table 42.

For mango, most farmers select the Carabao variety for planting. Others have planted Pico and it is observed that many households have 1-2 Indian mango trees in their yard for home consumption and shade. Asexually-propagated planting materials are usually used mostly by cleft grafting but not certified. Planting distance is from 10m x 10m to 15m x 15 m, but there are reports that some who have recently planted have adopted high density planting. This, however, is now causing problems as trees are quite unproductive due to overcrowding even with severe pruning as in the case of Marsman mango plantation (Ledesma 1999 during the Mango Congress). Almost all farmers use potassium nitrate for flower induction as smudging is barely practiced, if at all, only as supplement to various pest control measures. One report, however, noted that some farmers use flower induction chemical more than the recommended level. Fertilization is practiced by 36-60% of the growers but usually at lower than recommended rates. Growers do not normally irrigate their farms. Intercropping is adopted by farmers in Mindanao. For pests and diseases, chemical control is the most popular. While bagging of fruits is common among Cebu growers, an earlier study (1990) showed that it is not practiced by sampled farmers in Bulacan, Cavite, Nueva Ecija, Pangasinan and Zambales. Also, very few pruned their trees while some adopted post bloom shaking of trees. A recent study (1998) showed that growers in Batangas City provided support for low-lying branches during fruiting stage. Maturity index for fruits is usually based on the recommended number of days after flower induction (DAFI). Sorting of harvested fruits is done according to shape, condition and to some extent weight especially if bound for export. Bamboo baskets lined with banana leaves are the common packaging materials. Some farmers in Zamboanga del Norte induced ripening using calcium carbide. While most of them perform the various postharvest operations including storage, a few just sell immediately after harvest.

For papaya, Lizada (1995) noted the limited adoption of technologies such that blanket recommendations on fertilizer application are usually followed and field sanitation and preharvest disease control are not consistently practiced. Among 20 papaya growers in Laguna who planted the Sinta variety and availed of planting materials and technical information from IPB, UPLB, adoption rate for most technologies is relatively high. Not all farmers though apply fertilizer as recommended with some using more and others less while a few do not use at all depending on the farmers' perception of the fertility level of the soil. Pest and disease control is done as necessary but still some risk-averse farmers especially large ones opt to apply insecticides even if trees are not yet infected. Simple technologies for preparing the product for sale like sorting, cleaning, grading and wrapping with newspaper are widely practiced for the discriminating markets of Laguna and Metro Manila.

Durian growers in Cotabato appear to benefit from the USM R&D as they commonly adopt the chemical, cultural and mechanical (handpicking) methods of disease control. However, only 10-50% of farmers use the recommended rates

of chemicals. Cultural methods include removal of infested plant parts, pruning, light trapping, fogging or smoking, and fruit bagging.

Among banana growers particularly of Saba, technology adoption is quite low. Banana growers seem not to understand the importance of producing good quality raw materials for the production of chips which is an important export item. There also remains a general perception that Saba is a low priority crop.

4.2.5 Consequences of Adoption

The preceding discussions have pointed to the relatively high priority in R&D given to major fruits such as mango, banana, pineapple and papaya. Export banana and pineapple benefit from considerable private sector support being major export products of multinational corporations. Two related impact indicators of technology adoption are considered here, namely, yield and profitability.

Despite limitations in technology adoption especially among small farmers, some yield improvements in mango, banana and pineapple at the national, regional and farm (commercial vs. backyard) levels have been achieved although in varying degrees. Between 1990 and 1998, national average yields improved from 29.39 mt/ha to 37.16 mt/ha for pineapple (13%/year), 7.32 mt/ha to 10.23 mt/ha for mango, and 9.90 mt/ha to 10.53 mt/ha for banana. For banana and mango, the improvement is not very significant as these are more dominated by small farms and more widely distributed across all regions reflecting large yield variations as affected by varying climatic, soil and socio-economic conditions. As noted above, pineapple production is more highly concentrated with the top five regions producing more than 98% of the national output. Other fruits like durian, papaya and citrus all registered negative growth rates in yield during the same period. Despite the attention given to papaya especially at UPLB, production is much constrained by PRSV causing devastation of papaya farms in major producing provinces in Luzon. The yield gap for papaya thus remains very large (actual of 11.89 mt/ha vs. experimental yield of 60 mt/ha). While the Sinta variety has already been developed, the primary problem is the lack of planting materials which farmers could use for largescale plantings. The 20 papaya growers studied in Laguna reported that IPB (UPLB) is the only source of planting material and purchases are based on orders and by schedule such that sometimes farmers have to wait for the next available supply (Revilla 1999).

At the regional level, the highest yielders for mango and pineapple have exceeded the experimental yields of 21 mt/ha and 42 mt/ha, respectively. For banana, the highest regional yield also comes close to the experimental yield of 40 mt/ha. Unfortunately, in regions where technology adoption is low and bio-physical and climatic conditions are less favorable like Bicol and Eastern Visayas, yields are as low as 1.40-3.90 mt/ha and 2.30-5.06 mt/ha for mango and banana, respectively.

At the farm level, greater yield variabilities are expected due to varying adoption rates, planting distances, intercropping schemes, proportion of bearing to non-bearing trees and socio-economic characteristics of farmers (education, access to support services and inputs, market orientation, etc.). At present, the yield of pineapple farms under the management of the multinationals is very high ranging from 70-100 mt/ha (Dizon 1998). One farmer (Mr. Dalangin) in Bauan, Batangas revealed that he is able to obtain about 200 kaings of mango per tree in his most productive trees while the highest recorded is about 120-140 kaings in Zambales (pers. com.). He noted two important technologies in mango farming. These are determining the proper maturity of leaves for enhancing the effectiveness of KNO₃ spraying and bagging of fruits for pest and disease control.

A number of micro level studies conducted in specific locations point to economic incentives associated with technology adoption, either partially or as a package of technologies. Ranola *et al* (1990) found out that users of fertilizer in mango production obtained higher yield (268 kg per tree) and net returns (P1,863 per tree or P81,601 per farm) than non-users (132 kg per tree and P837 per tree or P41,427 per farm). Based on partial budget analysis, change in income due to fertilization is P838 per tree considering added fertilizer and labor inputs of P47.76 and added return of 116 kg valued at P870. Likewise, Brown (1992) observed that contract mango producers in Pangasinan who appear more knowledgeable on farm management practices, have greater capital and are expected to exhibit higher degree of technology adoption had higher yield at 108 kg per tree than owner operators (90 kg per tree). However, they obtained lower net return per tree (P1,089) than owner operators (P1,258). This result was attributed to the fact that owner operators are relatively more efficient in the use of chemical flower inducer and insecticides and use more family labor than contract producers. Mango growers in Zamboanga del Norte who performed simple postharvest operations such as cleaning, sorting, grading, packaging and had the option to ripen their produce also got higher net return from sales (P4,706 per 100 kg) than those who sold immediately after harvest and did not perform any of these operations (P1,589 per 100 kg)(Abas 1999).

Large growers of Sinta papaya also realized higher profit per tree than small growers with P381 and P358, respectively. Large farmers planted more trees (1,054) and used more fertilizer (729 kg) and pesticide (9.75 liters) per farm than small farmers. The latter planted about 68 trees and used 60 kg of fertilizer and 1 liter of pesticides, on the average.

In the case of Mindanao, the strategic location of USM and its active participation in fruits R&D appear to have contributed to the expansion of fruit production in the region. Being the leader in durian R&D, it helped considerably to expand area planted from an estimated 5,000 ha in 1992 to 19,214 ha in 1998. Large increases in commercial plantings were also reported for Cavendish and lakatan banana (Maguindanao, Cotabato highlands and Bukidnon); saba banana (Cotabato and Maguindanao); pineapple (South Cotabato, Sultan Kudarat,

Cotabato and Bukidnon); citrus (Cotabato and ARMM provinces); lanzones (Cotabato, Maguindanao and ARMM provinces); and jackfruit (Lanao del Sur and Norte, Cotabato and Maguindanao) (Pamplona and Oliva 1999). Unfortunately, reports on assessment of specific areas, impacts on farmers' incomes, and constraints faced by farmers are hardly available.

4.2.6 Constraints to Technology Adoption

Based on a number of studies, several factors constrain farmers from fully and correctly adopting the technologies. These are (a) lack of capital to purchase the required inputs associated with technology adoption, (b) limited dissemination of technologies resulting from many forms of inadequacies in the extension system, (c) subsistence nature of production, (d) lack of infrastructure and other support services, (e) farmers' perceptions and existing arrangements, and (f) government policies and programs. Oftentimes, these factors are interrelated and produce mixed effects, thus, solutions to problems require a holistic and integrated approach.

Since technology adoption requires purchase of modern inputs whose costs are rising, resource-poor farmers fail to fully adopt the technologies to their advantage. In most cases, farmers use inputs like fertilizer and pesticides below recommended rates or at inefficient levels. This is the case for mango producers in various provinces of Luzon using fertilizer (Ranola *et al* 1990), mango owner operators in Pangasinan using labor, fungicides, insecticides and fertilizer (Brown 1992), and papaya growers in Laguna using fertilizer (Revilla 1999). In all cases, the marginal value product (MVP) is lower than the marginal factor cost (MFC) for these inputs indicative of inefficiency in the use of these inputs.

One result, though, points to the fact that chemical flower inducer is being used beyond the standard or recommended level as was the case for mango producers in Pangasinan where owner operators and contract producers applied 3.56 kg and 6.82 kg per tree, respectively, while the recommended rate is about 0.62 kg (Brown 1992). Also, as shown above, some papaya farmers tend to use pesticides even before actual incidence of pests in their crops. Farmers perceive that yield levels would further improve with greater application of these inputs without regard to the additional cost incurred and negative effect on profit. As regards pest control, they do not understand that there is some economic threshold when pesticide application is necessary. It should be pointed out that these inputs comprise a major portion of total cost. The cost of labor and chemical for flower induction alone comprise 47% and 42% of the total cash cost of contract producers and owner operators, respectively (*Ibid*). If these inputs are too expensive, farmers would use them below recommended levels and thus not achieve the potential yield. On the other hand, overutilizing them will inflate the cost structure and lower net returns.

Despite caution and reminders regarding the general nature of many technologies, i.e. levels of use of fertilizer and other chemicals being simply

guidelines, farmers tend to use them as blanket recommendations applicable in all areas. The result is that application of these inputs turns out ineffective and simply adds to the cost. It is often specified that soil analysis should be done first to determine the required fertilizer amount which could be lower than the recommended (based on results from some experimental areas). A particular farmer's field may indeed be more fertile such that fertilization is not necessary. In some cases, non-chemical methods of pest control (pruning, fogging) may be what are needed and yet farmers insist on the use of chemicals, this being the common practice in nearby villages. In the case of high density planting for mango, it might have been that farmers misheard about the technology or were not sufficiently informed that it is a technology adopted in India for varieties that do not grow as profusely as the local mango varieties. Such problems could arise due to inadequacies in the extension system such as limited personnel, lack of incentives, uncoordinated efforts, and even inadequate technical expertise on the part of the extension worker. Thus, farmers do not receive the full information required for good decision-making.

In many cases, lack of market orientation offers little incentives for adopting the technologies. Farmers produce primarily for home consumption such that cash incentives are absent. Still, others do not realize the value-added associated with adoption of even the simple technologies like cleaning and sorting. Incidentally, produce sorted according to size, shape, degree of ripeness, and presence or absence of diseases and blemishes have considerable price differential over the assorted ones. The importance of sorting is not well appreciated by small producers despite the fact that it could be done utilizing excess family labor. To some extent, this situation relates to existing credit-marketing arrangements. The farmer is usually dependent on the trader for financing farm operations in exchange for the farmer's produce. More often, the trader takes the produce in whatever form according to a pricing system that is most favorable to him. Because higher level markets (export, institutional buyers, general consuming public) require quality, traders would nevertheless sort/grade the product. But before this could be done, quality and quantity losses could already be high due to the perishable nature of fruits and inadequacy of transport and postharvest facilities. The infrastructure problem greatly limits the farmer's option to find alternative markets that could offer better opportunities for technology adoption. With very small marketable surplus vis-à-vis high transport cost and distant markets, farmers find selling to the trader on a pick-up basis the best option without the benefit of technology adoption.

Various government policies may also constrain adoption. The case of inappropriate financial and credit policies limits capital availability for farmers, traders and processors who must contend with the rising cost of inputs and equipment/ machines for modernizing their operations. Incomplete trade liberalization and tariff reforms continue to adversely affect the price structure in both output and input markets and create disincentives for private sector technology-related investments. Banana exporters consider the banana hectare limit as preventing them from being able to make full adjustments in

their operations according to changes in market demand and supply conditions. Likewise, CARL has created considerable uncertainties among commercial fruit producers especially in cases where joint venture and contract-growing arrangements prove infeasible. It could also be said that the RDE system has in the past focused on production-related technologies and failed to give equal emphasis on value-adding activities consistent with the requirements of the market. Thus, postproduction technologies, provision of market information, and strengthening of production-processing-marketing linkages are not considered within the purview of the extension system. Despite the limited scope of agricultural extension, however, dissemination of technologies to farmers has been inadequate.

4.3 Current RDE Priorities

R&D priorities are expected to reflect national development goals and objectives. On-going projects for fruits are based on the five-year Medium-Term Research and Development Plan (1995-2000) which is an output of consultations conducted among 4 departments, namely, DA with its Key Production Areas program (KPA); DOST, Science and Technology Agenda for National Development (STAND); DECS, Medium Term Thrusts and Priorities; and DENR.

Toward agro-industrialization, R&D has been designed to reflect the following components: (a) integrated R&D programs for crops (fruits and others) including socio-economics; (b) technology transfer and commercialization through technology identification and area positioning, technology promotion, rural enterprise development and networking; (c) policy advocacy, applied communication, and information management; and (d) institution development and resources management. These form the basis of current IRDPs or flagship programs on mango, papaya, pineapple, cashew, and durian and the banana R&D program including various technology promotion and commercialization projects for mango, Saba banana and durian. At present, PCARRD pursues some impact assessment studies particularly for the various IRDPs it has implemented. A socio-economic evaluation and policy analysis for the Durian IRDP is expected to be started in early year 2000.

A special project funded by UNDP called the Mango Information Network (MIN) is also being implemented to improve database management and information services. MIN is a WWW-based information service designed to address the needs of the key players of the Philippine mango industry. Information services include market information (prices, demand and supply situation, export procedures); assistance from pest experts; technologies, cultural requirements and regulations; directory of growers, traders, processors, institutions, input suppliers, etc. The basic challenge is to provide such services on a sustainable basis even without the present UNDP project support.

Within DA, recent RDE and related activities are intended to address priorities relating to its Gintong Ani Program on High Value Commercial Crops

(GA-HVCC) (including fruits) which is the operationalization of RA 7900 or the High Value Crops Development Act. Currently, this falls within the Agrikulturang MakaMASA (HVCC) program. Consistent with initiatives toward improving the country's competitiveness in both domestic and world markets, the program components include (a) policy reform, market development and promotion; (b) infrastructure development; (c) investment and financing; (d) technology development, training, extension and communication support; (e) program advocacy, information networking and dissemination; and (f) program management. For 1999, the budget share of technology development, training, extension and communication support is 23% of the total of P527 M, much higher than the 1998 budget allocation of 12%. For the DA RFUs, this share is about 31% (Workshop Output of the Agrikulturang MakaMASA, February 9-11, 1999).

Among the SCUs, UPLB has the most comprehensive R&D agenda considering its pool of experts and relatively better facilities than other national or regional R&D centers. The bulk of its on-going projects are on banana, mango, papaya, pineapple and others like cashew, durian, jackfruit and pili, covering mostly varietal improvement, postharvest handling, pest management and cultural management. Much of these will be using biotechnology interventions like genetic engineering, cell fusion experiments, tissue culture, marker technology, cryogenic technology, and protoplast fusion and culture. Specific biotechnology projects on fruits include control of ripening of papaya, production of diagnostic kits using monoclonal antibodies for viral disease of selected fruits, mass production of virus-free planting materials, development of resistance to PRSV and BTV, conservation and enhancement of genetic pool, and others. Towards promoting biotechnology and its products, policy and social marketing studies as well as impact assessment of commercialized technologies are also included. Altogether, the UPLB biotechnology R&D program on fruits covers 13 studies on banana, 1 on mango, 2 on durian, 2 on papaya, and 1 on pili with a total budget of P47.57M (Table 37).

With the most recent reorganization at DA and BAR taking a proactive role in research planning and prioritization, future R&D is expected to be re-oriented towards the following themes: improving agriculture and fisheries productivity and profitability, protecting the environment, saving biodiversity, improving policy, and nurturing knowledge system in agriculture and fisheries. R&D thrusts is expected to remain focused on food security, poverty eradication and people empowerment, productivity and income, sustainable agricultural development, and global competitiveness. Strategies to be adopted will strive toward strengthening national and regional institutions, research excellence, accountability, sound economic rationale, and more defined private sector role. Moreover, increased R&D resource allocation for Mindanao is provided for (Ponce 1999). Socio-economics will also receive growing emphasis especially in terms of assessment of needs and constraints, marketing studies, policy analysis, and impact assessment of technologies and programs.

5. Strengths and Weaknesses of RDE Institutional Structure

5.1 RDE Institutions, Complementation and Networking

Almost all institutions involved in R&D also perform extension function. These include those comprising the NARRDS (see Section 4.1) and extension work could range from mere piloting and testing of technologies generated by involving a limited number of farmer-beneficiaries to extending technical assistance in various forms like training of farmers, conducting field demonstrations, responding to on-call requests for assistance and others.

Among the SCUs, extension forms part of the trilogy of functions and structurally is given as much importance as instruction and research usually with a separate Office of the Director for Extension. Recently at UPLB, this was elevated to the Office of the Vice Chancellor for Research and Extension (OVCRE) recognizing the important linkage between these two functions. In practice, however, extension at SCUs like UPLB is primarily extension education usually in terms of providing training programs and short courses with minimal extension service and actual contacts with farmers in the field. The recent UP initiative is the volunteer service program called the “Ugnayan ng Pahinungod”/Oblation Corps where volunteers for extension work include faculty, research personnel and students alike. The program provides only manpower resources, does not have budgetary support, and is much dependent on financial counterpart from the beneficiary LGU.

At the DA, the Agricultural Training Institute (ATI) is the primary training arm with all the field stations and research centers providing various forms of extension services. Since they form part of the regional consortia, their extension activities are expected to be coordinated with the various R&D centers comprising the regional consortium whose extension structure is based on PCARRD’s Farmer-Scientist Bureau (FSB) program popularly called the Magsasaka-Siyentista program. Together with all other extension modalities (technology forum, production and distribution of IEC materials, one-stop-information shop (OSIS), farmers information and technology services (FITS) or Techno Pinoy, commodity information network, research management service, rural-based enterprise development process, intellectual property rights services and technology assessment services), the FSB has evolved to an integrated program now called “Techno Gabay Unlad Para sa Masa Program” (PCARRD Information Bulletin No. 134/1999). The institutional partners include LGUs, business organizations, LBP and other line agencies. As of April 1999, 31 FITS sites have been established nationwide with base agencies such as the LGU, NGO, SUC, DA, PSTC and private sector.

Conceptually, the above program is based on the farmer-centered model of participatory development in agricultural development and natural resource management where farmers interact with NARRDN scientists and experts, thus becoming directly involved in technology generation and development. However,

the concept is relatively new to the NARRDN and its full operationalization would require much more resources, fine-tuning, dedication and more focused activities from all involved than what are currently provided. The limited dissemination of technologies and adoption by farmers described above attests to the deficiencies of the present system. This is not to say that the operational framework and networking arrangements among the member agencies of the various consortia are totally useless.

The present system has some unique features which can be further improved. First is that member-institutions have complementary roles. The SCUs have an important role of providing an objective environment for R&D particularly basic/upstream research with its large pool of experts, academic orientation having varied undergraduate and graduate curricular programs, and linkages with international institutions based in the campuses. On the other hand, the regional multi-commodity R&D centers like the BPI and specialized agencies like the NMRDC (Guimaras) which have more direct access to farmers, field experiences, a better understanding of agricultural production environments where they are based, and more focused (flagship) programs seem to be in a better position to address applied research problems and issues. When the private sector and LGUs are directly involved, they are able to provide feedback on current industry problems, needs, acceptability of technologies, and adoption constraints which can be inputted in the R&D agenda. Second is the resource-generating capacity of the consortium where PCARRD and member institutions put up counterpart funds and in some cases LGUs provide financial support for specific activities. Third is the increasing role not only of the LGUs as they are forced by the process of devolution to get more directly involved in RDE for the benefit of their constituents but also of the entrepreneurs/private sector who see the benefit of taking advantage of available services especially those whose own R&D funds are limited. For example, cashew planters and processors in Palawan, Antipolo (Rizal) and Cagayan de Oro participated in the implementation of Cashew IRDP through STARRDEC and for 1998, the LGUs/cooperatives chipped in P500,000, the NGOs P150,000, Victory Industrial P200,000, and Sandoval Foundation P50,000 (1998 STARRDEC Annual Report). In 1998 and 1999, the private sector has significant participation in the holding of the National Banana Congress and National Mango Congress, respectively. The latter was organized by the Visayas Chamber of Mango Industries, Inc. (VCMII), Rotary Club of Cebu-Guadalupe and Philippine Mango Industry Development Council in cooperation with DA (AMAS, BAR, BPI, NAFC/RAFC-7, RFUs 1-15), DOT, PFA, PCARRD, LGUs, and CPAP. And fourth, there is much opportunity for NARRDN to improve based on earlier experiences, problems encountered and lessons learned. The networking mechanism among the members should thus be strengthened and provided with adequate budgetary support. Most of all, a leadership that ensures implementation of more focused activities according to a well-thought out and planned R&D program/agenda must be in place.

5.2 Weaknesses of the RDE System

In general, the RDE system appears to be constrained by (a) too many and varied activities of the institutions which oftentimes are difficult to sustain due to lack of resources, (b) inadequate planning, (c) uncoordinated efforts, (d) limited capacity of LGUs, (e) lack of commitment on the part of RDE personnel, (f) poor incentives, and (g) weak monitoring and evaluation system.

Based on the report of the UPLB OVCRE, the R&D problems which cover non-fruits research as well primarily relate to lack of funds and delay in the release of budgeted funds. Within UPLB, appropriated budget for the different units are limited and R&D output of each unit is much dependent on its ability to generate funds from external sources. For relatively productive units like IPB and PHTRC, the bulk of research money come from outside sources. For example, IPB in 1997 has generated about P70.26 M while its regular budget for the year was P35.26 M. Other units within UPLB and other SCUs are not as successful in funds generation which explains their limited output. On extension, the problems include: lack of funds; high cost of promoting developed technologies; lack of financial support for sustainable technology promotion; lack of genuine commitment, understanding and appreciation of personnel of some LGUs and sectoral agencies; inadequate capability at the local levels; persistence of dole-out mentality and attitude among target beneficiaries; wait-and-see attitude of farmers; and adverse effects of devolution and local autonomy (e.g. lack of funds and projects being inconsistent with political agenda of local executives).

Among regional R&D centers (e.g. RIARCs), there is a general feeling that there are too many activities to be done and many commodities to cover relative to available resources (personal communication with STIARC staff). It may happen that a researcher is expected not only to do research but extension as well and in some cases is given some administrative function. While some other staff are available, their capability and training do not allow them to do such multiple functions. Thus, some are relatively overloaded than others. In some cases, they feel that there is too much paperwork to do and too many deadlines to meet such that quality of work is compromised and the ideal process of participatory approach in preparing R&D agenda is left out. Research budget is limited (less than P50,000 for many projects), and release is oftentimes delayed adversely affecting the planned activities. In some cases, the research equipment provided is inconsistent with the needs of researchers, not provided with accessories, and not complemented with adequate staff training, hence could not be used and simply wasted.

While the FITS is meant to bring technologies and information closer to farmers, the problems encountered in some sites demonstrate the need for better and more coordinated planning and preparation. The Marinduque Techno Pinoy launched on 22 April 1997 through the STARRDEC was later found out not operational during the site visit on September 14-15, 1998. Also, there was no

available space at the Office of the Provincial Agriculturist, and there was no assigned staff as information service specialist and technology service specialist. Similarly, the Rizal Techno Pinoy launched on 27 February 1997 first at the Training Center of the Municipal Building and then moved twice to another place is faced with a number of problems. It is not frequently visited as a mini-library; it lacks promotion; there is no staff assigned as site manager, information service specialist and technology service specialist; and the assigned staff to the FITS has no experience in the conduct of technology services. Two others in Roxas and El Nido, Palawan which were meant to support the Cashew IRDP were not also operational during the site visit due to lack of manpower, limited understanding on the concept, lack of funds and equipment, and depleting information materials (1998 STARRDEC Annual Report).

An evaluation of R&D requirements, capability and performance of selected NARRDN institutions) also reveals the limited capability of institutions resulting to low performance (RMC 1997). While the study covered a number of R&D centers, three which have relatively more work conducted on fruits, namely, UPLB, USM and BPI (especially BPI Davao), are presented here.

Table 43 shows that UPLB and USM are quite adequate in terms of manpower and expertise requirement while BPI needs more technical staff with advanced degrees. However, BPI has to be selective in sending people for graduate degree training since on average, its research personnel are older than those in UPLB and USM. The number of research personnel is increasing during the period considered but USM and BPI seem to be less able to generate funds from outside sources to support their R&D activities. The MOOE is almost the same for the three institutions but is very small and in the case of UPLB has even declined during the 1993-1995 period. Infrastructure in terms of floor area per research staff is grossly inadequate in the three institutions. While some facilities remain functional, some need repair, others are obsolete, while others need to be totally replaced. Information and communication technologies and equipment including vehicles need to be acquired.

Despite these inadequacies, USM appears to be a leading national center in fruits R&D having the biggest manpower resources both in quantity and quality and infrastructure resources in Mindanao. According to Pamplona and Oliva (1999), it has 41 fruit crop researchers most of whom have M.S. and Ph.D. degrees (about half obtained from UPLB) and who spend from 30% to 60% of their time in fruits R&D. USM has 2,856 sq.m. of fruit crop laboratory facilities, 300 ha of experimental fields, 976 sq.m. of greenhouses and screenhouses, 159 units of various types of irrigation facilities, 204 germplasm collections on fruit crops covering 69,000 sq.m., scion groves and clonal gardens with 45 clones covering 32,500 sq.m., fruit nurseries of 10,100 sq.m. and production demo farms (fruit orchards) of about 84.6 ha.

Performance of UPLB, USM and BPI, as measured by technologies generated and publications, is low (Table 44). For example, during the 1991-

1995 period, the figures show 19 technologies per 100 staff developed at UPLB and only 4 at BPI and 5 at USM. Journal publications averaged only 3 per 100 research staff at UPLB, 6 at USM and 5 at BPI. This is low relative to one journal article that could be published by a senior staff every 3 years.

The low rate of publications may reflect a number of things: the poor quality of research output, lack of follow-up on completed researches, lack of financial support and absence of premium/incentives for researchers who publish their papers. In most cases, publication is not considered part of the research process and is not included in the budget and thus not given much attention by researchers. Exceptions are when they form part of the promotion criteria and promotions come often. However, staff promotions are very limited in SCUs like UPLB.

Generally, the incentive structure for R&D is poor. PCARRD and BAR-funded projects following DOST rates provide very low honoraria for researchers (P3,000 and P2,000 per month for program and project leaders, respectively, with 20-40% of time spent on the project). An internationally-funded project with similar staff time involvement could provide about P10,000-P15,000 per month. Researchers also find other alternatives like consultancy projects even more financially rewarding. Incidentally, it happens that public R&D centers lose their researchers (whom they have trained) to the private sector which is more willing and able to provide higher pay. This lack of incentives also does not allow for maximum participation of the private sector as members of the national R&D teams. The honorarium given for attendance in meetings to evaluate research proposals for which their inputs are important is sometimes not even enough to pay for their transportation expenses. This also explains why non-Los Banos based commodity team members often send representatives (who may be a different person each time) to attend meetings held in PCARRD.

Although NARRDS has designed a system for M&E where experts from the academe and private sector can participate, the above problems including lack of follow-ups of specific recommendations make the system less effective. An on-going project can even be stopped due to budget constraint. Projects which have generated technologies that need further verification, refinements and piloting may not receive additional budget support.

At the DA level, RFUs are required to submit annual accomplishment reports relative to their respective work and financial plans and targets. Unfortunately, reports are usually in terms of numbers (seeds/planting materials produced and distributed, nurseries and foundation scion groves established, pockets of soil inoculants produced and distributed, training courses conducted, completed and on-going studies, etc.) and lack impact assessment. The latter may have to wait for some research proposals and budget allocation. Thus, specific needs and problems are not identified and addressed and oftentimes completely forgotten especially when new priorities and programs are fed into the system as a result of changes in administration and people.

6. Summary of Findings

The main points drawn from the above analysis are as follows:

On the Economic Contributions of Fruits

- Fruit production uses up 6.59% of total crop area and contributes about 13.34% to GVA. Comparatively, coconut and corn each contributes only 5-6% to GVA but both use up more land resources (25% and 21% of total area, respectively). Fruits' GVA share is rising over time and the most important contributors are banana, mango and pineapple.
- Fruits generate about 1/5 of total agricultural exports compared to 35% for coconut products.
- Employment in fruit industries is estimated to exceed 10 million. Fruit tree species have important environmental functions (soil protection, biodiversity, maintaining clean air and green surroundings, etc.) but these are not presently valued. Also, the value of non-marketed goods (fruits and fuelwood consumed at home) is not accounted for but is expected to be large.

On Area, Yield and Production

- Banana occupies almost 40% of total fruit area. Total area shows an upward trend with mango having the biggest increase.
- Although fruits are grown all over the country, production is concentrated in the top 5 regions. These regions are more adapted to production of particular fruits due to better soil and climatic conditions and have greater degree of technology adoption than others. This is true for banana, pineapple, durian and papaya grown in commercial scale in Mindanao and mango in several regions in Luzon.
- Fruit production is increasing except for citrus and papaya but the series of El Nino and La Nina phenomena caused production to drop between 1997 and 1998. Rising production is due to area expansion (except for pineapple) and yield improvements for major crops. Yields of citrus, durian and papaya have declined.
- National average yields for mango, banana, pineapple and papaya remain below the potential (experimental) yields. However, the highest yielders at the regional level have exceeded (mango and pineapple) or come close (banana) to the experimental yields.

On Domestic Consumption

- Per capita fruit consumption is expanding. Mango, banana, papaya and pineapple are the highly consumed fruits. Consumption is directly related to income, education, urbanization, and people's health consciousness. It is also higher in fruit-producing regions. In poor areas like Bicol and Eastern Visayas, banana forms part of the food staples.

On External Trade

- Export value of fruits exceeds value of imported fruits. Export was rising at an annual rate of 1.45% and import at 0.84%. Banana comprised more than half of total export, pineapple about 1/3, and mango 11%. Papaya, citrus, guyabano, jackfruit, cashew and others each has very small contribution and most of these registered negative export growth during the 1994-1998 period.
- Export of banana chips/crackers remains small relative to fresh banana export but was steadily growing. Pineapple is exported in many forms and as a whole showed some small growth like fresh banana. Mango export grew at much higher rate while papaya export declined markedly. Export of other fruits was highly variable.
- Export markets for Philippine fruits are highly diversified numbering as many as 55 for preserved pineapple. Major markets include Japan, Korea, Hong Kong, China, USA, and Singapore. Japan's import share of banana and fresh mango has been declining but new markets are emerging like Germany, Australia, Canada and UK especially for mango and banana.

On Market Potential

- Fruits have large potential in the domestic market. Increases in purchasing power and improving education, health and nutrition consciousness favor expansion in demand for fruits.
- Being already known in the world market and given the strong demand for fruits, Philippine banana, pineapple and mango are expected to be major export earners as long as these industries remain competitive in price, quality, volume, service and delivery requirements of buyers. The export potential of other fruits depends largely on our ability to expand domestic production of quality fruits (fresh and processed), increase export volume to existing markets, and explore new markets. World trade of fruits is generally rising and the Philippines needs to improve its competitiveness in order that it could at least maintain its share for the major fruit crops (banana, mango and pineapple) in the world market.

On Industry Constraints and Problems

- Resource-poor small farmers are the ones most affected by problems on lack of quality planting materials; inadequate extension services on technologies for orchard establishment, fertilization and water management, pest and disease control during production and postharvest, and processing; high cost of inputs; and lack of capital. Non-implementation or lack of product quality standards, poor handling, and inability to use appropriate packaging materials bring about large product losses.
- Limited market information and infrastructure problems prevent the efficient flow of products from supply areas to market centers.

On Fruits Research

- Public sector research on fruits is undertaken through the NARRDS consisting of different national and regional R&D centers and specialized agencies which include SCUs and line agencies. Networking is facilitated through the 14 regional consortia each focusing on flagship commodities. Mango is a flagship commodity in three consortia, durian in two, and cashew and pili in one each. At present, IRDPs for mango, cashew, pineapple, banana, and durian are being implemented.
- Private sector research is conducted by private firms to address their R&D needs. Technologies generated particularly for banana and pineapple are now widely adopted by commercial and export-oriented farms.
- DOST records show 413 fruit research projects with total budget of P61.82 M in 1996. By commodity, mango has the most number of research projects and largest budget (30.27% and 24.19% of total, respectively), followed by banana (13.92%). Next are cashew (11.08%) and durian (5.27%) which both have very minimal GVA contribution. Pineapple has public budget support of only 1.89%. It is expected though that the private sector particularly the export-oriented companies continue to invest heavily in pineapple R&D.
- The total budget was allocated as 73.46% direct research, 4.45% extension, 12.63% development, and 9.46% general R&D. This allocation is indicative of the low priority for activities intended to bring the technologies to farmers and determine any problems or constraints associated with adoption of these technologies.
- Budget allocation gave priority to varietal improvement/breeding (24.91%), cultural management (16.30%), and postharvest (12.02%). The lowest priority was for socio-economics (2.51%) and utilization of by-products and wastes (0.58%). There is no research at all to address environmental issues.

- By institution, SCUs had 52.10% share, the rest being for the line agencies. UPLB has the biggest allocation (32.92%) and USM a far 2nd (3.03%) indicative of the low priority for Mindanao despite its significant contribution in fruit production. About half of the line agencies' budget was committed to the KCCDP.
- Many projects (42%) are of short-term duration (1-2 years). Annual budgets varied considerably, as high as P4.4 M for one and as low as P2,000 for another project. But generally, researchers operate with very low annual budget with majority having less than P50,000 or less, most of which have P20,000 and below.
- The RIR for fruits as a whole is 0.34. By crop, the RIRs are 0.37 for mango, 0.17 for banana, 0.16 for citrus, 0.05 for pineapple, and 0.63 for other fruits. Considering the suggested RIR of 1% (that is, research budget should be at least 1% of its GVA contribution), the fruits R&D is clearly underfunded. Within the fruits sector, the allocation is also incongruent as indicated by the unequal RIRs for the different fruit crops.
- Fruits research at UPLB for 1980-1999 involved 163 projects with budget of P59.09 M. High priority fruit crops are banana, papaya, mango and pineapple. Priority research areas are postharvest, varietal improvement, pest control and cultural management. Technology dissemination and impact assessment rank low. There are no reports of socio-economics research on fruits except a few done as graduate theses. (It is possible that socio-economic studies undertaken by staff have not been reported). UPLB has a big biotechnology research program for fruits for 1998-2000 having a budget of P47.57 M. Budget allocation is 55.01% for banana, 15.77% for durian, 13.67% for papaya, 11.35% for mango, and 4.20% for pili. Research areas include development of virus-free planting materials, breeding and disease control.
- Fruits research including students' theses at USM cover a wide variety of fruits with the highest number for durian. The 9 completed research studies reported has a budget of P3.185 M and focused on varietal improvement and cultural management. Only one study each was recorded on processing and economics of production and marketing. There are 16 on-going researches, two of which have a total budget of P10.39 M. Banana and durian continue to be the priority commodities covering almost all aspects including socio-economics, marketing and development communication. Studies on impact assessment and analysis of constraints and needs of farmers, however, are lacking.

On Technologies Generated

- Technologies were generated through many years of intensive and extensive research conducted in various institutions. In recent years, however, the Global Technology Search (GTS) program of DOST helped USM fastrack development of POTs as in the case of technologies on durian, lanzones and mangosteen
- Technologies developed for mango relate to propagation, orchard establishment, cultural management, crop protection, harvesting and postharvest. The latter includes fruit maturity determination, pest control using HWT and VHT, protocol for refrigerated handling, cold treatment, proper handling and use of packaging materials, hastening fruit ripening, and processing methods.
- For banana, technologies include tissue culture and procedure for field planting of tissue-cultured cultivars, pest control and other aspects of cultural management, postharvest handling, and processing.
- For pineapple, there are recommendations on planting, fertilization, irrigation, pest and disease control, and waxing for delaying ripening, disease control and prevention of chilling injury during storage.
- For papaya, technologies on production and postharvest are available. Sinta variety has been recently developed.
- For durian, technologies include multiple rootstock techniques, orchard establishment through modified inarching, intercropping with lakatan banana and coconut, inarched large planting materials, modified budgrafting, single node grafting techniques, and other production technologies from nursery and orchard establishment to harvesting. A durian clone (*Duyaya*) has also been developed.
- For lanzones, technologies are available on cultural management, off-season production and modified crown grafting. In the case of mangosteen, technologies include nursery and orchard establishment and management and intercropping with banana and coconut.
- A plant diagnostic kit is available for positive identification of plant and feed pathogens and mycotoxins in banana, citrus, papaya, mango and others.
- Different fruit varieties have been developed and released by the Philippine Seed Board.

On Extent of Technology Adoption

- Studies assessing adoption rates are quite limited. Existing ones are either conducted many years ago, quite location-specific, or covered small samples.
- For mango, the most widely adopted technology is flower induction using KNO₃. Others are adopted at varying and lesser degrees like pest control, fertilization usually lower than recommended rates, intercropping, fruit bagging, and induced ripening. Very few irrigate their farms. Postharvest quality control measures are adopted by some exporters. Common practices at the farm level are sorting by size and condition of the fruits, and use of traditional packaging materials.
- Papaya farmers' adoption of technologies like field sanitation and disease control is limited. Laguna farmers who have planted the Sinta variety and availed of technical information from IPB, UPLB show relatively higher adoption rate. Still, fertilizer application and pest control practices are not always consistent with recommendations.
- Technology adoption among Saba banana farmers is low.
- Durian farmers adopt various methods of disease control but many do not use the recommended rates of chemical application.

On Consequences of Adoption

- Yields have improved through the years but national averages remain lower than potential yields. In regions where plantation-type farms are common especially for banana and pineapple in Mindanao, yields are much higher.
- A few studies comparing farms of varying degrees of technology adoption show higher yields and net returns for farmers with higher adoption rate.
- Expansion of commercial plantings of fruit crops like durian, lanzones, mango, banana, pineapple, citrus, lanzones and jackfruit in many various provinces in Mindanao has been partly attributed to the active participation of USM in fruits R&D and the various fruits POTs it has developed.

On Constraints to Technology Adoption

- Some factors which limit technology adoption include lack of capital to purchase required inputs, inadequate technology dissemination, subsistence nature of production, absence of infrastructure and support services, lack of incentives, and unfavorable government policies.

On Current RDE Priorities

- Existing RDE programs are based on the 1995-2000 MTRDP with emphasis on agro-industrialization and global competitiveness and meant to support recent programs like GA-HVCC and Agrikulturang MakaMASA.
- Priority fruit crops are banana, mango, papaya, pineapple, and others like cashew, durian, jackfruit and pili.
- Priority areas are varietal improvement, postharvest, pest and disease control and cultural management but with increasing emphasis on biotechnology interventions especially at UPLB. Currently, PCARRD supports a few initiatives on impact assessment of technologies developed and socio-economic evaluation of IRDPs (e.g. durian, mango)
- Toward a more integrated approach to RDE, socio-economics, extension and communication become important areas.

On the Strengths of RDE Institutional Structure

- **The NARRDS and NARRDN are efforts to achieve a more coordinated and effective**
RDE. There is much to be desired regarding the effectiveness of these initiatives but lessons can be learned in some of its present features.
- These include complementation among member-institutions and partners; design for resource generation; and participatory approach with involvement of LGUs, private sector, NGOs, SCUs, and line agencies.

On the Weaknesses of RDE System

- The RDE system is much constrained by the institutions' numerous and varied activities which are difficult to sustain due to lack of resources, inadequate planning, uncoordinated efforts, limited capacity of LGUs, lack of commitment of RDE personnel, poor incentives, and weak monitoring and evaluation system.
- Due to these constraints, many RDE institutions have inadequate capability to perform their functions and mandates resulting to low performance.

7. Conclusions and Recommendations

Fruits contribute significantly to GVA, employment, and foreign exchange earnings not to mention the unvalued non-marketed goods and services provided by multi-purpose fruit tree species. Fruits have considerable potential both in domestic and export markets.

However, R&D support for fruits is limited as is true for agriculture as a whole. Within the fruits sector, R&D budget allocation is inconsistent with commodity-specific economic contribution. Regional R&D centers like those in Mindanao receive too little research budget despite its importance as fruit producing region. Research budgets are very low and many projects are of short-term duration. With some exceptions, facilities are inadequate and while manpower may appear adequate in number, the same cannot be said of its quality. Research incentives like honoraria are very limited and researchers are not motivated to publish their research results. All these affect the performance of R&D institutions and should form part of the recommendations for comprehensive reforms needed in fruits R&D.

There are quite a number of technologies and fruit crop varieties that have been developed and reported. Private sector research has contributed greatly to the development and adoption of technologies for banana and pineapple in commercial, plantation-type farms. A broad examination of the technologies and consultations with key informants indicate that while some are considered mature, some need more refinements in terms of their adaptations to local conditions and as new problems arise as they are actually tested in farmers' fields. Problems regarding these technologies usually surface during dialogues and consultations with farmers and industry representatives. Clearly, there are constraints along various points in the entire RDE continuum, including inadequacies in the extension system and the present networking and coordination mechanisms. While general observations are reported, there is a need to adequately track down these problematic points, make an in-depth assessment of the constraints, and provide appropriate recommendations. Extension is a low priority activity and its scope has been limited to production technologies and concerns. Even then, these have not been adequately addressed.

The broad RDE areas covering varietal improvement, pest and disease control, postharvest improvement, and cultural management are well-defined priorities but budgetary problems and misallocation across commodities and regions have limited the entire fruits R&D program. Moreover, the program is weakened by the apparent neglect of socio-economics including analysis of benefits and costs associated with technology adoption; effectiveness of extension strategies; analysis of adoption constraints; analysis of markets, marketing arrangements and viable options, efficiency of the distribution systems, and infrastructure bottlenecks; and assessment of policies and technologies and their impacts on the various sectors comprising the fruits industry. Research on these areas are expected to support technology development and extension to intended users through identification of benefits and costs, problems associated with adoption, and required support services to complement and enhance the effectiveness of RDE. Research to address emerging environmental issues and externalities associated with technology adoption (excessive use of chemicals, plantation and monocropping schemes, waste disposal of fruit processing industry) as well as assessing the correct value

and contribution of fruit species through appropriate valuation of non-marketed goods and services is virtually absent.

The CPTs organized by BAR are currently preparing the fruits RDE agenda. Initial drafts identified mango, banana, pineapple, durian and citrus as priority commodities. Priority RDE areas were identified relative to problems and issues relating to production, marketing, environmental concerns, saving biodiversity, improving policy, and strengthening R&D institutions. While the proposed agenda will continue to undergo further refinements through more consultations, it is intended to address many of the problems earlier identified hence its implementation should be adequately supported. In the area of socio-economics, the following research areas are suggested but these should be refined and prioritized accordingly at the regional level.

- Economic valuation of non-marketed goods (home consumption of fruits and fuelwood) and services (environmental functions) provided by fruit crops
- Analysis of externalities (environmental and health impacts) of fruit production and processing activities relating to the use of pesticides, fertilizer, and other chemicals; plantation and monocropping system, fruits processing and waste disposal
- Evaluation of benefit and costs and distributional impacts of adoption of production, postproduction and processing technologies
- Identification and analysis of technology adoption constraints and measures of addressing them
- Investment analysis for determining appropriate scale of operations for fruits processing and possibilities for sourcing required equipment/machineries
- Analysis of the changing input and output market structure for fruits (at the farm, trading and processing levels) as affected by various factors (policy, infrastructure, marketing, joint venture and other institutional arrangements) including efficiency and distributional impacts
- Policy studies on agrarian reform, use of idle public lands for fruit plantation development, trade liberalization, hectareage limits for banana, quarantine regulations, financing, product standards and safety, certification, export procedures, transport, etc.
- Enhancing the effectiveness of cooperatives and producer groups in technology adoption, marketing, and advocacy for policy and support services
- Strengthening the extension system for fruits and analysis of various information delivery systems and communication strategies

- Assessment of market potentials in both domestic and international markets

As a whole, public sector support for fruits should be well provided in terms of increased budgetary outlays for direct research cost, development and commercialization of the resulting technologies, and disseminating these to users. For banana and pineapple, more efforts are needed to address the needs of small non-plantation farmers, traders and processors. Specifically, the Saba/Cardaba varieties of banana which are widely grown and have large potential for processing and meeting the staple needs of the poor should be given attention. Access to disease-free/certified planting materials especially for newly-developed varieties like Sinta papaya should be greatly improved. The scope of agricultural extension should be expanded to include postproduction (postharvest handling, treatment, packaging) and marketing concerns (market matching, information on supply/demand conditions, prices, benefits and costs of value-adding activities).

Adequate support for upgrading R&D facilities, strengthening institutions, and improving overall incentive structure is imperative. While AFMA provides a specific allocation of 1% of agricultural GVA for agricultural R&D, it is silent on how the incentive structure may be improved. Honoraria rates of DOST which obviously have lost its purchasing power over the years, for example, continue to be adopted. Unless, rate adjustments are made, researchers will continue to find consultancy projects and those funded by external donors (which have shorter duration and biased toward their respective RDE agenda) more attractive than DOST- and DA-funded projects. Thus, R&D may remain wanting in quality even if quantity may increase through increased budgetary allocation (via a greater number of research projects).

There is a need to continuously involve the private sector in order to make R&D relevant and responsive to their needs and to encourage them to provide feedback on the performance and needed refinements of technologies. Also their participation could be in terms of sharing their technologies and knowledge to the R&D community and other farmers for more widespread adoption of these technologies. More innovative approaches should be developed to enhance the participation of the LGUs through direct financial support; provision of facilities; coordination at the local level among farmers, people's organizations and private sector; and long-term commitment in RDE projects. The participation of more progressive and innovative farmers in bringing technologies to a greater number of users should be enhanced particularly in sharing their experiences and learnings to other farmers.

Public support to RDE should also be in terms of complementary support services (credit), facilitatory mechanisms to reduce cost of doing business (import and export procedures, obtaining licenses), favorable policies, market information and linkaging, and infrastructure (roads, bridges, postharvest facilities, shipping).

Public programs for enhancing environmental awareness at various points like production of raw materials, postharvest, processing, packaging and waste management should be initiated. Issues on the internalization of externalities associated with private sector activities and product certification are already emerging and should also be integrated in the fruits R&D agenda.

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Table 1. Relative importance of fruits in agricultural production value, volume, harvest area, GVA, and export value, Philippines, 1993-1997.

	1993	%	1997	%	1993-1997 Average	% a/
<u>Prod. value</u> (P million)						
All crops	177,472		276,826		230,807	
Fruits	36,465	20.55	58,925	21.29	45,897	19.90 (1.23)
Banana	10,564	5.95	14,921	5.39	12,693	5.55 (-0.54)
Mango	6,716	3.78	10,554	3.81	9,556	4.15 (-0.63)
Pineapple	5,394	3.04	11,090	4.01	6,957	2.98 (5.77)
Papaya	289	0.16	255	0.09	280	0.12 (-1.30)
Citrus	1,561	0.88	1,745	0.63	1,697	0.75 (-10.36)
Durian	739	0.42	885	0.32	840	0.38 (-4.48)
Other fruits	11,202	6.31	19,475	7.04	13,873	5.96 (1.33)
<u>Prod. volume</u> (‘000 mt)						
All crops	65,767		68,301		66,778	
Fruits	8,694	13.22	11,059	16.19	9,585	14.35 (2.74)
Banana	3,144	4.78	3,760	5.51	3,378	5.07 (1.77)
Mango	440	0.67	1,028	1.51	708	1.06 (20.13)
Pineapple	1,287	1.96	1,638	2.40	1,448	2.17 (2.82)
Papaya	65	0.10	65	0.10	62	0.09 (-3.06)
Citrus	142	0.22	143	0.21	144	0.22 (-2.98)
Durian	28	0.04	29	0.04	28	0.04 (-2.01)
Other fruits	3,588	5.46	4,396	6.44	3,817	5.71 (2.31)
<u>Harvest area</u> (‘000 ha)						
All crops	12,549		13,025		12,790	
Fruits	815	6.49	877	6.73	846	6.59 (0.93)
Banana	326	2.60	338	2.60	328	2.57 (-0.01)
Mango	61	0.49	92	0.71	77	0.61 (10.12)
Pineapple	43	0.34	40	0.31	43	0.34 (-2.56)
Papaya	6	0.05	6	0.05	5	0.04 (0)
Citrus	29	0.23	31	0.24	31	0.24 (1.13)
Durian	4	0.03	4	0.03	4	0.03 (-0.91)
Other fruits	346	2.76	366	2.81	355	2.78 (0.50)
<u>GVA in agric.</u> (P million)	163,556		182,383		172,584	
Fruits b/	9,554	5.84	32882	18.03	23,269	13.34 (39.62)
Banana	9,554	5.84	12893	7.07	11,358	6.57 (5.10)
Mango			12,637	6.93	8,875	5.04 (30.43)
Pineapple			6,966	3.82	5,546	3.16 (9.86)
Calamansi			386	0.21	468	0.27 (-10.69)
<u>Ag. export value</u> (FOB US\$ M)	2072 c/		2,338		2,304	
Fruits	439	21.19	474	20.28	468	20.36 (-0.80)
Banana	231	11.15	240	10.27	243	10.59 (-2.03)
Mango	41	1.98	53	2.27	50	2.18 (4.81)
Pineapple	146	7.05	150	6.42	148	6.47 (-1.58)
Papaya	1.39	0.07	0.58	0.02	1	0.05 (-28.15)
Citrus	0.6	0.03	1.53	0.07	1	0.03 (101.74)
Other fruits	19	0.92	29	1.24	24	1.05 (10.96)

a/ Figures in parentheses refer to growth rates of shares b/ Not available for "other fruits"
c/ 1994 values (including for all fruit items)

Source of basic data: BAS and NSO

Table 2. Harvest area, production volume and value and yield of fruit crops, Philippines, 1990-1998. a/

	Banana	Pineapple	Mango	Citrus	Papaya	Durian	Others	All Fruits
Harvest area b/								
1990	300.20	39.33	53.2	29.00	5.20	3.40	332.00	804.19
1998	337.10	40.23	92.9	31.00	5.50	4.40	365.90	877.42
1990-1998								
Average	323.41	41.39	71.54	30.00	5.33	3.74	347.83	829.18
%/year	1.29	-4.84	7.06	1.10	0.88	3.84	2.13	1.18
Production vol. c/								
1990	2,971.80	1,155.80	389.50	150.20	65.07	26.30	3,690.29	8,458.50
1998	3,550.00	1,495.12	950.10	142.80	65.41	28.80	4,395.49	11,059.30
1990-1998								
Average	3,285.03	1,349.54	633.79	144.24	63.73	27.61	3,777.56	9,284.13
%/year	2.07	5.16	8.27	-0.69	0.19	1.34	4.52	2.00
Production value d/								
1990	7,254.10	4,773.50	4,989.50	1,515.80	204.97	630.70	11,904.73	34,221.10
1998	14,921.10	11,090.40	10,554.20	1,745.00	255.24	884.80	19,475.36	58,926.00
1990-1998								
Average	11,372.93	6,131.76	8,032.93	1,604.33	251.99	837.65	13,226.42	42,724.13
%/year	11.27	14.81	12.02	2.35	4.32	16.66	9.44	5.10
Yield e/								
1990	9.90	29.39	7.32	5.18	12.51	7.74	11.12	10.52
1998	10.53	37.16	10.23	4.61	11.89	6.55	12.01	12.60
1990-1998								
Average	10.15	32.58	8.57	4.82	11.97	7.43	10.85	11.18
%/year	0.80	13.00	1.51	-1.54	-0.70	-2.18	2.12	2.80

a/ Data are for 1990 and 1997 for citrus, papaya, durian, others and all fruits

b/ In '000 hectares

c/ In '000 metric tons

d/ In million pesos

e/ In metric tons per hectare

Source of basic data: BAS

Table 3. Top five regions in fruit crops harvest area, production and yield, Philippines, 1997

	Harvest Area	%	Production	%	Yield (tons/ha)	Average
Banana	S. Tagalog, S. Mindanao, W. Visayas, CARAGA, C. Valley	59.76	S. Mindanao, C. Mindanao, C. Valley, W. Visayas, CARAGA	73.41	C. Mindanao, S. Mindanao, C. Luzon, N. Mindanao, ARMM	26.11
Pineapple	N. Mindanao, S. Mindanao, S. Tagalog, Bicol, Cagayan Valley	92.83	N. Mindanao, S. Mindanao, S. Tagalog, Bicol, C. Valley	98.17	N. Mindanao, S. Mindanao, CARAGA, Bicol, C. Visayas	49.7
Mango	Ilocos, S. Tagalog, Central Luzon, W. Visayas	73.46	Ilocos, Cagayan Valley, S. Tagalog, W. Visayas, Central Luzon	81.30	C. Valley, W. Mindanao, Ilocos S. Tagalog, W. Visayas	14.38
Papaya	W. Visayas, C. Luzon, C. Valley Bicol, S. Tagalog, S. Mindanao	63.54	S. Mindanao, S. Tagalog, W. Visayas, Ilocos, Central Luzon, C. Visayas, W. Mindanao	71.64	W. Mindanao, ARMM, S. Mindanao, Ilocos, S. Tagalog	20.83
Durian	S. Mindanao, CARAGA, ARMM C. Mindanao, W. Mindanao	77.60	CARAGA, S. Mindanao, ARMM, W. Mindanao, C. Mindanao	99.65	CARAGA, W. Mindanao, S. Mindanao, N. Mindanao, C. Mindanao	7.17
Calamansi	S. Tagalog, Bicol, Ilocos, W. Visayas, Cagayan Valley	82.40	S. Tagalog, Cagayan Valley, Bicol W. Visayas, Ilocos	77.55	Cagayan Valley, E. Visayas, ARMM, S. Mindanao, W. Mindanao	22.97
Mandarin	S. Tagalog, ARMM, S. Mindanao, Bicol, Cagayan Valley	96.05	S. Tagalog, ARMM, Cagayan Valley, S. Mindanao, Bicol	94.34	C. Mindanao, C. Valley, CAR, C. Visayas, CARAGA	8.78
Pomelo	S. Mindanao, Cagayan Valley, ARMM, W. Visayas, Bicol	75.63	C. Valley, S. Mindanao, ARMM, S. Tagalog, CARAGA	92.43	C. Valley, ARMM, S. Tagalog, S. Mindanao, CAR	14.49
Orange	S. Tagalog, Bicol, C. Valley, S. Mindanao, CAR	75.47	S. Tagalog, Cagayan Valley, CAR, Bicol, S. Mindanao	86.58	S. Tagalog, CAR, S. Mindanao, C. Mindanao, Cagayan Valley	5.66
Lemon	Bicol, E. Visayas, W. Mindanao, CAR, C. Valley	77.39	Bicol, CAR, N. Mindanao, E. Visayas, Cagayan valley	78.84	CAR, C. Mindanao, N. Mindanao, CARAGA, Cagayan Valley	4.15
Lime	Cagayan Valley, W. Mindanao, CAR, S. Tagalog, E. Visayas	89.91	C. Valley, CAR, N. Mindanao, S. Mindanao, W. Mindanao	97.47	Cagayan Valley, CAR, N. Mindanao, S. Mindanao, W. Visayas, C. Mindanao	2.62

Source: Appendix Tables 3a and 3b.

Table 4a. Banana production by variety and region, Philippines, 1997 (metric tons).

Regions	Total	Bungulan	Cavendish	Lacatan	Latundan	Saba	Others
Philippines	3,634,383	169,281	1,310,150	379,793	296,360	1,370,446	108,352
		[4.66]	[36.05]	[10.45]	[8.15]	[37.71]	[2.98]
CAR	29,273	10,178		4,385	4,476	7,901	2,332
		[34.77] a/		[14.98]	[15.29]	[26.99]	[7.97]
	{0.81}	{6.01} b/		{1.15}	{1.51}	{0.58}	{2.15}
I	51,810	3,364		10,391	23,390	13,209	1,457
		[6.49]		[20.06]	[45.14]	[25.49]	[2.81]
	{1.43}	{1.99}		{2.74}	{7.89}	{0.96}	{1.34}
II	119,869	7,260		14,127	18,760	76,652	3,070
		[6.06]		[11.79]	[15.65]	[63.95]	[2.56]
	{3.30}	{4.29}		{3.72}	{6.33}	{5.59}	{2.83}
III	33,449	8,395	1,461	2,876	5,868	9,999	4,850
		[25.10]	[4.37]	[8.60]	[17.54]	[29.89]	[14.50]
	{0.92}	{4.96}	{0.11}	{0.76}	{1.98}	{0.73}	{4.48}
IV	14,371	12,838	27	13,431	20,783	86,253	10,399
		[8.93]	[0.02]	[9.34]	[14.46]	[60.01]	[7.24]
	{3.95}	{7.58}	{0.00}	{3.54}	{7.01}	{6.29}	{9.60}
V	29,593	4,947		1,684	6,540	14,287	2,135
		[16.27]		[5.69]	[22.10]	[48.28]	[7.21]
	{0.81}	{2.92}		{0.44}	{2.21}	{1.04}	{1.97}
VI	240,586	22,476	516	4,298	27,898	178,868	6,530
		[9.34]	[0.21]	[1.79]	[11.60]	[74.35]	[2.71]
	{6.62}	{13.28}	{0.04}	{1.13}	{9.41}	{13.05}	{6.03}
VII	88,731	10,448		6,684	12,801	46,757	12,040
		[11.78]		[7.53]	[14.43]	[52.70]	[13.57]
	{2.44}	{6.17}		{1.76}	{4.32}	{3.41}	{11.11}
VIII	128,151	16,632		12,721	18,072	62,592	18,134
		[12.98]		[9.93]	[14.10]	[48.84]	[14.15]
	{3.53}	{9.82}		{3.35}	{6.10}	{4.57}	{16.74}
IX	105,747	13,431	12	8,987	14,744	56,126	12,446
		[12.70]	[0.01]	[8.50]	[13.94]	[53.08]	[11.77]
	{2.91}	{7.93}	{0.00}	{2.37}	{4.98}	{4.10}	{11.49}
X	202,079	10,148	11,115	30,102	14,469	133,117	3,129
		[5.02]	[5.50]	[14.90]	[7.16]	[65.87]	[1.55]
	{5.56}	{5.99}	{0.85}	{7.93}	{4.88}	{9.71}	{2.89}
XI	1,700,584	13,491	1,286,325	86,028	49,831	259,237	5,672
		[0.79]	[75.64]	[5.06]	[2.93]	[15.24]	[0.33]
	{46.79}	{7.97}	{98.18}	{22.65}	{16.81}	{18.92}	{5.23}
XII	343,263	14,829	49	102,584	30,266	181,712	13,822
		[4.32]	[0.01]	[29.88]	[8.82]	[52.94]	[4.03]
	{9.44}	{8.76}	{0.00}	{27.01}	{10.21}	{13.26}	{12.76}
CARAGA	245,095	13,859	9,984	26,797	32,253	155,967	6,234
		[5.65]	[4.07]	[10.93]	[13.16]	[63.34]	[2.54]
	{6.74}	{8.19}	{0.76}	{7.06}	{10.88}	{11.38}	{5.75}
ARMM	172,423	6,984	661	54,698	16,208	87,768	6,103
		[4.05]	[0.38]	[31.72]	[9.40]	[50.90]	[3.54]
	{4.74}	{4.13}	{0.05}	{14.40}	{5.47}	{6.40}	{5.63}

'a/ Figures in [] are ratios of banana variety to total banana.

'b/ Figures in { } are ratios of regions to Philippines.

Source of basic data: BAS

Table 4b. Mango production by variety and region, Philippines, 1997 (metric tons).

Regions	Total	Carabao	Piko	Others
Philippines	814,687	608,968	115,980	8,979
		[74.749]	[14.236]	[11.015]
CAR	3,664	3,227	423	13
		[88.09]	a/ [11.56]	[0.35]
	{0.45}	{0.53}	b/ {0.37}	{0.01}
I	376,372	328,496	9,949	37,927
		[87.28]	[2.64]	[10.07]
	{46.20}	{53.94}	{8.58}	{42.26}
II	2,982	1,328	93	1,561
		[44.52]	[3.13]	[52.36]
	{0.37}	{0.22}	{0.08}	{1.74}
III	192,175	104,523	68,734	18,918
		[54.40]	[35.77]	[9.84]
	{23.59}	{17.16}	{59.26}	{2.08}
IV	33,092	16,268	13,740	3,084
		[49.16]	[41.52]	[9.32]
	{4.06}	{2.67}	{11.85}	{3.44}
V	600	94	67	439
		[15.65]	[11.22]	[73.13]
	{0.07}	{0.02}	{0.06}	{0.49}
VI	60,322	57,811	307	2,205
		[95.84]	[0.51]	[3.66]
	{7.40}	{9.49}	{0.26}	{2.46}
VII	26,778	24,053	1,701	1,024
		[89.82]	[6.35]	[3.82]
	{3.29}	{3.95}	{1.47}	{1.14}
VIII	337	56	50	232
		[16.54]	[14.68]	[38.78]
	{0.04}	{0.01}	{0.04}	{0.26}
IX	26,477	12,677	9,848	3,952
		[47.88]	[37.20]	[14.93]
	{3.25}	{2.08}	{8.49}	{4.40}
X	10,213	5,176	1,873	3,165
		[50.68]	[18.33]	[30.98]
	{1.25}	{0.85}	{1.61}	{3.53}
XI	52,393	39,863	7,687	4,844
		[76.08]	[14.67]	[9.25]
	{6.43}	{6.55}	{6.63}	{5.40}
XII	4,810	2,406	800	1,603
		[50.03]	[16.64]	[33.34]
	{0.59}	{0.40}	{0.69}	{1.79}
CARAGA	11,698	11,389	191	118
		[97.36]	[1.63]	[1.01]
	{1.44}	{1.87}	{0.16}	{0.13}
ARMM	12,774	1,601	517	10,656
		[12.53]	[4.05]	[83.42]
	{1.57}	{0.26}	{0.45}	{11.87}

'a/ Figures in [] are ratios mango variety to total mango.

'b/ Figures in { } are ratios of regions to Philippines.

Source of basic data: BAS

Table 5. Mean one-day fruit consumption by survey year, income level, meal planner's education, household size and urbanization, Philippines.

	Vit. C - rich fruits	Other fruits	All fruits
<u>By food consumption survey year</u> <u>grams/day/person, raw as purchased</u>			
1978	30	74	104
1982	18	84	102
1987	24	83	107
1993	21	56	77
Actual inc./dec. 1978 to 1993	-3 ns	-27*	-30*
% inc./dec. 1978 to 1993	-12.50	-32.50	-28.00
<u>By income level (P/person/year)</u>			
< 3,000	9	52	61
3,000 - 5,999.99	12	53	65
6,000 - 8,999.99	28	53	81
9,000 - 11,999.99	27	44	71
12,000 - 14,999.99	32	64	96
15,000 - 17,999.99	28	73	101
18,000 and over	41	78	119
<u>By education of meal planner</u>			
No formal schooling	16	31	47
1-7 years	19	49	68
8-11 years	19	57	76
12 years and over	32	82	114
<u>By household size</u>			
1-2	26	68	94
3-4	24	68	92
5-6	22	60	82
7-8	18	54	72
9 and above	20	46	66
<u>By urbanization</u>			
Rural	15	58	73
Urban	27	55	82

Ns - not significant, * significant at 1% level

Source: FNRI

Table 6. Mean one-day per capita fruit consumption by region, Philippines, 1993

	NCR	Ilocos	CAR	C. Valley	C. Luzon	S. Tag.	Bicol	W. Vis.	C. Vis.	E. Vis.	W. Mind.	N. Mind.	C. Mind.	S. Mind.	ARMM
grams/day (raw as purchased)															
<u>Vit. C-rich fruits</u>	34	24	16	8	37	30	13	20	4	7	17	12	8	13	19
Mango	32	22	12	6	33	22	5	14	2	3	13	9	3	2	14
Papaya	1	n	3	1	1	5	6	3	1	3	2	2	2	10	2
Citrus fruits	2	n	1	n	2	1	2	n	n	1	1	n	2	1	n
Others	n	1	1	n	2	1	n	3	1	1	1	n	1	1	2
<u>Other fruits</u>	43	43	56	43	55	87	64	46	37	54	58	47	77	57	64
Bananas	19	15	39	22	24	29	47	36	32	45	34	32	67	41	55
Watermelon	8	n	2	4	6	9	n	n	0	1	n	2	0	0	0
Melon	5	4	3	n	5	5	0	0	0	n	0	0	0	n	0
Jackfruit	n	1	n	n	1	8	2	1	n	n	2	4	0	n	n
Pineapple	2	7	n	n	3	9	1	1	n	3	2	1	1	4	n
Young coconut	6	9	2	4	4	15	6	5	1	2	8	3	6	5	4
Kaimito	1	2	8	13	9	8	6	0	0	0	0	n	0	0	0
All other fruits	4	6	2	1	4	4	2	3	4	3	11	5	4	7	5
<u>Fruit juices</u>	n	0	n	n	1	n	n	n	n	n	0	0	0	0	n
<u>Other canned and processed fruits</u>	n	0	n	0	n	n	n	n	0	n	n	0	n	0	0

n = negligible (less than 0.5 gram)

Source: FNRI

Table 7a. Quantity of fruit exports and imports, Philippines, 1994-1998.

Item	1994	1995	1996	1997	1998	Growth rate (%/year)
	<u>'000 kg</u>					
<u>Exports</u>						
Banana, fresh/chips	1,170,658	1,231,182	1,270,573	1,162,429	1,164,072	0
Pineapple, all forms	459,711	448,465	439,235	410,834	371,116	-5.16
Mangoes, all forms	35,985	51,396	46,313	54,574	56,966	13.79
Papaya, fresh/dried	3,832	2,710	1,688	694	230	-48.18
Citrus, all forms	494	339	300	1,470	339	67.55
Grapes, all forms	63	28	25	3	32	203.10
Jackfruit, all forms	180	217	366	230	236	13.67
Guyabano, all forms	245	385	177	657	562	64.96
Others, all forms	30,762	35,482	38,431	41,594	36,847	5.12
<u>Imports</u>						
Fresh fruits	94,930	133,189	118,063	138,054	113,284	6.98
Fruit juices	6,890	7,592	7,175	9,162	6,837	1.75
Preserved fruits, fruits & fruit preparation	9,738	9,639	9,302	11,427	6,661	-5.84
Dried fruits	3,967	3,254	4,264	3,253	4,009	3.15

Source of basic data: Foreign Trade Statistics

Table 7b. Value of fruit exports and imports, Philippines, 1994-1998.

Item	1994	1995	1996	1997	1998	% share 1994-1998	Growth rt. (%/year)
	<u>'000 US \$ FOB</u>						
<u>Exports</u>							
Banana, fresh/chips	231,321	244,247	258,533	240,434	235,791	51.82	0.33
Pineapple, all forms	145,592	140,320	156,570	149,798	148,657	31.73	0.33
Mangoes, all forms	40,895	55,634	51,068	53,128	51,347	10.79	4.49
Papaya, fresh/dried	1,392	1,283	835	587	339	0.19	-44.39
Citrus, all forms	608	377	339	1,537	539	0.15	-44.92
Grapes, all forms	33	16	22	2	8	0	-250.99
Jackfruit, all forms	397	476	839	534	504	0.12	-0.80
Guyabano, all forms	265	455	218	878	646	0.11	-6.92
Others, all forms	18,843	21,774	25,004	27,576	25,735	5.09	7.14
Total	439,346	464,582	493,428	474,474	463,566	100	1.45
<u>Imports</u>							
	<u>'000 US \$ CIF</u>						
Fresh fruits	44,041	47,948	60,850	63,430	38,654	69.88	13.34
Fruit juices	8,514	10,045	10,380	11,758	8,226	13.41	11.53
Preserved fruits, fruits & fruit preparation	8,329	8,197	8,867	10,845	7,489	11.99	9.63
Dried fruits	2,577	2,398	3,780	3,519	4,939	4.72	14.59
Total	63,461	57,993	71,230	75,188	46,880	100	0.84
<u>Net exports</u>	375,885	406,589	422,198	399,286	416,686		1.95

Source of basic data: Foreign Trade Statistics

Table 8a. Quantity of banana exports, Philippines, 1994-1998.

Item	1994	1995	1996	1997	1998	Growth rate (%/year)
	<u>000 kg</u>					
Bananas, fresh	1,155,182	1,213,411	1,253,168	1,143,333	1,147,107	-0.03
Bananas, chips/ crackers	15,475	17,772	17,405	19,094	16,957	2.82

Table 8b. Value of banana exports, Philippines, 1994-1998.

Item	1994	1995	1996	1997	1998	Growth rate (%/year)	% share 1994-1998
	<u>000 US\$ FOB</u>						
Bananas, fresh	215,274	223,692	236,417	216,557	217,037	0.36	92.04
Bananas, chips/ crackers	16,004	20,504	22,069	23,882	18,758	5.63	7.96
Total	231,278	244,196	258,486	240,439	235,795	0.63	100.00

Source of basic data: Foreign Trade Statistics

Table 9a. Quantity of pineapple exports, Philippines, 1994-1998.

Item						Growth rate
	1994	1995	1996	1997	1998	(%/year)
	<u>'000 kg</u>					
Pineapples, fresh	161,426	163,432	146,040	144,735	117,317	-7.31
Pineapples, dried	86	92	108	67	45	-11.61
Pineapple, otherwise prepared/ preserved, nes, wtr/not contng. sugar/sweetng./spirit	215,227	191,649	203,485	185,296	169,359	-5.58
Pineapple juice concentrates	38,254	40,143	38,430	36,540	42,105	2.75
Pineapple juice, other than concentrates	44,553	53,046	51,021	44,057	42,130	-0.69
Nata de pina, prepared/preserved	165	104	152	139	161	4.11

Table 9b. Value of pineapple exports, Philippines, 1994-1998.

Item						Growth rate	% share
	1994	1995	1996	1997	1998	(%/year)	1994-1998
	<u>'000 US \$ FOB</u>						
Pineapples, fresh	24,227	24,545	24,601	26,947	28,717	4.41	17.42
Pineapples, dried	151	212	285	242	124	2.75	0.14
Pineapple, otherwise prepared/ preserved, nes, wtr/not contng. sugar/sweetng./spirit	90,183	80,781	93,152	85,789	79,245	-2.66	57.93
Pineapple juice concentrates	21,516	24,280	27,261	27,610	32,882	11.37	18.03
Pineapple juice, other than concentrates	9,243	10,191	10,969	8,939	7,384	-4.50	6.31
Nata de pina, prepared/preserved	273	212	304	271	304	5.59	0.18
Total	145,593	140,221	156,572	149,798	148,656	0.72	100.00

Source of basic data: Foreign Trade Statistics

Table 10a. Quantity of mango exports, Philippines, 1994-1998.

Item						Growth rate
	1994	1995	1996	1997	1998	(%/year)
	<u>000 kg</u>					
Mangoes, fresh	29,076	43,937	40,252	44,939	51,697	17.35
Mangoes, dried	625	620	614	614	671	1.88
Mango puree	4,857	4,598	3,553	4,036	2,647	-12.22
Mango in brine, sulphur water/ other temporary preservatives, unsuitable in that state	408	10				-98.77
Mango, uncooked/cooked by steaming/boiling in water, frozen	352	269	278	286	450	10.00
Mangoes/edible parts thereof, prepared/preserved, nes	32	58	9	46	27	91.64
Mango juice concentrates	9	430	23	2,959	1	4312.09
Mango juice, other than concentrates	1,033	1,474	1,584	1,696	1,417	10.19

Table 10b. Value of mango exports, Philippines, 1994-1998.

Item						Growth rate	% share
	1994	1995	1996	1997	1998	(%/year)	1994-1998
	<u>000 US \$ FOB</u>						
Mangoes, fresh	29,533	43,234	39,761	40,477	41,739	10.82	77.26
Mangoes, dried	4,150	4,449	4,551	4,528	4,247	0.7	8.70
Mango puree	5,212	5,061	4,208	4,681	2,740	-12.49	8.69
Mango in brine, sulphur water/ other temporary preservatives, unsuitable in that state	1	5				150.00	0.00
Mango, uncooked/cooked by steaming/boiling in water, frozen	874	620	733	871	1,052	7.19	1.65
Mangoes/edible parts thereof, prepared/preserved, nes	46	63	20	85	60	66.07	0.11
Mango juice concentrates	17	611	38	576	5	1179.25	0.49
Mango juice, other than concentrates	1,052	1,591	1,757	1,911	1,505	12.30	3.10
Total	40,885	55,634	51,068	53,129	51,348	7.14	100.00

Source of basic data: Foreign Trade Statistics

Table 11a. Quantity of papaya exports, Philippines, 1994-1998.

Item	1994	1995	1996	1997	1998	Growth rate
						(%/year)
			<u>000 kg</u>			
Papayas, fresh	3,426	2,313	1,400	407	60	-57.04
Papayas, dried	406	397	288	287	170	-17.7

Table 11b. Value of papaya exports, Philippines, 1994-1998

Item	1994	1995	1996	1997	1998	Growth rate	% share
						(%/year)	1994-1998
			<u>000 US \$ FOB</u>				
Papayas, fresh	839	718	400	122	85	-39.63	48.78
Papayas, dried	554	565	435	465	253	-14.93	51.22
Total	1393	1283	835	587	338	-28.73	100.00

Source of basic data: Foreign Trade Statistics

Table 12a. Quantity of citrus exports, Philippines, 1994-1998.

Item						Growth rate
	1994	1995	1996	1997	1998	(%/year)
	<u>In kg</u>					
Lemons and limes, dried	1,300	50	800	909		329.37
Calamansi, fresh/dried	610	1,294	1,199	2,371	4,225	70.18
Jellies, citrus fruit, cooked, wtr/ not wtr/ not contg. added sugar/sweetng.	76	422	76		1,045	91.09
Orange juice concentrates, not frozen	1,928	5,602	13,124			74.94
Orange juice, other than concentrates, not frozen	193,705	200,001	167,419	386,687	79,098	9.60
Calamansi juice concentrates	97,089	11,818		128,447	682	-95.77
Calamansi juice, other than concentrates	60,774	102,363	84,352	122,963	154,592	30.58
Juice of any other single citrus fruit, concentrates, nes	86,005	11,794	63		62,550	-95.25
Juice of any other single citrus, other than concentrates, nes	52,121	5,886	30,339	575,109	36,496	507.17
Pomelo, fresh	100		1,500			-100.00
Other citrus fruit, nes, fresh			60			-100.00
Orange juice concentrate, frozen			459			-100.00
Grapefruit juice, other than concentrates			1,000	253,440		12,572
Fruit concentrates					24	

Source of basic data: Foreign Trade Statistics

Table 12b. Value of citrus exports, Philippines, 1994-1998.

Item	1994	1995	1996	1997	1998	Growth rate (%/year)	% share 1994-1998
	<u>In US \$ FOB</u>						
Lemons and limes, dried	6,890	483	4,470	4,975		160.94	0.49
Calamansi, fresh/dried	780	2,498	2,630	4,745	8,676	97.20	0.57
Jellies, citrus fruit, cooked, wtr/ not wtr/ not contg. added sugar/sweetng.	187	1,426	212		118,521	159.14	3.54
Orange juice concentrates, not frozen	11,280	22,540	31,984			13.91	1.94
Orange juice, other than concentrates, not frozen	155,422	142,457	160,391	384,162	59,929	14.84	26.55
Calamansi juice concentrates	61,985	47,511		59,968	602	-74.12	5.00
Calamansi juice, other than concentrates	51,201	105,764	84,336	122,753	143,257	37.14	14.92
Juice of any other single citrus fruit, concentrates, nes	271,177	47,455	157		184,891	-94.06	14.82
Juice of any other single citrus, other than concentrates, nes	48,872	7,005	50,063	671,403	22,683	418.38	23.54
Pomelo, fresh	93		2,500			-100.00	0.08
Other citrus fruit, nes, fresh			240			-100.00	0.01
Orange juice concentrate, frozen			1,188				0.03
Grapefruit juice, other than concentrates			550	288,712		-100.00	
Fruit concentrates					116	26,146.55	8.51
Total	607,887	377,139	338,721	1,536,718	538,675	60.15	100.00

Source of basic data: Foreign Trade Statistics

Table 13a. Quantity of selected fruit exports, Philippines, 1994-1998.

Item	1994	1995	1996	1997	1998	Growth rate (%/year)
			000 kg			
Lanzones fresh		4	3	2	2	-19.44
Melons, fresh	84		8	46	676	581.22
Watermelons, fresh	1,879	3,116	1,685	482	927	10.21
<u>Strawberries</u>						
Strawberries, fresh	4	30	19	9	19	167.95
Strawberries, edible parts thereof, prepared, preserved	1		3	2		-77.78
Other fresh fruits, nes	5	1	4	8	5	70.63
Santol, fresh		6	4	3	8	36.11
Santol, edible parts thereof, prepared, preserved	1		11	1	6	103.03
Tamarind, edible parts thereof, prepared, preserved, nes	40	60	60	88	48	12.80
Fruit pulps, prepared, preserved, nes	765	309	117	574	142	48.40
Avocados, fresh		1	1	1	3	66.67
Mangosteens, fresh					4	
Chicos, fresh				1	230	
<u>Apple</u>						
Apple juice concentrates	2	6				50.00
Apple juice other than concentrates	21	39	19	3	13	70.89
Apples, fresh					75	
Juice concentrates of any single fruit/veg., nes	147		1		41	-100.00
Juice of any single fruit/veg. other than concentrates, nes	4,720	3,813	3,516	4,592	2,139	-12.46
Mixture of f&v juices, concentrates					9	
Mixture of f&v juices, other than concentrates	909	831	1,009	1,006	741	-3.45
Cashew nuts, prepared, preserved		2			100	-100.00
Cashew nuts, fresh/dried, wtr/ not, shelled, peeled	1,152	1,122	298	555	2,098	72.05
Other edible nuts, fresh/dried, nes, wtr/not, shelled/peeled	51		1	8		166.67
Pili nuts, prepared/preserved						
Other dried fruits, nes	3	8	18	9	25	104.86
Mixtures of nuts/dried fruits	7	2		1	10	242.86
Jams & marmalades, other than citrus fruit, cooked, wtr/not contg. sugar/sewwtng.	2,813	2,724	2,855	1,790	806	-22.66
Other fruit puree and fruit pastes, cooked, wtr/not contg. added sugar/sweetng.	1,390	1,268	1,807	626	772	-2.08
Fruit and nuts, uncooked/ cooked by steaming/boiling						

Continued Table 13a, page 2

in water, frozen	37	40	48	56	30	-0.41
Palm fruit (kaong)/edible parts thereof, prepared/preserved, nes	383	379	546	515	628	14.82
Other fruit/edible parts of plant, prepared/preserved, nes	62	153	143	105	86	23.89
Mixtures of fruits/other edible parts of plants, prepared/preserved, nes	16,217	21,537	26,252	31,091	27,195	15.15
Jellies other than citrus fruit, cooked wtr/not contg. added sugar/sweetng.	68	19	3	21	9	96.65
Other fruits in brine, sulphur, water/other temporary preservative, unsuitable		10				-100.00
Guavas, dried					3	
<u>Grapes</u>						
Grapes, fresh	a/				20	-100.00
Grapes, dried (raisins)	a/	27	19	3		9,206.64
Grape juice, other than concentrate	63				11	-100.00
Grape juice, concentrates			6			-100.00
Total	63	28	25	3	32	228.03
<u>Jackfruit</u>						
Jackfruit/edible parts thereof, prepared/preserved, nes	180	210	364	225	235	14.08
Jackfruit, fresh		7	2	4	1	-6.01
Jackfruit, dried	a/	a/		1 a/		30.96
Total	180	217	366	230	236	13.73
<u>Guyabano</u>						
Soursop puree	123	295	89	557	454	144.03
Soursop juice concentrates	1		a/	a/		-25.00
Soursop juice other than concentrates	120	90	88	101	108	-1.51

a/ Less than 1,000 kg

Source of basic data: Foreign Trade Statistics

Table 13b. Value of selected fruit exports, Philippines, 1994-1998.

Item	1994	1995	1996	1997	1998	Growth rate (%/year)	% share 1994-1998
	000 US\$ FOB						
Lanzones fresh		18	10	8	9	-17.31	0.04
Melons, fresh	26		6	14	332	768.25	0.30
Watermelons, fresh	367	575	306	80	146	4.63	1.19
<u>Strawberries</u>							
Strawberries, fresh	13	97	58	30	34	142.75	0.19
Strawberries, edible parts thereof, prepared, preserved	2	1	7	4		101.79	0.01
Other fresh fruits, nes	13	4	13	14	17	46.22	0.05
Santol, fresh		16	15	14	31	36.17	0.06
Santol, edible parts thereof, prepared, preserved	1		13	1	17	469.23	0.03
Tamarind, edible parts thereof, prepared, preserved, nes	72	110	112	167	92	14.70	0.45
Fruit pulps, prepared, preserved, nes	823	406	149	658	133	36.96	1.75
Avocados, fresh		4	3	5	9	40.56	0.02
Mangosteens, fresh					3		0.00
Chicos, fresh				3	35	1,066.67	0.03
<u>Apple</u>							
Apple juice concentrates	11	22				0.00	0.03
Apple juice other than concentrates	14	21	11	2	6	30.14	0.04
Apples, fresh					19		0.02
Juice concentrates of any single fruit/veg., nes	146		2		120	-100.00	0.22
Juice of any single fruit/veg. other than concentrates, nes	2,060	1,924	1,943	2,144	1,272	-8.99	7.52
Mixture of f&v juices, concentrates					30		0.02
Mixture of f&v juices, other than concentrates	296	410	265	331	359	9.13	1.34
Cashew nuts, prepared, preserved	2	14	3		74	140.48	0.07
Cashew nuts, fresh/dried, wtr/ not, shelled, peeled	780	866	232	394	1,359	63.14	2.92
Other edible nuts, fresh/dried, nes, wtr/not, shelled/peeled	11			4		-100.00	0.01
Pili nuts, prepared/preserved		1	3	2	1	38.89	0.01
Other dried fruits, nes	20	57	38	43	98	73.18	0.21
Mixtures of nuts/dried fruits	23	12	1	6	40	231.79	0.07
Jams & marmalades, other than citrus fruit, cooked, wtr/not contg. sugar/sewwtng.	2,893	2,700	2,946	1,907	1,073	-19.14	9.27
Other fruit puree and fruit pastes, cooked, wtr/not contg. added sugar/sweetng.	959	1,059	1,527	779	723	-0.39	4.06
Fruit and nuts, uncooked/ cooked by steaming/boiling							

continued Table 13b, page 2

in water, frozen	85	107	115	124	52	-4.22	0.39
Palm fruit (kaong)/edible parts thereof, prepared/preserved, nes	778	778	1,194	1,095	1,262	15.11	4.11
Other fruit/edible parts of plant, prepared/preserved, nes	126	219	334	247	181	18.39	0.89
Mixtures of fruits/other edible parts of plants, prepared/preserved, nes	9,210	12,305	15,691	19,460	18,182	19.64	60.26
Jellies other than citrus fruit, cooked wtr/not contg. added sugar/sweetng.	92	41	8	39	17	48.79	0.16
Other fruits in brine, sulphur, water/other temporary preservative, unsuitable		7				-100.00	0.01
Guavas, dried				2	11	450.00	0.01
<u>Grapes</u>							
Grapes, fresh	a/	1			3	-100.00	0.00
Grapes, dried (raisins)	33	16	14	2		-62.43	0.05
Grape juice, other than concentrate					5		0.00
Grape juice, concentrates			8			-100.00	0.01
<u>Jackfruit</u>							
Jackfruit/edible parts thereof, prepared/preserved, nes	397	462	832	513	498	13.80	2.18
Jackfruit, fresh		11	6	16	4	15.40	0.03
Jackfruit, dried		3	2	5	2	18.89	0.01
<u>Guyabano</u>							
Soursop puree	164	358	123	763	525	135.45	1.56
Soursop juice concentrates	2		a/	a/		-100.00	0.00
Soursop juice other than concentrates	99	96	95	115	110	3.16	0.41
Total	19,518	22,721	26,085	28,991	26,884	8.77	100.00

a/ Less than US \$ 1,000

Source of basic data: Foreign Trade Statistics

Table 14. Number of markets and quantity shares of major markets of Philippine fruit exports, 1994 and 1998.

Item	1994			1998		
	No.	Top 5	% Top 5	No.	Top 5	% Top 5
<u>Banana</u>						
Fresh	18	Japan, Korea, S. Arabia, UAE, HK	95.21	20	Japan, China, UAE, Taiwan, Korea	95.91
Chips/crackers	12 + others	HK, USA, UK, Germany, Japan	76.49	12 + others	USA, UK, CHR, Japan, Germany	63.72
<u>Pineapple</u>						
Fresh	13	Japan, Korea, HK, New Zealand, Okinawa	99.21	8	Japan, Korea, HK, New Zealand, UAE	99.32
Dried	13	Australia, HK, Israel, Hawaii, Germany	99.18	10	HK, Australia, USA, Germany, Singapore	92.86
Juice conc.	26	USA, Netherlands, Canada, France, Japan	87.26	30	USA, Netherlands, Japan, Australia, Thailand	84.42
Juice, oth.than conc.	34	USA, Canada, Hawaii, Singapore, HK	94.81	34	USA, Canada, Hawaii, HK, Japan	97.46
Oth.wise prepared/preserved	57	USA, Japan, Netherlands, Germany, Canada	80.02	55	USA, Japan, Canada, Germany, Netherlands	81.65
Nata de pina	26	Japan, USA, Canada, S. Arabia, UAE	87.75	25	USA, Canada, UAE, S. Arabia, Australia	87.91
<u>Mangoes</u>						
Fresh	16	HK, Japan, Singapore, Australia, Canada	99.74	18	HK, Japan, Singapore, Switzerland, UK	99.89
Dried	28	HK, USA, Singapore, Canada, Taiwan	93.24	29	HK, USA, Canada, Singapore, Germany	92.12
Juice conc.	6	Japan, USA, Palau, Australia, Trust Terri.	96.80	4	Japan, CHR, Guam, USA	100.00
Juice oth. than conc.	26	Japan, China, HK, USA, Brunei	66.77	25	USA, China, Japan, Brunei, Netherlands	73.58
Edible parts, prepared/preserved, nes	5	Japan, USA, Switzerland, Denmark	100.00	6	Japan, USA, CHR, Canada, Netherlands	99.45
Puree	14	USA, HK, Japan, N Zealand, Malaysia	93.43	19	Netherlands, USA, HK, N. Zealand, Japan	89.74
Uncooked/cooked by steaming/boiling	12	Netherlands, HK, Belgium, Japan, Germany	92.42	9	Germany, CHR, Netherlands, HK, USA	92.34
in Brine, sulphur H2O	1	USA	100.00	3	Taiwan, USA, UK	100.00
<u>Papaya</u>						
Fresh	4	HK, UAE, Saudi Arabia, Japan	100.00	3	Japan, UAE, Saudi Arabia	100.00
Dried	9	Australia, USA, Israel, Hawaii, Germany	99.95	7	Australia, USA, Germany, Hawaii, Italy	99.91

Source: Appendix Tables 4a through 21b

Table 15. Number of markets and quantity shares of major markets of Philippine citrus and other fruit exports, 1994 and 1998

Fruit Item	1994			1998		
	No.	Top 5 markets	% top 5	No.	Top 5 markets	% top 5
Calamansi, fresh/dried	1	Austria	100.00	3	Switzerland, Hong Kong, Saudi	100.00
Lemons & limes	2	HK, USA	100.00			
Orange juice, oth. than conc., not frozen	13	Russia, Guam, HK, Malaysia, Trust Territories	93.27			
Jellies, citrus fruit, cooked, wtr/ not wtr/not contng added sugar/sweetng	1	USA	100.00	1	USA	100.00
Orange juice conc., not frozen	1	Malaysia	100.00			
Orange juice oth. than. conc. not frozen				11	CHR, Guam, Trust Terr., Singapore, Hong Kong	90.27
Calamansi juice conc.	4	USA, Malaysia, Australia, Greece	100.00	2	Japan, Hong Kong	100.00
Juice of any oth. single citrus fruit, conc., nes	6	Japan, Taiwan, Malaysia, US, Singapore	99.47	4	Netherlands, CHR, Japan, Singap.	100.00
Calamansi juice, oth. than conc.	13	Japan, US, Canada, Russia, Guam	95.57	9	USA, Japan, Canada, Guam, Netherlands	98.92
Juice of any oth. single citrus fruit, oth. than conc., nes	7	Saudi, Hawaii, Japan, US, Kuwait	98.63	6	Australia, Singap., USA, Canada, Japan	99.83
Grapes dried (raisins)	1	Guam	100.00			
Grapes, fresh				1	Hong Kong	100.00
Grape juice conc.				2	Japan, Hong Kong	100.00
Grape juice, oth. than conc.	9	Russia, Guam, Taiwan, USA, Trust Territory	95.25	2	USA, CHR	100.00
Jackfruit/edible parts thereof, prepared, preserved, nes	30	USA, Canada, Saudi, Italy, Netherlands	77.73	33	USA, Canada, Saudi, Trust Terri., Australia	83.33
Jackfruit, dried				2	USA, Canada	100.00
Jackfruit, fresh				2	Hong Kong, Switzerland	100.00
Soursop (guyabano) puree	4	China, Hong Kong, Indonesia, Singapore	100.00	9	UK, Singapore, USA, Puerto Rico, Brazil	95.33
Soursop juice conc.	1	Australia	100.00	1	Japan	100.00
Sursop juice conc., oth, than conc.	19	Japan, USA, Vietnam, Guam, Canada	90.68			

Source: Appendix Tables 22a through 24b

Table 16a. Quantity of imports of fresh fruits, Philippines, 1994-1998.

Item	1994	1995	1996	1997	1998	Growth rate (%/year)	% share 1994-1998
	000 kg						
Oranges, fresh	18,851	18,780	27,591	32,594	19,500	6.12	20.95
Mandarins, clementines, wilkins & similar citrus, hybrids, fresh	6,495	4,585	4,672	15,351	28,715	72.03	10.68
Other citrus fruits, nes, fresh					56		0.01
Lemons and limes, fresh	32	43	50	94	96	35.20	0.06
Grapefruit, fresh	5	5	35	52	16	144.84	0.02
Pomelos, fresh	4	16		10	10		0.01
Apples, fresh	50,122	52,377	62,611	64,724	48,453	0.57	49.69
Grapes, fresh	9,630	10,748	16,349	17,246	11,309	8.70	11.66
Cashew nuts, fresh/dried, wtr/ not, shelled, peeled	8	3	55	237	92	485.14	0.07
Melons, fresh	130	225	98	254	10	19.94	0.13
Watermelons, fresh	65	24	56	51	5	-7.22	0.04
Pears & quinces, fresh	1,697	1,417	1,446	2,890	3,799	29.22	2.01
Apricots, fresh	22	11	11	15	17	-0.08	0.01
Cherries, fresh	70	42	44	57	14	-20.28	0.04
Pineapples, fresh		217		1	924		0.2
Peaches including nectarines, fresh	10	105	36	20	3		0.03
Plums & sloes, fresh	49	23	20	52	442	188.71	0.10
Strawberries, fresh	58	22	18	18	26	210.97	0.03
Raspberries, blackberries, mulberries, loganberries, fresh	3	106	34	5	4	-8.95	0.03
Black, white/red currants & gooseberries, fresh	433	708					0.20
Banana (inc. plantains), fresh		268			37		0.05
Cranberries, billberries & other genus vaccinium, fresh	266	185			25		0.08
Oates, fresh	78	38	5	7	26	43.33	0.03
Avocados, fresh	13	6	2	762	1	9,444.90	0.14
Litchi, fresh	1,454	1,374	3,225	2,247	66	0.46	1.49
Other fresh fruits, nes	6,211	1,458	1,706	2,127	1,001	-21.64	2.23
Total	95,706	92,786	118,064	138,814	114,647	6.09	100.00

Source of basic data: Foreign Trade Statistics

Table 16b. Value of imports of fresh fruits, Philippines, 1994-1998

Item	1994	1995	1996	1997	1998	Growth Rate (%/year)	% share 1994-1998
	000 US \$ CIF						
Oranges, fresh	7,500	8,467	14,975	10,998	5,213	2.65	18.38
Mandarins, clementines, wilkins & similar citrus, hybrids, fresh	2,733	1,800	1,692	3,782	12,801	80.46	8.89
Other citrus fruits, nes, fresh					20		0.01
Lemons and limes, fresh	147	97	127	150	52	-12.58	0.22
Grapefruit, fresh	49	58	50	93	27	4.90	0.11
Pomelos, fresh	2	6		20	3	5.00	0.01
Apples, fresh	19,642	22,360	22,995	32,037	13,772	-0.25	43.19
Grapes, fresh	8,830	10,390	14,233	10,635	4,877	(6.90)	19.08
Cashew nuts, fresh/dried, wtr/ not, shelled, peeled	60	24	108	553	87	154.44	0.32
Melons, fresh	979	1,202	787	1,645	54	0.14	1.82
Watermelons, fresh	169	210	332	369	49	1.69	0.44
Pears & quinces, fresh	813	624	2,589	919	1,014	59.37	2.32
Apricots, fresh	63	69	68	96	23	-6.70	0.12
Cherries, fresh	93	104	115	140	27	-9.14	0.19
Pineapples, fresh		2		12	6	-75.00	0.01
Peaches including nectarines, fresh	11	50	18	30	13	75.14	0.05
Plums & sloes, fresh	38	30	22	48	84	36.37	0.09
Strawberries, fresh	192	91	66	77	21	-34.03	0.17
Raspberries, blackberries, mulberries, loganberries, fresh	23	74	37	38	10	25.19	0.07
Black, white/red currants & gooseberries, fresh	513	2				-99.81	0.20
Banana (inc. plantains), fresh		7			13	-100.00	0.01
Cranberries, billberries & other genus vaccinium, fresh	313	3			6	-99.20	0.13
Oates, fresh	373	44	4	5	12	-3.53	0.17
Avocados, fresh	76	30	14	11	447	957.09	0.23
Litchi, fresh	613	646	1,440	835	65	-1.48	1.4
Other fresh fruits, nes	2,002	1,558	1,179	936	406	-30.93	2.37
Total	45,234	47,948	60,851	63,429	39,102	-0.30	100.00

Source of basic data: Foreign Trade Statistics

Table 17a. Quantity of imports of dried fruits, Philippines, 1994-1998.

Item	1994	1995	1996	1997	1998	Growth rate (%/year)	% share 1994-1998
	<u>000 kg</u>						
Bananas (including plantains)							
Grapes, dried (raisins)	3,411	2,836	3,774	2,775	3,121	0.55	84.9
Avocados, dried				7		-100.00	0.04
Figs, dried		1			1	-100.00	0.01
Oates, dried	43	38	52	30	76	34.06	1.27
Jackfruit, dried					1		0.01
Guavas, dried		1				-100.00	0.01
Apricots, dried	3	2		8	8	-44.44	0.11
Prunes, dried	452	279	364	348	559	12.11	10.68
Apples, dried	10	14	1	19	58	488.1	0.54
Peaches, dried	1	1			2	-50.00	0.02
Pears, dried							
Other dried fruit, nes	46	79	48	61	151	51.78	2.05
Mixtures of dried fruits	2	4	26	4	32	316.35	0.36
Mandarins, clementines & citrus hybrids, wilkings, dried							
Total	3,968	3,255	4,265	3,252	4,009	3.15	100.00

Table 17b. Value of imports of dried fruits, Philippines, 1994-1998.

Item	1994	1995	1996	1997	1998	Growth rate (%/year)	% share 1994-1998
	<u>000 US \$ CIF</u>						
Bananas (including plantains)							
Grapes, dried (raisins)	2,126	1,953	3,312	2,766	3,364	16.65	78.56
Avocados, dried				3		-100.00	0.02
Figs, dried		1			1	-100.00	0.01
Oates, dried	60	44	35	56	67	8.13	1.52
Jackfruit, dried					2		0.01
Guavas, dried	1	7				250.00	0.05
Apricots, dried	2	1		4	6	-33.33	0.08
Prunes, dried	273	255	368	477	1,137	51.43	14.58
Apples, dried	51	71	11	128	239	276.67	2.91
Peaches, dried	1	1			7	-50.00	0.05
Pears, dried							0.00
Other dried fruit, nes	61	59	39	74	78	14.19	1.81
Mixtures of dried fruits	2	6	14	12	34	125.60	0.40
Mandarins, clementines & citrus hybrids, wilkings, dried					2		0.01
Total	2,577	2,398	3,779	3,520	4,937	21.01	100.00

Source of basic data: Foreign Trade Statistics

Table 18a. Quantity of imports of preserved fruits and fruit preparations, Philippines, 1994-1998.

Item	1994	1995	1996	1997	1998	Growth rate (%/year)	% share 1994-1998
	<u>000 kg</u>						
Marmalades, citrus fruit, cooked wtr/not contg. added sugar/ other sweetng.	1				5	-100.00	0.01
Jams and marmalade, other than citrus fruit, cooked, not contg. added sugar/sweetng.	117	153	89	217	201	31.35	1.66
Jellies other than citrus fruit, cooked, wtr/not contg. added sugar, sweetng.	410	86	465	493	296	81.93	3.74
Other fruit puree & pastes, cooked wtr/not contg. added sugar/sweetng.	96	177	335	294	143	27.51	2.23
Cherries, in brine, sulphur water/ other temporary preservatives unsuitable	31	417	138	4	273	1,951.54	1.85
Strawberries, in brine, sulphur water/other temporary preservatives, unsuitable	4	52				550.00	0.12
Other fruits in brine, sulphur water/other temporary preservatives, unsuitable	105	45	17	45		-13.66	0.45
Peel of citrus fruit/melons, dried, frozen, in brine, sulphur water etc.	7		7	43	61	152.05	0.25
Strawberries, frozen, wtr/not contg. added sugar, other sweetng. matter	17		3	30	1	234.44	0.11
Rasp-/black-/mul-/logan berries, frozen wtr/not contg added sugar/sweetng.	37	16	54	53	39	38.12	0.43
Black, white, red currants & gooseberries, frozen, wtr/not contg. sugar/sweetng.	4	3	4	2		-35.42	0.03
Fruit & nuts, uncooked/ cooked by steaming/boiling in water, frozen	12	5	2		7	-72.78	0.06
Cashew nuts, prepared/preserved	36	46	4	7	5	-4.27	0.21
Pineapple, others prepared/ preserved, nes, wtr/not contg. sugar/sweetng./spirit		2		3		150.00	0.01
Citrus fruit, prepared/preserved nes, wtr/not contg. added sugar/sweetng./spirit	52		31			-100.00	0.18
Apricots, others prepared/ preseved, nes, wtr/not contg. added sugar/sweetng./spirit	13	8	24	31	9	29.93	0.18
Cherries, others prepared/ preserved, nes, wtr/not contg.							

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added sugar/sweetng./spirit	256	133	248	345	196	8.59	2.52
Peaches, others prepared/ preserved, nes, wtr/not contg. sugar/sweetng./spirit	1,217	978	1,061	1,361	861	-4.90	11.71
Pears/edible parts thereof, preserved/prepared, nes	230	61	140	55	127	31.56	1.31
Strawberries/edible parts thereof, prepared/preserved, nes	27	109	75	66	117	84.45	0.84
Mangoes, edible parts thereof, prepared, preserved, nes			1				
Plums/edible parts thereof, prepared/preserved, nes	88	2	20	3		154.32	0.24
Other fruits/edible parts of plants prepared/preserved, nes	1,258	1,662	1,943	1,915	965	-0.51	16.56
Mixtures of fruits/other edible parts of plants, prepared/ preserved, nes	5,721	5,679	4,640	6,459	3,349	-6.99	55.27
Jams, citrus fruit, cooked, wtr/ not contg. added sugar/other sweetng.					5		0.01
Jellies, citrus fruit, cooked, wtr/ not contg. added sugar/ sweetng.		4			1	-100.00	0.01
Total	5,721	5,683	4,640	6,459	3,355	-6.97	100.00

Source of basic data: Foreign Trade Statistics

Table 18b. Value of imports of preserved fruits and fruit preparations, Philippines, 1994-1998.

Item	1994	1995	1996	1997	1998	Growth rate (%/year)	% share 1994-1998
	<u>000 US \$ CIF</u>						
Marmalades, citrus fruit, cooked wtr/not contg. added sugar/ other sweetng.	5				6	-100.00	0.03
Jams and marmalade, other than citrus fruit, cooked, not contg. added sugar/sweetng.	181	276	253	522	368	30.24	3.66
Jellies other than citrus fruit, cooked, wtr/not contg. added sugar, sweetng.	199	63	304	437	203	76.10	2.76
Other fruit puree & pastes, cooked wtr/not contg. added sugar/sweetng.	60	146	244	338	192	51.45	2.24
Cherries, in brine, sulphur water/ other temporary preservatives unsuitable	67	566	192	18	155	337.30	2.28
Strawberries, in brine, sulphur water/other temporary preser- vatives, unsuitable	11	103	1			212.44	0.26
Other fruits in brine, sulphur water/other temporary preser- vatives, unsuitable	302	94	46	30		-63.38	1.08
Peel of citrus fruit/melons, dried, frozen, in brine, sulphur water etc.	9	1	16	48	56	406.94	0.30
Strawberries, frozen, wtr/not contg. added sugar, other sweetng. matter	36		3	40		344.44	0.18
Rasp-/black-/mul-/logan berries, frozen wtr/not contg added sugar/sweetng.	87	22	61	53	55	23.30	0.64
Black, white, red currants & gooseberries, frozen, wtr/not contg. sugar/sweetng.	6	5	4	2		-46.67	0.04
Fruit & nuts, uncooked/ cooked by steaming/boiling in water, frozen	40	7	6		5	-65.60	0.13
Cashew nuts, prepared/preserved	106	185	12	36	43	50.11	0.87
Pineapple, others prepared/ preserved, nes, wtr/not contg. sugar/sweetng./spirit	2	6	1	7		154.17	0.04
Citrus fruit, prepared/preserved nes, wtr/not contg. added sugar/sweetng./spirit	23		26			-100.00	0.11
Apricots, others prepared/ preseved, nes, wtr/not contg. added sugar/sweetng./spirit	18	11	24	57	48	50.25	0.36
Cherries, others prepared/ preserved, nes, wtr/not contg.							

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added sugar/sweetng./spirit	100	119	277	358	276	39.53	2.58
Peaches, others prepared/ preserved, nes, wtr/not contg. sugar/sweetng./spirit	1,085	840	942	1,239	797	-3.65	11.21
Pears/edible parts thereof, preserved/prepared, nes	237	93	146	74	152	13.08	1.61
Strawberries/edible parts thereof, prepared/preserved, nes	58	171	223	132	244	67.32	1.89
Mangoes, edible parts thereof, prepared, preserved, nes	4		1			-100.00	0.01
Plums/edible parts thereof, prepared/preserved, nes	154	7	23	4		-12.37	0.43
Other fruits/edible parts of plants prepared/preserved, nes	1,028	1,139	2,237	1,706	987	10.33	16.23
Mixtures of fruits/other edible parts of plants, prepared/ preserved, nes	4,512	4,331	3,826	5,742	3,882	0.50	50.98
Jams, citrus fruit, cooked, wtr/ not contg. added sugar/other sweetng.		1			16	-100.00	0.04
Jellies, citrus fruit, cooked, wtr/ not contg. added sugar/ sweetng.		12		1	1	-50.00	0.03
Total	8,330	8,198	8,868	10,844	7,486	-0.52	100.00

Source of basic data: Foreign Trade Statistics

Table 19a. Quantity of imports of fruit juices, Philippines, 1994-1998.

Item						Growth rate (%/year)
	1994	1995	1996	1997	1998	
	<u>'000 kg</u>					
Orange juice concentrates, frozen	999	1,235	1,174	1,304	1,185	5.16
Orange juice, other than concentrates, frozen	387	232	631	511	175	11.79
Orange juice concentrates, not frozen	590	577	802	957	467	1.23
Orange juice, other than concentrates, not frozen	1,648	2,004	1,317	2,068	1,238	1.05
Grapefruit juice concentrates	18	40	1	9	16	225.63
Grapefruit juice, other than concentrates	76	126	67	189	129	42.33
Juice of any other single citrus fruit, conc., nes	10	74	114	139	27	158.85
Juice of any other citrus fruit, other than conc., nes	19	155	207	240	193	186.42
Pineapple juice, other than concentrates	55	21	17	33	59	23.01
Grape juice concentrates	41	56	181	55	46	43.46
Grape juice, other than concentrates	487	377	305	654	638	17.57
Apple juice concentrates	141	164	68	89	94	-1.43
Apple juice, other than conc.	671	674	454	849	1,046	19.5
Mango juice concentrates	2		23		18	-100
Juice concentrates of any single fruit/vegetable, nes	106	149	204	69	154	33.62
Mango juice, other than conc.	9	35	1	18	4	453.49
Juice of any single fruit/veg. other than concentrates, nes	1,162	1,375	1,077	1,183	902	-4.31
Mixture of fruit and veg. juices, concentrates	5	27	7	5	15	134.34
Mixture of fruit and veg. juices other than concentrates	464	268	524	788	430	14.56
Pineapple juice concentrates		2		1		-100

Source of basic data: Foreign Trade Statistics

Table 19b. Value of imports of fruit juices, Philippines, 1994-1998.

Item						Growth rate	% share
	1994	1995	1996	1997	1998	(%/year)	1994-1998
	000 US \$ CIF						
Orange juice concentrates frozen	1,330	2,086	1,819	1,737	1,496	6.42	17.31
Orange juice, other than concentrates, frozen	537	401	630	585	312	-5.51	5.04
Orange juice concentrates, not frozen	876	877	833	1,334	622	0.47	9.28
Orange juice, other than concentrates, not frozen	2,115	2,450	3,220	2,233	1,647	-2.41	23.85
Grapefruit juice concentrates	38	70	2	21	27	241.41	0.32
Grapefruit juice, other than concentrates	65	141	48	210	165	91.76	1.29
Juice of any other single citrus fruit, conc., nes	15	316	423	467	82	492.12	2.66
Juice of any other citrus fruit, other than conc., nes	55	395	664	1,156	255	170.61	5.16
Pineapple juice, other than concentrates	116	145	74	386	159	84.71	1.80
Grape juice concentrates	33	59	204	62	56	61.32	0.85
Grape juice, other than concentrates	566	376	286	581	740	18.25	5.21
Apple juice concentrates	177	143	125	112	95	-14.34	1.33
Apple juice, other than conc.	720	809	423	833	993	20.2	7.72
Mango juice concentrates	3		29		24	-100	0.11
Juice concentrates of any single fruit/vegetable, nes	99	157	226	78	179	41.63	1.51
Mango juice, other than conc.	12	42	2	27	4	329.89	0.18
Juice of any single fruit/veg. other than concentrates, nes	1,151	1,199	863	1,165	870	-3.55	10.73
Mixture of fruit and veg. juices, concentrates	7	31	7	9	14	87.39	0.14
Mixture of fruit and veg. juices other than concentrates	597	345	504	761	484	4.62	5.50
Pineapple juice concentrates		2		1		-100.00	0.01
Total	8,512	10,044	10,382	11,758	8,224	1.14	100.00

Source of basic data: Foreign Trade Statistics

Table 20. World volume of production of selected fruits, 1995-1997.

Item	1995	1996	1997	Average	Growth rate (%/year)
	<u>000 mt</u>				
Banana	56,090	57,998	58,975	57,688	2.54
Pineapple	12,305	12,394	12,794	12,498	1.98
Mango	22,111	23,036	23,428	22,858	2.94
Papaya	5,091	5,011	5,024	5,042	-0.66
Citrus, nes	3,949	4,029	4,017	3,998	0.86
Grapefruit and pomelo	5,159	4,963	5,038	5,053	-1.14

Source: FAO Trade Yearbook Vol. 50-1996

Table 21. World's top five producers of selected fruits, 1997.

Item	Top 5	Production <u>000 mt</u>	% share
Banana	India	9,935	16.85
	Brazil	5,779	9.80
	Ecuador	5,727	9.71
	Indonesia	4,768	8.08
	Philippines	3,500	5.93
	World	58,975	100.00
Pineapple	Thailand	2,000	15.63
	Brazil	1,937	15.14
	Philippines	1,452	11.35
	India	1,100	8.60
	China	899	7.03
	World	12,794	100.00
Mango	India	12,000	51.22
	China	2,148	9.17
	Mexico	1,444	6.16
	UAE	1,350	5.76
	Indonesia	1,128	4.81
	World	23,428	100.00
Papayas	Brazil	1,763	35.09
	Nigeria	500	9.95
	India	500	9.95
	Indonesia	500	9.95
	Peru	149	2.97
	China	143	2.85
	Thailand	115	2.29
	World	5,024	100.00
Citrus, nes	Nigeria	2,200	54.77
	China	484	12.05
	Japan	265	6.60
	Guinea	230	5.73
	Syria	219	5.45
	World	4,017	100.00
Grapefruit and pomelo	USA	2,620	52.00
	Israel	390	7.74
	Cuba	261	5.18
	China	222	4.41
	Mexico	150	2.98
	World	5,038	100.00

Source: FAO Trade Yearbook Vol. 51-1997

Table 22a. World volume of export and import of selected fruits, 1994-1996.

Item	1994	1995	1996	Average	Growth rate (%/year)
<u>Export ('000 mt)</u>					
Banana	12,775	13,541	14,145	13,487	5.23
Pineapple, fresh	751	769	837	786	5.62
Pineapple, canned	1,110	993	1,008	1,037	-4.51
Citrus, nes	1,145	1,236	1,223	1,201	3.45
<u>Import ('000 mt)</u>					
Banana	12,631	13,059	13,718	13,136	4.22
Pineapple, fresh	699	697	774	723	5.38
Pineapple, canned	1,071	902	933	969	-6.17
Citrus, nes	1,130	1,099	1,141	1,123	0.54

Table 22b. World value of export and import of selected fruits, 1994-1996.

Item	1994	1995	1996	Average	Growth rate (%/year)
<u>Export ('000 US\$)</u>					
Banana	4,129,568	4,717,075	4,911,022	4,585,888	9.17
Pineapple, fresh	261,548	298,707	346,907	302,387	15.17
Pineapple, canned	573,471	570,861	682,588	608,973	9.56
Citrus, nes	551,173	627,309	628,443	602,308	7.00
<u>Import ('000 US\$)</u>					
Banana	6,403,029	6,935,471	7,137,877	6,825,459	5.62
Pineapple, fresh	386,650	446,890	478,920	437,487	11.37
Pineapple, canned	720,339	647,060	783,222	716,874	5.44
Citrus, nes	741,081	767,145	769,936	759,387	1.94

Source: FAO Trade Yearbook Vol. 50-1996

Table 23. World's top five exporters of selected fruits, 1996.

Item	Top 5	Export ('000 mt)	% share
Banana	Ecuador	3,931	27.79
	Costa Rica	2,125	15.02
	Colombia	1,477	10.44
	Philippines	1,252	8.85
	Bel-Lux	878	6.21
	World	14,145	100.00
Pineapple, (fresh)	Costa Rica	179	21.39
	Cote Diviore	170	20.31
	Philippines	144	17.20
	France	77	9.20
	Bel-Lux	58	6.93
	World	837	100.00
Pineapple, (canned)	Thailand	352	34.92
	Philippines	250	24.80
	Indonesia	126	12.50
	Malaysia	36	3.57
	Netherlands	28	2.78
	World	1,008	100.00
Oth. citrus fruit	USA	488	39.90
	Israel	129	10.55
	Cuba	90	7.36
	Bel -Lux	89	7.28
	Netherlands	85	6.95
	World	1,223	100.00

Source: FAO Trade Yearbook Vol. 50-1996

Table 24. World's top five importers of selected fruits, 1996.

Item	Top 5	Imports ('000 mt)	% share
Banana	USA	3,964	28.90
	Bel-Lux	1,123	8.19
	Germany	1,119	8.16
	Japan	819	5.97
	Italy	544	3.97
	World	13,718	100.00
Pineapple	France	142	18.35
	USA	135	17.44
	Japan	97	12.53
	Bel-Lux	82	10.59
	Italy	48	6.20
	World	774	100.00
Pineapple (canned)	USA	282	30.23
	Germany	118	12.65
	Netherlands	67	7.18
	Japan	59	6.32
	UK	52	5.57
	World	933	100.00
Oth. citrus fruit	Japan	270	23.66
	France	125	10.96
	Netherlands	116	10.17
	Bel-Lux	114	9.99
	UK	83	7.27
	World	1,141	100.00

Source: FAO Trade Yearbook Vol. 50-1996

Table 25. Problems/constraints/weaknesses of the fruits industry a/

Commodity/Area	Problem/Constraint	Observation/Remark
<u>General</u>		
Production	Low productivity especially for backyard and non-plantation farms Small-scale nature of most farms High cost of inputs Limited area for planting expansion	Limited adoption of technologies, short-run variability due to changes in weather conditions Few options for production management, marketing and processing due to low marketable surplus Limits application of recommended rates of fertilizer, other farm chemicals, irrigation water and labor for cultivation Shift of farmlands to non-agricultural uses and tenurial insecurity in the use of idle public lands
Postharvest	Poor handling techniques resulting to high postharvest losses	Limited incentives and knowledge of appropriate techniques
Processing	Limited options for small producers	Lack of technologies, financing and marketing possibilities
Marketing	High cost of marketing and existence of marketing bottlenecks	Limited market outlets due to lack of market infrastructure and information
<u>Mango</u>		
Pre-production	Predominance of backyard plantings Lack of breeding work to improve existing variety in terms of tree structure, flowering regularity, insect/disease resistance and eating quality and shelf life improvement Dwarfing rootstocks have not been developed to minimize growth of mango trees Lack of supply of quality planting materials from accredited nurseries Method and distance of plantings need to be evaluated and improved Long gestation period of Carabao mango	Result in poorly managed trees, reliance on contractors, marketing problems and slow technology dissemination and transfer; average farm size in Luzon is 1.22 ha Should develop more strains of Carabao variety Recommendations regarding rootstocks remain unresolved Uncertified materials are being used, no concerted efforts to establish scion groves High-density plantings adopted from other countries create productivity problems to orchard owners Disincentive to establish new plantations, use of large planting materials and intercropping not widely practiced High interest rates for long-term financing
Production	Inadequate credit support for establishment and maintenance of orchards Flushing and flowering mechanisms poorly understood Recommended rates of KNO ₃ application based on phenological studies limited/not fully explored	Questions on possibility of controlling/regulating flushing for uniform leaf maturity during flower induction and on the practical indices of readiness to flower Need to investigate other methods of flower induction

continued Table 25, page 2

<p>Postharvest</p>	<p>Relatively low yield (7.0 tons/ha in 10x10 m) in less managed trees Seasonality of supply within the year</p> <p>Poor fruit quality</p> <p>High cost of mango production per hectare</p> <p>Antiquated equipment (sprayer, pruning and harvesting tools and post harvest equipment) Inadequacies in production technologies such as: Fertilization - identification of critical levels, practical guide to deficiency symptoms of major and minor elements, frequency and methods of fertilizer application, use of foliar fertilizers, growth regulators and organic fertilization Irrigation - water requirement of bearing trees, amount, method and frequency of application Pest control - integrated pest management based on specific locations; modification of bagging procedures using different materials; survey of pest composition, extent of damage, impact assessment; optimization of pesticidal sprays and conditions associated with emerging pests Cropping system - development of mango-based systems by region Pruning - techniques to reduce size of trees Pollination studies Cultural management Difficulty in harvesting fruits on tall trees</p> <p>Poor quality of fruits due to insect damage, disease infection, mechanical injuries, abnormal fruit size and physiological disorders</p> <p>Subjective (mainly morphological) indices used in determining harvest maturity Timing of harvesting when fruit moisture content is</p>	<p>As low as 1.40 tons/ha in some regions, production cost is high and will be unable to compete Slack periods provide opportunity to competitors to supply present markets High proportion of rejects due to a number of factors limit export volume and may lead to loss of markets Due to high input costs and low yields, recommended fertilization rates not widely adopted, irrigation not done in small farms Replacement cost for modern equipment is high</p> <p>Blanket recommendations are usually followed, organic fertilization not widely practiced, application of micronutrients not consistently done and there is no baseline information</p> <p>Present recommendations are not adopted particularly in non-plantation farms No IPM formulation for mango; trapping/baiting of pests not widely practiced; no biological control developed for mango; eradication (male sterilization) only initiated in one island</p> <p>To augment farmers' income during non-productive years</p> <p>Present practices only in some commercial orchards To improve fruit setting To minimize fruit drop and increase fruit size Gadgets presently used not efficient and cause mechanical injuries resulting to rejects Fungicidal sprays widely practiced but not optimized; field sorting is seldom practiced; timely hot water treatments for postharvest disease control not practiced by growers; disinfestation not always done; non-implementation of national standards partly due to lack of widespread awareness Farmers harvest immature fruits to take advantage of high prices at the beginning of the season</p>
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continued Table 25, page 3

	low not always observed Short storage life of fruits specially for those destined to distant markets Lack/high cost of packing containers that allow ventilation and prevent injury to fruits Increasing costs of processing mango products and inconsistent quality	Appropriate temperature management not observed in trucks and ships and controlled atmosphere system is not fully developed Stackable plastic crates are expensive, hence use of bamboo baskets and wooden crates is prevalent High cost of labor, fuel and electricity and packaging materials; technologies for dried mango production not well disseminated; no uniform application of quality control measures among exporters Dumping is the usual manner of waste disposal Poor linkages between producers and processors and quality problems Reliance of small farmers on middlemen who may be able to manipulate pricing Best marketing options not available to producers and they have no knowledge on value adding activities for their product Inadequate transport facilities/infrastructure and practice of mixing commodities during transport which affects quality Need to fully implement tariff reduction program to reduce cost
Processing	Little or no consideration for environmental impacts Lack of consistent supply of quality raw materials	
Marketing	Poor marketing structure with predominance of middlemen Limited access to reliable and timely market information on supply, demand and buyers' requirements High cost of freight and limited/expensive air cargo space for delivering mango to foreign markets High cost of packaging materials Lack of effective marketing promotions and strategies Stiff competition among exporters	
Extension	Inadequate information dissemination of technologies	There is need to improve farm productivity and adhere to world market requirements which require adoption of technologies Limited knowledge of small farmers on basic cultural practices
<u>Banana</u>		
Production	Low productivity in backyard, non-plantation farms Lack and high cost of capital for small farmers Insufficient supply of pest-free planting materials Bunchy top disease particularly in small farms where proper cultural management is less adopted Bugtok disease in Saba variety Harvesting of immature fruits of Saba	As low as 2.30 tons/ha in Bicol compared with up to 38.42 tons/ha in plantation farms in Central Mindanao; developed technologies are not adopted Farmers are dependent on traders for financing and to some extent are constrained from selling to other buyers who can offer better prices; lack of capital constrains farmers from using adequate water and fertilizer Available only to commercial farms with tissue culture facilities Many farmers are unable to diagnose the problem and refuse to cut infected plants Bagging which protects banana from the disease is not practiced by some farmers Determination of maturity based on the drying of leaves or of

continued Table 25, page 4

	Postharvest	Poor handling of harvested fruits	finger size Multiple handling before fruits finally reach consumers; transport is characterized by bulk-loading in trucks and container vans to maximize use of space causing damage to the fruits; jampacked stacking in commonly used containers (sacks, bamboo baskets, wooden crates also cause damage
	Processing	Large amounts of Cavendish-rejects Limited supply of raw materials for processing into chips Lack of quality assurance for banana chips Lack of dissemination of production and handling technologies for the chips industry Lack of processing facilities High risks involved in banana trading	Problem in Region X with rejects coming from other regions Problem is serious when typhoons hit Saba producing areas; in Butuan City, the slack supply period in January-February affects the operations of processors There is no established set of national or industry quality standards for banana chips unlike for mango chips Extension system needs to be improved
	Marketing	Lack of buying and selling stations High cost and difficulty of transport Absence of standards in selling bananas Stiff competition in the world market Limited operations of producer groups/cooperatives due to lack of capital, storage and transport facilities	Include first fry facilities and machine-banana peeler Low priority given for transport of Saba banana (possibility of being "shut-out"), unreliable shipping schedules and dry-docking; vans used for shipping bananas does not allow heat dissipation resulting to green-soft disorder problem making bananas inedible Small farmers depend on traders who buy on pick-up basis Inadequate roads especially for farms located in interior areas which are accessible only by path or trails Bananas sold in clusters of several hands or multiples of five fingers with the excess fingers in a hand disregarded; selling on per kilo basis is practiced in some areas. Export to Japan, a major market, has declined due to increasing entry of bananas from other ASEAN producers and Mexico Marketing through the cooperative is not an attractive option hence farmers continue to rely on middlemen
<u>Papaya</u>	Production	Lack of supply Lack of certified seeds PRSV infestation in Luzon Unreliable determination of harvest maturity	Harvest area and production have changed very little through the years and yield per hectare has slightly decreased No serious effort to establish grower/coop based production of seeds Has resulted to shift of papaya areas to other crops or non-agricultural uses Based on color of stem end; leads to high incidence of "evergreens" which do not ripen normally, usually treated with ethylene but

continued Table 25, page 5

	Incidence of "catface" or deformed fruits in summer months due to temperature stress	texture and flavor remain unacceptable
	Limited cultivars for orchard establishment	Lack of irrigation worsens the problem
	Variable distances adopted for "Cavite Special"	Based mainly on <i>Kapoho</i> , "Cavite Special", "DMPI" and <i>Sinta</i> which is moderately-resistant to PRSV
	Fertilization application based on blanket recommendations	Recommended spacing of 2-3m x 3m followed in <i>Solo</i>
	Problems in plant protection	Need specific rates based on soil/tissue analysis and crop response
	Limited access to formal credit sources for small growers	Field sanitation not practiced by small farmers; IPM not developed; Limits expansion of plantings
	Pre-harvest disease control not optimized	No consistent practice of pre-harvest disease control
	High cost of pesticides	Limits pest control
Postharvest	Poor quality of fruits	Due to inadequate disease control
	Lack of standards	Sorting is not practiced and there are no known standards
Processing	Same problems as in mango	
Marketing	Use of inappropriate packing materials/containers	Stackable plastic materials are expensive
	Fruits exposed to heat and adverse conditions	Appropriate temperature management not provided in trucks and ships during transport; modified atmosphere packaging for long-distance transport developed but not widely adopted
	High marketing cost	Due to high postharvest losses and transport cost, same marketing problems as in other fruits

a/ Mostly lifted from Lizada (1995), (Golez 1999), Mango Congress (June 3-5, 1999), Banana Congress (December 8-9, 1998), other sources

Table 26. The regional R&D consortia, their base agencies, inception date, membership and flagship commodities

Region	Consortium	Base Agency	Inception Date	Number of Agencies		Flagship Commodity
				Inception	Current	
CAR	HARRDEC	BSU	Nov-78	2	16	white potato
I	ILARRDEC	MVSU	Dec-78	4	13	mango and bamboo
II	CVARRD	ISU	Nov-78	4	13	peanut
III	CLARRDEC	CLSU	Dec-78	5	17	mango and bamboo
IV	STARRDEC	UPLB	May-88	12	14	cashew
V	BiCARRD	CSSAC	Jan-76	5	15	pili
VI	WESVARRDEC	DA-Reg. VI	May-88	21	26	mango and bamboo
VII	CV-CIRRD	DA-Reg. VII	Aug-87	11	11	water resources
VIII	ViCARP	ViSCA	Nov-78	5	20	abaca
IX	WESMARRDEC	PCA-Reg. IX	Nov-87	13	15	coconut
X	NOMCARRD	CMU	Dec-78	2	14	feedlot cattle
XI	SMARRDEC	DA-Reg. XI	Aug-87	9	19	durian
XII	CEMARRDEC	USM	Jan-88	11	18	durian
XIII	C-CARRD	DOST-Reg. XIII	Dec-96	10	10	

Source: DAR (1997)

Table 27. BAR-organized RDE network program and sub-programs areas and membership, as of June 1999

Program/Sub-program Area	Institutional Members
Corn R&D	UPLB, USM, VISCA, CMU, BAI, CVIARC
Fruit Crops R&D (mango, banana, citrus, durian, pineapple)	USM, UPLB, BPI, CVSU
Rootcrops R&D (camote, cassava, taro, gabi, ubi, others)	CLSU, UPLB, PCRTC-VISCA, WESMIARC, DA-NOMIARC, USM-DA-CEVIARC, BSU-CIARC, ATI, BPI, CSSAC, ARMM
Vegetables R&D (fruit vegetables, leafy vegetables)	UPLB, BSU, VISCA, BPI, CVSU
Ornamentals R&D	UPLB, BSU, VISCA, BPI, CVSU
Coconut R&D	PCA, DA-RIARCS, ATI, UPLB
Livestock and Poultry R&D	UPLB, PCARRD, BAI, CLSU, USM, VISCA, NDA, LDC, COBARMS, PCC
Fiber Crops R&D (abaca, coir, silk)	FIDA, DMMSU-SRDI, VISCA-NARC, UPLB, PTRI, BSU
Plantation Crops R&D (rubber, coffee, cacao)	USM, CVSU, UPLB, BSU, CMU, DA-WESMIARC, WVSU
Fisheries R&D	
Capture Fisheries R&D	UPV-IMFO, BFAR, UP-MSI, MSU, ZSCMST
Aquaculture R&D	UPV-IA, UP-MSI, MSU-Naawan, CLSU-FAC/CF, BFAR-NFFTRC/CO
Fisheries Postharvest and Marketing	UPV-IFPT, BFAR, UP-MSI
Biotechnology	UPLB, UPV, BSU, VISCA, MSU, UPD
Soil and Water Resources a/	
Food Science and Nutrition a/	UPLB, others
Agriculture and Fisheries Engineering a/	UPV, UPD, BFAR
Socio-Economics a/	PIDS, others

a/ Not yet final

Source: BAR

Table 28. Number of researches and budgetary allocation by fruit crop. a/

Fruit crop	<u>Researches</u>		<u>Budget</u>	
	No.	%	000 Pesos	%
Banana	26	6.3	8,606	13.92
Mango	125	30.27	14,951	24.19
Citrus	19	4.60	1,133	1.83
Durian	44	10.65	3,255	5.27
Papaya	12	2.91	2,356	3.81
Pineapple	10	2.42	1,166	1.89
Cashew	58	14.04	6,852	11.08
Jackfruit	12	2.91	1,252	2.03
Others b/	107	25.91	22,246	35.99
Total	413	100.00	61,817	100.00

a/ Based on 1996 Work and Financial Plan

b/ Includes apple, strawberry, pili, avocado, guapple, guava, guyabano, lychee/longan, pomelo, rambutan, lanzones, sineguelas, mangosteen, passion fruit, gubas, tamarind and fruits (unspecified/ combination)

Source of basic data: DOST

Note: PIDS maintains a database of these researches

Table 29. Research, development and extension projects by fruit crop (based on 1996 work and financial plans).

	Mango	Banana	Pineapple	Papaya	Citrus	Cashew	Durian	Jackfruit	Others	All	% share
	<u>000 Pesos</u>										
<u>Research</u>											
Varietal improvement (breeding)	2,206	2,722	600	600	555	820	359	109	7,427	15,398	24.91
Cultural management	2,675	1,106	237	57	220	1,124	1,270	27	3,358	10,074	16.30
Pest management	960	2,093	20	1,090	268	93	373	68	834	5,799	9.38
Postharvest handling/ TQM system	824		50	494		7		55	6,000	7,430	12.02
Food processing	3,072					90			1,641	4,803	7.77
By-products and waste utilization		83				15		54	205	357	0.58
Socio-economics	409		45	114	25	255	325	47	330	1,550	2.51
Sub-total	10,146	6,004	952	2,355	1,068	2,404	2,327	360	19,795	45,411	73.46
<u>Extension-related</u>											
Technology dissemination/ extension	1,010		114			28	223			1,375	2.22
Demo farms	206	50			30	17			22	325	0.53
Plant material/seed products					35	60		296	659	1,050	1.70
Sub-total	1,216	50	114		65	105	223	296	681	2,750	4.45
<u>Development-related</u>											
Development of component technology		33							85	118	0.19
Industry development	2,108	24				676	279		669	3,757	6.08
Management and utilization		466							203	668	1.08
Information network	60									60	0.10
Pilot food processing plant/ trading/packing house	311					30				341	0.55
Development of tools	48									48	0.08
Production projects	142		100			2,550			22	2,814	4.55
Sub-total	2,669	523	100			3,256	279		979	7,806	12.63
<u>General R&D</u>	922	2,030				1,086	425	596	791	5,850	9.46
TOTAL	14,953	8,607	1,166	2,355	1,133	6,851	3,254	1,252	22,246	61,817	100.00

Source of basic data: DOST

Table 30. Number of researches and budgetary allocations by agency and SCU.

Agency-SCU	<u>Researches</u>		<u>Budget</u>	
	No.	%	000 Pesos	%
<u>Agency</u>				
DA-BPI	56	13.56	1,913	3.09
DA-CAR	9	2.18	416	0.67
DA-R1	21	5.08	912	1.48
DA-R2	8	1.94	309	0.50
DA-R3	2	0.48	339	0.55
DA-R4	34	8.23	923	1.49
DA-R5	11	2.66	1,038	1.68
DA-R6	9	2.18	245	0.40
DA-R7	12	2.91	303	0.49
DA-R8	9	2.18	592	0.96
DA-R11	15	3.63	1,493	2.42
DA-R12	15	3.63	1,093	1.77
DA-BAR	2	0.48	2,300	3.72
DA-BAI	1	0.24	54	0.09
DA-KCCDP	14	3.39	15,456	25.00
DOST-PCASTRD	4	0.97	2,876	4.65
DOST-PCARRD	3	0.73	1,411	2.28
DOST-FPRDI	2	0.48	123	0.20
DENR-CAR	1	0.24		0.00
DENR-RIO	1	0.24	4	0.01
ASIST	1	0.24	322	0.52
NORMISIST	1	0.24	86	0.14
Sub-total	231	55.93	32,208	52.10
<u>SCU</u>				
UPLB	36	8.72	20,350	32.92
DSAC	10	2.42	485	0.78
CNSC	1	0.24	50	0.08
NVSIT	1	0.24	126	0.20
UEP	1	0.24	58	0.09
USM	21	5.08	1,871	3.03
SKPSC	2	0.48	64	0.10
SPCP	7	1.69	321	0.52
ISU	2	0.48	345	0.56
MMSU	12	2.91	1,150	1.86
NVSIT	1	0.24	172	0.28
PSU	12	2.91	248	0.40
TONC	1	0.24	60	0.10
USP	8	1.94	211	0.34
WLAC	44	10.65	478	0.77
WMSU	2	0.48	139	0.22
WVSU	1	0.24	60	0.10
QSC	1	0.24	574	0.93
VISCA	3	0.73	596	0.96
RSC	1	0.24	150	0.24
BSU	2	0.48	575	0.93
BU	3	0.73	920	1.49
CATSC	1	0.24	32	0.05
CSU	1	0.24	31	0.05
DMMMSU	6	1.45	429	0.69
PAC	1	0.24	64	0.10
PARSC	1	0.24	50	0.08
Sub-total	182	44.07	29,609	47.90
TOTAL	413	100.00	61,817	100.00

Source of basic data: DOST

Table 31. Study duration of fruit researches. a/

No. of Years	Banana	Mango	Pineapple	Papaya	Citrus	Durian	Cashew	Jackfruit	Others	All
1	2	21	4	4	2	2	7	5	6	53
2	7	11	1	2	2	7	5	1	20	56
3	2	10		2	2	5	1	3	12	37
4		11			1	9	13	1	13	48
5	4	8			3	5	1	1	9	31
6	1	2		1	4	3			3	14
7					1	1			1	3
8		1					1			2
9		3								3
10		1				1			2	4
11		1							3	4
12										0
13		2					1		1	4
Not reported	10	54	5	3	4	11	29	1	37	154
All	26	125	10	12	19	44	58	12	107	413

a/ Based on 1996 Work and Financial Plans

Source of basic data: DOST

Table 32. Number and budget of completed and on-going researches undertaken at UPLB by fruit crop, 1980-2004.

Fruit Crop	Number	%	Total Budget (P) a/	%
Mango	38	23.31	10,695,012	19.07
Banana	31	19.02	11,045,826	19.69
Papaya	18	11.04	7,422,861	13.23
Pineapple	4	2.45	2,572,659	4.59
Citrus	6	3.68	73,326	0.13
Lychees	1	0.61		
Cashew prunes	1	0.61		
Passion fruit	1	0.61		
Rambutan	1	0.61		
Lanzones	1	0.61	5,000	0.01
Avocado	1	0.61	750,000	1.34
Watermelon/melon	2	1.23	262,000	0.47
Pili and mangosteen	1	0.61	1,600,000	2.85
Papaya and citrus	1	0.61		
Papaya and mango	3	1.84	2,204,427	3.93
Banana and papaya	3	1.84	2,075,634	3.70
Banana and citrus	1	0.61	128,999	0.23
Mango and banana	2	1.23	11,335	0.02
Banana and pineapple	1	0.61	606,606	1.08
Guava, guyabano and passion fruit	1	0.61	439,026	0.78
Mango, citrus, jackfruit, chico, cashew, durian, longan and lychee	1	0.61		
Banana, citrus and papaya	1	0.61	116,727	0.21
Durian and lychee	1	0.61		
Papaya, mango and banana	1	0.61	10,000	0.02
Unspecified fruits	41	25.15	16,073,142	28.65
All	163	100.00	56,092,580	100.00

a/ No entries means no report

Source of basic data: UPLB Office of the Vice-Chancellor for Research and Extension

Table 33. Number and budget of researches on fruits undertaken at UPLB by department/institute, 1980-2004.

Department/Institute	Number	% share	Budget (P) a/	% share
<u>Completed</u>				
Ag. Ed. & Rural Studies	1	0.62		
Entomology	4	2.48	430,487	0.77
Horticulture	13	8.07	7,129,776	12.71
Plant Pathology	5	3.11	451,575	0.81
Farming Systems and Soil Resources Institute	1	0.62		0.00
Food Science and Technology	13	8.07	306,612	0.55
Institute of Plant Breeding	13	8.07	5,796,385	10.33
National Crop Protection Center	17	10.56	849,057	1.51
Postharvest Horticulture Training & Research Center	35	21.74	14,902,741	26.57
Institute of Biological Sciences	3	1.86	538,003	0.96
Institute of Chemistry	1	0.62		0.00
National Institute of Molecular Biology and Biotechnology	3	1.86	626,606	1.12
Subtotal	109	67.70	31,031,242	55.32
<u>On-going</u>				
Entomology	2	1.24	405,956	0.72
Horticulture	10	6.21	3,316,083	5.91
Plant Pathology	1	0.62	757,608	1.35
Food Science and Technology	1	0.62	502,211	0.90
Institute of Plant Breeding	24	14.91	7,022,861	12.52
National Crop Protection Center	2	1.24	143,063	0.26
Postharvest Horticulture Training & Research Center	11	6.83	11,666,434	20.80
National Institute of Molecular Biology and Biotechnology	3	1.86	1,247,122	2.22
Subtotal	54	33.54	25,061,338	44.68
Total	163	100.00	56,092,580	100.00

a/ No entries means no report

Source of basic data: UPLB Office of the Vice-Chancellor for Research and Extension

Table 34. Number of completed and on-going researches on fruits undertaken at the UPLB by R&D area, 1980-2004.

Fruit Crop	R & D AREA a/											ALL
	VI	PM	CM	PH	FP	BPWU	TA	TDE	PFP/PH	DT/C	OTH	
Mango	3	9	5	13	3		3		1		1	38
Banana	16	6	1	5	1		1		1			31
Papaya	7	8		2				1				18
Pineapple	2			1			1					4
Citrus	4	1			1							6
Lychees							1					1
Cashew prunes					1							1
Passion fruit					1							1
Rambutan	1											1
Lanzones				1								1
Avocado	1											1
Melon	1	1										2
Pili and mangosteen	1											1
Papaya and mango	2			1								3
Papaya and citrus		1										1
Banana and papaya		1		2								3
Mango and banana	1			1								2
Banana and pineapple							1					1
Guava, guyabano and passion fruit	1											1
Mango, citrus, jackfruit, chico, cashew, durian, longan and lychee	1											1
Banana and citrus	1											1
Banana, citrus and papaya		1										1
Durian and lychee	1											1
Papaya, mango and banana				1								1
Unspecified fruits	8	5	2	19	6					1		41
ALL	51	33	8	46	13	3	4	1	2	1	1	163

a/ VI - Varietal improvement, PM - Pest management, CM - Cultural management, PH - Postharvest handling, FP - Food processing, BPWU - By product and waste utilization, TA - Technology assessment, TD/E - Technology dissemination/extension, PFP/PH - Pilot food processing plant/packing house, DT/C - Development of tools/containers, OTH - Others (general)

Source of basic data: UPLB Office of the Vice-Chancellor for Research and Extension

Table 35. Budget of completed and on-going researches on fruits undertaken at the UPLB by R&D area, 1980-2004.

Fruit Crop	R & D AREA a/									ALL
	VI	PM	CM	PH	FP	BPWU	TA	PFP/PH	OTH	
Mango	1,041,868	783,058	994,785	6,937,587			280,762	378,991	277,961	10,695,012
Banana	5,545,458	2,220,059	757,608	2,163,683				359,018		11,045,826
Papaya	6,465,167	761,592		196,102						7,422,861
Pineapple	763,047			1,709,612		100,000				2,572,659
Citrus	73,326									73,326
Lychees										
Cashew prunes										
Passion fruit										
Rambutan										
Lanzones				5,000						5,000
Avocado	750,000									750,000
Melon		262,000								262,000
Pili and mangosteen	1,600,000									1,600,000
Papaya and mango	2,179,427			25,000						2,204,427
Papaya and citrus										
Banana and papaya		10,000		2,065,634						2,075,634
Mango and banana				11,335						11,335
Banana and pineapple						606,606				606,606
Guava, guyabano and passion fruit	439,026									439,026
Mango, citrus, jackfruit, chico, cashew, durian, longan and lychee										
Banana and citrus	128,999									128,999
Banana, citrus and papaya		116,727								116,727
Durian and lychee										
Papaya, mango and banana				10,000						10,000
Unspecified fruits	280,767	667,326	390,873	14,427,564	306,612					16,073,142
ALL	19,267,085	4,820,762	2,143,266	27,551,517	306,612	706,606	280,762	738,009	277,961	56,092,580

a/ VI - Varietal improvement, PM - Pest management, CM - Cultural management, PH - Postharvest handling, FP - Food processing, BPWU - By product and waste utilization, TA - Technology assessment, TD/E - Technology dissemination/extension, PFP/PH - Pilot food processing plant/packing house, DT/C - Development of tools/containers, OTH - Others (general)

Source of basic data: UPLB Office of the Vice-Chancellor for Research and Extension

Table 36. DA-BAR programs/projects under different fund sources.

Fruit/Program/Project	Proponent	Fund Source	Budget P'000	%
Mango				
1.Mango pulp weevil in Palawan c/	DA-IV STIARC	ASAP/ARF	215	0.9
2.Effect of location & harvest season on the histo-physiol. char.of Guimaras-grown mango a/	BAR, DA-6 NMDRC	GIA	30	0.1
3.Calcium application: its effect on the yield, fruit quality & postharvest character of carabao mango b/	DA-12	GIA	50	0.2
4.Synergistic effect of parent materials and soil mineralogy on the quality of Philippine carabao mango (b)	BSWM	Gintong Ani for HVC (regular funds)	1,013	4.5
5.Sustainable mango production integrated pre and postharvest management of mango anthracose (b)	UPLB-CA	GA-HVC(reg. funds)	1,478	6.5
6.Integrated fruit fly management based on steriles insect release method in Guimaras Island (b)	BPI-NMRDC	SASP	1,952	8.7
7.Improvement of cultural management practices for sustainable mango production b/	DA-12 CENMIARC	SASP	450	2.0
Sub-total 7			5,188	23.1
Banana				
1.Banana bunchy top control and rehabilitation program in the Philippines b/	DA-BPI, UPLB-BIOTECH, LGUS	ASAP/ARF	2,800	12.4
2.Banana research and development proj. b/	UPLB	GIA	5,578	24.8
3.Interaction of Fusarium Wilt and banana bunchy top virus in banana seedling c/	DA-VIII	GIA	50	0.2
Sub-total 3			8,428	37.5
Durian				
1.Development of quality standard program c/	DA-XI SMIARC	ASAP/ARF	200	0.8
2.Durian research and development program b/	DA-ARMM	GA-HVC (reg.funds)	650	2.9
Sub-total 2			850	3.7
Jackfruit				
1.Characterization of jackfruit germplasm using morphological characteristics and isosyne analysis and correlation of fruit physical characteristics c/	DA-VIII	GIA	50	0.2
2.Jackfruit research and development program b/	DA-8 EVIARC	GA-HVC reg. funds)	1,264	5.6
Sub-total 2			1264	5.6
Cashew				
1.Palawan cashew R & D program b/	DA-4 STIARC	GIA	870	3.8
2.R&D program for cashew in region III b/	DA-III	GA-HVC (reg. funds)	1,125	5.0
Subtotal 2			1,995	8.8
Others				
1.Improvement of postharvest handling systems for selected fruit, vegetables and flowers in regions 7, 9, 11 and CAR b/	UPLB-PHTRC	GA-HVC (reg. funds)	3,690	16.4
2.Improvement of postharvest handling systems for selected fruits, vegetables and flowers a/ 2	UPLB-PHTRC	SASP	975	4.3
Sub-total			4,665	20.7
TOTAL 18			22,440	100.0

a/ completed

b/ on-going

c/ check for release

Source of basic data: BAR

Table 37. Agriculture biotechnology R & D, CY 1998-2000.

Fruit/Program/Project	Agency	Budget (P '000)	%
Banana			
1.Studies on the production & testing of diagnostic kits for widening viral diseases of identified fruits	UPLB-BIOTECH	727	1.53
2.Mass production of virus-free planting materials of banana (N. Luzon)	BSU	2,650	0.00
3.Mass production of virus-free planting materials of banana (S. Luzon)	UPLB	2,800	5.57
4.Mass production of virus-free planting materials of banana (S. Mindanao)	BPI-DNCRDC	1,200	5.89
5.Mass production of virus-free planting materials of banana (C. Mindanao)	DA-CEMIARC	359	2.52
6.Mass... (CARAGA)	DA-CARAGA	359	0.75
7.Investigation in the in-vitro propagation of banana for conservation and utilization	UPLB	900	0.75
8.Development of enhanced practical immunological assay using polyclonal antibodies for detection of banana bunchy top virus	UPLB-NCPC	3,670	1.89
9.Use of protoplast fusion and somoclonal variation in banana cultivars development	UPLB-IPB	2,500	7.72
10.DNA/Isozyme fingerprinting of Philippine banana germplasm	UPLB-IPB, UPLB-IBS & UPD-MM	3,000	5.26
11.In-vitro gene banking of banana (and abaca) germplasm	UPLB-IPB	2,000	6.31
12.Development of bunchy-top virus resistance in banana (and abaca) by gebnetic engineering	UPLB-IPB	4,000	4.20
13.Biotechnology-assisted development of BTV resistance in banana (and abaca) by mutation breeding	UPLB-PNRI	2,000	8.41
Sub-total 13		26,165	4.20
Mango			55.01
1.Molecular marker techniques for improvement of coconut and mango; genome mapping in coconut & DNA-based fingerprinting in mango cultivars	UPLB-IPB	5,400	11.35
Sub-total 1			
Durian			
1.Identification of male character in durian and rambutan by molecular markers	UPLB-IPB,UPLB-IBS & UPD-MBB	4,500	9.46
2.Determiration of genetic diversity of germplasm and molecular fingerprinting of varieties of durian.	UPLB-IPB,UPLB-IBS & UPD-MBB	3,000	6.31
Sub-total 2		7,500	15.77
Papaya			
1.Control of ripening in papaya by genetic engineering	IPB (w/ U. of Queensland & MARDI	4,000	8.41
2.Development of papaya ringspot virus resistance in papaya by genetic engineering	UPLB-IPB & Cornell	2,500	5.26
Sub-total 2		6,500	13.67
Pili			
1.Development of a molecular assay for sex determination in pili	PCA-Albay	2,000	4.20
Sub-total 1		2,000	4.20
TOTAL		47,565	100.00

Table 38. Research intensity ratios (in percent) by fruit crop.

Fruit Crop	GVA		GVA (‘000,000 P) c/	RIR (%) d/
	Research Budget a/ share (‘000 P)	b/ % b/		
Banana	8,606	2.85	5,044	0.17
Mango	14,951	2.3	4,071	0.37
Pineapple	1,166	1.38	2,442	0.05
Citrus	1,133	0.39	690	0.16
Other fruits	35,961	3.24	5,734	0.63
All fruits	61,817	10.16	17,981	0.34

a/ Based on the 1996 Work and Financial plans

b/ For 1995-1997 (David, et. al. 1998)

c/ Based on GVA shares (1995-1997)

d/ Research budget as percent of GVA

Source of basic data: DOST and BAS

Table 39. Publications/published materials by fruit crop.

Fruit Crop	Philippines Recommends		Theses		IPB-UPLB	All
	Series (Bibliography)	UPLB MS	UPLB PhD	USM BS	Annual Reports	
Mango	209	12	6	13	5	245
Banana	116	20	1	19	28	184
Pineapple	a/		1	3	1	5
Durian	b/	1	1	41	1	44
Citrus	32	2	2	6	11	53
Papaya	46	2	1	5	16	70
Jackfruit				3	2	5
Rambutan			2	8		10
Apple					1	1
Strawberry					1	1
Guava					1	1
Passion fruit			1		4	5
Longan, lychee, alupang					2	2
Watermelon					1	1
Avocado					5	5
Galo					1	1
Kubili					1	1
Banana/mango					1	1
Coconut/mango					1	1
Lanzones			5			5
Mabolo			1			1
Mangosteen			1			1
Pomelo			2			2
Chico					1	1
Rambutan/durian					1	1
Guyabano					1	1
Santol					1	1
Unspecified fruits			2		26	28
TOTAL	403	37	26	98	113	677

a/ Latest available is 1974 issue

b/ Not available

Table 40. Technologies generated for the different commodities

Fruit Crop/Process Flow	Technology
<p><u>Mango</u></p> <p>Production</p> <p> Propagation</p> <p> Orchard establishment</p> <p> Cultural management</p> <p> Crop protection</p> <p>Harvesting</p> <p>Postharvest</p> <p>Processing</p>	<p>Grafting which results in trees with little variation, shortened juvenile period & improved growth habit</p> <p>Ideal growing conditions (season, soil, elevation, temperature); characteristics and source of; planting design and distance of planting (range of 10-14 m) to consider propagation method, plan for pruning/thinning or mechanized operations</p> <p>Fertilizer application (rate/tree/year, fertilizer grade, method and time); use of organic fertilizer</p> <p>Irrigation (levels by tree age, stage); mulching as water conservation measure</p> <p>Ring cultivation, inter-row cultivation, cover cropping and use of chemicals for weed control</p> <p>Use of vegetables, legumes and short-maturing trees as intercrops</p> <p>Flower induction through use of potassium nitrate; suggestions on concentration of inducer according to season (whether early or late)</p> <p>Bagging of fruits 50-60 days after flower induction (DAFI)</p> <p>Shaking ("yugyog") to remove dried twigs that harbor pests</p> <p>Use of methyl eugenol to trap fruitflies to decrease their number</p> <p>Use of pesticides with suggested spray schedule on number of days after induction, kind of pesticide and dosage</p> <p>Basis of fruit maturity is 110-120 DAFI; 82-88 days after full bloom for trees not applied with chemical inducer; use of flotation method</p> <p>Method is by hand (carefully) or use of a picking pole and ladder</p> <p>Time is 9:00 A.M. to 3:00 P.M.</p> <p>Hot water treatment (HWT) to control diseases (anthracnose, stem end rot), remove latex on the peel and does not involve residue problem</p> <p>Vapor heat treatment (VHT) to disinfest mangoes of fruitflies; protocol for minimizing quality problem initially encountered with VHT has been developed</p> <p>Protocol for refrigerated holding during shipment already developed</p> <p>Use of stackable plastic crates as transport containers</p> <p>Cold treatment (CT) involving exposure of fruits to near freezing temperatures for a specified period</p> <p>Hastening of ripening using ethylene, ethephon or calcium carbide</p> <p>Processing methods for various products (dried, puree, etc.)</p>
<p><u>Banana</u></p> <p>Production</p> <p> Propagation</p> <p> Planting</p> <p> Cultural management</p>	<p>Tissue culture as a means of vegetative propagation which can help produce disease-free planting materials; steps, advantages, application areas, benefits and limitations have been defined</p> <p>Procedure for field planting of tissue culture bananas, care for the plants, & materials/inputs required</p> <p>Fertilization, irrigation and drainage, sucker pruning, leaf pruning, fruit care (fruit obstacle removal, bunch spray, propping, removal of style/perianth/male bud, bagging), field sanitation; cropping systems (with coffee, pineapple, papaya or coconut)</p>

continued Table 40, page 2

Pest management	Mechanical and chemical methods for weed control Chemical control for insect pests regarding insecticides to be used (common and brand names) and rate, method and frequency of application Improved cultural practices and satisfactory chemical spray program for disease control (including common/trade name and distributor/manufacturer of chemical, rate and frequency of application)
Harvesting	Maturity indices of banana for the local market depends on the variety (consider number of weeks after shooting); for the export market, this depends on specifications and requirements of importing countries but commonly used indices are calibration size and number of weeks from shooting; depends on whether bunches are big (there is a harvester and a backer) or small; in plantations, harvested fruits are hanged on field hangers or on rollers of a cable system
Postharvest	Packinghouse operations like dehanding, deflowering, washing and sorting, crown mold control and labeling; packaging; transport; storage (under low temperature, modified atmosphere); ripening and degreening (with guidelines on the kind of ripening agents, concentration, method of application, length of exposure and days to ripen)
Processing	Processes for chips, puree, figs and flour
<u>Pineapple</u>	
Production	Planting, fertilization, irrigation, pest/disease control
Postharvest	Waxing of pineapple involving application of wax emulsion on the entire fruit surface to delay ripening, control diseases, prevent the development of chilling injury during storage thus extend shelf life
<u>Papaya</u>	
Hybrid development	Sinta hybrid papaya which is moderately resistant to PRSV, produces more quality seeds, semi-dwarf, early-maturing, sweet and has firmer flesh; includes recommendations on land preparation, germination, planting, irrigation, fertilization (time, amount per tree, type of fertilizer), weeding, insect/pest/disease control and harvesting
Production	Seed selection, varieties, propagation and planting, fertilization, irrigation and drainage, pest and disease control, intercropping and replanting/crop rotation
Harvesting	Harvest time depends on intended use (as vegetable, as fruit intended for local or export which should be harvested at color break), time of harvesting when fruit moisture content is low
Postharvest	Timely hot water treatment and fungicidal treatment for disease control Storage temperatures for ripe and partially ripe papayas Use of appropriately designed containers for packing Use of stackable plastic crates as transport containers
<u>Durian</u>	
Production	Multiple rootstock techniques on durian trees; durian establishment through modified inarching (1995) Intercropping durian with lakatan banana (1997) Intercropping durian with coconut (1997) Single-node grafting method in the production of planting materials (1997) Planting large-sized planting materials (LPM) Inarched-large planting material (ILPM) (1997) Modified budgrafting (1997)

continued Table 40, page 3

	<p>Selection of appropriate production site</p> <p>Providing the orchard with adequate water and drainage system</p> <p>Selection of early maturing, high yielding and recommended clones</p> <p>Making correct layouting, holing and planting</p> <p>Providing the plants with 40-50% shade during establishment</p> <p>Supplying regularly adequate fertilizer</p> <p>Training and pruning the trees to develop balanced canopy</p> <p>Practicing aided pollination and fruit thinning</p> <p>Propping fruit branches</p> <p>Providing adequate control of weeds, insect pests and diseases</p> <p>Harvesting at the right time</p> <p>Integrating the major management practices</p> <p>Development of durian clone "Duyaya" (a superior variety)</p>
<u>Lanzones</u> Production	<p>Cultural management for high-yield production of <i>longkong</i></p> <p>Off-season production of <i>longkong</i></p> <p>Modified crown grafting (MCG)</p>
<u>Mangosteen</u> Production	<p>Nursery management and orchard site selection, establishment and management</p> <p>Intercropping of banana during 1st 3 years of mangosteen</p> <p>Intercropping of mangosteen under mature coconut</p>
<u>Marang</u> Production	<p>Maraguinto: A new marang variety (1995)</p>
<u>Other Fruits</u> Processing	<p>Jackfruit seed flour: a potential substitute to wheat flour for biscuit, muffins, & cookies/pastries (1993)</p> <p>Tiesa fruit flour: excellent for hot cakes, pastillas de leche, cookies, butter cake, pandesal, chippy, cuchinta and puto (1995)</p> <p>Yawtia, sweet potato and cardava banana, excellent extenders for durian jam (1994)</p>
<u>Others</u>	<p>Plant diagnostic kit (adapted the enzyme-linked immunosorbent assay or ELISA technique for the detection of plant, food and feed pathogens and mycotoxins such as PRSV, citrus tristeza virus (CTV), greening disease of citrus or leaf mottling (LM), banana bunchy top virus (BBTV), banana bract mosaic virus (BBMV), mango anthracnose organism, etc.</p>

Sources: Lizada (1995), The Philippines Recommends for Mango (1994), Banana (1992), Papaya (1984), PCARRD Information Bulletin Series/Leaflets, University of Southern Mindanao

Table 41. Fruit varieties released by the Philippine Seed Board

Fruit	Year	Name of Variety	Institute/Company
Abiu	1995	RCF Gold	RC Farm
Atemoya	1989	African Pride	IPB, UPLB
Atis	1989	Nang Thong	IPB, UPLB
	1989	Morado	IPB, UPLB
Avocado	1991	De Leon	Jose de leon, Batangas.
	1991	Calma	Jose de leon, Batangas.
	1991	Tacloban Selection	Maria Elisa A. Pernejo, Tacloban City
	1992	Avocado (Bat-Av-0-3)	Teodoro V. Katigbak, Batangas
	1995	Cepillo Green	Gualberto Cepillo
	1997	RCF Morado	RC Farm
Balimbing	1991	Kwangtung	IPB, UPLB
Banana	1991	Saba	IPB, UPLB
	1991	Latundan	IPB, UPLB
	1991	Lakatan	IPB, UPLB
Bitungol	1995	Mirabuena	Florinda, Mirabuena
Caimito	1995	RCF Purple	RC Farm
Cashew	1991	R2T3-QP	Palawan Seed Farm
	1991	R2T4-QP (Mitra)	Palawan Seed Farm
	1991	Guevara/WLAC 501	WLAC, Zambales
	1997	Makiling	UPLB
Chico	1991	Ponderosa	IPB, UPLB
	1991	Pineras	IPB, UPLB
	1991	Gonzlaes	IPB, UPLB
	1992	Chico Sao Mla. (QAES-Ch-0-11)	Quezon Agri, Exp. Station, Tiaong, Quezon
	1992	Sao Manila (QAES-Ch-0-8)	Quezon Agri, Exp. Station, Tiaong, Quezon
	1992	Ponderosa (QAES-Ch-0-7)	Quezon Agri, Exp. Station, Tiaong, Quezon
	1992	Ponderosa (QAES-Ch-0-6)	Quezon Agri, Exp. Station, Tiaong, Quezon
	1992	Pondersa (QAES-Ch-0-4)	Quezon Agri, Exp. Station, Tiaong, Quezon
Durian	1991	DES-1545	Domingo Sotilleza, Davao City
	1991	Malagkit	BAEX Nursery Orchard, c/o Kibawe Seed Farm, Bukidnon
	1991	Chanee	BPI Davao Exp. Station
	1992	DES-806	Romy Francisco, Davao City
	1995	Arancillo	Davao NCRDC, BPI
	1995	GD69	Galang Farm
	1997	Lacson Uno	Simeon Latayan
	1997	Oboza	Alcon Farm
	1997	Alcon Fancy	Alfonso & Conchita Abad
Guyabano	1991	Sour Guyabano	Manuel L. Roxas Mem. Exp. Stat., Lipa City
Jackfruit	1991	Torres	IPB, UPLB
	1991	Jo 1	Mandaue Exp. Station
	1991	Jo 2	Mandaue Exp. Station
	1992	Bat.-Jf-0-2	Vicente Macasaet, Batangas
	1992	Bat-Jf-0-3	Alfredo Macasaet, Batangas
	1992	Bat-Jf-0-4	Crispulo Dimayuga, Batangas
	1995	Sinapelo	Felimon Sinapelo
	1996	Burabod	Estilita dela Cruz
Lanzones	1991	Paete	IPB, UPLB
	1991	Dubu	Davao NCRDC, BPI

Continued Table 41, page 2

Mango	1991	Carabao (Lamao #1)	IPB, UPLB
	1991	GES 85	Guimaras Exp. Staion
	1991	GES 84	Guimaras Exp. Staion
	1991	GES 77	Guimaras Exp. Staion
	1991	GES 73	Guimaras Exp. Staion
Marang	1997	MMSU Golg (Carabao)	MMSU
	1996	Maraginto	USM
	1991	Oas	IPB, UPLB
Pili	1991	Mayion	IPB, UPLB
	1991	Katutubo	IPB, UPLB
Pumelo	1996	Martha	Cornelio Maligalig
Rambutan	1991	Seematjan	Rodrigo F. Dizon, Davao City
	1991	Lebak Bulus	UPLB
	1992	Maharlika	Cionito Villacorta, Davao City
	1992	DES-1550	Dr. Carlota Sandique, North Cotabato
	1992	DES-1551	Dr. Carlota Sandique, North Cotabato
	1992	DES-1554	Dr. Carlota Sandique, North Cotabato
	1992	DES-1548	Alfonso Abad, Davao City
	1995	JMG-3	Goyena Orchard
	1995	JMG-5w	Goyena Orchard
	1996	Acc. Sp	Cirilo R. Balagapo, Jr.
Santol	1991	Bangkok	IPB, UPLB
	1992	Bangkok (LAG-LBNCRDC-Sa-Bk-0-5-91)	Los Banos, NCRDC, BPI
	1992	Bangkok (LAG-LBNCRDC-Sa-Bk-0-4-91)	Los Banos, NCRDC, BPI
	1992	Bangkok (LAG-LBNCRDC-Sa-Bk-0-3-91)	Los Banos, NCRDC, BPI
	1992	Bangkok (LAG-LBNCRDC-Sa-Bk-0-2-91)	Los Banos, NCRDC, BPI
Tiesa	1992	Saludo	Anatacio Saludo, Guimaras

Table 42. Extent of adoption of production and postproduction technologies on fruits.

Source	Fruit Crop	Sample Size and Location	Adoption Rate
Ranola <i>et al</i> (1990)	Mango	200 farmers from Bulacan, Cavite, N. Ecija, Pangasinan and Zambales	Varietal selection - 85% planted Carabao variety, others both Pico & Carabao Flower induction - all but one applied potassium nitrate using either manually operated or motor-driven sprayers Fertilization - 36% applied fertilizer but less than recommended rate Crop protection - all used insecticides and fungicides; none practiced bagging; 7% practiced pruning; some practice post bloom shaking; 37% practiced weeding done once a year by underbrushing Irrigation - practiced by 2 farmers only Index of maturity used - 120 after October flower induction and 105-110 days for later induction Sorting of harvested fruits practiced. Grading practiced according to shape, condition and weight Packing practiced using banana leaves for lining and ropes and baskets as packing materials Intercropping adopted - with cash crops and coconut
Oliva <i>et al</i> (1996)	Mango	Farmer-members of cooperative in Southern Mindanao	
Brown (1992)	Mango	69 owner operators and contract producers in	Flower induction - 100%; actual more than recommended Pest control using insecticide & fungicide - 96%; actual less than recommended Fertilization - 55%; actual less than recommended
Abas (1999)	Mango	Pangasinan 45 farmers in Zamboanga del Norte	Number of DAFI - adopted as index of maturity but of wider range than recommended Harvesting from 9:00 A.M. - 5:00 P.M. - adopted Handpicking and pole picking methods of harvesting - adopted Cleaning of harvested fruits - 44% water spraying or wiping with cloth or paper Sorting by size, shape and color (91%) or condition (free from blemishes and scars (62%) Grading according to classes by weight - 71% of large farmers Induced ripening using calcium carbide - 44% Packaging using bamboo baskets - 14%, wooden crates - 53%, fiber boxes (33%) All operations including cleaning, sorting, grading, packaging with option to ripen - 44%; partial including sorting, packaging and selling - 47%; no services performed (sell fruits immediately after harvest) - 9%
Nones Jr. (1998)	Mango	60 growers in Batangas City	Square system of planting - 87%, the rest have scattered trees Planting distance from 10mx10m to 15mx15m - 72% Use of asexually propagated planting materials mostly by cleft grafting - 42%; both sexually and asexually propagated materials - 45% Source of planting materials - not indicated whether certified or not Fertilization - 60% of 30 self-spraying tree owners

Continued Table 42, page 2

			<p>Mulching - 83% of 30 self-spraying tree owners</p> <p>Pest and disease control by chemical spray - 100%, weeding - 100%, post bloom shaking - 97%, bagging - 17%, pruning - 13%, smudging - 43%</p> <p>Irrigation/watering - 27%</p> <p>Supporting to provide brace for low-lying branches during fruiting stage - 97%</p>
Revilla (1999)	Sinta Papaya	20 papaya growers in Laguna	<p>Source of planting material - IPB, UPLB</p> <p>Distance of planting - 3mx3.5m (10%), 2x3 - 25%, 3x3 - 50%, 4x4-5x5 - 15%</p> <p>Irrigation for newly planted seedlings - 70% as the need arises (by pump, deepwell or gravity), rain (30%)</p> <p>Fertilization - applied immediately after planting; 40% used recommended rate, 25% used more, 25% used less, 10% did not apply</p> <p>Weeding and cultivation - practiced in most farms</p> <p>Pest and disease control - as need arises but large farms applied pesticides even if trees not yet infected to avoid occurrence</p> <p>Harvesting after 8-10 months after transplanting - adopted</p> <p>Sorting and wiping with cloth to remove spots or unwanted particles on skin - adopted by majority</p> <p>Grading by weighing, covering with newspaper to avoid damage, piling in wooden crates or plastic containers for marketing - adopted</p> <p>Planting distance of 2-3mx3m - adopted for Solo, variable distances for Cavite Special which are usually intercropped</p> <p>Irrigation during dry months - practiced for Solo</p> <p>Fertilization - blanket recommendations usually followed</p> <p>Application of borax - not consistently done especially in Cavite Special</p> <p>Field sanitation - not practiced in smaller farms</p> <p>Preharvest disease control - not optimized, not consistently practiced</p>
Lizada (1995)	Papaya		
Legada, L.V.. and Evangelista,C.C.(1997)	Durian	durian growers in Cotabato	<p>Chemical control against insect pests - 90-100%, 10-50% used recommended rates; all used cultural methods of control (removing of infested plant parts, pruning, light trapping, fogging or smoking, fruit bagging)</p> <p>Botanical control - not adopted</p> <p>Mechanical control method (handpicking) - practiced by some</p>
Lizada (1995)	Banana		<p>Pest and disease control by roguing and quarantining - not adopted in small farms</p> <p>Fruit maturity based on number of weeks after shooting - not commonly adopted by Saba farmers</p> <p>Fertilization - not usually adopted by small producers of Saba</p> <p>Appropriate postharvest handling - not commonly adopted</p>

Table 43. Capability of selected R&D centers engaged in fruits R&D, 1991-1995

		UPLB	USM	BPI
Research personnel by degree				
Ph.D.		53 (45) a/	37 (17)	5 (40)
M.S.		206 (64)	72 (21)	42 (55)
B.S.		225 (74)	8 (22)	160 (55)
Total		484 (183)	117 (30)	107 (150)
Graduate:Undergraduate degrees		1.15	4.08	0.21
Senior:Junior staff		0.50	1.75	0.08
Research:Administrative staff		3.14	0.86	1.99
Technical:Administrative staff		0.46	0.86	2.22
Ave. age of researchers		41	43	52
Ph.D. technical:Ph.D non-technical staff		1.44	1.43	1.00
Number of research personnel	1993	543	129	266
	1995	604	135	317
R&D funding from outside sources (P M)	1994	14.86	2.43	1.67
	1995	18.07	1.30	2.19
MOOE (research):No. of FT staff	P/staff	49,304	46,285	47,813
MOOE:floor area	P/sq.m.	1,828	2,042	2,415
% change in MOOE/staff	1993-1995	-0.44	7.46	17.06
Floor area research):research staff	sq.m./staff	70 (144) b/	32 (86)	37 (94)
Description of facilities:				
UPLB:	NCPC - experimental fields little below min. standard; most infrastructure & facilities functional; greenhouse & training need repair; additional equipment for lab., communication, power supply, furniture & vehicles needed Entomology - screenhouse functional, biocontrol lab partially functional; greenhouses need repair; additional microscope, opaque projectors and computers needed Plant Pathology - microscopes need replacement; greenhouses, training room, media and transfer room & diagnostic room needed including required equipment Horticulture - greenhouse & teaching lab nearly meet min. reqts.; seed storage small; farm demo area insufficient; postharvest facilities and laboratory equipment needed Agronomy - infrastructure facilities though functional nearly meet min. reqts.; seed storage, screen house and glass house need repair; vehicles needed IPB - experimental farms more than meet min. reqt.; infrastructure facilities mostly in good form; additional or improvement of the tissue culture lab, seed storage and screen house needed			
USM:	has very large research area but only 2 of 4 tractors functional; only equipment for land prep., grass cutting, corn drying/shelling and rubber sheeting operations available while all others required are not; greenhouses and screen houses inadequate; fruit processing equipment available; instrumentation equipment obsolete; vehicles needed			
BPI:	facilities inadequate except tissue culture laboratories recently established, seed quality lab in Manila, greenhouse and nursery facilities with new drip/sprinkler system; adequate field experimentation areas except Manila and Los Banos; transportation and farm mechanization capabilities inadequate except Baguio; service vehicles old and non-functional; need improvement in computer, communication and information facilities			

a/ Figures in parentheses are minimum requirements of PCARRD as national R&D centers and based on commodity responsibilities

b/ Figures in parentheses are minimum requirements and include nursery, storage, laboratory and drying facilities

Source: Various tables in RMC (1997)

Table 44. Performance of selected R&D centers engaged in fruits R&D, 1991-1995

	UPLB	USM	BPI
Technologies developed: No. of FT research staff	0.19	0.05	0.04
No. of journal articles published:			
No. of FT research staff a/	0.03	0.06	0.05
Promotional publications: No. of FT research staff b/	0.08	0.02	0.06
Extension activities: No. of FT research staff c/	0.11	0.03	0.23
Scientific awards: No. of FT research staff	0.06	0.008	0.3
No. of research projects with core and external funding per year	>1,000	50	50
Linkages:	Linkages forged with national and intentional agencies for funding, training, facilities, exchange of research information and materials, and technology dissemination; linkages among NARRDN institutions established and functional.		

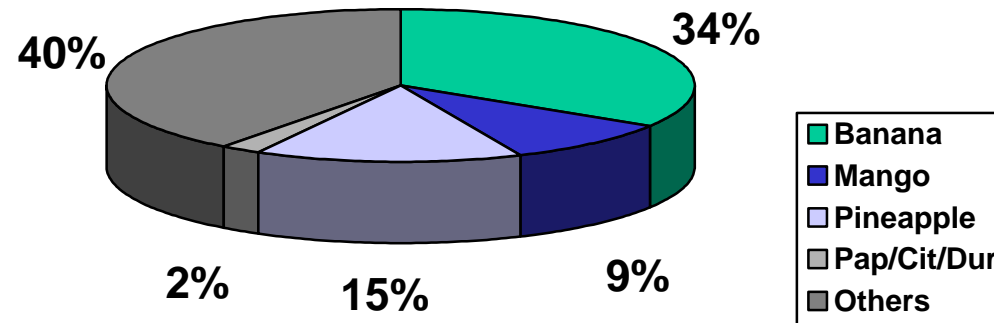
a/ Journal publications include technical publications and proceedings of scientific conventions which have been evaluated and accepted by a team of referees or editorial board.

b/ Promotional publications are popular materials on technologies, new crop varieties, highly-recommendable agricultural practices, and other information aside from institutional promotion for general public readership.

c/ Extension activities included training programs, short courses, farmers' field day, farm demonstrations, exhibits, on-farm visits, radio broadcasts, distribution of agency-developed materials, and other audio-visual production/presentation.

Source: Various tables in RMC (1997)

**Fig. 1. Production Volume
Shares, 1997**



Harvest Area Shares, 1997

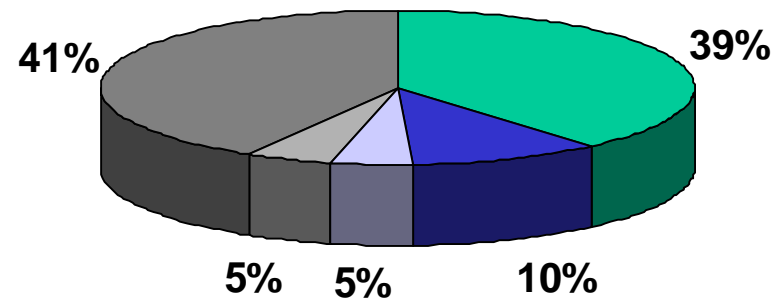


Fig. 2. GVA Shares, 1997

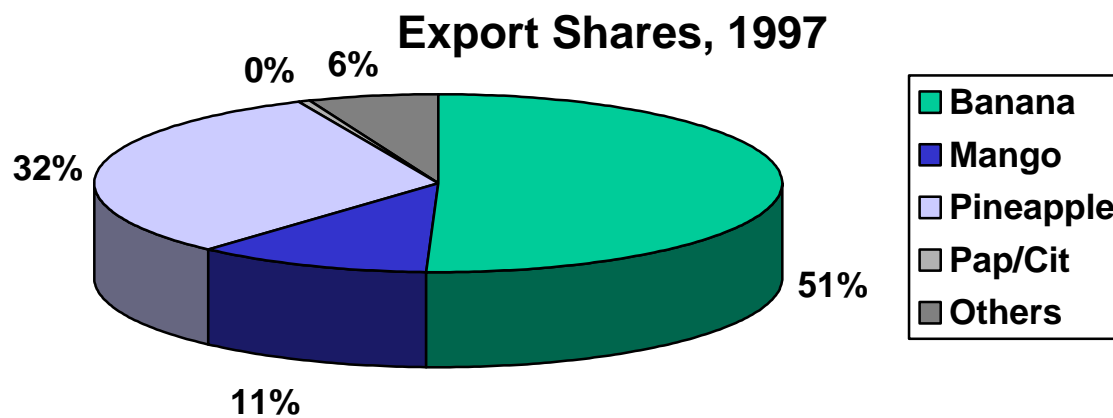
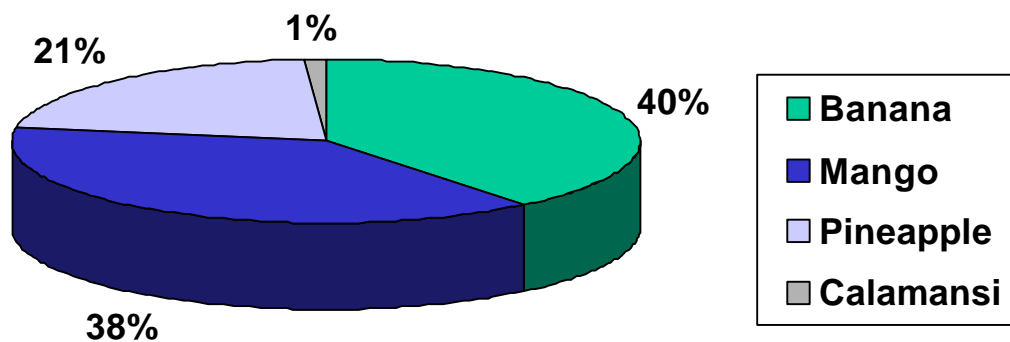
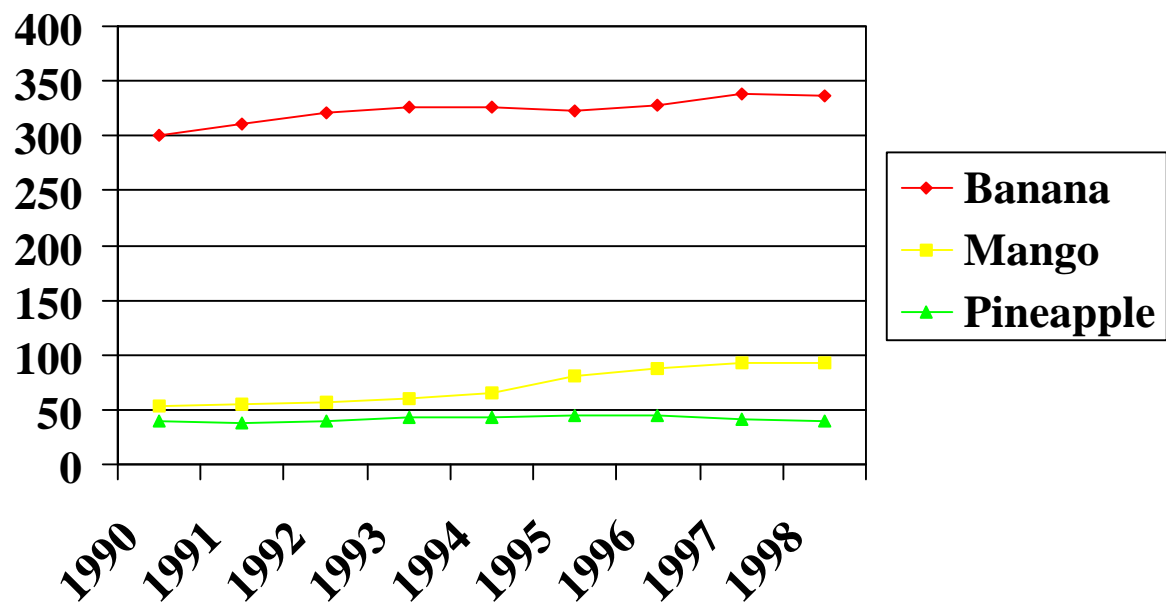
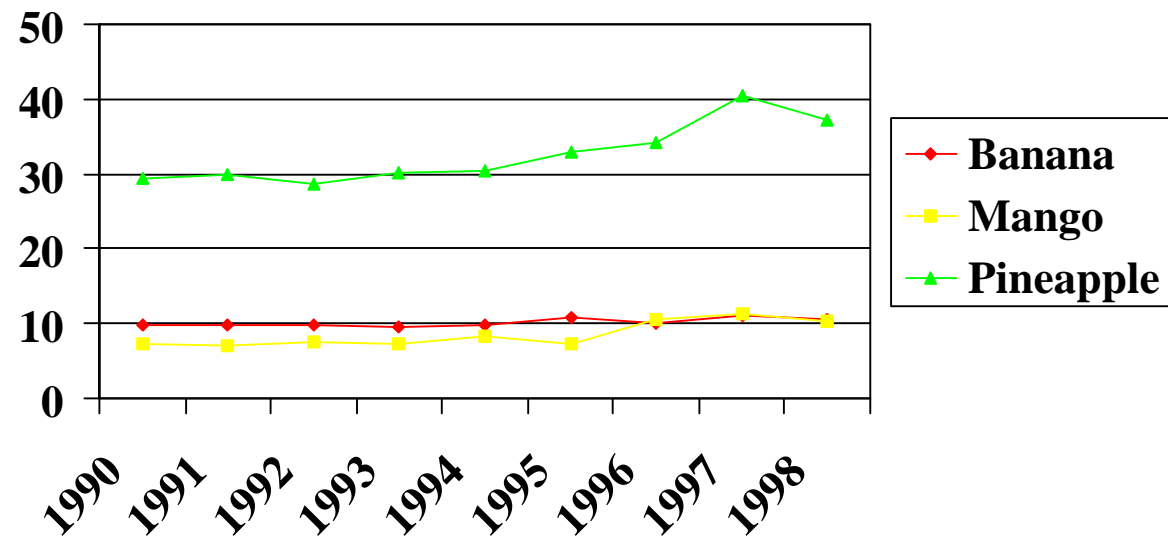


Fig. 3. Harvest Area ('000 ha), 1990-1998



**Fig. 4. Yield Per Unit Area (Tons/ha),
1990-1998**



**Fig. 5. Production Volume ('000 tons),
1990-1998**

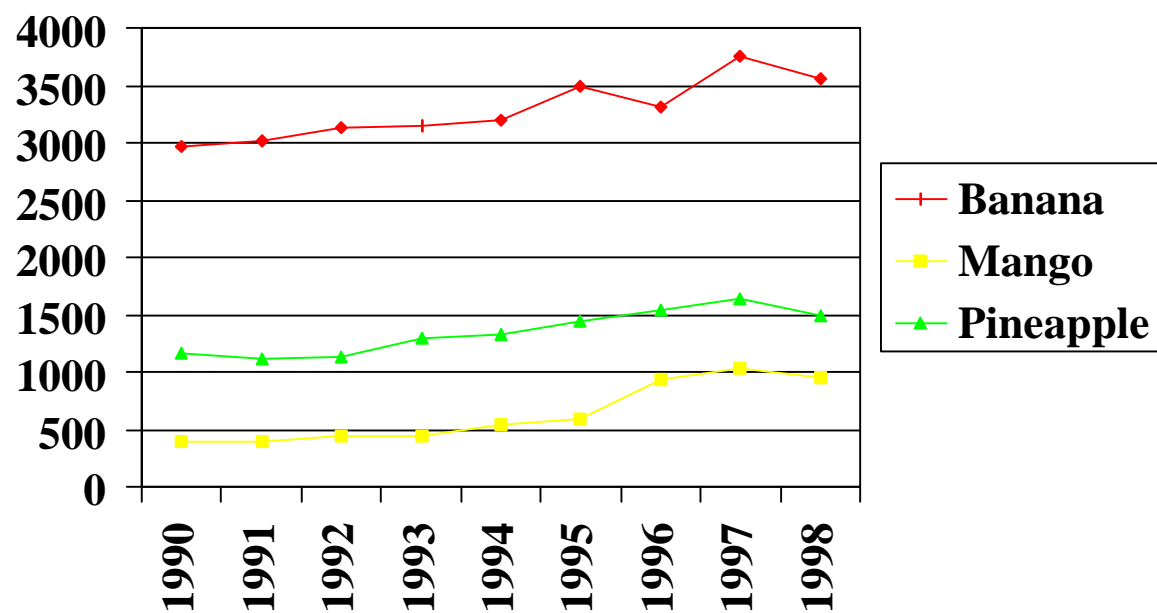
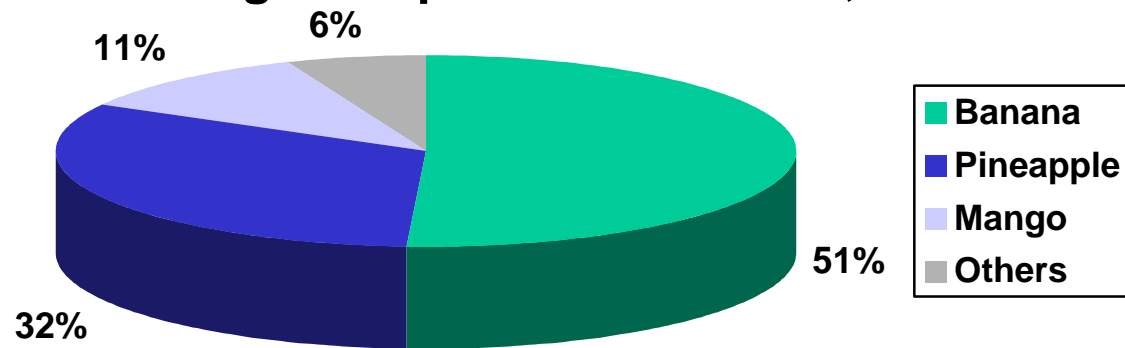
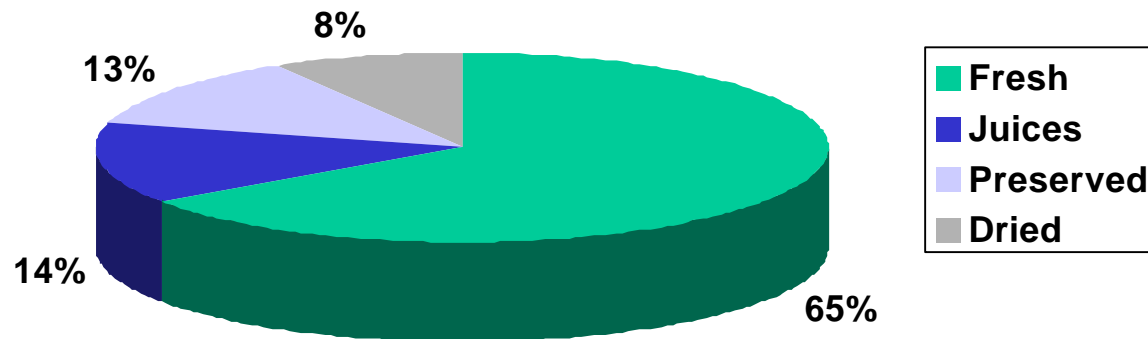


Fig. 6. Export Value Shares, 1998



Import Value Shares, 1998



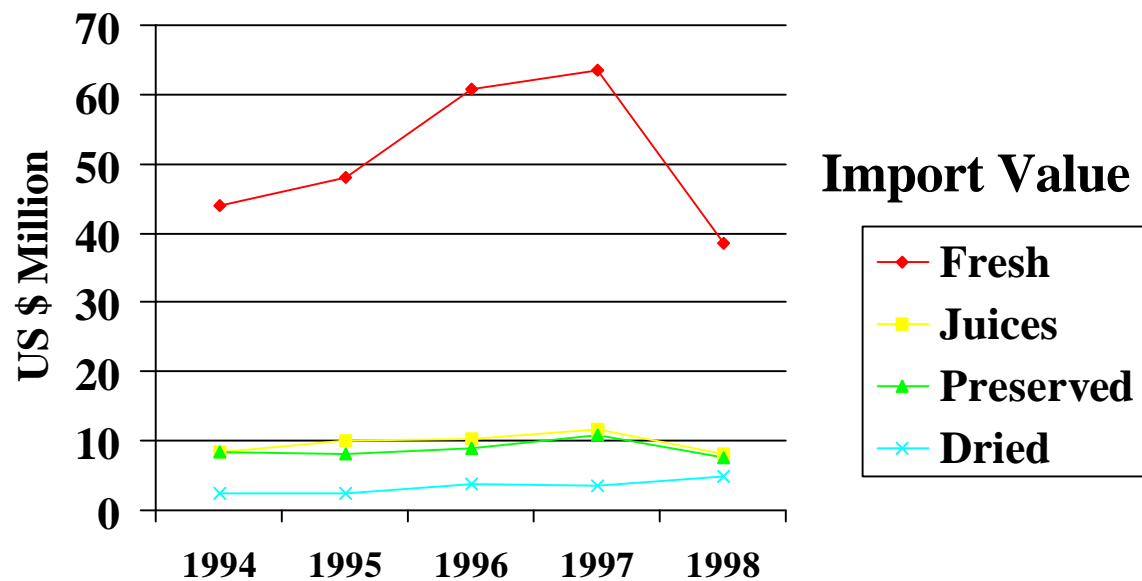
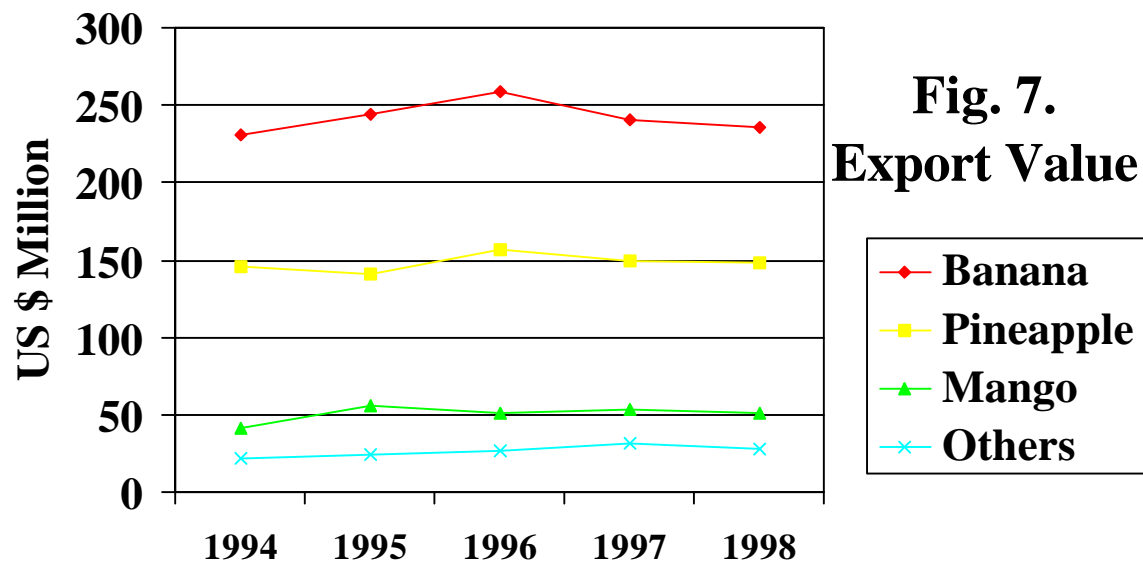
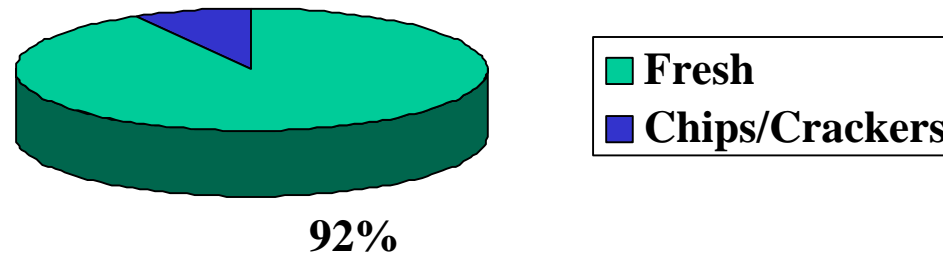
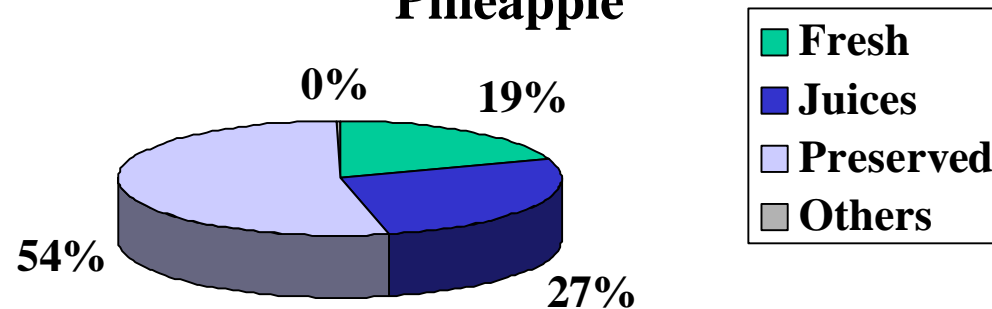


Fig. 8. Export Value Shares (1998)

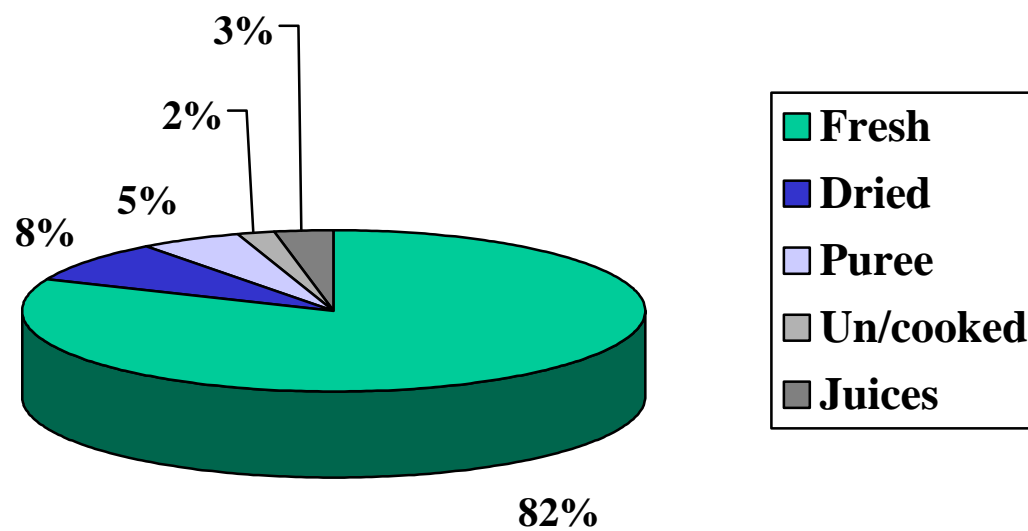
By Form: Banana



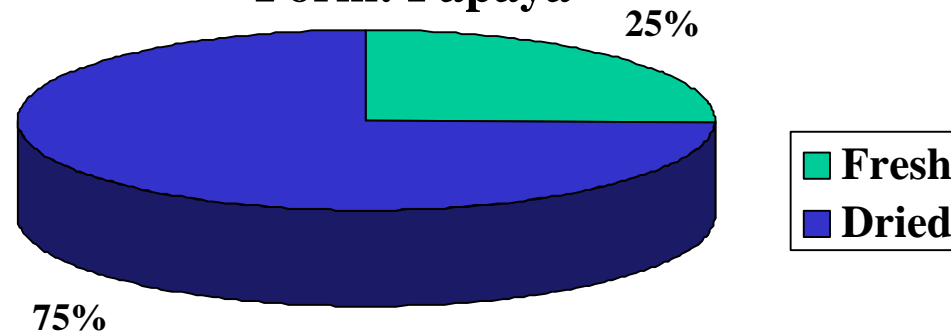
**Export Value Shares (1998) By Form:
Pineapple**



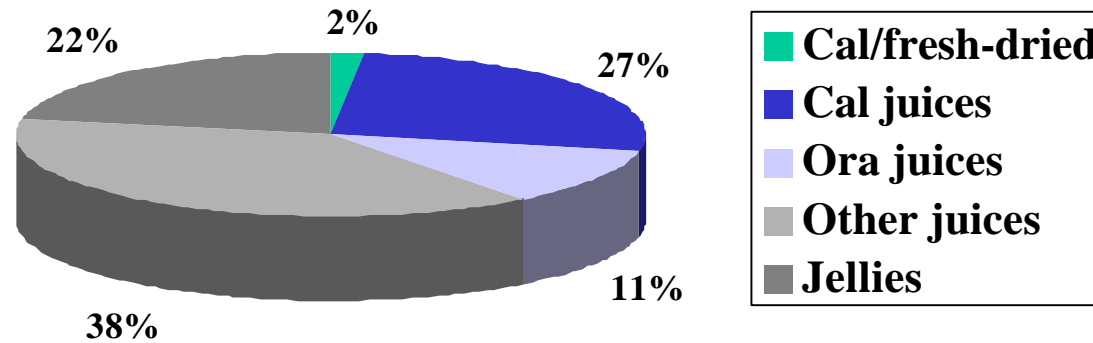
**Fig. 9. Export Value Shares (1998) By
Form: Mango**



**Fig. 10. Export Value Shares (1998) By
Form: Papaya**



**Export Value Shares (1998) by Form:
Citrus**



Appendix Table 1a. Production value and volume, harvest area and yield of banana, mango and pineapple, Philippines, 1990-1998.

	BANANA				MANGO				PINEAPPLE			
	Value a/	Vol. b/	Area c/	Yield d/	Value	Vol.	Area	Yield	Value	Vol.	Area	Yield
1990	7,254.10	2,971.80	300.20	9.90	4,989.50	389.50	53.20	7.32	4,773.50	1,155.80	39.33	29.39
1991	9,738.60	3,023.30	311.30	9.71	5,618.00	391.50	55.10	7.11	4,691.80	1,117.10	37.48	29.81
1992	10,523.70	3,130.20	321.40	9.74	5,876.60	435.30	57.20	7.61	4,801.90	1,135.20	39.76	28.55
1993	10,563.80	3,144.00	325.80	9.65	6,715.90	440.10	60.50	7.27	5,394.20	1,287.40	42.62	30.21
1994	11,748.70	3,192.60	326.50	9.78	9,409.30	541.70	65.00	8.33	5,805.40	1,331.40	43.66	30.49
1995	12,422.40	3,489.50	322.00	10.84	9,903.10	595.10	80.40	7.40	5,078.70	1,442.70	43.96	32.82
1996	13,811.00	3,304.10	328.10	10.07	11,196.80	932.70	87.70	10.64	7,418.20	1,542.20	45.05	34.23
1997	14,921.10	3,759.80	338.30	11.11	10,554.20	1,028.10	91.90	11.19	11,090.40	1,638.90	40.42	40.55
1998		3,550.00	337.10	10.53		950.10	92.90	10.23		1,495.12	40.23	37.16
Average	11,372.93	3,285.03	323.41	10.15	8,032.93	633.79	71.54	8.57	6,131.76	1,349.54	41.39	32.58
Growth rate (%/year)	11.27	2.07	1.29	0.80	12.02	8.27	7.06	1.51	14.81	5.16	-4.84	13.00

a/ In million pesos

b/ In '000 tons

c/ In '000 hectares

d/ In metric tons per hectare

Source of basic data: BAS

Appendix 1b. Production value and volume, harvest area and yield of citrus, durian, papaya, other fruits, and all fruits. Philippines, 1990-1997

	CITRUS				DURIAN				PAPAYA			
	Value a/	Vol. b/	Area c/	Yield d/	Value	Vol.	Area	Yield	Value	Vol.	Area	Yield
1990	1,515.80	150.20	29.00	5.18	630.70	26.30	3.40	7.74	204.97	65.07	5.20	12.51
1991	1,534.90	142.20	29.00	4.90	556.30	26.90	3.50	7.69	176.77	67.21	5.40	12.45
1992	1,299.30	141.70	29.00	4.89	1,315.60	27.50	3.50	7.86	230.66	66.67	5.40	12.35
1993	1,561.00	142.40	29.00	4.91	739.00	27.60	3.60	7.67	289.07	64.81	5.50	11.78
1994	1,780.90	145.10	29.00	5.00	928.00	28.00	3.60	7.78	303.36	62.04	5.10	12.16
1995	1,655.00	146.80	33.00	4.45	1,006.10	28.50	3.70	7.70	284.40	58.16	5.10	11.40
1996	1,742.70	142.70	31.00	4.60	640.70	27.30	4.20	6.50	271.43	60.45	5.40	11.19
1997	1,745.00	142.80	31.00	4.61	884.80	28.80	4.40	6.55	255.24	65.41	5.50	11.89
Average Growth	1,604.33	144.24	30.00	4.82	837.65	27.61	3.74	7.43	251.99	63.73	5.33	11.97
rate (%/yr)	2.35	-0.69	1.10	-1.54	16.66	1.34	3.84	-2.18	4.32	0.19	0.88	-0.7

	OTHER FRUITS				ALL FRUITS e/			
	Value	Vol.	Area	Yield	Value	Vol.	Area	Yield
1990								
1991	11,904.73	3,690.29	332.00	11.12	34,221.10	8,458.50	804.19	10.52
1992	11,316.74	3,668.03	328.00	11.18	35,364.50	8,604.60	784.26	10.97
1993	11,201.43	3,588.59	345.70	10.38	36,464.40	8,694.90	812.72	10.70
1994	10,573.74	3,590.76	347.60	10.33	40,549.40	8,891.60	820.46	10.84
1995	11,426.60	3,220.34	354.20	9.09	41,776.30	8,981.10	842.36	10.66
1996	16,686.37	4,289.45	361.40	11.87	51,767.20	10,298.90	862.85	11.94
1997	19,475.36	4,395.49	365.90	12.01	58,926.00	11,059.30	877.42	12.60
Average Growth	13,226.42	3,777.56	347.83	10.85	42,724.13	9,284.13	829.18	11.18
rate (%/yr)	9.44	4.52	2.13	2.12	5.10	2.00	1.18	2.80

a/ In million pesos

b/ In '000 metric tons

c/ In '000 hectares

d/ In metric tons per hectare

e/ Includes banana, mango, pineapple, citrus, durian, papaya, and other fruits (See also Table 21).

Source of basic data: BAS

Appendix Table 1c. Production value and volume, harvest area and yield of citrus by type, Philippines, 1990-1997.

	CALAMANSI				MANDARIN				POMELO			
	Value a/	Vol. b/	Area c/	Yield d/	Value	Vol.	Area	Yield	Value	Vol.	Area	Yield
1990	408.5	49.6	11.4	4.35	247.6	22.5	8.7	2.59	90.7	26.3	3.8	6.92
1991	452.6	47.4	11.2	4.23	392.3	22.4	8.6	2.60	93.5	26.5	3.7	7.16
1992	464.7	47.1	11.2	4.21	375.6	20.9	8.9	2.35	63.9	23.8	3.7	6.43
1993	493.6	48.1	11.3	4.26	382.7	20.3	8.4	2.42	133.2	23.9	3.7	6.46
1994	453.3	48.2	10.6	4.55	335.1	20.5	7.7	2.66	124.7	22.7	3.7	6.14
1995	465.1	47.3	10.3	4.59		20.7	7.7	2.69	105.6	22.6	3.8	5.95
1996	564.8	53.6	10.2	5.25	287.4	27.1	8.7	3.11	481	48.5	4.4	11.02
1997	452.1	52.5	10.2	5.15	213.8	27.9	8.5	3.28	498.6	48.9	4.4	11.11
Average	469.3	49.2	10.8	4.57	319.2	22.8	8.4	2.71	198.9	30.4	3.9	7.65
Growth rate (%/year)	2.23	0.95	-1.55	2.59	0.63	3.69	-0.13	3.70	59.62	14.42	2.27	10.25

	ORANGE (DALANDAN)				LEMON				LIME			
	Value e/	Vol.	Area	Yield	Value e/	Vol.	Area	Yield	Value e/	Vol.	Area	Yield
1990		9.5	2.1	4.52		0.35	0.14	2.50		1.03	0.45	2.29
1991		9.6	2.1	4.57		0.47	0.17	2.76		1.03	0.45	2.29
1992		9.1	2.1	4.33		0.54	0.19	2.84		1.04	0.45	2.31
1993		8.6	2.1	4.10		0.5	0.18	2.78		1.03	0.45	2.29
1994		8.5	2.1	4.05		0.57	0.2	2.85		1.04	0.45	2.31
1995		8.5	2.1	4.05		0.57	0.2	2.85		1.04	0.46	2.26
1996		8.8	2.1	4.19		0.66	0.22	3.00		1.03	0.46	2.24
1997		9.1	2.1	4.33		0.7	0.24	2.92		1.03	0.46	2.24
Average		9.0	2.1	4.27		0.55	0.19	2.81		1.03	0.45	2.28
Growth rate (%/year)		-0.55	0	-0.55		11.09	8.3	2.33		0.14	0.32	-0.31

a/ In million pesos

b/ In '000 metric tons

c/ In '000 hectares

d/ In metric tons per hectare

e/ Farm prices not available

Source of basic data: BAS

Appendix Table 2a. Regional production, area and yield of pineapple, banana, mango, durian and papaya, Philippines, 1990.

Region	PINEAPPLE			BANANA			MANGO			DURIAN			PAPAYA		
	Prod a/	Area b/	Yield	Prod.	Area	Yield	Prod.	Area	Yield	Prod.	Area	Yield	Prod.	Area	Yield
CAR	758	99	7.66	29,094	3,628	8.02	2,558	501	5.11				2,000	148	13.50
Ilocos	488	69	7.07	62,850	10,636	5.91	135,678	11,733	11.56				5,000	243	20.60
Cagayan Valley	1,123	141	7.96	29,427	8,508	3.46	4,961	1,594	3.11				1,000	169	5.90
Central Luzon	95	10	9.50	33,531	2,561	13.09	34,999	5,057	6.92				7,000	795	8.80
S. Tagalog	38,724	4,126	9.39	153,131	42,752	3.58	30,036	6,450	4.66				9,000	643	14.00
Bicol	42,225	2,803	15.06	47,520	11,476	4.14	702	464	1.51				5,000	532	9.40
W. Visayas	6,563	373	17.60	249,648	40,807	6.12	46,771	9,690	4.83				8,000	678	11.80
C. Visayas	1,087	184	5.91	66,142	8,699	7.60	27,370	4,695	5.83				5,000	495	10.10
E. Visayas	3,969	343	11.57	137,686	32,317	4.26	328	92	3.57				3,000	448	6.70
W. Mindanao	476	86	5.58	90,088	14,257	6.32	37,068	1,894	19.57	210	80	2.63	2,000	152	13.20
N. Mindanao	605,062	13,884	43.58	179,046	18,232	9.82	10,669	1,389	7.68	60	30	2	5,000	239	20.90
S. Mindanao	449,390	16,783	26.78	1,184,856	40,171	29.50	30,807	6,002	5.13	6,490	1,950	3.33	7,000	294	23.80
C. Mindanao	531	39	13.62	255,508	12,691	20.13	1,154	388	2.97	170	120	1.42	1,000	55	18.10
CARAGA	5,167	380	13.60	316,637	40,165	7.88	12,733	1,535	8.30	18,760	830	22.6	3,000	226	13.30
ARMM	93	10	9.30	136,630	13,300	10.27	13,683	1,671	8.19	650	430	1.51	2,000	71	28.30
Philippines	1,155,751	39,330	29.39	2,971,794	300,200	9.80	389,517	53,155	7.33	26,340	3,440	7.66	65,000	5188	12.53

a/ In metric tons

b/ In hectares

Source of basic data: BAS

Appendix Table 2b. Regional production, area and yield of citrus, Philippines, 1990.

REGION	CALAMANSI			MANDARIN			POMELO			ORANGE (DALANDAN)			LEMON			LIME		
	Prod a/	Area b/	Yield	Prod.	Area	Yield	Prod.	Area	Yield	Prod.	Area	Yield	Prod.	Area	Yield	Prod.	Area	Yield
CAR	218	60	3.63	240	92	2.60	600	75	7.96	817	110	7.43	59	16	3.70	41	18	2.28
Ilocos	3,493	1,130	3.09	10	8	1.20	200	92	2.17	43	15	2.87				5	9	0.56
Cagayan Valley	1,058	190	5.57	200	34	5.90	1,400	347	4.04	901	236	3.82	55	16	3.40	921	344	2.68
Central Luzon	1,690	300	5.63	20	15	1.30	100	93	1.08	65	115	0.57				3	3	1.00
S. Tagalog	22,104	6,200	3.57	6,380	3,358	1.90	1,600	176	9.08	4,655	564	8.25				5	16	0.31
Bicol	5,895	1,110	5.31	1,300	1,300	1.00	300	231	1.3	767	353	2.17	46	21	2.20	3	10	0.30
W. Visayas	5,327	910	5.85	110	61	1.80	1,100	275	4.00	58	45	1.29	1	1	1.00	10	5	2.00
C. Visayas	1,118	180	6.60	190	40	4.70	400	202	1.98	124	43	2.88	6	6	1.00	1	2	0.50
E. Visayas	1,232	150	8.21	40	40	1.00	200	62	3.25	98	40	2.45	32	26	1.20	6	12	0.50
W. Mindanao	1,588	250	6.35	60	13	4.50	400	144	2.78	206	83	2.48	34	24	1.40	5	14	0.36
N. Mindanao	1,909	370	5.16	50	36	1.40	400	211	1.90	196	58	3.38	30	9	3.30	16	8	2.00
S. Mindanao	2,800	370	7.57	4,960	1,600	3.10	15,900	1,641	9.69	1,250	282	4.43	2	1	2.00	8	5	1.60
C. Mindanao	1,133	160	7.08	90	11	8.50	100	52	1.94	92	27	3.41	65	15	4.30	1	1	1.00
CARAGA	767			150	40	3.70	700	51	13.82	141	80	1.76	16	4	4.00			
ARMM	769			8,740	2,033	34.30	3,100	251	12.37	72	53	1.36						
Philippines	51,101	11,380	4.36	22,540	8,681	2.60	26,500	3,903	6.79	9,485	2,104	4.51	346	139	2.5	1,025	447	2.29

a/ In metric tons

b/ In hectares

Source of basic data: BAS

Appendix Table 3a. Regional production, area and yield of pineapple, banana, mango, durian and papaya, Philippines, 1997.

Region	PINEAPPLE			BANANA			MANGO			DURIAN			PAPAYA		
	Prod. a/	Area b/	Yield	Prod.	Area	Yield	Prod.	Area	Yield	Prod.	Area	Yield	Prod.	Area	Yield
CAR	1,090	309	3.53	28,070	3,493	8.04	3,664	607	6.0362				2,000	194	10.30
Ilocos	418	63	6.63	55,447	10,056	5.51	298,185	18,853	15.82				6,000	290	20.70
Cagayan Valley	12,733	1,367	9.31	249,563	29,383	8.49	227,420	9,550	23.81				3,000	612	4.90
Central Luzon	443	75	5.91	35,102	2,500	14.04	75,222	12,778	5.89				6,000	674	8.90
S. Tagalog	62,057	5,564	11.15	148,053	53,465	2.77	150,951	14,594	10.34				9,000	588	15.30
Bicol	61,285	3,250	18.86	29,593	12,868	2.30	908	649	1.40				3,000	612	4.90
W. Visayas	11,683	925	12.63	238,283	39,581	6.02	84,086	11,738	7.16				7,000	667	10.50
C. Visayas	2,324	132	17.61	87,292	15,807	5.52	26,799	5,220	5.13				5,000	500	10.00
E. Visayas	4,991	398	12.54	134,596	26,602	5.06	491	126	3.90				3,000	417	7.20
W. Mindanao	1,182	240	4.93	117,861	21,843	5.40	66,712	2,807	23.77	380	90	4.22	5,000	157	31.80
N. Mindanao	867,990	16,083	53.97	188,684	16,899	11.17	10,213	1,387	7.36	100	50	2	2,000	165	12.10
S. Mindanao	603,996	11,260	53.64	1,689,932	48,146	35.10	52,553	7,620	6.90	7,450	2,690	2.77	10,000	450	22.20
C. Mindanao	1,024	366	2.80	354,267	9,221	38.42	5,977	2,005	2.98	230	180	1.28	1,000	95	10.50
CARAGA	6,377	296	21.54	227,843	31,596	7.21	11,698	1,824	6.41	20,020	920	21.76	2,000	150	13.30
ARMM	412	94	4.38	175,206	16,817	10.42	13,240	2,141	6.18	630	520	1.21	3,000	99	30.20
Philippines	1,638,005	40,422	40.52	3,759,792	338,277	11.11	1,028,119	91,899	11.19	28810	4450	6.47	67,000	5670	11.82

a/ In metric tons

b/ In hectares

Source of basic data: BAS

Appendix Table 3b. Regional production, area and yield of citrus, Philippines, 1997.

Region	CALAMANSI			MANDARIN			POMELO			ORANGE			LEMON			LIME		
	Prod a/	Area b/	Yield	Prod.	Area	Yield	Prod.	Area	Yield	Prod.	Area	Yield	Prod.	Area	Yield	Prod.	Area	Yield
CAR	225	35	6.43	830	100	8.30	600	80	7.50	997	146	6.83	124	28	4.43	53	20	2.65
Ilocos	2,125	530	4.01	10	11	0.91	200	60	3.33	77	31	2.48				6	11	0.55
Cagayan Valley	6,221	160	38.88	5,580	600	9.30	27,700	870	31.84	1,306	351	3.72	72	21	3.43	914	340	2.69
Central Luzon	890	98	9.08	10	5.26	1.90	100	30	3.33	75	25	3.00				2	3	0.67
S. Tagalog	23,053	2,570	8.97	7,450	2,700	2.76	1,400	170	8.24	3,670	475	7.73				5	16	0.31
Bicol	6,073	890	6.82	1,730	1,200	1.44	300	200	1.50	988	387	2.55	187	57	3.28	2	8	0.25
W. Visayas	3,246	425	7.64	70	36.84	1.90	500	230	2.17	58	38	1.53	1	1	1.00	3	3	1.00
C. Visayas	1,314	150	8.76	310	40.79	7.60	200	180	1.11	127	47	2.7	11	9	1.22	1	2	0.50
E. Visayas	1,933	85	22.74	20	33.33	0.60	200	80	2.50	91	44	2.07	85	44	1.93	6	12	0.50
W. Mindanao	1,827	125	14.62	40	19.05	2.10	400	160	2.50	210	84	2.5	40	29	1.38	8	22	0.36
N. Mindanao	1,052	85	12.38	60	35.29	1.70	300	210	1.43	198	73	2.71	87	20	4.35	16	8	2.00
S. Mindanao	1,785	120	14.88	4,760	1,700	2.80	13,100	1,730	7.57	951	241	3.95	11	1	11.00	12	10	1.20
C. Mindanao	811	65	12.48	80	9.52	8.40	100	50	2.00	109	29	3.76	70	16	4.38	1	1	1.00
CARAGA	995	150	6.63	150	41.67	3.60	1,100	50	22.00	196	90	2.18	16	4	4.00			
ARMM	957	64	14.95	6,820	1,900	3.59	2,700	290	9.31	85	59	1.44						
Philippines	52,507	5,552	9.46	27,920	8,433	3.31	48,900	4,390	11.14	9,138	2,120	4.31	704	230	3.06	1,029	456	2.26

a/ In metric tons

b/ In hectares

Source of basic data: BAS

Appendix Table 4a. Quantity of exports of Philippine bananas (fresh) by country of destination, 1994-1998

Country of Destination	1994		1995		1996		1997		1998		1994-1998	
	000 kg	%	000 kg	%	000 kg	%	000 kg	%	000 kg	%	000 kg	%
Bahrain	5,360	0.46	2,949	0.24	1,925	0.15			535	0.05	2,692	0.23
PROC	16,345	1.41	105,245	8.67	191,146	15.25	132,077	11.55	198,838	17.33	128,730	10.82
Taiwan	40	0.00	700	0.06	3,134	0.25	13,968	1.22	49,821	4.34	13,533	1.14
France	a/		a/				1	0.00 a/			1	0.00
Hong Kong	29,380	2.54	29,680	2.45	29,540	2.36	20,346	1.78	9,339	0.81	23,657	1.99
Italy	2,943	0.25	42	0.00		0.00 a/					1,493	0.13
Japan	762,067	65.97	719,719	59.31	692,101	55.23	726,421	63.54	702,190	61.21	720,500	60.56
Nansei Is. (nes)	17	0.00									17	0.00
Okinawa	6,729	0.58	6,885	0.57	1,534	0.12	516	0.05	28	0.00	3,138	0.26
Korea, Rep. Of	117,825	10.20	104,186	8.59	96,091	7.67	77,039	6.74	49,282	4.30	88,885	7.47
Kuwait	1,347	0.12	247	0.02							797	0.07
New Zealand	14,434	1.25	14,507	1.20	8,347	0.67	11,386	1.00	2,662	0.23	10,267	0.86
Saudi Arabia	102,544	8.88	121,797	10.04	112,805	9.00	22,946	2.01	27,435	2.39	77,505	6.51
Singapore	1,689	0.15	2,238	0.18	4,498	0.36	3,468	0.30	2,157	0.19	2,810	0.24
Spain	2,348	0.20					46	0.00			1,197	0.10
Switzerland	a/		1	0.00	8,383	0.67	950	0.08	10	0.00	2,336	0.20
Russia	4,101	0.36	8,902	0.73	11,207	0.89	10,251	0.90	4,417	0.39	7,776	0.65
UAE	88,013	7.62	95,955	7.91	81,968	6.54	123,270	10.78	100,178	8.73	97,877	8.23
Vietnam			358	0.03	9,421	0.75					4,890	0.41
Austria					89	0.01	42	0.00			66	0.01
Belgium					445	0.04	16	0.00	12	0.00	158	0.01
Costa Rica					266	0.02					266	0.02
Cyprus					1	0.00					1	0.00
Denmark					66	0.01					66	0.01
Indonesia					4	0.00					4	0.00
Netherlands					197	0.02					197	0.02
BMU							590	0.05			590	0.05
AUT (Australia)									39	0.00	39	0.00
Canada									3	0.00	3	0.00
Germany									11	0.00	11	0.00
United Kingdom									68	0.01	68	0.01
USA									82	0.01	82	0.01
TOTAL	1,155,182	100.00	1,213,411	100.00	1,253,168	100.00	1,143,333	100.00	1,147,107	100.00	1,189,652	100.00

a/ Less than 1000 kg

Source of basic data: Foreign Trade Statistics

Appendix Table 4b. Value of exports of Philippine bananas (fresh) by country of destination, 1994-1998

Country of Destination	1994		1995		1996		1997		1998		1994-1998	
	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%
							000					
Bahrain	947	0.44	523	0.23	342	0.14			123	0.06	484	0.22
PROC	3,049	1.42	19,908	8.90	35,889	15.18	25,559	11.80	39,304	18.11	24,742	11.16
Taiwan	17	0.01	116	0.05	831	0.35	2,541	1.17	9,742	4.49	2,649	1.19
France	a/	a/					1	0.00 a/			1	0.00
Hong Kong	5,112	2.37	5,304	2.37	5,579	2.36	3,770	1.74	1,757	0.81	4,304	1.94
Italy	531	0.25	7	0.00		a/					269	0.12
Japan	147,206	68.38	139,185	62.22	135,100	57.14	140,435	64.85	134,101	61.79	139,205	62.76
Nansei Is. (nes)	3	0.00		0.00		0.00					3	0.00
Okinawa	1,443	0.67	1,515	0.68	422	0.18	87	0.04	20	0.01	697	0.31
Korea, Rep. Of	20,279	9.42	17,140	7.66	16,278	6.89	13,113	6.06	9,031	4.16	15,168	6.84
Kuwait	230	0.11	46	0.02		0.00					138	0.06
New Zealand	2,602	1.21	2,632	1.18	1,541	0.65	2,072	0.96	497	0.23	1,869	0.84
Saudi Arabia	17,099	7.94	20,067	8.97	20,072	8.49	4,205	1.94	5,322	2.45	13,353	6.02
Singapore	292	0.14	384	0.17	796	0.34	604	0.28	380	0.18	491	0.22
Spain	416	0.19					9	0.00			213	0.10
Switzerland	a/	a/			1,260	0.53	139	0.06	9	0.00	469	0.21
Russia	708	0.33	1,438	0.64	1,906	0.81	1,712	0.79	860	0.40	1,325	0.60
UAE	15,340	7.13	15,341	6.86	13,749	5.82	22,196	10.25	15,798	7.28	16,485	7.43
Vietnam			86	0.04	2,464	1.04					1,275	0.57
Austria					14	0.01	8	0.00			11	0.00
Belgium					84	0.04	19	0.01	2	0.00	35	0.02
Costa Rica					46	0.02					46	0.02
Cyprus				a/								
Denmark					11	0.00					11	0.00
Indonesia					1	0.00					1	0.00
Netherlands					32	0.01					32	0.01
BMU						0.00	87	0.04			87	0.04
AUT (Australia)									8	0.00	8	0.00
Canada									2	0.00	2	0.00
Germany									10	0.00	10	0.00
United Kingdom									36	0.02	36	0.02
USA									35	0.02	35	0.02
TOTAL	215,274	100.00	223,692	100.00	236,417	100.00	216,557	100.00	217,037	100.00	221,795	100.00

a/ Less than US\$1000 FOB

Source of basic data: Foreign Trade Statistics

Appendix Table 5a. Quantity of exports of Philippine bananas (chips/crackers) by country of destination, 1994-1998

Country of Destination	1994		1995		1996		1997		1998		1994-1998	
	000 kg	%	000 kg	%	000 kg	%	000 kg	%	000 kg	%	000 kg	%
CHR	1	0.01	54	0.30	31	0.18	669	3.50	2,066	12.18	564	3.25
Germany	1,853	11.97	1,968	11.07	2,135	12.27	2,539	13.30	1,729	10.20	2,045	11.79
Hongkong	3,729	24.10	5,697	32.06	4,103	23.57	4,373	22.90	1,462	8.62	3,873	22.33
Japan	1,475	9.53	1,095	6.16	1,159	6.66	1,232	6.45	2,000	11.79	1,392	8.03
Netherlands	526	3.40	667	3.75	888	5.10	714	3.74	888	5.24	737	4.25
Singapore	84	0.54	77	0.43	502	2.88	645	3.38	493	2.91	360	2.08
UK	2,189	14.15	2,032	11.43	3,028	17.40	2,258	11.83	2,193	12.93	2,340	13.49
USA	2,591	16.74	2,827	15.91	2,240	12.87	3,099	16.23	2,819	16.62	2,715	15.66
Australia	556	3.59	605	3.40	421	2.42	438	2.29	437	2.58	491	2.83
France	574	3.71	489	2.75	543	3.12	787	4.12	524	3.09	583	3.36
Korea	637	4.12	740	4.16	730	4.19	893	4.68	489	2.88	698	4.02
Sweden	286	1.85	382	2.15	292	1.68	418	2.19	321	1.89	340	1.96
Others	974	6.29	1,139	6.41	1,333	7.66	1,029	5.39	1,536	9.06	1,202	6.93
TOTAL	15,475	100.00	17,772	100.00	17,405	100.00	19,094	100.00	16,957	100.00	17,341	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 5b. Value of exports of Philippine bananas (chips/crackers) by country of destination, 1994-1998

Country of Destination	1994		1995		1996		1997		1998		1994-1998	
	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%
	<u>000</u>											
CHR	1	0.01	70	0.34	42	0.19	763	3.19	2,188	11.66	613	3.03
Germany	1,704	10.65	2,176	10.61	2,687	12.18	3,214	13.46	1,860	9.92	2,328	11.50
Hongkong	3,773	23.58	6,199	30.23	4,810	21.80	5,150	21.56	1,411	7.52	4,269	21.09
Japan	1,953	12.20	1,659	8.09	1,756	7.96	1,871	7.83	2,868	15.29	2,021	9.99
Netherlands	539	3.37	733	3.57	1,021	4.63	857	3.59	891	4.75	808	3.99
Singapore	89	0.56	70	0.34	767	3.48	791	3.31	663	3.53	476	2.35
UK	2,294	14.33	2,371	11.56	3,947	17.88	2,879	12.06	2,481	13.23	2,794	13.80
USA	2,491	15.56	3,304	16.11	2,859	12.95	3,853	16.13	2,998	15.98	3,101	15.32
Australia	536	3.35	672	3.28	507	2.30	514	2.15	435	2.32	533	2.63
France	560	3.50	578	2.82	736	3.33	1,036	4.34	603	3.21	703	3.47
Korea	710	4.44	815	3.97	836	3.79	1,130	4.73	496	2.64	797	3.94
Sweden	304	1.90	455	2.22	356	1.61	504	2.11	369	1.97	398	1.96
Others	1,050	6.56	1,402	6.84	1,745	7.91	1,320	5.53	1,495	7.97	1,402	6.93
TOTAL	16,004	100.00	20,504	100.00	22,069	100.00	23,882	100.00	18,758	100.00	20,243	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 6a. Quantity of exports of Philippine pineapple (fresh) by country of destination, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	000 kg	%	000 kg	%	000 kg	%	000 kg	%	000 kg	%	000 kg	%
Algeria			265	0.16							265	0.18
Australia												
Bahrain			7	0.00							7	0.00
Bangladesh												
Brazil							66	0.05			66	0.04
Canada	22	0.01									22	0.01
CHR									343	0.29	343	0.23
France												
Germany												
Guam	7	0.00									7	0.00
Hong Kong	5,649	3.50	6,499	3.98	7,571	5.18	5,158	3.56	4,251	3.62	5,826	3.93
Japan	128,770	79.77	122,777	75.12	111,645	76.45	115,839	80.04	97,471	83.08	115,300	77.80
Korea, Rep. Of	20,975	12.99	25,566	15.64	19,202	13.15	18,263	12.62	13,325	11.36	19,466	13.14
New Zealand	3,597	2.23	3,419	2.09	2,193	1.50	2,443	1.69	796	0.68	2,490	1.68
Okinawa					576	0.39					576	0.39
People's Republic of China	23	0.01	2,310	1.41	984	0.67	443	0.31	338	0.29	820	0.55
Russian, Federation	117	0.07	1,085	0.66	81	0.06	172	0.12	110	0.09	313	0.21
Saudi Arabia	191	0.12	281	0.17	510	0.35	1,118	0.77			525	0.35
Singapore					131	0.09	116	0.08			124	0.08
Taiwan					17	0.01					17	0.01
Trust Territory of the Pacific Is.					68	0.05					68	0.05
USA	10	0.01	14	0.01			26	0.02			17	0.01
Okinawa	111	0.07					2	0.00			57	0.04
United Arab Emirates	1,164	0.72	925	0.57			59	0.04			716	0.48
	790	0.49	285	0.17	3,063	2.10	1,028	0.71	682	0.58	1,170	0.79
Total	161,426	100.00	163,433	100.00	146,041	100.00	144,733	100.00	117,316	100.00	148,193	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 6b. Value of exports of Philippine pineapple (fresh) by country of destination, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%
Algeria			39	0.16							39	0.16
Australia				0.00								
Bahrain			1	0.00							1	0.00
Bangladesh												
Brazil							12	0.04			12	0.05
Canada	8	0.03									8	0.03
CHR									86	0.42	86	0.35
France												
Germany												
Guam	5	0.02									5	0.02
Hong Kong	775	3.20	885	3.61	1,190	4.84	839	3.11	657	3.17	869	3.56
Japan	19,356	79.89	18,500	75.37	18,778	76.33	21,541	79.94	17,181	82.93	19,071	78.17
Korea, Rep. Of	3,189	13.16	3,820	15.56	3,269	13.29	3,503	13.00	2,430	11.73	3,242	13.29
New Zealand	534	2.20	516	2.10	406	1.65	453	1.68	147	0.71	411	1.69
Okinawa	175	0.72	139	0.57	89	0.36	12	0.04			104	0.43
People's Republic of China	3	0.01	364	1.48	145	0.59	78	0.29	52	0.25	128	0.53
Russian, Federation	16	0.07	185	0.75	13	0.05	28	0.10	18	0.09	52	0.21
Saudi Arabia	29	0.12	44	0.18	100	0.41	201	0.75			94	0.38
Singapore					24	0.10	24	0.09			24	0.10
Taiwan					3	0.01					3	0.01
Trust Territory of the Pacific Is.	5	0.02	3	0.01	15	0.06	9	0.03			8	0.03
USA	15	0.06									15	0.06
Okinawa		0.00										
United Arab Emirates	117	0.48	48	0.20	569	2.31	246	0.91	146	0.70	225	0.92
Total	24,227	100.00	24,544	100.00	24,601	100.00	26,946	100.00	20,717	100.00	24,397	100.00

*All US\$ in '000

Source of basic data: Foreign Trade Statistics

Appendix Table 7a. Quantity of exports of pineapple (otherwise prepared/preserved, nes, wtr/not contng. sugar/sweetng./spirit), Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	000 kg	%	000 kg	%	000 kg	%	000 kg	%	000 kg	%	000 kg	%
Argentina	35	0.02	448	0.23	231	0.11	234	0.13	401	0.24	270	0.14
Australia	125	0.06	996	0.52	458	0.23	190	0.10	454	0.27	445	0.23
Austria	406	0.19			15	0.01	31	0.02	65	0.04	129	0.07
Bahamas	28	0.01	10	0.01	26	0.01	35	0.02	27	0.02	25	0.01
Bahrain			1	0.00							1	0.00
Barbados	10	0.00	34	0.02	54	0.03	69	0.04	45	0.03	42	0.02
Belgium	2,919	1.36	2,702	1.41	3,832	1.88	5,187	2.80	3,569	2.11	3,642	1.87
Bermuda	21	0.01	18	0.01	42	0.02	23	0.01	77	0.05	36	0.02
Brazil	32	0.01	35	0.02	18	0.01		0.00		0.00	28	0.01
Brunei Darussalam		0.00	12	0.01				0.00		0.00	12	0.01
Canada	10,690	4.97	8,941	4.67	9,706	4.77	9,727	5.25	8,095	4.78	9,432	4.84
Canary Islands	108	0.05	39	0.02	16	0.01		0.00		0.00	54	0.03
Chile	206	0.10	256	0.13	251	0.12	123	0.07	34	0.02	174	0.09
China			99	0.05	9	0.00					54	0.03
CHR							1	0.00	75	0.04	38	0.02
CUR							7	0.00		0.00	7	0.00
Colombia					16	0.01		0.00	244	0.14	130	0.07
Cyprus	31	0.01	30	0.02	46	0.02	31	0.02	46	0.03	37	0.02
Denmark	362	0.17	207	0.11	376	0.18	301	0.16	1,039	0.61	457	0.23
Dominican Republic	11	0.01									11	0.01
Egypt Arab Republic					15	0.01	15	0.01	102	0.06	44	0.02
Finland	5,547	2.58	1587	0.83	1,945	0.96	854	0.46	1,566	0.92	2,299	1.18
France	841	0.39	2,690	1.40	411	0.20	1,924	1.04	2,139	1.26	1,601	0.82
Germany	12,437	5.78	5,413	2.82	6,066	2.98	6,227	3.36	4,963	2.93	7,021	3.61
Greece	82	0.04	271	0.14			393	0.21	353	0.21	275	0.14
Hong Kong	2,678	1.24	3,466	1.81	5,863	2.88	3,365	1.82	3,226	1.90	3,720	1.91
Hungary	83	0.04	17	0.01							50	0.03
IRL							30	0.02			30	0.02
Israel	689	0.32	1,033	0.54	563	0.28	133	0.07	16	0.01	487	0.25
Indonesia							30	0.02			30	0.02
Italy	2,895	1.35	2,562	1.34	2,701	1.33	2,021	1.09	1,767	1.04	2,389	1.23
Japan	15,600	7.25	18,064	9.43	12,767	6.27	13,192	7.12	13,398	7.91	14,604	7.50
Jamaica			23	0.01	7	0.00	41	0.02	32	0.02	26	0.01
Jordan					15	0.01	187	0.10	74	0.04	92	0.05
Kuwait			31	0.02	15	0.01	15	0.01	28	0.02	22	0.01
Okinawa	118	0.05	30	0.02			200	0.11			116	0.06
Korea	3,484	1.62	5,953	3.11	5,645	2.77	3,504	1.89	3,671	2.17	4,451	2.29
Lebanon	217	0.10	122	0.06	129	0.06	119	0.06	28	0.02	123	0.06
MLI							15	0.01			15	0.01

Continued Appendix Table 7a, page 2

Malaysia												
Mexico	2,181	1.01	809	0.42							1,495	0.77
Netherlands	14,128	6.56	6,060	3.16	5,673	2.79	3,202	1.73	4,532	2.68	6,719	3.45
Netherlands Antilles	14	0.01	18	0.01			11	0.01	10	0.01	13	0.01
New Zealand	1,428	0.66	1,608	0.84	1,753	0.86	1,776	0.96	979	0.58	1,509	0.77
Norway	1,548	0.72	1,116	0.58	898	0.44	353	0.19	106	0.06	804	0.41
Pakistan	95	0.04	29	0.02	88	0.04	170	0.09	15	0.01	79	0.04
Palau							1	0.00			1	0.00
Panama	11	0.01	28	0.01	23	0.01	37	0.02	7	0.00	21	0.01
POL							77	0.04			77	0.04
Peru	17	0.01	86	0.04					15	0.01	39	0.02
Portugal	31	0.01	30	0.02			262	0.14	76	0.04	100	0.05
Puerto Rico	12	0.01	70	0.04	60	0.03	76	0.04	21	0.01	48	0.02
Romania	19	0.01				0.00	14	0.01	15	0.01	16	0.01
Saudi Arabia	98	0.05	237	0.12	183	0.09	122	0.07	164	0.10	161	0.08
Singapore	2,429	1.13	1,426	0.74	2,570	1.26	3,314	1.79	3,433	2.03	2,634	1.35
South Africa	364	0.17	76	0.04	106	0.05	181	0.10	514	0.30	248	0.13
Spain	2,548	1.18	2,105	1.10	1,690	0.83	3,518	1.90	2,375	1.40	2,447	1.26
Sweden	1,543	0.72	784	0.41	1,199	0.59	776	0.42	260	0.15	912	0.47
Switzerland	3,432	1.59	3,450	1.80	3,159	1.55	1,726	0.93	1,537	0.91	2,661	1.37
Taiwan	78	0.04	18	0.01							48	0.02
Thailand							12	0.01	74	0.04	43	0.02
Trinidad and Tobago	29	0.01	91	0.05	97	0.05			32	0.02	62	0.03
Trust Territory of the Pacific Is.	4	0.00	27	0.01	27	0.01	50	0.03	75	0.04	37	0.02
Turkey	35	0.02	46	0.02	16	0.01	63	0.03	221	0.13	76	0.04
Russian, Federation of	393	0.18		0.00	696	0.34			108	0.06	399	0.20
UAE	34	0.02	61	0.03	29	0.01			15	0.01	35	0.02
Oman	16	0.01									16	0.01
Qatar	15	0.01	15	0.01							15	0.01
UK	4,481	2.08	2,473	1.29	3,185	1.57	2,687	1.45	1,496	0.88	2,864	1.47
USA	119,371	55.46	115,380	60.20	130,233	64.00	116,632	62.94	107,281	63.35	117,779	60.48
Guam	24	0.01	77	0.04	118	0.06	85	0.05	196	0.12	100	0.05
Hawaii	1,143	0.53	405	0.21	396	0.19	1,911	1.03	220	0.13	815	0.42
Uruguay	18	0.01	34	0.02	48	0.02	16	0.01	31	0.02	29	0.02
Venezuela	33	0.02		0.00		0.00		0.00	17	0.01	25	0.01
Total	215,227	100.00	191,649	100.00	203,485	100.00	185,296	100.00	169,359	100.00	194,749	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 7b. Value of exports of pineapple (otherwise preprd/preservd, nes, wtr/not contg.sugar/sweetg./spirit), Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%
Argentina	13	0.01	223	0.28	123	0.13	123	0.14	206	0.26	138	0.16
Australia	41	0.05	322	0.40	138	0.15	78	0.09	136	0.17	143	0.16
Austria	161	0.18			5	0.01	15	0.02	23	0.03	51	0.06
Bahamas	13	0.01	4	0.00	12	0.01	16	0.02	12	0.02	11	0.01
Bahrain			3	0.00	1	0.00					2	0.00
Barbados	3	0.00	11	0.01	21	0.02	24	0.03	17	0.02	15	0.02
Belgium	1,163	1.29	1,044	1.29	1,612	1.73	2,157	2.51	1,577	1.99	1,511	1.74
Bermuda	9	0.01	8	0.01	19	0.02	10	0.01	26	0.03	14	0.02
Brazil	9	0.01	14	0.02	8	0.01					10	0.01
Brunei Darussalam			7	0.01		0.00					7	0.01
Canada	4,357	4.83	3,751	4.64	4,406	4.73	4,407	5.14	3,366	4.25	4,057	4.67
Canary Islands	44	0.05	16	0.02	5	0.01					22	0.02
Chile	73	0.08	98	0.12	112	0.12	54	0.06	15	0.02	70	0.08
China			40	0.05	9	0.01					25	0.03
CHR					7	0.01	1	0.00	98	0.12	35	0.05
CUR					19	0.02	3	0.00			11	0.01
Colombia					207	0.22			120	0.15	164	0.19
Cyprus	12	0.01	12	0.01			12	0.01	17	0.02	13	0.02
Denmark	192	0.21	138	0.17			189	0.22	633	0.80	288	0.33
Dominican Republic	4	0.00									4	0.00
Egypt Arab Republic					5	0.01	6	0.01	79	0.10	30	0.03
Finland	2,445	2.71	767	0.95	912	0.98	444	0.52	903	1.14	1,094	1.26
France	316	0.35	980	1.21	200	0.21	1,026	1.20	931	1.17	691	0.80
Germany	4,469	4.96	2,053	2.54	2,530	2.72	2,585	3.01	2,580	3.26	2,843	3.28
Greece	59	0.07	138	0.17			252	0.29	206	0.26	164	0.19
Hong Kong	1,173	1.30	1,474	1.82	2,667	2.86	1,543	1.80	1,442	1.82	1,660	1.91
Hungary	35	0.04	7	0.01							21	0.02
IRL							14	0.02			14	0.02
Israel	229	0.25	387	0.48	246	0.26	53	0.06	9	0.01	185	0.21
Indonesia						0.00	13	0.02			13	0.01
Italy	1,238	1.37	1,083	1.34	1,139	1.22	1,078	1.26	929	1.17	1,093	1.26
Japan	5,581	6.19	7,053	8.73	5,769	6.19	6,070	7.08	5,992	7.56	6,093	7.02
Jamaica			7	0.01	3	0.00	24	0.03	24	0.03	15	0.02
Jordan					5	0.01	63	0.07	32	0.04	33	0.04
Kuwait			11	0.01	6	0.01	6	0.01	13	0.02	9	0.01
Okinawa	37	0.04	9	0.01			88	0.10			45	0.05
Korea	1,626	1.80	2,550	3.16	2,655	2.85	1,666	1.94	1,600	2.02	2,019	2.33

Lebanon	99	0.11	53	0.07	66	0.07	57	0.07	12	0.02	57	0.07
MLI							8	0.01			8	0.01
Malaysia												
Mexico	801	0.89	283	0.35							542	0.62
Netherlands	4,990	5.53	2,443	3.02	2,582	2.77	1,460	1.70	2,312	2.92	2,757	3.18
Netherlands Antilles	5	0.01	8	0.01	856	0.92	5	0.01	5	0.01	176	0.20
New Zealand	472	0.52	655	0.81		0.00	885	1.03	454	0.57	617	0.71
Norway	548	0.61	480	0.59	405	0.43	162	0.19	48	0.06	329	0.38
Pakistan	38	0.04	12	0.01	36	0.04	76	0.09	6	0.01	34	0.04
Palau	1	0.00					1	0.00		0.00	1	0.00
Panama	3	0.00	13	0.02	11	0.01	18	0.02	3	0.00	10	0.01
POL							30	0.03			30	0.03
Peru	6	0.01	33	0.04					7	0.01	15	0.02
Portugal	15	0.02	15	0.02			124	0.14	40	0.05	49	0.06
Puerto Rico	4	0.00	25	0.03	27	0.03	45	0.05	10	0.01	22	0.03
Romania	5	0.01				0.00	7	0.01	6	0.01	6	0.01
Saudi Arabia	38	0.04	91	0.11	68	0.07	46	0.05	66	0.08	62	0.07
Singapore	1,034	1.15	637	0.79	1,265	1.36	2,079	2.42	2,018	2.55	1,407	1.62
South Africa	235	0.26	49	0.06	68	0.07	117	0.14	281	0.35	150	0.17
Spain	1,063	1.18	879	1.09	801	0.86	1,675	1.95	1,075	1.36	1,099	1.27
Sweden	640	0.71	337	0.42	555	0.60	372	0.43	125	0.16	406	0.47
Switzerland	1,329	1.47	1,363	1.69	1,290	1.38	699	0.81	634	0.80	1,063	1.22
Taiwan	43	0.05	12	0.01							28	0.03
Thailand							10	0.01	57	0.07	34	0.04
Trinidad and Tobago	11	0.01	31	0.04	40	0.04			11	0.01	23	0.03
Trust Territory of the Pacific Is.	5	0.01	11	0.01	13	0.01	24	0.03	41	0.05	19	0.02
Turkey	13	0.01	17	0.02	7	0.01	21	0.02	85	0.11	29	0.03
Russian, Federation of	175	0.19			325	0.35			45	0.06	182	0.21
UAE	12	0.01	21	0.03	11	0.01			6	0.01	13	0.01
Oman	5	0.01									5	0.01
Qatar	5	0.01	5	0.01							5	0.01
UK	1,814	2.01	1,017	1.26	1,297	1.39	1,062	1.24	635	0.80	1,165	1.34
USA	52,885	58.64	49,854	61.72	60,334	64.77	53,874	62.80	50,059	63.17	53,401	61.52
Guam	12	0.01	34	0.04	49	0.05	41	0.05	87	0.11	45	0.05
Hawaii	555	0.62	179	0.22	182	0.20	863	1.01	109	0.14	378	0.44
Uruguay	6	0.01	14	0.02	23	0.02	8	0.01	15	0.02	12	0.01
Venezuela	10	0.01							7	0.01	9	0.01
Total	90179	100.00	80781	100.00	93152	100.00	85789	100.00	79245	100.00	86,801	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 8a. Quantity of Philippine pineapple juice concentrates exports by country of destination, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-1998	
	000 kg	%	000 kg	%	000 kg	%	000 kg	%	000 kg	%	000 kg	%
Australia	90	0.24	125	0.31	37	0.10	251	0.69	1,428	3.39	386	0.96
Austria	15	0.04									15	0.04
Argentina					11	0.03					11	0.03
Bahrain												
Belgium	129	0.34	314	0.78	399	1.04	480	1.31	336	0.80	332	0.82
Canada	1,946	5.09	1,789	4.46	1,586	4.13	2,232	6.11	1,146	2.72	1,740	4.31
CHR									1	0.00	1	0.00
Cyprus	142	0.37			33	0.09			20	0.05	65	0.16
Finland					36	0.09	78	0.21	63	0.15	59	0.15
France	1,728	4.52			181	0.47	313	0.86	108	0.26	583	1.45
Germany, Federal	481	1.26	296	0.74	214	0.56	199	0.54	56	0.13	249	0.62
Greece		0.00	30	0.07	15	0.04					23	0.06
Guam	4	0.01							14	0.03	9	0.02
Hawaii	79	0.21	80	0.20	23	0.06	365	1.00	39	0.09	117	0.29
HND									87	0.21	87	0.22
Hong Kong		0.00	41	0.10	865	2.25	156	0.43	52	0.12	279	0.69
Israel	199	0.52	187	0.47	242	0.63	317	0.87	416	0.99	272	0.67
Italy	390	1.02	79	0.20			289	0.79	663	1.57	355	0.88
JAM				0.00			4	0.01			4	0.01
Japan	1,357	3.55	1,672	4.17	1,527	3.97	1,001	2.74	1,580	3.75	1,427	3.54
Korea, Rep. Of	472	1.23	201	0.50	150	0.39			37	0.09	215	0.53
Latvia					16	0.04					16	0.04
Lebanon	467	1.22	152	0.38	345	0.90	390	1.07	358	0.85	342	0.85
LWW							18	0.05			18	0.04
Mexico	245	0.64	323	0.80							284	0.70
MLT		0.00		0.00					133	0.32	133	0.33
Netherlands	4,369	12.13	4,616	11.50	3,395	8.83	4,832	13.22	10,905	25.90	5,677	14.08
New Zealand	17	0.04	18	0.04			74	0.20			36	0.09
Pakistan							39	0.11			39	0.10
Papua New Guinea					18	0.05	9	0.02			14	0.03
People's Republic of China			16	0.04	27	0.07					22	0.05
Puerto Rico			513	1.28	284	0.74	293	0.80	793	1.88	471	1.17
SAF									22	0.05	22	0.05

Continued Appendix Table 8a, page 2

Saudi Arabia	31	0.08	70	0.17	81	0.21	16	0.04	16	0.04	43	0.11
Singapore	16	0.04	8	0.02	2	0.01	109	0.30	366	0.87	100	0.25
Spain	1,209	3.16	3,264	8.13	4,094	10.65	2,253	6.17	74	0.18	2,179	5.40
Sweden	37	0.10	74	0.18	73	0.19	182	0.50			92	0.23
Switzerland	14	0.04					150	0.41	1,220	2.90	461	1.14
Thailand	411	1.07	434	1.08	79	0.21	397	1.09	1,343	3.19	533	1.32
Trust Territory of the Pacific Is.									5	0.01	5	0.01
U. K. of Great Britain and Northern Ireland	382	1.00	549	1.37	368	0.96	546	1.49	434	1.03	456	1.13
United Arab Emirates	37	0.10		0.00	37	0.10					37	0.09
USA	23,717	62.00	25,292	63.00	24,290	63.21	21,545	58.97	20,292	48.19	23,027	57.09
USR/Russia									97	0.23	97	0.24
Total	38,254	100.00	40,143	100.00	38,428	100.00	36,538	100.00	42,104	100.00	40,332	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 8b. Value of Philippine pineapple juice concentrates exports by country of destination, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-1998	
	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%
Australia	50	0.23	70	0.29	30	0.11	211	0.76	742	2.26	221	0.76
Austria	11	0.05									11	0.04
Argentina					10	0.04					10	0.03
Bahrain												
Belgium	71	0.33	176	0.72	278	1.02	391	1.42	243	0.74	232	0.80
Canada	1,034	4.81	1,012	4.17	1,115	4.09	1,645	5.96	880	2.68	1,137	3.90
CHR									1	0.00	1	0.00
Cyprus	78	0.36			20	0.07			12	0.04	37	0.13
Finland	911	4.23			41	0.15	49	0.18	41	0.12	261	0.89
France					112	0.41	198	0.72	56	0.17	122	0.42
Germany, Federal	195	0.91	155	0.64	169	0.62	129	0.47	47	0.14	139	0.48
Greece			31	0.13	24	0.09					28	0.09
Guam	2	0.01							8	0.02	5	0.02
Hawaii	56	0.26	83	0.34	43	0.16	294	1.06	51	0.16	105	0.36
HND									59	0.18	59	0.20
Hong Kong			26	0.11	678	2.49	145	0.53	39	0.12	222	0.76
Israel	109	0.51	125	0.51	389	1.43	276	1.00	254	0.77	231	0.79
Italy	209	0.97	43	0.18			183	0.66	401	1.22	209	0.72
JAM							3	0.01			3	0.01
Japan	747	3.47	1,010	4.16	1,133	4.16	856	3.10	1,185	3.60	986	3.38
Korea, Rep. Of	267	1.24	115	0.47	171	0.63			42	0.13	149	0.51
Latvia					10	0.04					10	0.03
Lebanon	264	1.23	91	0.37	244	0.90	310	1.12	244	0.74	231	0.79
LWW							15	0.05			15	0.05
Mexico	136	0.63	175	0.72							156	0.53
MLT	2,334	10.85							86	0.26	1,210	4.15
Netherlands		0.00	2,993	12.33	2,543	9.33	3,477	12.59	9,517	28.94	4,633	15.90
New Zealand	10	0.05	10	0.04			54	0.20			25	0.08
Pakistan							25	0.09			25	0.09
Papua New Guinea					40	0.15	21	0.08			31	0.10
People's Republic of China			11	0.05	43	0.16					27	0.09
Puerto Rico			289	1.19	176	0.65	217	0.79	639	1.94	330	1.13
SAF									16	0.05	16	0.05

Saudi Arabia	16	0.07	37	0.15	55	0.20	14	0.05	13	0.04	27	0.09
Singapore	3	0.01	2	0.01	2	0.01	162	0.59	451	1.37	124	0.43
Spain	646	3.00	1,904	7.84	2,837	10.41	1,613	5.84	54	0.16	1,411	4.84
Sweden	20	0.09	43	0.18	53	0.19	148	0.54		0.00	66	0.23
Switzerland	8	0.04					95	0.34	748	2.27	284	0.97
Thailand	283	1.32	267	1.10	62	0.23	307	1.11	1,072	3.26	398	1.37
Trust Territory of the Pacific Is.									4	0.01	4	0.01
U. K. of Great Britain and Northern Ireland	172	0.80	274	1.13	251	0.92	449	1.63	306	0.93	290	0.09
United Arab Emirates	20	0.09			30	0.11					25	53.44
USA	13,863	64.43	15,337	63.17	16,702	61.27	16,323	59.12	15,610	47.47	15,567	0.21
USR/Russia		0.00							62	0.19	62	
Total	21,515	100.00	24,279	100.00	27,261	100.00	27,610	100.00	32,883	100.00	29,135	100.00

All US\$ in '000

Source of basic data: Foreign Trade Statistics

Appendix Table 9a. Quantity of exports of pineapple juice (other than concentrates), Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	kg	%	kg	%	kg	%	kg	%	kg	%	kg	%
Australia	631	0.00	33,900	0.06			231	0.00	1,294	0.00	9,014	0.02
Austria	20,381	0.05			230	0.00	420	0.00			7,010	0.01
Bahamas	29,366	0.07	45,383	0.09	58,731	0.12	50,722	0.12	57,397	0.14	48,320	0.1
Barbados	5,797	0.01	41,238	0.08	23,646	0.05					23,560	0.05
Bahrain							518	0.00			518	0
Belgium	144,100	0.32			29,584	0.06	426	0.00			58,037	0.12
Bermuda	76,874	0.17	121,087	0.23	44,743	0.09	74,748	0.17	66,003	0.16	76,691	0.16
BRB							39,283	0.09	20,747	0.05	30,015	0.06
BPR									13,348	0.03	13,348	0.03
Brunei			9,736	0.02							9,736	0.02
Canada	2,267,633	5.09	2,138,265	4.03	2,780,812	5.45	2,776,487	6.30	2,479,348	5.89	2,488,509	5.25
Canary Islands	17,785	0.04	4,879	0.01					10,911	0.03	11,192	0.02
CHR							19,038	0.04	16,277	0.04	17,658	0.04
CUR							8,009	0.02			8,009	0.02
Denmark							13,348	0.03			13,348	0.03
Taiwan	56,606	0.13	3,507	0.01	4,658	0.01					21,590	0.05
Dominican Republic	2,777	0.01									2,777	0.01
Finland	14,119	0.03									14,119	0.03
Fiji Island			1,200	0.00							1,200	0
France			514	0.00	60	0.00	101	0.00	43,555	0.10	11,058	0.02
Ghana			200	0.00							200	0
Greece			27,656	0.05							27,656	0.06
Germany	128,414	0.29	5,870	0.01	28,159	0.06	30,013	0.07			48,114	0.1
Hong Kong	411,376	0.92	388,219	0.73	572,525	1.12	325,056	0.74	247,270	0.59	388,889	0.82
Israel							1,142	0.00	250	0.00	696	0
Italy					1,866	0.00	14,283	0.03			8,075	0.02
Japan	236,113	0.53	236,456	0.45	376,774	0.74	159,494	0.36	212,472	0.50	244,262	0.52
Jamaica			15,637	0.03	13,427	0.03	18,740	0.04	23,580	0.06	17,846	0.04
Korea	340,067	0.76			13,348	0.03	107,633	0.24	100,028	0.24	140,269	0.3
MYS									896	0.00	896	0
MNG									4,760	0.01	4,760	0.01
Marshall Islands	286	0.00									286	0
Mozambique	1,272	0.00									1,272	0
Netherlands	238,390	0.54	164,462	0.31	21,923	0.04	57,507	0.13	118,767	0.28	120,210	0.25

Netherlands Antilles	16,634	0.04	52,026	0.10	26,696	0.05	84,093	0.19	30,013	0.07	41,892	0.09
New Zealand	48,713	0.11							30	0.00	24,372	0.05
Norway									10,679	0.03	10,679	0.02
Okinawa							17,776	0.04			17,776	0.04
Pakistan	13,573	0.03	58,630	0.11	34,399	0.07	58,388	0.13	14,508	0.03	35,900	0.08
Palau	2,813	0.01	30	0.00							1,422	0
Panama	4,004	0.01	4,005	0.01	6,310	0.01	9,343	0.02	21,357	0.05	9,004	0.02
Papua New Guinea					78	0.00			90	0.00	84	0
Puerto Rico	16,018	0.04	131,594	0.25	42,714	0.08	34,705	0.08	131,764	0.31	71,359	0.15
Saudi Arabia					100	0.00		0.00	816	0.00	458	0
Singapore	602,646	1.35	247,679	0.47	761,479	1.49	344,883	0.78	60,362	0.14	403,410	0.85
Spain			208,832	0.39	392,071	0.77	52,708	0.12	95,766	0.23	187,344	0.4
Sweden	14,215	0.03									14,215	0.03
Switzerland	44,933	0.10		0.00	180	0.00	28	0.00	57,280	0.14	25,605	0.05
Trinidad and Tobago	63,387	0.14	125,297	0.24	118,143	0.23	58,023	0.13	41,953	0.10	81,361	0.17
Trust Territories	30,601	0.07	54,118	0.10	17,538	0.03	98,634	0.22	59,639	0.14	52,106	0.11
Russian Federation	282,375	0.63	4,520	0.01	358,082	0.70					214,992	0.45
UAE					1,368	0.00					1,368	0
UK	194,907	0.44	12,550	0.02					14,185	0.03	73,881	0.16
US	37,984,504	85.26	48,176,019	90.82	44,718,416	87.65	38,765,492	87.99	37,784,091	89.68	41,485,704	87.57
Guam	264,624	0.59	206,854	0.39	155,678	0.31	108,767	0.25	53,150	0.13	157,815	0.33
Hawaii	976,705	2.19	525,569	0.99	417,154	0.82	727,180	1.65	337,289	0.80	596,779	1.26
Total	44,552,639	100.00	53,045,932	100.00	51,020,892	100.00	44,057,219	100.00	42,129,875	100.00	47,376,664	100

Source of basic data: Foreign Trade Statistics

Appendix Table 9b. Value of exports of pineapple juice (other than concentrates), Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%
Australia	573	0.01	19,269	0.19			271	0.00	1,265	0.02	5,345	0.06
Austria	5,289	0.06			450	0.00	802	0.01			2,180	0.02
Bahamas	5,703	0.06	8,180	0.08	10,261	0.09	8,861	0.10	9,650	0.13	8,531	0.09
Barbados	1,148	0.01	8,182	0.08	4,675	0.04	7,951	0.09	3,844	0.05	5,160	0.05
Bahrain							544	0.01			544	0.01
Belgium	44,051	0.48			6,336	0.06	535	0.01			16,974	0.18
Bermuda	14,748	0.16	22,148	0.22	7,928	0.07	13,059	0.15	10,859	0.15	13,748	0.15
BRB												0.00
BPR									2,332	0.03	2,332	0.02
Brunei			8,791	0.09							8,791	0.09
Canada	492,094	5.32	519,959	5.10	528,208	4.82	525,144	5.88	447,638	6.06	502,609	5.30
Canary Islands	1,984	0.02	902	0.01					2,042	0.03	1,643	0.02
CHR							26,541	0.30	25,535	0.35	26,038	0.27
CUR							1,399	0.02			1,399	0.01
Denmark							2,332	0.03			2,332	0.02
Taiwan	19,397	0.21	4,450	0.04	4,226	0.04					9,358	0.10
Dominican Republic	548	0.01									548	0.01
Finland	3,251	0.04									3,251	0.03
Fiji Island			2,141	0.02							2,141	0.02
France			912	0.01	63	0.00	207	0.00	7,896	0.11	2,270	0.02
Ghana			90	0.00							90	0.00
Greece			6,660	0.07							6,660	0.07
Germany	33,841	0.37	1,084	0.01	5,151	0.05	6,042	0.07			11,530	0.12
Hong Kong	101,526	1.10	95,173	0.93	139,674	1.27	63,519	0.71	47,942	0.65	89,567	0.95
Israel							1,379	0.02	313	0.00	846	0.01
Italy					2,326	0.02	2,397	0.03			2,362	0.02
Japan	49,824	0.54	52,356	0.51	75,558	0.69	41,054	0.46	50,891	0.69	53,937	0.57
Jamaica			3,276	0.03	5,351	0.05	10,393	0.12	13,162	0.18	8,046	0.08
Korea	67,849	0.73			2,332	0.02	20,433	0.23	17,823	0.24	27,109	0.29
MYS									1,634	0.02	1,634	0.02
MNG									2,666	0.04	2,666	0.03
Marshall Islands	275	0.00									275	0.00
Mozambique	719	0.01									719	0.01
Netherlands	108,041	1.17	60,697	0.60	8,416	0.08	77,867	0.87	19,966	0.27	54,997	0.58

Netherlands Antilles	5,298	0.06	9,220	0.09	4,664	0.04	14,692	0.16	4,485	0.06	7,672	0.08
New Zealand	10,529	0.11							33	0.00	5,281	0.06
Norway									1,795	0.02	1,795	0.02
Okinawa							2,450	0.03			2,450	0.03
Pakistan	2,543	0.03	17,198	0.17	9,530	0.09	10,635	0.12	2,725	0.04	8,526	0.09
Palau	6,085	0.07	60	0.00							3,073	0.03
Panama	739	0.01	699	0.01	1,102	0.01	1,633	0.02	3,643	0.05	1,563	0.02
Papua New Guinea					33	0.00			122	0.00	77.5	0.00
Puerto Rico	2,957	0.03	30,194	0.30	7,462	0.07	6,064	0.07	22,776	0.31	13,891	0.15
Saudi Arabia		0.00		0.00	118	0.00		0.00	1,024	0.01	571	0.01
Singapore	159,643	1.73	59,385	0.58	180,814	1.65	93,236	1.04	11,549	0.16	100,925	1.06
Spain			76,114	0.75	262,810	2.40	10,950	0.12	18,115	0.25	91,997	0.97
Sweden	3,612	0.04									3,612	0.04
Switzerland	11,270	0.12			316	0.00	47	0.00	22,549	0.31	8,546	0.09
Trinidad and Tobago	13,299	0.14	25,360	0.25	25,111	0.23	11,877	0.13	7,843	0.11	16,698	0.18
Trust Territories	11,402	0.12	21,627	0.21	5,369	0.05	25,467	0.28	18,097	0.25	16,392	0.17
Russian Federation	88,241	0.95	2,426	0.02	75,413	0.69					55,360	0.58
UAE					424	0.00					424	0.00
UK	70,406	0.76	11,000	0.11					3,612	0.05	28,339	0.30
US	7,654,328	82.81	8,982,830	88.15	9,491,418	86.53	7,800,109	87.26	6,527,856	88.41	8,091,308	85.37
Guam	56,687	0.61	44,400	0.44	29,740	0.27	21,542	0.24	9,993	0.14	32,472	0.34
Hawaii	194,917	2.11	96,035	0.94	73,051	0.67	129,174	1.45	61,908	0.84	111,017	1.17
Total	9,242,817	100.00	10,190,818	100.00	10,968,330	100.00	8,938,606	100.00	7,383,583	100.00	9,477,620	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 10a. Quantity of exports of Philippine pineapple (dried) by country of destination, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	kg	%	kg	%	kg	%	kg	%	kg	%	kg	%
Australia	70,300	81.18	38,685	42.09	24,176	44.28	2,500	3.72	13267	29.35	29,786	31.27
Austria							1,240	1.84			1,240	1.30
Bahrain			50	0.05							50	0.05
Canada	200	0.23	20	0.02					800	1.77	340	0.36
Denmark	71	0.08									71	0.07
France					20	0.04					20	0.02
Germany	384	0.44	2,450	2.67	10,500	19.23	9,200	13.69	3,630	8.03	5,233	5.49
Guam							17	0.03	124	0.27	71	0.07
Hawaii	2,641	3.05	450	0.49			626	0.93	724	1.60	1,110	1.17
Hong Kong	7,969	9.20	6,622	7.20	5,430	9.95	32,378	48.17	16,300	36.06	13,740	14.42
Israel	4,600	5.31									4,600	4.83
Italy			2,420	2.63							2,420	2.54
Japan	90	0.10	80	0.09			2,080	3.09	914	2.02	791	0.83
Kuwait							932	1.39			932	0.98
Korea												
Nauru, Rep. Of	20	0.02									20	0.02
Netherlands					625	1.14	250	0.37	668	1.48	514	0.54
New Zealand												
Norway	50	0.06									50	0.05
Okinawa												
Russian Fedaration					2,923	5.35					2,923	3.07
Saudi Arabia												
Singapore	125	0.14			9,950	18.22	300	0.45	1,461	3.23	2,959	3.11
Switzerland			7	0.01			30	0.04			19	0.02
Taiwan			4,970	5.41							4,970	5.22
Trust Territory of the Pacific Is.	45	0.05	50	0.05	61	0.11					52	0.05
UAE												
UKG							250	0.37			250	0.26
United States of America	100	0.12	36,112	39.29	54,600	50.42	17,408	25.90	7,317	16.19	23,107	24.25
Total	86,595	100.00	91,916	100.00	108,285	100.00	67,211	100.00	45,205	100.00	95,267	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 10b. Value of exports of Philippine pineapple (dried) by country of destination, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%
Australia	99,593	65.96	57,507	27.09	34,468	12.09	2,750	1.14	22,150	18	43,294	15.67
Austria							9,920	4.10			9,920	3.59
Bahrain			243	0.11							243	0.09
Canada	860	0.57	25	0.01					3,600	3	1,495	0.54
Denmark	373	0.25									373	0.13
France					84	0.03					84	0.03
Germany	2,593	1.72	13,434	6.33	77,550	27.20	73,600	30.44	29,040	23	39,243	14.20
Guam							96	0.04	530	0	313	0.11
Hawaii	4,475	2.96	2,475	1.17			900	0.37	675		2,131	0.77
Hong Kong	33,143	21.95	27,214	12.82	22,350	7.84	106,118	43.89	36,994	30	45,164	16.34
Israel	8,160	5.40									8,160	2.95
Italy			17,825	8.40							17,825	
Japan	480	0.32	360	0.17			9,360	3.87	3,236	3	6	
Kuwait							4,220	1.75			3,359	1.22
Korea											4,220	1.53
Nauru, Rep. Of	132	0.09										
Netherlands					3,325	1.17	1,400	0.58	3,345	3	132	0.05
New Zealand											2,690	0.97
Norway	161	0.11										
Okinawa											161	0.06
Russian Fedaration					3,920	1.37						
Saudi Arabia											3,920	1.42
Singapore	504	0.33			44,775	15.70	1,335	0.55	8,593	7		
Switzerland			35	0.02			133	0.06			13,802	4.99
Taiwan			38,130	17.96							84	0.03
Trust Territory of the Pacific Is.											38,130	13.80
UAE	300	0.20	350	0.16	174	0.06						
UKG							1,320	0.55			275	0.10
United States of America	215	0.14	54,702	25.77	98,490	34.54	30,646	12.67	15,864	13	1,320	0.48
Total	150,989	100.00	212,300	100.00	285,136	100.00	241,798	100.00	124,027	100.00	276,321	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 11a. Quantity of export of nata de pina, Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	kg	%	kg	%	kg	%	kg	%	kg	%	kg	%
Australia	3,079	1.87	1,062	1.02	4,240	2.80	2,307	1.66	3,733	2.32	2,884	1.94
Austria			41	0.04	41	0.03	641	0.46			241	0.16
Bahrain	980	0.59			82	0.05	1,266	0.91	82	0.05	603	0.40
BGD									685	0.43	685	0.46
BRN									735	0.46	735	0.49
Belgium	245	0.15	41	0.04	486	0.32	163	0.12			234	0.16
Canada	6,521	3.95	5,714	5.50	11,408	7.52	18,715	13.46	15,622	9.70	11,596	7.78
CHR							1,825	1.31	898	0.56	1,362	0.91
Denmark			245	0.24	3,837	2.53	816	0.59	408	0.25	1,327	0.89
France					24	0.02					24	0.02
Germany	156	0.09	163	0.16							160	0.11
Greece			245	0.24	403	0.27	1,088	0.78			579	0.39
Guam	2,826	1.71	896	0.86	1,445	0.95	2,453	1.76	1,349	0.84	1,794	1.20
Hawaii	2,122	1.29	2,571	2.48	3,445	2.27	2,202	1.58	1,794	1.11	2,427	1.63
Hong Kong	147	0.09	3,456	3.33			1,632	1.17	245	0.15	1,370	0.92
Israel					612	0.40	492	0.35			552	0.37
Iceland	41	0.02									41	0.03
Italy	776	0.47	856	0.82	3,590	2.37	3,442	2.47	2,571	1.60	2,247	1.51
Japan	78,767	47.74	31,467	30.30	14,519	9.57	1,469	1.06	1,977	1.23	25,640	17.21
Jordan							408	0.29			408	0.27
Kuwait	2,245	1.36	1,377	1.33	3,533	2.33	2,615	1.88	1,224	0.76	2,199	1.48
Lebanon					408	0.27			220	0.14	314	0.21
Netherlands	2,122	1.29	2,027	1.95	2,816	1.86	1,306	0.94	1,610	1.00	1,976	1.33
New Zealand			82	0.08	490	0.32	82	0.06	702	0.44	339	0.23
Norway	122	0.07	408	0.39	245	0.16	245	0.18	326	0.20	269	0.18
Oman	282	0.17	147	0.14	205	0.14	721	0.52	149	0.09	301	0.20
Palau	41	0.02	41	0.04	41	0.03	211	0.15			84	0.06
Papua New Guinea	82	0.05	106	0.10					408	0.25	199	0.13
Qatar	41	0.02	979	0.94	1,551	1.02	1,543	1.11			1,029	0.69
Saudi Arabia	5,602	3.40	5,299	5.10	4,055	2.67	8,854	6.37	4,655	2.89	5,693	3.82
Spain			408	0.39	689	0.45	408	0.29			502	0.34
Singapore	163	0.10			464	0.31	408	0.29			345	0.23
Sweden							163	0.12			163	0.11
Switzerland	28	0.02	25	0.02	217	0.14	47	0.03	82	0.05	80	0.05
Taiwan	21	0.01	245	0.24	122	0.08					129	0.09
Trust Territory	2,490	1.51	1,959	1.89	3,417	2.25	4,583	3.30	1,469	0.91	2,784	1.87
UAE	3,766	2.28	1,560	1.50	4,532	2.99	3,042	2.19	4,688	2.91	3,518	2.36
UK	2,204	1.34	2,063	1.99	2,204	1.45	408	0.29	2,530	1.57	1,882	1.26
USA	50,126	30.38	40,357	38.86	82,562	54.43	75,525	54.30	112,840	70.09	72,282	48.51
Total	164,995	100.00	103,840	100.00	151,683	100.00	139,080	100.00	161,002	100.00	148,997	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 11b. Value of export of nata de pina, Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%
Australia	6,289	2.31	2,042	0.97	8,308	2.74	4,472	1.65	6,961	2.29	5,614	2.00
Austria			76	0.04	95	0.03	1,133	0.42			435	0.15
Bahrain	1,864	0.68			153	0.05	2,508	0.93	1,375	0.45	1,475	0.52
BGD									1,300	0.43	1,300	0.46
BRN									153	0.05	153	0.05
Belgium	576	0.21	95	0.04	906	0.30	295	0.11			468	0.17
Canada	12,657	4.64	10,816	5.11	21,519	7.09	33,624	12.41	29,036	9.54	21,530	7.66
CHR							3,375	1.25	1,704	0.56	2,540	0.90
Denmark			454	0.21	7,153	2.36	1,524	0.56	762	0.25	2,473	0.88
France					54	0.02					54	0.02
Germany	298	0.11	302	0.14							300	0.11
Greece			531	0.25	950	0.31	2,885	1.06			1,455	0.52
Guam	5,491	2.01	1,929	0.91	2,963	0.98	4,640	1.71	2,563	0.84	3,517	1.25
Hawaii	4,714	1.73	5,518	2.61	7,224	2.38	5,009	1.85	4,108	1.35	5,315	1.89
Hong Kong	275	0.10	9,000	4.26			4,574	1.69	458	0.15	3,577	1.27
Israel					1,141	0.38	900	0.33			1,021	0.36
Iceland	76	0.03									76	0.03
Italy	1,498	0.55	1,596	0.75	6,856	2.26	6,324	2.33	4,779	1.57	4,211	1.50
Japan	109,742	40.25	69,298	32.76	21,154	6.97	2,745	1.01	3,666	1.20	41,321	14.69
Jordan							762	0.28			762	0.27
Kuwait	4,360	1.60	2,584	1.22	6,702	2.21	4,864	1.80	2,289	0.75	4,160	1.48
Lebanon					761	0.25			441	0.14	601	0.21
Netherlands	3,765	1.38	4,162	1.97	5,962	1.96	2,659	0.98	2,842	0.93	3,878	1.38
New Zealand			153	0.07	914	0.30	144	0.05	1,312	0.43	631	0.22
Norway	233	0.09	861	0.41	560	0.18	570	0.21	732	0.24	591	0.21
Oman	525	0.19	270	0.13	376	0.12	1,307	0.48	271	0.09	550	0.20
Palau	83	0.03	90	0.04	127	0.04	588	0.22			222	0.08
Papua New Guinea	164	0.06	234	0.11					762	0.25	387	0.14
Qatar	93	0.03	2,023	0.96	2,891	0.95	2,767	1.02			1,944	0.69
Saudi Arabia	10,383	3.81	10,036	4.74	7,919	2.61	18,506	6.83	8,188	2.69	11,006	3.91
Spain			935	0.44	1,292	0.43	764	0.28			997	0.35
Singapore	330	0.12			870	0.29	765	0.28			655	0.23
Sweden							304	0.11			304	0.11
Switzerland	50	0.02	46	0.02	420	0.14	88	0.03	207	0.07	162	0.06
Taiwan	40	0.01	454	0.21	246	0.08					247	0.09
Trust Territory	4,615	1.69	3,806	1.80	6,660	2.19	8,305	3.07	2,720	0.89	5,221	1.86
UAE	6,852	2.51	2,843	1.34	8,144	2.68	5,618	2.07	8,639	2.84	6,419	2.28
UK	4,268	1.57	4,242	2.01	4,111	1.35	762	0.28	4,731	1.55	3,623	1.29
USA	93,377	34.25	77,118	36.46	177,279	58.37	148,154	54.68	214,380	70.43	142,062	50.51
Total	272,618	100.00	211,514	100.00	303,710	100.00	270,935	100.00	304,379	100.00	281,255	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 12a. Quantity of exports of mangoes (fresh), Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	kg	%	kg	%	kg	%	kg	%	kg	%	kg	%
Australia	117,893	0.41	232,068	0.53	35,883	0.09	59,504	0.13			111,337	0.26
Austria	610	0.00	475	0.00	921	0.00					669	0.00
Bahrain					315	0.00					315	0.00
Belgium							62,000	0.14	6,105	0.01	34,053	0.08
Brunei	15,120	0.05	216	0.00	3,200	0.01			1,510	0.00	5,012	0.01
Canada	24,025	0.08	8,643	0.02	1,200	0.00	300	0.00	10,796	0.02	8,993	0.02
Canary Islands									4,000	0.01	4,000	0.01
China									5,700	0.01	5,700	0.01
CHR									15,753	0.03	15,753	0.04
Taiwan	228	0.00	3,000	0.01							1,614	0.00
France	2,113	0.01	275	0.00	4,418	0.01	829	0.00	7,246	0.01	2,976	0.01
Germany			3,848	0.01			620	0.00	2,998	0.01	2,489	0.01
Hawaii							6,220	0.01			6,220	0.01
Hong Kong	20,435,959	70.31	31,547,932	71.80	30,911,675	76.79	36,898,381	82.11	43,102,395	83.37	32,579,268	77.38
Italy			21,666	0.05			230	0.00	275	0.00	7,390	0.02
Japan	8,134,451	27.99	11,814,720	26.89	8,971,915	22.29	7,409,131	16.49	8,249,062	15.96	8,915,856	21.18
Korea					1,073	0.00					1,073	0.00
Kuwait									600	0.00	600	0.00
Malaysia					9,450	0.02	12,150	0.03			10,800	0.03
Macau	20,100	0.07									20,100	0.05
Netherlands			8,082	0.02							8,082	0.02
Palau	400	0.00									400	0.00
Saudi Arabia	7,707	0.03	9,550	0.02	445	0.00					5,901	0.01
Singapore	276,630	0.95	248,475	0.57	275,159	0.68	435,780	0.97	236,262	0.46	294,461	0.70
Somalia									1,566	0.00	1,566	0.00
Switzerland	8,050	0.03	11,028	0.03	11,299	0.03	16,603	0.04	28,674	0.06	15,131	0.04
Trust Territory	4,418	0.02							22	0.00	2,220	0.01
Oman	675	0.00									675	0.00
UAE					362	0.00					362	0.00
USR							1,000	0.00	4,379	0.01	2,690	0.01
UK	15,714	0.05	27,160	0.06	24,720	0.06	19,550	0.04	19,787	0.04	21,386	0.05
USA							16,205	0.04			16,205	0.04
Vietnam					188	0.00					188	0.00
Total	29,064,093	100.00	43,937,138	100.00	40,252,223	100.00	44,938,503	100.00	51,697,130	100.00	42,103,483	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 12b. Value of exports of mangoes (fresh), Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%
Australia	235,548	0.80	381,941	0.88	99,592	0.25	173,516	0.43			222,649	0.57
Austria	975	0.00	900	0.00	2,640	0.01					1,505	0.00
Bahrain					675	0.00					675	0.00
Belgium							37,762	0.09	7,497	0.02	22,630	0.06
Brunei	34,671	0.12	520	0.00	4,000	0.01			2,999	0.01	10,548	0.03
Canada	46,860	0.16	14,372	0.03	740	0.00	160	0.00	11,956	0.03	14,818	0.04
Canary Islands									4,500	0.01	4,500	0.01
China									2,964	0.01	2,964	0.01
CHR									7,032	0.02	7,032	0.02
Taiwan	400	0.00	4,073	0.01							2,237	0.01
France	3,329	0.01	383	0.00	13,192	0.03	1,296	0.00	16,666	0.04	6,973	0.02
Germany			9,710	0.02			1,350	0.00	2,378	0.01	4,479	0.01
Hawaii							10,660	0.03			10,660	0.03
Hong Kong	14,060,729	47.63	20,160,402	46.63	22,066,731	55.50	24,988,085	61.73	27,454,117	65.78	21,746,013	55.59
Italy			38,032	0.09			299	0.00	500	0.00	12,944	0.03
Japan	14,725,265	49.88	22,332,708	51.65	17,288,456	43.48	14,665,618	36.23	13,845,018	33.17	16,571,413	42.36
Korea					2,640	0.01					2,640	0.01
Kuwait									1,658	0.00	1,658	0.00
Malaysia					6,165	0.02	8,100	0.02			7,133	0.02
Macau	20,000	0.07									20,000	0.05
Netherlands			11,139	0.03							11,139	0.03
Palau	1,000	0.00									1,000	0.00
Saudi Arabia	15,957	0.05	25,548	0.06	2,860	0.01					14,788	0.04
Singapore	333,480	1.13	201,651	0.47	207,736	0.52	476,331	1.18	249,317	0.60	293,703	0.75
Somalia									1,839	0.00	1,839	0.00
Switzerland	9,742	0.03	14,606	0.03	16,974	0.04	29,157	0.07	56,902	0.14	25,476	0.07
Trust Territory	9,514	0.03							34	0.00	4,774	0.01
Oman	2,250	0.01									2,250	0.01
UAE					429	0.00					429	0.00
USR							2,550	0.01	6,911	0.02	4,731	0.01
UK	22,632	0.08	38,413	0.09	47,610	0.12	49,093	0.12	66,535	0.16	44,857	0.11
USA							38,916	0.10			38,916	0.10
Vietnam					320	0.00					320	0.00
Total	29,522,352	100.00	43,234,398	100.00	39,760,760	100.00	40,482,893	100.00	41,738,823	100.00	39,117,690	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 13a. Quantity of exports of mangoes (dried), Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	kg	%	kg	%	kg	%	kg	%	kg	%	kg	%
Aruba									20	0.00	20	0.00
Australia	1,207	0.19	1,880	0.30	1,942	0.32	1,121	0.18	2,610	0.39	1,752	0.27
Austria					200	0.03	2,197	0.36	300	0.04	899	0.14
Bahrain	50	0.01	150	0.02					100	0.01	100	0.02
Belgium	1,000	0.16	100	0.02							550	0.08
Brunei									547	0.08	547	0.08
Canada	32,640	5.22	31,639	5.10	37,648	6.13	29,441	4.80	44,355	6.61	35,145	5.41
CHR							14,106	2.30	10,868	1.62	12,487	1.92
Cyprus									300	0.04	300	0.05
Taiwan	14,530	2.32	18,925	3.05	15,050	2.45					16,168	2.49
Denmark	86	0.01	95	0.02			191	0.03			124	0.02
France	178	0.03	1,878	0.30	637	0.10	300	0.05	1,200	0.18	839	0.13
Germany	10,245	1.64	30,120	4.86	66,300	10.79	32,667	5.32	28,065	4.18	33,479	5.15
Greece	20	0.00	80	0.01	20	0.00					40	0.01
Hong Kong	377,783	60.38	317,781	51.26	287,289	46.76	313,953	51.16	366,563	54.64	332,674	51.19
Ireland												
Israel					105	0.02			4,000	0.60	2,053	0.32
Italy			2,300	0.37	257	0.04			923	0.14	1,160	0.18
Indonesia					272	0.04					272	0.04
Japan	3,823	0.61	4,490	0.72	5,962	0.97	11,929	1.94	15,236	2.27	8,288	1.28
Korea	2,000	0.32	2,000	0.32							2,000	0.31
Kuwait							500	0.08			500	0.08
Lebanon							36	0.01	18	0.00	27	0.00
Malaysia			208	0.03			29	0.00			119	0.02
Marshall Is.					134	0.02					134	0.02
Nauru	50	0.01									50	0.01
Netherlands	50	0.01	1,260	0.20	3,310	0.54	2,984	0.49	3,472	0.52	2,215	0.34
New Zealand	1,020	0.16	1,000	0.16	1,023	0.17	1,010	0.16	1,000	0.15	1,011	0.16
Norway	450	0.07	1,400	0.23	1,509	0.25	970	0.16	890	0.13	1,044	0.16
Palau	51	0.01	160	0.03							106	0.02
Papua New Guinea	10	0.00							10	0.00	10	0.00
Saudi Arabia			695	0.11					620	0.09	658	0.10
Singapore	46,225	7.39	69,067	11.14	73,582	11.98	42,358	6.90	31,592	4.71	52,565	8.09
Spain									450	0.07	450	0.07

Sweden	200	0.03									200	0.03
Switzerland	53	0.01	133	0.02	300	0.05	329	0.05	112	0.02	185	0.03
Russian Territory					380	0.06					380	0.06
Trust Territory	1,669	0.27	827	0.13	2,042	0.33	2,755	0.45	558	0.08	1,570	0.24
UAE	1,093	0.17			394	0.06	313	0.05	1,343	0.20	786	0.12
Oman	280	0.04									280	0.04
UK	12,115	1.94	10,775	1.74	7,177	1.17	11,672	1.90	7,965	1.19	9,941	1.53
USA	112,209	17.93	117,273	18.92	104,635	17.03	143,415	23.37	147,453	21.98	124,997	19.23
Guam	2,566	0.41	3,659	0.59	1,630	0.27	1,051	0.17	132	0.02	1,808	0.28
Hawaii	4,086	0.65	2,037	0.33	2,505	0.41	350	0.06	216	0.03	1,839	0.28
Vietnam				0.00	120	0.02					120	0.02
Total	625,689	100.00	619,932	100.00	614,423	100.00	613,677	100.00	670,918	100.00	649,889	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 13b. Value of exports of mangoes (dried), Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	kg	%	kg	%	kg	%	kg	%	kg	%	kg	%
Aruba									185	0.00	185	0.00
Australia	14,059	0.34	16,509	0.37	16,847	0.37	10,857	0.24	23,186	0.55	16,292	0.36
Austria					2,483	0.05	21,082	0.47	3,150	0.07	8,905	0.20
Bahrain	389	0.01	1,723	0.04					400	0.01	837	0.02
Belgium	7,377	0.18	1,037	0.02							4,207	0.09
Brunei									5,773	0.14	5,773	0.13
Canada	232,589	5.59	245,456	5.52	311,487	6.84	261,274	5.77	327,893	7.72	275,740	6.09
CHR							63,622	1.40	38,923	0.92	51,273	1.13
Cyprus									2,750	0.06	2,750	0.06
Taiwan	58,600	1.41	88,751	2.00	94,804	2.08					80,718	1.78
Denmark	721	0.02	780	0.02			1,761	0.04			1,087	0.02
France	1,198	0.03	14,901	0.33	6,065	0.13	2,775	0.06	11,100	0.26	7,208	0.16
Germany	77,907	1.87	274,430	6.17	476,195	10.46	263,600	5.82	266,123	6.27	271,651	6.00
Greece	247	0.01	984	0.02	280	0.01					504	0.01
Hong Kong	2,515,060	60.45	2,288,497	51.44	2,225,729	48.91	2,347,927	51.85	2,074,260	48.84	2,290,295	50.61
Ireland									32,000	0.75	32,000	0.71
Israel					949	0.02					949	0.02
Italy			20,700	0.47	2,635	0.06			9,004	0.21	10,780	0.24
Indonesia					2,038	0.04					2,038	0.05
Japan	34,429	0.83	45,891	1.03	57,817	1.27	116,792	2.58	113,333	2.67	73,652	1.63
Korea	15,000	0.36	15,000	0.34							15,000	0.33
Kuwait							4,250	0.09			4,250	0.09
Lebanon							333	0.01	176	0.00	255	0.01
Malaysia			2,076	0.05			275	0.01			1,176	0.03
Marshall Is.					1,212	0.03					1,212	0.03
Nauru	610	0.01									610	0.01
Netherlands	388	0.01	11,762	0.26	34,089	0.75	27,912	0.62	31,646	0.75	21,159	0.47
New Zealand	8,238	0.20	8,518	0.19	10,503	0.23	9,653	0.21	9,093	0.21	9,201	0.20
Norway	4,390	0.11	14,580	0.33	14,212	0.31	11,779	0.26	8,384	0.20	10,669	0.24
Palau	505	0.01	1,823	0.04							1,164	0.03
Papua New Guinea	95	0.00							99	0.00	97	0.00
Saudi Arabia			1,042	0.02					4,530	0.11	2,786	0.06
Singapore	346,445	8.33	527,498	11.86	518,073	11.38	276,750	6.11	244,311	5.75	382,615	8.46
Spain									4,158	0.10	4,158	0.09

Sweden	1,975	0.05									1,975	0.04
Switzerland	324	0.01	1,255	0.03	3,907	0.09	2,297	0.05	1,101	0.03	1,777	0.04
Russian Territory					2,660	0.06					2,660	0.06
Trust Territory	13,228	0.32	7,023	0.16	21,868	0.48	28,591	0.63	4,937	0.12	15,129	0.33
UAE	8,585	0.21			3,645	0.08	2,964	0.07	12,415	0.29	6,902	0.15
Oman	2,172	0.05									2,172	0.05
UK	103,016	2.48	95,551	2.15	65,283	1.43	109,938	2.43	71,652	1.69	89,088	1.97
USA	672,217	16.16	710,429	15.97	640,903	14.08	949,951	20.98	943,688	22.22	783,438	17.31
Guam	19,163	0.46	34,541	0.78	15,254	0.34	11,008	0.24	1,112	0.03	16,216	0.36
Hawaii	21,497	0.52	17,845	0.40	20,597	0.45	3,080	0.07	1,900	0.04	12,984	0.29
Vietnam					1,500	0.03					1,500	0.03
Total	4,160,424	100.00	4,448,602	100.00	4,551,035	100.00	4,528,471	100.00	4,247,282	100.00	4,525,035	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 14a. Quantity of exports of mango puree, Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	kg	%	kg	%	kg	%	kg	%	kg	%	kg	%
Australia	26,710	0.55							220	0.01	13,465	0.29
Belgium			500	0.01						0.00	500	0.01
Canada	1,200	0.02	1,800	0.04	4,758	0.13	11,100	0.27	25,040	0.95	8,780	0.19
China	60,000	1.24	63,610	1.38	334,021	9.40	108,025	2.68	23,280	0.88	117,787	2.52
CHR							56,096	1.39	1,000	0.04	28,548	0.61
Taiwan	132,040	2.72	246,247	5.36	150,250	4.23					176,179	3.77
Germany	2,291	0.05									2,291	0.05
Greece							232	0.01			232	0.00
Hong Kong	1,564,453	32.21	1,776,269	38.63	828,512	23.32	866,108	21.46	455,268	17.20	1,098,122	23.51
Indonesia					1,000	0.03	8,220	0.20			4,610	0.10
Italy							1,053	0.03			1,053	0.02
Japan	801,081	16.49	39,000	0.85	69,825	1.97	56,895	1.41	129,762	4.90	219,313	4.69
Okinawa	3,250	0.07	8,089	0.18	15,165	0.43	14,897	0.37	3,563	0.13	8,993	0.19
Korea	52,500	1.08	40,000	0.87	250	0.01	500	0.01	17,500	0.66	22,150	0.47
Malaysia	164,000	3.38	212,032	4.61	262,050	7.38	217,255	5.38	193,360	7.30	209,739	4.49
Netherlands									730,992	27.62	730,992	15.65
New Zealand	369,453	7.61	70,615	1.54	498,920	14.04	310,686	7.70	300,382	11.35	310,011	6.64
Saudi Arabia									480	0.02	480	0.01
Singapore	40,500	0.83	30,587	0.67	42,826	1.21	43,532	1.08	7,957	0.30	33,080	0.71
Sweden									35,200	1.33	35,200	0.75
Thailand									3,175	0.12	3,175	0.07
Trust Territories					21	0.00					21	0.00
UK									100	0.00	100	0.00
USA	1,638,797	33.74	2,109,179	45.87	1,344,980	37.86	2,339,286	57.95	695,356	26.27	1,625,520	34.80
Guam	1,063	0.02					2,550	0.06	6,327	0.24	3,313	0.07
Vietnam									18,000	0.68	18,000	0.39
Total	4,857,338	100.00	4,597,928	100.00	3,552,578	100.00	4,036,435	100.00	2,646,962	100.00	4,671,654	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 14b. Value of exports of mango puree, Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%
Australia	47,679	0.91							176	0.01	23,928	0.46
Belgium			474	0.01							474	0.01
Canada	2,640	0.05	3,921	0.08	8,118	0.19	21,587	0.46	29,495	1.08	13,152	0.26
China	70,003	1.34	91,586	1.81	391,587	9.31	135,104	2.89	28,356	1.03	143,327	2.78
CHR							69,683	1.49	945	0.03	35,314	0.69
Taiwan	197,689	3.79	354,770	7.01	210,618	5.01					254,359	4.94
Germany	5,159	0.10									5,159	0.10
Greece							226	0.00			226	0.00
Hong Kong	1,697,632	32.57	1,903,046	37.60	950,939	22.60	992,096	21.20	433,008	15.80	1,195,344	23.23
Indonesia					750	0.02	10,925	0.23			5,838	0.11
Italy							2,000	0.04			2,000	0.04
Japan	1,040,343	19.96	54,027	1.07	89,651	2.13	128,865	2.75	165,173	6.03	295,612	5.74
Okinawa	4,784	0.09	18,345	0.36	68,496	1.63	21,977	0.47	5,700	0.21	23,860	0.46
Korea	50,491	0.97	50,308	0.99	425	0.01	850	0.02	18,658	0.68	24,146	0.47
Malaysia	191,480	3.67	268,097	5.30	347,932	8.27	260,436	5.56	222,022	8.10	257,993	5.01
Netherlands									705,013	25.73	705,013	13.70
New Zealand	473,033	9.08	95,355	1.88	690,016	16.40	429,490	9.18	261,434	9.54	389,866	7.58
Saudi Arabia									750	0.03	750	0.01
Singapore	50,672	0.97	38,759	0.77	44,045	1.05	43,640	0.93	7,933	0.29	37,010	0.72
Sweden									47,520	1.73	47,520	0.92
Thailand									2,880	0.11	2,880	0.06
Trust Territories					74	0.00					74	0.00
UK									100	0.00	100	0.00
USA	1,378,754	26.45	2,182,663	43.12	1,405,421	33.40	2,557,543	54.64	785,999	28.69	1,662,076	32.29
Guam	2,080	0.04					5,955	0.13	10,440	0.38	6,158	0.12
Vietnam									14,400	0.53	14,400	0.28
Total	5,212,439	100.00	5,061,351	100.00	4,208,072	100.00	4,680,377	100.00	2,740,002	100.00	5,146,579	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 15a. Quantity of exports of mango juice concentrates, Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	kg	%	kg	%	kg	%	kg	%	kg	%	kg	%
Australia	480	5.37	200	0.05	153	0.65					278	0.02
China			34,400	8.00							34,400	2.36
CHR									450	29.15	450	0.03
Greece							60	0.00			60	0.00
Hong Kong			6,300	1.46	23,325	99.35	309,016	10.44			112,880	7.74
Japan	3,600	40.27					2,304,110	77.88	741	47.99	769,484	52.74
Korea							303,887	10.27			303,887	20.83
Netherlands			18,128	4.21							18,128	1.24
New Zealand			368,746	85.74			20,310	0.69			194,528	13.33
Palau	1,938	21.68	1,822	0.42							1,880	0.13
Taiwan			500	0.12							500	0.03
Trust Territory	300	3.36									300	0.02
UAE							20,467	0.69			20,467	1.40
USA	2,335	26.12							100	6.48	1,218	0.08
Guam	287	3.21					864	0.03	253	16.39	468	0.03
Total	8,940	100.00	430,096	100.00	23,478	100.00	2,958,714	100.00	1,544	100.00	1,458,927	100.00

Appendix Table 15b. Value of exports of mango juice concentrates, Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%
Australia	515	3.00	450	0.07	427	1.13					464	0.07
China			60,050	9.82							15,361	2.26
CHR							1,050	21.80			30,550	4.50
Greece									120	0.02	585	0.09
Hong Kong			10,582	1.73	37,280	98.87			60,416	10.49	27,100	4.00
Japan	4,672	27.26					2,000	41.52	374,900	65.07	81,642	12.04
Korea									107,251	18.62	122,206	18.02
Netherlands			18,106	2.96							62,679	9.24
New Zealand			517,394	84.62					28,420	4.93	187,973	27.71
Palau	4,223	24.64	3,802	0.62							138,460	20.41
Taiwan			1,037	0.17							3,021	0.45
Trust Territory	812	4.74									925	0.14
UAE									3,212	0.56	2,012	0.30
USA	5,838	34.06					475	9.86			3,175	0.47
Guam	1,080	6.30					1,292	26.82	1,820	0.32	2,101	0.31
Total	17,140	100.00	611,421	100.00	37,707	100.00	4,817	100.00	576,139	100.00	678,251	100.00

Appendix Table 16a. Quantity of exports of mango juice other than concentrates, Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	kg	%	kg	%	kg	%	kg	%	kg	%	kg	%
Australia	2,973	0.29	1,482	0.10	3,004	0.19	7,029	0.41	6,627	0.46	4,223	0.26
Austria	163	0.02	408	0.03	565	0.04					379	0.02
Belgium			225	0.02	263	0.02					244	0.02
Brunei	89,562	8.67	220,134	14.93	191,167	12.07	249,880	14.74	184,437	12.69	187,036	11.66
Canada	18,178	1.76	34,325	2.33	133,860	8.45	184,968	10.91	216,853	14.92	117,637	7.33
China	158,800	15.37	97,836	6.64	15,000	0.95			7,875	0.54	69,878	4.36
CHR							87,537	5.16	71,281	4.90	79,409	4.95
Cyprus									1,236	0.09	1,236	0.08
Denmark					200	0.01					200	0.01
Taiwan	50,617	4.90	26,619	1.81	41,950	2.65					39,729	2.48
France			435	0.03	213	0.01					324	0.02
French Polynesia			3,000	0.20							3,000	0.19
Germany	34,819	3.37	73,420	4.98	79,936	5.05	141,356	8.34	55,926	3.85	77,091	4.81
Ghana			2,600	0.18							2,600	0.16
Greece			900	0.06	2,125	0.13	1,528	0.09			1,518	0.09
Hawaii			1,641	0.11	4,375	0.28	2,025	0.12	750	0.05	2,198	0.14
Hong Kong	105,750	10.23	93,866	6.37	40,420	2.55	45,198	2.67	77,357	5.32	72,518	4.52
Ireland							2,500	0.15			2,500	0.16
Italy	656	0.06	1,249	0.08	3,168	0.20	1,188	0.07	4,175	0.29	2,087	0.13
Japan	245,836	23.79	235,526	15.98	329,131	20.77	270,311	15.94	209,918	14.44	258,144	16.09
Korea					30,400	1.92	21,000	1.24	3,390	0.23	18,263	1.14
Okinawa	10,800	1.05									10,800	0.67
Lebanon							69	0.00			69	0.00
Malaysia	2,625	0.25	39,562	2.68	86,571	5.46	85,546	5.05	41,200	2.83	51,101	3.19
Marshall Is.	17	0.00					6,149	0.36			3,083	0.19
Micronesia					2,168	0.14	14,196	0.84			8,182	0.51
Mozambique	1,272	0.12									1,272	0.08
Nauru	6,818	0.66									6,818	0.43
Netherlands	7,500	0.73	9,263	0.63	20,228	1.28	68,430	4.04	89,981	6.19	39,080	2.44
New Zealand	272	0.03	67,680	4.59	735	0.05	2,091	0.12	885	0.06	14,333	0.89
Norway							412	0.02			412	0.03
Oman			18,104	1.23							18,104	1.13
Palau	37,571	3.64	38,282	2.60	88,734	5.60	12,578	0.74	10,514	0.72	37,536	2.34
Panama									1,730	0.12	1,730	0.11

Saudi Arabia			36,329	2.46	100	0.01			375	0.03	12,268	0.76
Singapore	38,846	3.76	14,514	0.98	26,360	1.66	20,126	1.19	34,535	2.38	26,876	1.68
South Africa					34	0.00					34	0.00
Switzerland	244	0.02	148	0.01	529	0.03	542	0.03	199	0.01	332	0.02
Sweden							510	0.03	907	0.06	709	0.04
Trust Territory	35,579	3.44	59,111	4.01	46,833	2.96	85,596	5.05	27,561	1.90	50,936	3.18
Russian Federation	2,600	0.25	4,520	0.31							3,560	0.22
UK	862	0.08	64,344	4.36	105	0.01					21,770	1.36
USA	89,958	8.71	239,464	16.24	374,810	23.66	341,063	20.12	368,247	25.34	282,708	17.62
Guam	65,861	6.37	89,202	6.05	61,431	3.88	43,681	2.58	37,088	2.55	59,453	3.71
Vietnam	25,200	2.44						0.00	455	0.03	12,828	0.80
Total	1,033,379	100.00	1,474,189	100.00	1,584,415	100.00	1,695,509	100.00	1,453,502	100.00	1,604,207	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 16b. Value of exports of mango juice other than concentrates, Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%
Australia	4,005	0.38	2,020	0.13	4,908	0.28	9,256	0.48	7,932	0.53	5,624	0.33
Austria	270	0.03	875	0.05	1,242	0.07					796	0.05
Belgium			540	0.03	570	0.03					555	0.03
Brunei	106,423	10.12	279,114	17.54	249,887	14.22	300,096	15.71	198,415	13.37	226,787	13.37
Canada	18,270	1.74	35,060	2.20	151,365	8.61	207,348	10.85	226,675	15.28	127,744	7.53
China	114,243	10.86	53,485	3.36	9,061	0.52			4,219	0.28	45,252	2.67
CHR							80,176	4.20	55,944	3.77	68,060	4.01
Cyprus									1,275	0.09	1,275	0.08
Denmark					331	0.02					331	0.02
Taiwan	34,796	3.31	23,656	1.49	30,622	1.74					29,691	1.75
France			884	0.06	211	0.01					548	0.03
French Polynesia			2,970	0.19							2,970	0.18
Germany	37,257	3.54	78,283	4.92	67,690	3.85	159,055	8.33	55,513	3.74	79,560	4.69
Ghana			1,040	0.07							1,040	0.06
Greece			1,615	0.10	4,018	0.23	3,825	0.20			3,153	0.19
Hawaii			1,988	0.12	3,310	0.19	3,359	0.18	1,122	0.08	2,445	0.14
Hong Kong	108,156	10.28	111,554	7.01	52,765	3.00	51,026	2.67	60,187	4.06	76,738	4.52
Ireland							4,800	0.25			4,800	0.28
Italy	992	0.09	1,969	0.12	5,416	0.31	1,659	0.09	6,066	0.41	3,220	0.19
Japan	249,689	23.74	231,731	14.56	292,800	16.66	270,015	14.13	197,028	13.28	248,253	14.64
Korea					40,470	2.30	27,930	1.46	4,068	0.27	24,156	1.42
Okinawa	9,897	0.94									9,897	0.58
Lebanon							84	0.00			84	0.00
Malaysia	1,079	0.10	50,151	3.15	105,091	5.98	110,470	5.78	44,525	3.00	62,263	3.67
Marshall Is.	28	0.00					6,300	0.33			3,164	0.19
Micronesia					4,381	0.25	17,093	0.89			10,737	0.63
Mozambique	731	0.07									731	0.04
Nauru	12,518	1.19									12,518	0.74
Netherlands	9,500	0.90	12,394	0.78	24,154	1.37	84,110	4.40	97,694	6.58	45,570	2.69
New Zealand	321	0.03	92,722	5.83	1,177	0.07	3,132	0.16	1,325	0.09	19,735	1.16
Norway							475	0.02			475	0.03
Oman			13,130	0.83							13,130	0.77
Palau	73,339	6.97	68,535	4.31	118,418	6.74	12,793	0.67	12,081	0.81	57,033	3.36
Panama									1,785	0.12	1,785	0.11

Saudi Arabia			12,133	0.76	165	0.01			620	0.04	4,306	0.25
Singapore	49,209	4.68	18,798	1.18	34,938	1.99	24,853	1.30	43,325	2.92	34,225	2.02
South Africa					57	0.00					57	0.00
Switzerland	210	0.02	174	0.01	542	0.03	805	0.04	326	0.02	411	0.02
Sweden							844	0.04	1,497	0.10	1,171	0.07
Trust Territory	40,739	3.87	85,972	5.40	71,097	4.05	112,316	5.88	34,905	2.35	69,006	4.07
Russian Fed.	1,729	0.16	2,427	0.15							2,078	0.12
UK	1,383	0.13	42,455	2.67	173	0.01					14,670	0.87
USA	97,981	9.31	267,335	16.80	412,278	23.46	368,851	19.31	385,665	26.00	306,422	18.07
Guam	60,670	5.77	98,153	6.17	69,866	3.98	49,847	2.61	40,664	2.74	63,840	3.76
Vietnam	18,459	1.75							750	0.05	9,605	0.57
Total	1,051,894	100.00	1,591,163	100.00	1,757,003	100.00	1,910,518	100.00	1,483,606	100.00	1,695,909	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 17a. Quantity of exports of mangoes/edible parts thereof, prepared/preserved, nes, Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-1998	
	kg	%	kg	%	kg	%	kg	%	kg	%	kg	%
Australia	68	0.21			816	9.55					442	0.55
Belgium			10,500	18.04							10,500	13.02
Brunei									149	0.55	149	0.18
Canada					245	2.87			829	3.08	537	0.67
CHR							2,898	6.35	882	3.28	1,890	2.34
Denmark	43	0.13	41	0.07							42	0.05
Hong Kong			13,812	23.74	34	0.40					6,923	8.58
Japan	22,000	68.10			6,268	73.33	39,860	87.38	23,060	85.71	22,797	28.27
Netherlands			513	0.88	279	3.26	140	0.31	500	1.86	358	0.44
Okinawa							720	1.58			720	0.89
Switzerland	82	0.25									82	0.10
Taiwan			33,120	56.92							33,120	41.07
Trust Territory					154	1.80					154	0.19
UAE							28	0.06			28	0.03
USA	10,112	31.30	205	0.35	752	8.80	1,969	4.32	1,485	5.52	2,905	3.60
Total	32,305	100.00	58,191	100.00	8,548	100.00	45,615	100.00	26,905	100.00	80,647	100.00

Appendix Table 17b. Value of exports of mangoes/edible parts thereof, prepared/preserved, NES, Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%
Australia	153	0.33			1,700	8.33					927	0.86
Belgium			28,791	45.91							28,791	26.79
Brunei									393	0.66	393	0.37
Canada					552	2.70			1,492	2.49	1,022	0.95
CHR							5,796	6.81	3,010	5.03	4,403	4.10
Denmark	97	0.21	109	0.17							103	0.10
Hong Kong			18,336	29.24	78	0.38					9,207	8.57
Japan	25,625	55.59			15,485	75.85	70,473	82.80	43,977	73.48	38,890	36.18
Netherlands			3,262	5.20	810	3.97	625	0.73	4,400	7.35	2,274	2.12
Okinawa							2,800	3.29			2,800	2.61
Switzerland	193	0.42									193	0.18
Taiwan			11,192	17.85							11,192	10.41
Trust Territory					304	1.49					304	0.28
UAE							88	0.10			88	0.08
USA	20,032	43.45	1,022	1.63	1,486	7.28	5,333	6.27	6,578	10.99	6,890	6.41
Total	46,100	100.00	62,712	100.00	20,415	100.00	85,115	100.00	59,850	100.00	107,477	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 18a. Quantity of exports of mango (uncooked/cooked by steaming/ boiling in water, frozen), Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	kg	%	kg	%	kg	%	kg	%	kg	%	kg	%
Australia	200	0.06							346	0.08	273	0.02
Belgium	52,506	14.93	500	0.01	21,000	7.56	48,790	17.07			30,699	1.97
Canada	7,656	2.18	1,800	0.04	7,002	2.52	176	0.06			4,159	0.27
CHR							2,053	0.72	83,178	18.50	42,616	2.73
China			63,610	1.38							63,610	4.08
France							57,750	20.20			57,750	3.70
Taiwan	8,640	2.46	246,247	5.36							127,444	8.17
Germany	25,765	7.33			55,038	19.82	43,431	15.19	148,476	33.03	68,178	4.37
Greece	177	0.05									177	0.01
Guam									11,880	2.64	11,880	0.76
Hong Kong	97,753	27.79	1,776,269	38.63	105,925	38.15	57,514	20.12	69,585	15.48	421,409	27.02
Japan	45,752	13.01	39,000	0.85	4,563	1.64	40,808	14.27	17,984	4.00	29,621	1.90
Korea			40,000	0.87			2,650	0.93			21,325	1.37
Malaysia	2,010	0.57	212,032	4.61	2,010	0.72			4,200	0.93	55,063	3.53
Netherlands	103,265	29.36			22,125	7.97	8,625	3.02	81,000	18.02	53,754	3.45
New Zealand			70,615	1.54							70,615	4.53
Okinawa			8,089	0.18	997	0.36					4,543	0.29
Singapore			30,587	0.67							30,587	1.96
Trust Territory	207	0.06									207	0.01
UK					23,660	8.52					23,660	1.52
USA	7,778	2.21	2,109,179	45.87	35,335	12.73	24,092	8.43	32,854	7.31	441,848	28.33
Total	351,709	100.00	4,597,928	100.00	277,655	100.00	285,889	100.00	449,503	100.00	1,559,416	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 18b. Value of exports of mango (uncooked/cooked by steaming/ boiling in water, frozen), Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%
Australia	1,196	0.14							918	0.09	1,057	0.09
Belgium	180,269	20.63	113,557	18.33	70,098	9.56	166,642	19.14			132,642	11.28
Canada	21,200	2.43	18,203	2.94	17,645	2.41	308	0.04			14,339	1.22
CHR							6,004	0.69	33,590	3.19	19,797	1.68
China												
France							196,166	22.53			196,166	16.68
Taiwan	34,560	3.95	1,038	0.17							17,799	1.51
Germany	71,802	8.22	123,532	19.94	164,664	22.46	137,015	15.74	491,284	46.71	197,659	16.81
Greece	585	0.07									585	0.05
Guam									19,598	1.86	19,598	1.67
Hong Kong	130,696	14.96	237,347	38.31	214,228	29.22	108,865	12.50	114,655	10.90	161,158	13.70
Japan	101,397	11.60			21,797	2.97	163,038	18.73	59,631	5.67	86,466	7.35
Korea							15,780	1.81			15,780	1.34
Malaysia	4,950	0.57	7,537	1.22	5,101	0.70			10,080	0.96	6,917	0.59
Netherlands	307,360	35.17			76,021	10.37	29,096	3.34	262,160	24.93	168,659	14.34
New Zealand												
Okinawa					3,240	0.44					3,240	0.28
Singapore												
Trust Territory	620	0.07	105	0.02							363	0.03
UK			85,410	13.79	90,745	12.38					88,078	7.49
USA	19,277	2.21	32,831	5.30	69,640	9.50	47,739	5.48	59,794	5.69	45,856	3.90
Total	873,912	100.00	619,560	100.00	733,179	100.00	870,653	100.00	1,051,710	100.00	1,176,158	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 19a. Quantity of exports of mango in brine, sulphur water/other tempo preservatives, unsuitable in that state, Philippines, 1994-1995.

Country of Destination	1994		1995		1994-95	
	kg	%	kg	%	kg	%
USA	408	100.00	572	5.74	490	4.96
Taiwan			9,302	93.40	9,302	94.18
UK			85	0.85	85	0.86
Total	408	100.00	9,959	100.00	9,877	100.00

Appendix Table 19b. Value of exports of mango in brine, sulphur water/other tempo preservatives, unsuitable in that state, Philippines, 1994-1995.

Country of Destination	1994		1995		1994-95	
	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%
USA	1,000	100.00	1,750	35.02	1375	29.74903
Taiwan			3,056	61.16	3056	66.11856
UK			191	3.82	191	4.13241
Total	1,000	100.00	4,997	100.00	4,622	100.00

Note: There are no export figures reported for 1996-1998.

Source of basic data: Foreign Trade Statistics

Appendix Table 20a. Quantity of exports of papayas (fresh) by country of destination, Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	kg	%	kg	%	kg	%	kg	%	kg	%	kg	%
Canary Is.							3,000	0.74			3,000	0.16
China							6,774	1.66			6,774	0.36
Bahrain					16	0.00					16	0.00
Hawaii							3,350	0.82			3,350	0.18
Hong Kong	3,386,173	98.83	2,144,923	92.73	1,290,313	92.16	350,029	85.95			1,792,860	94.31
Japan	9,927	0.29	77,706	3.36	3,968	0.28	22,465	5.52	55,452	92.51	33,904	1.78
Korea					268	0.02					268	0.01
Netherlands			1,575	0.07							1,575	0.08
Saudi Arabia	11,700	0.34	55,945	2.42	44,580	3.18	20,432	5.02	1,000	1.67	26,731	1.41
Singapore			550	0.02	29,980	2.14					15,265	0.80
UAE	18,375	0.54	32,294	1.40	30,839	2.20	1,200	0.29	3,490	5.82	17,240	0.91
Vietnam					110	0.01					110	0.01
Total	3,426,175	100.00	2,312,993	100.00	1,400,074	100.00	407,250	100.00	59,942	100.00	1,901,092	100.00

Appendix Table 20b. Value of exports of papayas (fresh) by country of destination, Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%
Canary Is.							3,000	2.46			3,000	0.43
China							2,268	1.86			2,268	0.32
Bahrain					35	0.01	68,684	56.31			34,360	4.88
Hawaii							3,910	3.21			3,910	0.55
Hong Kong	819,019	97.66	619,803	86.38	358,298	89.58					599,040	85.00
Japan	10,218	1.22	68,455	9.54	4,940	1.24	40,162	32.93	83,093	97.44	41,374	5.87
Korea					197	0.05					197	0.03
Netherlands			2,228	0.31							2,228	0.32
Saudi Arabia	3,666	0.44	17,596	2.45	12,145	3.04	3,119	2.56	1,300	1.52	7,565	1.07
Singapore			150	0.02	8,039	2.01					4,095	0.58
UAE	5,781	0.69	9,291	1.29	16,214	4.05	821	0.67	882	1.03	6,598	0.94
Vietnam					120	0.03					120	0.02
Total	838,684	100.00	717,523	100.00	399,988	100.00	121,964	100.00	85,275	100.00	704,754	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 21a. Quantity of exports of papayas (dried) by country of destination, Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	kg	%	kg	%	kg	%	kg	%	kg	%	kg	%
Australia	347,400	85.52	277,884	69.91	141,321	49.02	158,800	55.40	146,861	86.58	214,453	63.02
Austria							750	0.26			750	0.22
Bahrain			50	0.01							50	0.01
Canada					51,000	17.69	500	0.17			25,750	7.57
CSK							2,000	0.70			2,000	0.59
Denmark	72	0.02									72	0.02
France					20	0.01					20	0.01
Germany	384	0.09			2,800	0.97	4,500	1.57	1,000	0.59	2,171	0.64
Guam							14	0.00	100	0.06	57	0.02
Hong Kong			250	0.06			28	0.01			139	0.04
Israel	7,600	1.87									7,600	2.23
Italy			920	0.23	720	0.25			150	0.09	597	0.18
Japan	60	0.01									60	0.02
New Zealand			6,800	1.71							6,800	2.00
Norway	50	0.01									50	0.01
Palau			20	0.01							20	0.01
Russia					522	0.18					522	0.15
Saudi Arabia									50	0.03	50	0.01
Trust Territories	42	0.01	50	0.01	53	0.02					48	0.01
USA	48,000	11.82	111,284	28.00	91,618	31.78	119,838	41.81	21,119	12.45	78,372	23.03
Hawaii	2,621	0.65	235	0.06	240	0.08	200	0.07	338	0.20	727	0.21
Total	406,229	100.00	397,493	100.00	288,294	100.00	286,630	100.00	169,618	100.00	340,308	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 21b. Value of exports of papayas (dried) by country of destination, Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%
Australia	469,561	84.83	387,194	68.49	204,300	46.93	231,987	49.84	218,445	86.22	302,297	59.40
Austria							5,250	1.13			5,250	1.03
Bahrain			215	0.04							215	0.04
Canada					68,255	15.68	2,250	0.48			35,253	6.93
CSK							3,600	0.77			3,600	0.71
Denmark	252	0.05									252	0.05
France					84	0.02					84	0.02
Germany	2,367	0.43			18,200	4.18	35,500	7.63	7,000	2.76	15,767	3.10
Guam							80	0.02	505	0.20	293	0.06
Hong Kong			1,000	0.18			118	0.03			559	0.11
Israel	11,400	2.06									11,400	2.24
Italy			5,740	1.02	4,680	1.07			1,050	0.41	3,823	0.75
Japan	628	0.11									628	0.12
New Zealand			12,175	2.15							12,175	2.39
Norway	161	0.03									161	0.03
Palau			120	0.02							120	0.02
Russia					700	0.16					700	0.14
Saudi Arabia									280	0.11	280	0.06
Trust Territories	350	0.06	350	0.06	150	0.03					283	0.06
USA	64,800	11.71	157,513	27.86	138,289	31.76	185,960	39.95	25,735	10.16	114,459	22.49
Hawaii	4,000	0.72	1,050	0.19	700	0.16	700	0.15	350	0.14	1,360	0.27
Total	553,519	100.00	565,357	100.00	435,358	100.00	465,445	100.00	253,365	100.00	508,959	100.00

Source of basic data: Foreign Trade Statistics

Appendix Table 22a. Quantity of exports of jackruit (fresh) by country of destination, Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	kg	%	kg	%	kg	%	kg	%	kg	%	kg	%
Canada			6,504	95.48							6,504	77.56
Hong Kong			308	4.52	1,843	100.00	4,182	99.55	1,112	98.15	1,861	22.2
Switzerland				0.00			19	0.45	21	1.85	20	0.24
Total			6,812	100.00	1,843	100.00	4,201	100.00	1,133	100.00	8,385	100.00

Appendix Table 22b. Value of exports of jackruit (fresh) by country of destination, Philippines, 1994-1998.

Country of Destination	*1994		1995		1996		1997		1998		1994-98	
	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%
Canada			9,835	90.35							9,835	63.17
Hong Kong			1,051	9.65	1,843	100.00	15,603	99.57	4,239	99.25	5,684	36.51
Switzerland							67	0.43	32	0.75	50	0.32
Total			10,886	100.00	1,843	100.00	15,670	100.00	4,271	100.00	15,569	100.00

*No available data

Source of basic data: Foreign Trade Statistics

Appendix Table 23a. Quantity of exports of jackfruit (edible parts thereof, preprd/presrwd, NES) by country of destination, Phils, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	kg	%	kg	%	kg	%	kg	%	kg	%	kg	%
Australia	3,695	2.05	6,603	3.15	9,526	2.62	8,194	3.64	6,667	2.84	6,937	2.78
Austria	163	0.09	245	0.12	408	0.11	992	0.44	163	0.07	394	0.16
Bahrain	2,122	1.18	1,020	0.49	1,674	0.46	245	0.11	907	0.39	1,194	0.48
BGD									1,416	0.60	1,416	0.57
BHR							1,224	0.54	1,363	0.58	1,294	0.52
Belgium	490	0.27	82	0.04	1,330	0.37					634	0.25
CHR							2,641	1.17	2,176	0.93	2,409	0.97
Canada	14,188	7.89	13,023	6.21	23,223	6.38	18,388	8.17	14,809	6.31	16,726	6.71
Cyprus									40	0.02	40	0.02
Taiwan	1,849	1.03	163	0.08	939	0.26					984	0.39
Denmark	1,062	0.59	163	0.08	4,693	1.29	816	0.36	449	0.19	1,437	0.58
France	238	0.13	1,291	0.62							765	0.31
FSM							18	0.01			18	0.01
Germany	505	0.28	245	0.12	82	0.02			34	0.01	217	0.09
Greece	236	0.13	65	0.03	310	0.09	408	0.18			255	0.1
Hong Kong	2,003	1.11	1,603	0.76	1,075	0.30	2,295	1.02	737	0.31	1,543	0.62
Iceland			16	0.01							16	0.01
Israel			2,694	1.28	245	0.07	676	0.30	408	0.17	1,006	0.4
Italy	4,737	2.63	5,953	2.84	5,403	1.48	5,783	2.57	3,047	1.30	4,985	2
Japan	2,477	1.38	2,229	1.06	6,563	1.80	6,599	2.93	3,250	1.38	4,224	1.69
Korea									816	0.35	816	0.33
Kuwait	1,552	0.86	1,551	0.74	8,171	2.24	2,932	1.30	3,765	1.60	3,594	1.44
Lebanon					163	0.04	1,306	0.58	898	0.38	789	0.32
Marshall Is.	327	0.18			418	0.11					373	0.15
Netherlands	3,999	2.22	3,183	1.52	1,714	0.47	2,120	0.94	1,733	0.74	2,550	1.02
New Zealand	245	0.14	899	0.43	1,552	0.43	205	0.09	1,061	0.45	792	0.32
Norway	82	0.05	490	0.23	122	0.03	122	0.05			204	0.08
Palau	106	0.06	65	0.03	469	0.13	131	0.06	606	0.26	275	0.11
Panama									41	0.02	41	0.02
Papua New Guinea	8	0.00	123	0.06	193	0.05	1,630	0.72	408	0.17	472	0.19
Saudi Arabia	13,007	7.23	21,177	10.10	7,422	2.04	14,151	6.28	10,108	4.31	13,173	5.28
Spain			163	0.08	1,574	0.43			245	0.10	661	0.26
Switzerland			245	0.12	49	0.01	31	0.01			108	0.04
Sweden					408	0.11	41	0.02			225	0.09

Singapore	408	0.23			1,364	0.37	1,328	0.59	55	0.02	789	0.32
Trust Territories	4,146	2.31	7,309	3.49	9,173	2.52	12,653	5.62	6,824	2.91	8,021	3.22
UAE	7,625	4.24	5,988	2.86	7,264	2.00	4,547	2.02	6,615	2.82	6,408	2.57
Oman	204	0.11	327	0.16	41	0.01	808	0.36	775	0.33	431	0.17
Qatar	531	0.30	1,674	0.80	1,832	0.50	1,703	0.76	489	0.21	1,246	0.5
UK	2,483	1.38	1,960	0.93	1,551	0.43	979	0.43	1,959	0.83	1,786	0.72
US	103,837	57.75	116,543	55.58	250,483	68.81	123,818	54.99	157,173	66.97	150,371	60.3
Guam	3,297	1.83	6,875	3.28	6,514	1.79	6,604	2.93	3,175	1.35	5,293	2.12
Hawaii	4,184	2.33	5,723	2.73	8,051	2.21	1,775	0.79	2,495	1.06	4,446	1.78
Total	179,806	100.00	209,690	100.00	363,999	100.00	225,163	100.00	234,707	100.00	249,353	100

Source of basic data: Foreign Trade Statistics

Appendix Table 23b. Value of exports of jackfruit (edible parts thereof, prepared/preserved, NES) by country of destination, Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%
Australia	9,204	2.32	13,656	2.96	19,467	2.34	16,089	3.14	13,123	2.64	14,308	2.57846515
Austria	540	0.14	690	0.15	1,313	0.16	2,260	0.44	578	0.12	1,076	0.19394625
Bahrain	4,526	1.14	2,521	0.55	3,402	0.41	490	0.10	1,741	0.35	2,536	0.45702258
BGD									2,691	0.54	2,691	0.48495574
BHR									2,730	0.55	2,730	0.49198408
Belgium	1,190	0.30	210	0.05	2,598	0.31	2,574	0.50			1,643	0.29609152
CHR							4,980	0.97	4,177	0.84	4,579	0.82510957
Canada	31,527	7.94	29,577	6.40	48,525	5.84	35,465	6.92	29,230	5.87	34,865	6.28312332
Cyprus									143	0.03	143	0.02577059
Taiwan	4,603	1.16	466	0.10	1,787	0.21					2,285	0.41184895
Denmark	2,039	0.51	440	0.10	9,010	1.08	1,567	0.31	859	0.17	2,783	0.50153542
France	457	0.12	3,002	0.65							1,730	0.31168003
FSM							33	0.01			33	0.00594706
Germany	1,403	0.35	466	0.10	157	0.02			67	0.01	523	0.09429695
Greece	646	0.16	267	0.06	1,032	0.12	1,232	0.24			794	0.14313493
Hong Kong	3,814	0.96	3,232	0.70	2,028	0.24	4,885	0.95	1,545	0.31	3,101	0.55880742
Iceland			46	0.01							46	0.00828984
Israel			6,753	1.46	466	0.06	1,270	0.25	783	0.16	2,318	0.41773594
Italy	10,263	2.58	11,714	2.54	10,985	1.32	11,172	2.18	6,068	1.22	10,040	1.80942014
Japan	4,977	1.25	4,246	0.92	12,576	1.51	12,729	2.48	6,408	1.29	8,187	1.47544765
Korea									2,200	0.44	2,200	0.39647069
Kuwait	2,962	0.75	2,728	0.59	17,200	2.07	6,021	1.17	8,122	1.63	7,407	1.33477264
Lebanon					313	0.04	2,526	0.49	2,883	0.58	1,907	0.34372807
Marshall Is.	627	0.16			799	0.10					713	0.12849255
Netherlands	8,614	2.17	7,538	1.63	4,186	0.50	5,367	1.05	3,915	0.79	5,924	1.06758744
New Zealand	466	0.12	1,921	0.42	2,980	0.36	411	0.08	2,016	0.41	1,559	0.28091751
Norway	288	0.07	1,302	0.28	405	0.05	465	0.09			615	0.11083158
Palau	336	0.08	217	0.05	1,002	0.12	495	0.10	1,150	0.23	640	0.11533693
Panama									79	0.02	79	0.0142369
Papua New Guinea	25	0.01	400	0.09	403	0.05	3,033	0.59	783	0.16	929	0.16738272
Saudi Arabia	27,310	6.87	46,529	10.07	16,770	2.02	34,945	6.82	22,977	4.62	29,706	5.35347164
Spain			617	0.13	2,948	0.35			470	0.09	1,345	0.24238776
Switzerland			467	0.10	138	0.02	102	0.02			236	0.04247042
Sweden					783	0.09	79	0.02			431	0.07767221

Singapore	1,250	0.31			3,254	0.39	2,491	0.49	105	0.02	1,775	0.31987976
Trust Territories	8,042	2.02	14,662	3.17	18,142	2.18	24,286	4.74	13,185	2.65	15,663	2.82276318
UAE	17,294	4.35	13,290	2.88	19,432	2.34	10,795	2.11	14,524	2.92	15,067	2.71528358
Oman	474	0.12	981	0.21	79	0.01	1,500	0.29	1,624	0.33	932	0.16788732
Qatar	1,151	0.29	3,729	0.81	3,502	0.42	3,475	0.68	1,322	0.27	2,636	0.47500793
UK	5,245	1.32	4,987	1.08	2,969	0.36	1,851	0.36	3,988	0.80	3,808	0.68625472
US	230,298	57.97	256,054	55.42	592,442	71.24	297,860	58.09	334,967	67.31	342,324	61.6915963
Guam	6,931	1.74	14,446	3.13	13,258	1.59	16,895	3.30	6,117	1.23	11,529	2.07775872
Hawaii	10,753	2.71	14,829	3.21	17,227	2.07	5,388	1.05	7,104	1.43	11,060	1.99320233
Total	397,255	100.00	461,983	100.00	831,578	100.00	512,731	100.00	497,674	100.00	554,896	100.000006

Source of basic data: Foreign Trade Statistics

Appendix Table 24a. Quantity of exports of jackfruit (dried) by country of destination, Philippines, 1994-1998.

Country of Destination	1994		1995		1996		1997		1998		1994-98	
	kg	%	kg	%	kg	%	kg	%	kg	%	kg	%
Bahrain			50	15.43							50	4.67
Hong Kong			254	78.40	40	14.29	306	41.98			200	18.68
Switzerland			20	6.17			56	7.68			38	3.55
Taiwan				0.00	200	71.43					200	18.68
France				0.00	40	14.29					40	3.74
Guam				0.00			331	45.40			331	30.92
USA				0.00			36	4.94	285	84.82	161	14.99
Canada				0.00					51	15.18	51	4.76
Total			324	100.00	280	100.00	729	100.00	336	100.00	1,071	100

Appendix Table 24b. Value of exports of jackfruit (dried) by country of destination, Philippines, 1994-1998.

Country of Destination	*1994		1995		1996		1997		1998		1994-98	
	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%	US\$ FOB	%
Bahrain			461	17.29							461	6.55
Hong Kong			2,000	74.99	118	7.65	2531	48.73			1549.667	22.01
Switzerland			206	7.72			129	2.48			167.5	2.38
Taiwan				0.00	1100	71.34					1100	15.62
France				0.00	324	21.01					324	4.60
Guam				0.00			2309	44.46			2309	32.79
USA				0.00			225	4.33	1327	78.89	776	11.02
Canada				0.00					355	21.11	355	5.04
Total			2,667	100.00	1,542	100.00	5,194	100.00	1,682	100.00	7,042	100.00

*No available data

Source of basic data: Foreign Trade Statistics

Appendix Table 25. Completed and on-going researches on fruits undertaken at UPLB, 1980-2004.

Researcher	Title	Funding	Duration	Budget (P)
	<u>Completed (109)</u>			
Cardenas VR	<u>Dept. of Ag. Educ. And Rural Studies (1)</u> Control of papaya and citrus diseases	NFC	1992-93	
Calilung VJ	<u>Dept. of Entomology (4)</u> Control of melon thrips, Thrips palmi Karny by	DOST	1991-95	262,000
Medina JR	Anthocorid bug, Orius tantillus Motsch.	NAFC-DA	1992-95	168,487
Ocampo VR	Pilot trials on viruses of banana	PCARRD /	1994-98	
Sumalde AC	Preflowering reproductive bioecology & control of the mango leafhopper, Idioscopus clypealis (Leth) & associated minor pest species	DOST	1995-97	430,487
Subtotal	Papaya rehabilitation and development project In Southern Tagalog (Training and extension component)			
Angeles DE	<u>Dept. of Horticulture (13)</u> Pineapple production – postharvest R & D: Pineapple development project	DOST/PCARRD	1994-97	1,440,630
Angeles DE	Regulation of flowering in selected fruit crops	PCARRD UPLB-Applied	1990-93	272,230
Angeles DE	Fruit yield in relation to the vegetative characteristics of mango	PCARRD		170,026
Espino RRC	Cleaning up of citrus by tissue culture	PCARRD	1991-93	73,326
Espino RRC	Citrus breeding	NAFC		
Espino RRC	Development of rapid indexing for detection of leaf mottling and Tristeza virus in citrus	PCARRD /	1984-89	2,258,308
Espino RRC	Mass production of virus-free planting materials	DOST PCARRD /DOST PCARRD	1984-89	277,961
Espino RRC	in S.Tagalog of banana (Proj.2, Study 1)	PCARRD	1989-92	1,600,000
Espino RRC	Mango development project	/BUCAF DA-Reg. GIARA	1994-98	551,626
Javier FB	Rapid method of propagating pili and Mangosteen		1991-94	
Javier FB		Horticultu	1993-	169,669
				316,000

Namuco LO	Rapid selection of mango rootstocks inducing dwarfing and resistant to adverse soil and water conditions (VN Villegas)	re IDRC IFS/ UPLBFI	98	7,129,776
Namuco LO	On-site evaluation of lyches in the Philippines		1991-94	
Namuco LO	Technology assessment in mango in Luzon		1987-89	
Protacio CM	Elucidation of the mechanisms of KNO ₃ induced flowering in mango		1988	
Subtotal			1994-95	
Bajet NB	<u>Dept. of Plant Pathology (5)</u> Virus-like particles in banana, citrus, papaya, and vegetable legumes: Isolation and role in disease development	PCARRD / DOST	1993-97	116,727
Bajet NB	Infectivity and relation of the virus particles in papaya	UP Basic	1991-92	60,808
Divinagracia GG	Control of papaya virus disease by Intercropping	UP Basic/ Applied	1992-96	198,460
Opina OS	Resistance of selected fruits to important diseases	IPB/DA	1987-93	75,580
Subtotal	Development of disease management against papaya ringspot with special emphasis on cross protection technique	PCARRD / ASSP	1987-89	451,575
Labios RV	<u>Farming Systems & Soil Resources Institute (1)</u> Fruit and vegetable container project	ASEAN	1983-86	
Mabesa LB	<u>Institute of Food Science & Technology (13)</u> Sugarcane juice as a substitute for syrup in fruit processing*	PCIERD	1990-92	122,875
Mabesa LB	Development of beverage from blends of fruit & vegetable juices	PCIERD	1994-95	178,737
Raymund LC	Fruit-flavored syrup	IFST		
Raymund LC	Cashew prunes	IFST	1988	
Raymund LC	Fruit crispies/kropeck	IFST	1988	
Raymund LC	Instant mango juice powder	IFST	1988	
Raymund LC	Standardization of processing method and evaluation of different packaging	IFST	1993-96	
Raymund LC		IFST	1993-	

Raymund LC	materials and storage conditions of mango roll	IFST	96	5,000
Raymund LC	Dehydrated fruits	IFST		
Raymund LC	Development of instant calamansi juice	IFST/PCRDF	1992-94	
Raymund LC	Chemical and microbial changes in mango roll	FFC	1992-93	
Raymund LC	Development & improvements of fruit products (2 studies)	IFST	1996-97	
Raymund LC	Feasibility study of processing passion fruit		1989-91	
Raymund LC	wine and brandy in Lucban, Quezon			
Sanchez PC	Pilot production of pectic enzymes for food utilization (re: application to banana wine production)		1991-92	306,612
Sanchez PC			1995-97	
Subtotal				
Avenido RA	<u>Institute of Plant Breeding (13)</u> Micropropagation of banana and rattan for mass distribution	IPB/NSF	1989-94	40,000
Barba RC	Citrus improvement through biotechnology (3 studies)	IPB	1990-93	
Hautea DM	PCR-based fingerprinting of bananas and other Musa species in the Philippines for	IAEA	1994-95	
Mendoza DM	plant breeding and in vitro culture applications	PCASTR D-PCARRD		315,488
Molina GC	Control of ripening in papaya and mango by genetic engineering	IPB-NAFC	1997-98	
Patena LF	Etiology and transmission of vein necrosis in rambutan	IPB	1996-97	128,999
Patena LF	Citrus improvement through biotechnology	PCARRD / DOST	1990-94	
Villegas VN	Micropropagation of banana and rattan for mass distribution (2 studies)		1989-93	4,648,945
Villegas VN	Somatic embryogenesis/organogenesis in banana (Musa sp.) & calamansi (X. Citrofurtenella mitis)	ACIAR QDPI	1993-94	
Villegas VN	Control of papaya ringspot virus in the	DOST		351,001
Zamora AB		IPB/DA		35,000
				116,921
				160,031

Zamora AB	Philippines by the development of PRSV resistant hybrids	IDRC	1994-97	5,796,385
Subtotal	Varietal development in pineapple Breeding selected fruit crops (4 studies) Tissue culture of banana (Phase III) (2 studies) Banana (Philippine) project – Phase 3 – Tissue culture of banana	PCARRD / IDRC	1993-98 1987-92 1990-93 1990-95	
Bajet CM	National Crop Protection Center (17) Assessment of mango farmers' exposure to pesticides	NAFC	1994-96	111,093
Bajet CM	Maximum residue limits & assessment of occupational exposure of pesticides used in mango	NAFC-DA	1992-95	
Bato SM	Survey of mango pulp weevil (Pest Management & quarantine strategies for mango pulp weevil)	DA	1997-98	
Bato SM Bato SM	Control of mango leafhoppers Biology, ecology and population dynamics of mango tip borer <i>Chlumetia transversa</i> Walker	NCPC UP Basic	1982-89 1990-92	22,344
Bato SM Ayot Rig	Control of vectors of papaya ringspot virus	UPLB/BP I IPB		239,973
Bayot RiG	Screening of papaya cultivars or accessions against papaya ringspot virus (joint project of NCPC with IPB)	UP Basic	1990-91 1985-89	43,334
Cadatal TD	Isolation, characterization and screening of potential microbial antagonists against banana grown rot pathogens	NCPC		2,000
Dangan JM Dangan JM	Bio-control of mango leafhoppers, <i>Idioscopus clypealis</i> (Lethierry) and <i>Idioscopus niveosparsus</i>	NAFC NAFC-DA	1991-92	184,271
Dangan JM Palacio VB	Microbiological control of mango leafhopper	UP Basic ACIAR/PCARRD	1989-91	59,271
Talens AD	Management of mango hoppers and other	NAFC-DA	1994-96	184,271
Talens AD Tejada AW		NAFC/		2,500

Subtotal	pests using fungi Spot anthracnose on fruit crops Development of heat systems for quarantine disinfestation in tropical fruits – Entomology Etiology, characterization, identification and control of papaya virus diseases Fertilizer management as an alternative strategy for papaya ringspot virus control Studies on papaya viruses in the Philippines HPLC-Fluorescence determination of Avermectin B1 and its Delta 8,9 Isomer in Cavendish banana fruits	NCPC NCPC Hoechst/ DFI	1988-90 1992-95 1992-96 1992-98 1994-95 1992-94	849,057
De Ramos JD Bautista OK	<u>Postharvest Horticulture Training & Research Center (35)</u> Modification of the PHTRC dielectric hot water dipping tank for 'carabao' mango Improvement of postharvest handling systems for selected fruits, vegetables and flowers	TAPI BAR/PCARRD	1993 1995-96	52,325 975,040
Bautista OK Lizada MCC	in the regions (Phase 1) Postharvest handling of fruits and vegetables Development of postharvest systems for banana and papaya in the Philippines	RP-JAPAN AAPSI ACIAR/PCARRD	1991 1991-94 1993-95	1,000,000 265,634 1,186,144 1,800,000
Lizada MCC	Development of heat systems for quarantine disinfestation in tropical fruits – Fruit physiol	DA/BAR	1991-94	100,000 208,250
Lizada MCC	Postharvest systems improvement project for the banana and papaya Minimally processed 'Queen' pineapple and waste utilization	IAEA IAEA PNRI	1994-95 1991-94	25,000 346,930
Lizada MCC Lizada MCC	Evaluation of the shelf-life & quality of mangoes irradiated with doses required for fruit fly disinfestation (w/ EB Esguerra) Modified atmosphere packaging of 'solo' papaya	RRDP/PCARRD PH PH	1993 1989-90	994,000

MCC	Comparative effects of gamma radiation and VHT on the physiological and postharvest behavior of 'carabao' mangoes	PH PH-JSPS	1991-93	5,000 25,000
Lizada MCC	Reduction of fruit injury in 'carabao' mango subjected to vapor heat treatment*		1993	25,000
Lizada MCC	Controlled atmosphere storage studies on tropical fruits	PNRI-GIA	1995-96	202,479
Lizada MCC	Biological and physiological studies on fruits, vegetables and cutflowers	UP Basic/ Applied	1992-93 1989	627,000
Lizada MCC	Studies on lanzones (2 studies)	USAID/ Israel		11,335
Lizada MCC	Temporal relationship between some physico-chemical changes and the pattern of ethylene biosynthesis during maturation and ripening of the mango fruit	ACIAR UP Basic	1992-93	13,500
Lizada MCC	Studies on the shelf-life and acceptability of 'carabao' mango and 'solo' papaya subjected to gamma irradiation	RP/ JAPAN	1992-94	113,350
Lizada MCC	Handling trials for important fruit and plantation crops grown in the Southern Tagalog region	DOST	1994-97	171,102
Lizada MCC	Prevention of postharvest diseases by enhancing natural resistance of subtropical fruits	RRDP-PCARRD JSPS	1984-88 1989-90	1,969,000
Nuevo PA Nuevo PA	Induced physiological disorders in mango	IDRC	1988	1,590,222
Quisumbing EC	Morpho-anatomical studies of selected tropical fruits and vegetable. Phase I.		1992-95	130,222
Serrano EP	Mango and banana Commercial seed transport trials of selected fruits in modified atmosphere storage (4 studies)	GIARA-HAIGUD UPLB App. Research	1991-93 1994-01	277,663 357,350
M.C.C.Lizada	The use of modified atmosphere (MA) storage in extending the postharvest quality of some tropical fruits	IAEA		99,683
N.B. Flor	Reduction of fruit injury for 'solo' papaya	AUSAID		635,769
M.C.C.Lizada		NAST-		
E.B.Esguerra				
JU.Agrava				

nte E.P. Serrano N.B. Flor M.C.C.Liza da M. Maunahan L.A. Artes K.F.Yapten co M.C.C.Liza da	Subjected to VHT Postharvest biochemistry and morpho- anatomy Of fruits in the tropics	DOST DOST- PCARRD	1991- 93	1,532,210
M. Maunahan L.A. Artes K.F.Yapten co M.C.C.Liza da	Postharvest technologies for banana- Philippines	DOST- PCARRD	1991- 93	
			1993- 95	
			1993- 95	
E.P. Serrano R.D. Bugante M.C.C.Liza da	Biological control of postharvest diseases of Fruits Handling trials for horticultural crops grown in The Southern Tagalog regions		1993- 95	
E.B.Esguer ra N.B. Flor E.B.Esguer ra K.F.Yapten co E.B.Esguer ra	Evaluation of shelf-life and quality of mangoes Irradiated with doses required for fruit fly Disinfestation Pilot ASEAN ripening/pre-cooling complex		1996- 98	
			1996- 98	
E.B.Esguer ra K.F.Yapten co E.Q.Amato rio D.R. del Carmen M.C.C.Liza da N.A. Biglete N.A. Maas	Postharvest behavior of promising banana Cultivars with export potential Action research project on mango packinghouse		1996- 98	
	Extending the marketable life of 'Carabao' Mango by controlled atmosphere (CA) storage			
Lizada MCC	Evaluation of the hot water treatment as a method of disinfestation for the carabao mango (study)	PCARRD / RRDP	1991	59,627
Lizada MCC	Reduction of fruit injury in solo papaya subjected to vapor heat treatment	PCARRD /	1989- 91	171,102

MCC Lizada MCC Rejesus RS Subtotal	Postharvest handling of fruits and vegetables Reduction of fruit injury in carabao mango subjected to vapor heat treatment (2 studies)	/ RRDP RP-JAPAN PCARRD / RRDP	1991 1989-91	52,533 51,373 15,073,843
Ramirez DA Raymundo AK Raymundo AK Subtotal	<u>Institute of Biological Sciences (3)</u> Genetic control of sex expression in selected fruit crops exhibiting androeciousness and hermaphroditism Genetic analysis of Philippine banana strains Pseudomonas solanacearum Genetic analysis of Philippine strains of Pseudomonas solanacearum: banana (Bugtok) strains	UP Basic ACIAR PCARRD / DOST	1985-89 1993 1994-97	 538,003 538,003
Del Rosario EJ Subtotal	<u>Institute of Chemistry (1)</u> Extraction and ethanol fermentation of sugar from ripe banana	PCARRD	1984	
Espino TM Padua LE Santos TSJ Subtotal Total	<u>National Institute of Molecular Biology and Biotechnology (3)</u> Pilot production and utilization of pectic enzymes for food (banana and pineapple) applications Microbial control of oriental fruitfly, Bactrocera dorsalis (Hendel) infesting fruits of papaya, mango and banana Development of PGPR (Plant Growth Promoting Rhizobacteria) – based technologies for plant growth improvement & disease control of banana and papaya	PCIERD/TRRC/IFI BIOTEC H BIOTEC H	1995-97 1995-96 1995-97	606,606 10,000 10,000 626,606 31,758,352
Medina JR	<u>On-going (54)</u> <u>Dept. of Entomology (2)</u> IRDP Mango – Enhancing productivity of the Philippine mango industry: Development of site-specific IPM in mango	DOST/PCARRD	1997-99	80,631

Velaso LRI	Development of bait traps and detection protocol for use in quarantine surveillance	DA/BAR GA-HVCC	1998-2000	325,325
Subsubtotal I	of the mango pulp weevil in Palawan			405,956
Cedo MLO	Dept. of Horticulture (10) IRDP-Mango (Enhancing productivity of the Philippine mango) fertilizer application on	DOST PCARRD	1997-99	376,269
Angeles DE	mango through the diagnostic and Recommendation integrated system (DRIS)	DOST/ PCARRD	1996-99	118,643
Espino RRC	Nitrogen diagnosis of selected fruit crops in less than two minutes using the rapid nitrate test	DA/BAR		383,816
Espino RRC	Banana bunchy top disease control and rehabilitation of affected areas – Program coordination	DA/BAR	1998-2002	748,776
Espino RRC	Banana R & D project Subproj. 3. Cultivar improvement & germplasm conservation	PCARRD / DOST	1995-99	1,054,113
Espino RRC	In banana Study 1. Mutation breeding & Selection in banana	IDRC/ PCARRD PCASTR D	1994-99	170,304
Espino RRC	Community-based piloting of control strategies & rehabilitation of areas affected by banana	IPB	1985 Contg. 1996-2001	464,162
Namuco LO	bunchy top disease in Southern Tagalog Morphological studies of Philippine banana	HORTI	1991-Contg.	
Namuco LO	Use of protoplast fusion and somaclonal variation in banana cultivar development for disease resistance	IFS	1997-Contg. 1998-2001	3,316,083
Protacio CM	Breeding selected fruit crops: mango, citrus, jackfruit, chico, cashew, durian, longan and lychee			
Subsubtotal I	Varietal improvement of durian & lychee Controlling mango flowering and fruit			

	selling			
Opina OS	<u>Dept. of Plant Pathology (1)</u> Enhancing the productivity of the 'Saba' Industry Proj. 2. Improvement management System for 'Saba' banana	DOST/PCARRD	1997-99	757,608
Subsubtotal				757,608
Raymundo LC	<u>Institute of Food Science & Technology (1)</u> IRDP-Mango (Enhancing productivity of the Philippine mango Industry): Improved raw material handling and process control in mango	DOST/PCARRD	1997-99	502,211
Subsubtotal				502,211
Zamora AB	<u>Institute of Plant Breeding (24)</u> Banana R & D project Subproj. 4. Tissue culture of banana	BAR	1995-98	284,844
Coronel RE	Acquisition, conservation and management of genetic resources of priority fruit and ornamental crops	DOST/PCARRD	1996-99	245,767
Coronel RE	Collection, characterization, conservation & documentation of tree fruits germplasm	IPB-NAFC		
Damasco OP	Cell and tissue culture requirements and plant regeneration in banana & abaca	IPB	1975-Contg. 1996-2000	
Dizon TO	Disease resistance in papaya	IPB-NAFC	1995-Contg. 1999-2004	564,892
Garcia RN	Development of transgenic papaya resistant to PRSV – Proj. 1 Genetic diversity and molecular fingerprinting of papaya varieties.	PCARRD		
Hautea DM	elite lines and germplasm	IPB	1996-Contg. 1996	80,328
Hautea DM	DNA fingerprinting of banana, mango, and other priority crops	IPB	Contg. 1994-99	750,000
Hautea DM	Genome mapping of priority fruit crops	IAEA		
Mendoza EMT	PCR-based fingerprinting of banana and other Musa species in the Philippines for plant breeding and in vitro culture applications	USAID-Israel CDR PCASTR D/PCARRD	1995-99	1,863,939
Mendoza EMT	Avocado rootstock resistant to Phytophthora	DOST/PCARRD	1997-2000	490,242
Molina GC			1997-2000	

Narciso JO	root rot disease in cell cultures			
Mejico AP	Control of ripening in papaya and mango by genetic engineering	DOST/PCARRD	1997-98	
Perez EA	IRDP-Mango – Enhancing productivity of the Philippine mango industry:	IPB/DA-NAFC	1989-Contg.	
Rabara RC	Development	IPB	1990	
Sotto RC	of objective indices (biochemical, physiological & physical) for cultivar identification in mango	IPB	Contg. 1995-99	
Villegas VN	Sustainable production of cooking banana:	IPB-NAFC	1997-Contg.	939,558
Villegas VN	Disease management		1975-Contg.	311,772
Villegas VN	Varietal improvement of traditional cucurbits (watermelon, melon, cucumber)	IPB	1981-Contg.	412,046
Villegas VN	Asexual propagation of fruit bearing trees:	DOST/PCARRD	1999-2000	439,026
Villegas VN	Propagation of mango			
Zamora AB	Improvement of selected characters in banana by irradiation and tissue culture	DOST/PCARRD	1998-99	640,447
Subtotal	Establishment of a botanical collection of fruit and nut species	DOST/PCARRD / DOST	1993-99	7,022,861
	Collection, evaluation, conservation and documentation of small fruits	DOST/PCARRD	1993-99	
	Breeding selected fruit crops			
	Development of transgenic papaya resistant to PRSV Proj.1. Development of ringspot virus resistance through genetic engineering		1996-99	
	Varietal development in papaya (Phase 3)			
	Varietal development in pineapple			
	Varietal development of fruits with improved processing qualities: guava, guyabano, and passion fruit			
	Investigations on the in-vitro propagation of bananas for conservation and			

	utilization			
Santiago DR	<u>National Crop Protection Center (2)</u> Biological control of thrips by Entomopathogenic fungi in fruits & vegetables	NAFC	1996-98	
Talens AD	Development of enhanced & practical Immunological assays using polyclonal antibodies for detection of banana bunchy top virus in the Philippines	PCARRD / RCASTRD	1996-99	143,063
Subtotal				143,063
	<u>Postharvest Horticulture Training & Research Center (11)</u>			
Flor NB	Determination of readiness to flower in mango (fr.MCC Lizada)	DOST/PCARRD	1997-99	132,490
Esguerra EB	Enhancing productivity of the Philippine mango industry: Action research project on mango packinghouse (fr. MCC Lizada)	DOST/PCARRD	1997-99	378,991
Nuevo PA	Quality assurance systems for ASEAN fruits, fresh and minimally processed (w/ MCC Lizada)	AAECP		781,407
Nuevo PA		DOST/PCARRD	1997-99	359,018
Nuevo PA	Enhancing the productivity of the 'Saba' industry: Sub-Proj. 1. Action Research	DA/BAR	1997-99	1,759,317
Serrano EP	Project on 'Saba' packinghouse Improvement of postharvest handling systems for selected fruits, vegetables and flowers in Cordillera Administrative Region and Region XI (Phase II)	DOST/PCARRD	1997-99	268,982
Lizada, M.C.; L.A. Artes	Pineapple production R & D: Development of postharvest technologies for the 'Queen' pineapple	USAID-ARO		2,145,000
E.B.Esguerra	Prevention of postharvest diseases by enhancing natural resistance of subtropical fruits	DOST-PCARRD	1996-99	3,246,229
N.B. Flor	Action research project on Mango Packinghouse	PCARRD - Pantas Award Basic Res. UPLB	1994-2001	500,000
M.C.C.Lizada	Ameliorating symptoms of chilling injury in Horticultural crops	DA-NAFC	1994-01	95,000
JU.Agravante				2,000,000
E.P. Serrano				11,666,434

Subtotal	Postharvest factors affecting the development of Pulp tissue hardening in 'Latundan' banana Postharvest systems improvement project for Horticultural perishables (fruits, vegetables, and cutflowers) under Gintong Ani High Value Commercial Crops Program		1994-01	
Espino TM	<u>National Institute of Molecular Biology and Biotechnology (3)</u> Banana bunchy top diseases control and rehabilitation of affected areas Component	DA/BAR	1998-2002	639,067
Espino TM	2 – Production of diagnostic kits for indexing banana top virus and training	PCARRD /	1994-99	608,055
Luis EM	Production of diagnostic kits for indexing viral diseases of identified fruits	DOST BIOTEC H	1997-99	
Subtotal	Application of vesicular-arbuscular mycorrhizal fungi for improved growth of export potential fruit crops/trees			1,247,122
Total				25,061,338
GRAND TOTAL				56,253,682

Source: UPLB Office of the Vice-Chancellor for Research and Extension

Appendix Table 26a. MS Theses conducted at UPLB, 1980-1998.

Author	Year	Title
<u>Mango (12)</u>		
Marciales, L.B., Pantastico, E.B. (Agronomy)	1981	Epicotyl grafting and budding of carabao mango (<i>Mangifera indica</i> L.), Philippines
Covacha, S.A. (Horticulture)	1986	Response of carabao mango (<i>Mangifera indica</i> L.) to methods of irrigation
Gautam, D.M. (Horticulture)	1984	Postharvest behavior of carabao mango (<i>Mangifera Indica</i> L.) treated with preharvest calcium sprays, Philippines
Brown, E.O (AECO)	1992	Contract vs. owner-operator schemes in mango production: motivation, efficiency and output shares of earners
Laranang, C.C. (Horticulture)	1982	Seasonal variation in the endogenous growth regulators (stimulators or inhibitors) in mango (<i>Mangifera indica</i> Linn) stem cuttings, Philippines
Mercado, E.L. (Horticulture)	1981	Root activity in carabao mango (<i>Mangifera indica</i> L.) trees by radiotracer technique using ³² P (radioactive phosphorus), Philippines
Gonzales, J.L. (Plant pathology)	1981	Morphology, cultural characteristics, virulence and reaction to fungicides of <i>Colletotrichum gloeosporioides</i> from mango (<i>Mangifera indica</i> L.), Philippines
Bauran, N.L. (Statistics)	1986	Sampling techniques for measuring selected fruit characters in carabao mango (<i>Mangifera indica</i> L.), Philippines
Calvo, A. D. (Horticulture)	1983	Response to potassium nitrate application of <i>Mangifera indica</i> L. cultivars and <i>M. odorata</i> Griff. In Digos, Davao del Sur
Cua, A.U. (Ag. Chemistry)	1989	Ethylene biosynthesis in carabao mango fruit (<i>Mangifera indica</i> L.) during maturation and ripening
Magnaye, D. C. (AECO)	1995	Strategic planning for the development of mango industry in the Philippines
Syed-Nurul-Alam(Entomology)	1994	Population dynamics, varietal reactions, and microbial control of different species of mango leafhoppers
<u>Banana (20)</u>		
Gelido, M.E.R.A. (Horticulture)	1986	Characterization of the postharvest quality of cavendish banana (<i>Musa</i> sp. Cv. Umalog) from selected areas in Davao, Philippines
Rivera, F.N. (Horticulture)	1981	The use of protein and isoenzyme banding patterns in determining taxonomic relationships among Philippine cooking bananas and their parents (<i>Musa</i> species)
Valdez, E.R.T. (Horticulture)	1981	Some factors affecting the occurrence of senescent spotting in banana cv. Bungulan, Phil.
Rillo, A.R. (Plant pathology)	1981	Differences of <i>Pseudomonas solanacearum</i> EFS isolates (a bacterium) in abaca and banana, Philippines
Boncato, A.A., Davide, R.G. (Plant pathology)	1980	<i>Radopholus similis</i> on Cavendish banana in Davao del Norte (Philippines), culture and pathogenicity
Boncata, A.A., Davide, R.G.	1980	<i>Radopholus similis</i> on Cavendish banana in Davao del Norte (Philippines), laboratory and field evaluation of nematicides for <i>R. similis</i> control

Fabregar, E. T. Jr. (Soil science)	1986 Nitrogen and potassium fertilization of banana (Musa sp. Cv. "umalag" on a matina sandy clay loam
Damasco, O. P. (Horticulture)	1983 In vitro culture of saba banana (Musa spp. cv. Saba (BBB), Philippines
Tan, A.B. (Statistics)	1983 Prediction of yield of giant cavendish banana (Musa cavendishii Lambert)
Catao, B.T. (Statistics)	1983 A model for predicting exportable fruit yield of giant cavendish banana (Musa cavendishii Lamb.), Philippines
Cueto, C.A. (Plant pathology)	1989 Cultural and physiological requirements for toxin production of <i>Mycosphaerella musicola</i> Leach causing yellow Sigatoka in bananas
Soguilon, C.E. (Plant pathology)	1990 Survey, etiology and control of the "bugtok" disease of cooking bananas
Maghirang, H.C. (Food Science)	1992 Partial purification and characterization of polyphenoloxidase from banana (Musa spp.) buds
Payot, J. A. (Horticulture)	1993 Ripening response of "Bungulan" bananas to low temperature storage
Tandjung, A.I. (Food Science)	1983 Single-cell protein production from starchy materials (cassava flour, sweet potato flour and banana flour), Philippines
Pepito, Ma. F. B. (Horticulture)	1993 Physiological characterization of the green soft disorder of "Saba" banana
Roca, H. R. (Horticulture)	1992 Floral apex culture of Philippine banana cultivars
Munez, A. R. (Plant pathology)	1992 Symptomatology transmission and purification of banana bract mosaic virus (BBMV) I in giant cavendish banana
Artes, L. A. (Horticulture)	1994 Role of low oxygen levels in the devt. of ripening disorders in "saba" banana (Musa spp)
Bautista, M. G. (Botany)	1994 Morpho-anatomical characterization of some banana (Musa spp. Linn.) cultivars in relation to fiber quality
<u>Papaya (3)</u>	
Tantung, R. L. (Horticulture)	1994 Application of rapid nitrate test in papaya (<i>Carica papaya</i> L.)
Ortiz, G. I. (Horticulture)	1994 Physiological and biochemical characterization of hyperthermal injury in double dip treated "solo" papaya fruits (<i>Carica papaya</i> L.)
Velilla, A. D.R. (Plant pathology)	1996 Ethylene production and pectic enzyme activity in Papaya (<i>Carica papaya</i> L. cv. "Solo") fruit infected by <i>Lasiodiplodia theobromae</i>
<u>Selected fruits (3)</u>	
Golez, H.G. (Entomology)	1981 Population studies and control of oriental fruit fly <i>Dacus dorsalis</i> Hendel (Diptera: Tephritidae) in Guimaras Island, Philippines
Hueter, S.G. (Applied nutrition)	1989 Nutrition-orientation of selected advertisements and their influence on food behavior of selected rural and urban households, Philippines (includes fruit products)
Macabasco, D. R. (AECO)	1993 Export performance and prospects of selected fruits and vegetables in the Philippines, 1970-1990
<u>Durian</u>	
Shripan-Cheyginted (Horticulture)	1993 Effect of ethephon on the physico-chemical changes during the ripening of "Chanee" durian (<i>Durio zibethinus</i> Murray) harvested at different maturity stages

<u>Citrus (2)</u> Herradura, L. E. (Plant pathology) Sta. Cruz, F.C. (Horticulture)	1992 Isolation and partial characterization of Citrus tristeza closterovirus in the Philippines 1987 In vitro grafting of meristem tip for the recovery of Triteza virus-free pummelo (Citrus grandis Osbeck), Philippines
<u>Papaya, mango, and guava (1)</u> Koirala, M. (Social forestry)	1990 Correlates of the extent of woody perennials integrated with annual crops in upland farms: the case of Joson upland farmers assoc. in Nueva, Ecija, Phil. (incl. Papaya, mango, & guava)
<u>Pineapple (2)</u> Ravanera, R.R. (Agrarian studies)	1990 Impact of an agri-based transnational enterprise on peasants and peasant community: the case of Del Monte in Bukidnon, Philippines 1990 Improving the efficiency of flower induction in pineapple
Suba-Heenkenda, H.M. (Horticulture) <u>Cashew (1)</u> Dela Rosa, B.A. (Horticulture)	1990 Growth response of cashew (Anacardium occidentale L.) seedlings to varying light intensities and nitrogen levels
<u>Passion fruit (2)</u> Hardiyanto (Horticulture)	1994 Seed germination pre-treatments by fermentation, scarification and use of GA3 and ascorbic acid in passion fruit (Passiflora edulis Sims. F. flavicarpa Deq.) 1994 Cyanide metabolism in relation to ethylene biosynthesis in yellow passion fruit (Passiflora edulis f. flavicarpa)
Escalona, C. V. D. (Horticulture)	
<u>Watermelon (1)</u> Banasihan, V.P. (Entomology)	1983 Life history, damage and susceptibility to insecticides of Diaphania indica (Saunders) (Pyralidea, Lepodoptera) on watermelon, Philippines
<u>Jackfruit (1)</u> Fernandez, P.G. (Agronomy)	1982 Effects of air-drying moist storage and soaking on the physiology of jackfruit (Artocarpus heterophyllus Lam) seeds, Philippines
<u>Chico (1)</u> Pineda, D.C. (Horticulture)	1984 Some factors influencing the success of cleft grafting in chico (manilkara zapote (Linn) van Royen), Philippines
<u>Mangosteen (1)</u> Odtojan, R.C. (Horticulture)	1982 Floral seed and fruit development in mangosteen (Garcenia mangostana L.), Philippines
<u>Rambutan (1)</u> Fortuna, T.L.C. (Horticulture)	1982 Physical, chemical and physiological changes during rambutan (Nephelium lappaceum, L.) fruit development, Philippines
<u>Sugar apple (1)</u> Navachinda, S. (Horticulture)	1981 Effect of pruning and irrigation of sugar apple (Annona squamosa L.) production in Thailand*

Source: UPLB

Appendix Table 26b. Ph.D. dissertations on fruits conducted at UPLB, 1980-1998.

Author	Year	Title
<u>Mango (7)</u>		
Kunoongkeit, N. (Horticulture)	1985	Effect of storage atmosphere and exposure periods on the incidence of internal breakdown and physicochemical changes of carabao mango (<i>Mangifera indica</i> L.) fruits, Philippines
Corey, F.M. Jr. (Entomology)	1986	Some ecological studies and economic injury levels of the leafhopper (<i>Idioscopus clypealis</i> (Leath.)) on mango (<i>Mangifera indica</i> L.), Philippines
Golez, H.G. (Entomology)	1986	Bionomics and control of the mango seed borer <i>Noorda albizonalis</i> Hampson (Pyrilidae, Lepidoptera), Philippines
Khumlert, R. (Horticulture)	1992	Effect of gibberellic acid (GA3) on some physicochemical and physiological characteristics of "Kheaw Sawoey" mango (<i>Mangifera indica</i> L.) fruit
Gulatera, A. B. (Horticulture)	1993	Graft-take and growth response of different types of mango (<i>Mangifera indica</i> cv. "Carabao") scion treated with indolacetic acid and kinetin
Calvo, A. D. (Horticulture)	1994	Rambutan-based intercropping system
Cabahug, L. M. (Horticulture)	1994	Underlying mechanisms of VHT-induced internal breakdown of Carabao mango (<i>Mangifera indica</i> L.)
<u>Rambutan (2)</u>		
Sirithron, P. (Plant pathology)	1985	Morphological, biochemical and pathologic properties of the bacterium causing vein necrosis of rambutan (<i>Nephelium lappaceum</i> L.)
Sali Chinsathit (Horticulture)	1995	Effect of pacloburtrazol on shoot growth flowering, fruit set, and yield of rambutan (<i>Nephelium lappaceum</i> L.)
<u>Citrus (2)</u>		
Agustin, E.T. (Extension education)	1990	Sustainability of AEOP Agricultural Education Outreach Projects - Assisted Outreach Projects: the case of Aklan Agricultural College, Philippines (includes citrus-based farming systems
Carandang, L. D. (Extension education)	1995	Ariendo practice as an entry point for extension education among citrus growers in three municipalities in Oriental Mindoro
<u>Pineapple (1)</u>		
Abrigo, C.S. Jr (Ag. Chemistry)	1987	Optimization of parameters for volatile fatty acids and biogas production from pineapple peel, Philippines
<u>Bananas (4)</u>		
Acedo, A.L. Jr. (Horticulture)	1989	Ripening requirement and changes of saba bananas (<i>Musa</i> , BBB group) treated with ethylene from <i>Gliricidia</i> leaves (<i>Gliricidia sepium</i> Steud)
Fabregar, Ma. E. R. G. (Horticulture)	1997	Morpho-anatomy, nutrient uptake growth and development of three Banana (<i>Musa</i> spp.) Cavendish cultivars under high nitrogen, magnesium and zinc inputs
Mortuza, M.D. G. (Plant pathology)	1997	Effects of antagonistics, alum and ultraviolet irradiation on major fruit rots of banana (<i>Musa sapientum</i> L.)
Generalao, L. C. (Plant pathology)	1998	Microbial control of three major nematode species attacking Cavendish banana (<i>Musa</i> spp.)
<u>Passion fruit (1)</u>		
Kamtuo, A. (Plant breeding)	1990	Characterization, inheritance and mechanism of resistance to <i>Fusarium solani</i> in passion fruit (<i>Passiflora edulis</i> Sims)
<u>Papaya (2)</u>		
Sison, C. M. A. (Horticulture)	1992	Embryo rescue, isozyme analysis and preliminary screening for resistance to papaya ringspot virus of <i>Carica papaya</i> x <i>C. pubescens</i> interspecific hybrids
Roldan, M.B. (Horticulture)	1997	Anatomical and biochemical mechanism of tissue hardening in heat-treated "Solo" papaya (<i>Carica carica</i> L.) fruits

<u>Longan (1)</u> Sotto, R.C. (Horticulture)	1996 Morphological and biochemical investigations on three Sapindaceous species: Longan (<i>Dimocarpus longan</i> Larv. spp. <i>longan</i> var <i>longan</i>), Lychee (<i>Litchi chinensis</i> Sonn. Spp. <i>Chinensis</i>) and Alupag (<i>L. chinensis</i>)
<u>Mangosteen (1)</u> Somporn Na Nalorn (Horticulture)	1997 Effects of rate of nitrogen and timing of paclobutrazol application on flowering, yield and fruit quality of mangosteen (<i>Garcina mangostana</i> L.)
<u>Durian (1)</u> Evangelista, C. C. (Entomology)	1995 Biology, ecology, and control of durian fruit borers, <i>Tonica lagaropis</i> Meyrick (Decophoridae: Lepidoptera) and <i>Conogethes punctiferalis</i> (Guene) (Pyralidae: Lepidoptera)
<u>Others (1)</u> Del Rosario, M.J.D. (Food science)	1996 Formulation of ready-to-drink blends from fruit and vegetable juices

Source: UPLB

Appendix Table 27. Undergraduate theses conducted in the University of Southern Mindanao, Kabacan, Cotabato: 1996-1997.

Specialization	Author	Date	Title
Agronomy			
Horticulture (27)			
<u>Banana (7)</u>	Apusaga, H.L.; Roca, H.R.	1996	Floral apex culture of Lacatan banana as affected by solid and double phase media and levels of 2-Isopentenyl Adenine (2-ip).
	Decolas, T.A.; Roca, H.R.	1996	Effect of Cultar on the vegetative growth of Saba banana.
	Penkian, V.M.; Roca, H.R.	1996	Shoot tip culture of lacatan banana influenced by media composition and levels of 2-Isopentynyl Adenine (2-ip).
	Sabido, C.J.; Tornos, N.A.	1996	Efficacy of sel.fungicides & alum on the storability & disease control in Cavendish banana.
	Yog, J.C.; Turnos, N.A.	1996	Effect of alum & selected fungicides on the storability, quality, and disease in Lakatan banana.
	Oria, M.A.C.; Oria, D.V.	1997	Field evaluation of 2, 4-D as desuckering agent on 'Saba' banana.
	Renegado, A.L.; Roca, H.R.	1997	Maintenance and evaluation of Paclobitrazol-treated 'Saba' banana plants.
<u>Mango (7)</u>	Altares, J.F.C.; Turnos, N.	1996	Storability and quality of carabao mango treated with diff. Concentrations of napthalene acetic acid (ANAA).
	Bayacag, F.C.; Calvo, A.D.	1997	Effects of complete fertilizer (14-14-14) on the production of large planting materials (LPM) in mango (<i>Mangifera indica</i> L.).
	Evangelio, R.S.; Flojo, L.D.	1997	Growth response of mango rootstocks and grafting success as influenced by GA3 and Multicote (24-8-16) fertilizer application.
	Gabuat, M.N.; Amilbahar, A.K.	1997	Performance of grafted mango seedling as affected by albatros foliar fertilizer.
	Lavalle, R.L.; Bassal, M.G.	1997	Growth performance of grafted mango as affected by different levels of foliar fertilizer (ALGA FER LPF PLUS).
	Padernal, J.C.; Calvo, A.D.	1997	Growth of mango rootstock as influenced by growmax yellow/orange foliar fertilizers.
	Pagaran, E.B.; Calvo, A.D.	1997	Flowering and fruiting response of chemically-induced 'carabao' mango grafted on different rootstocks.
<u>Papaya (2)</u>	Baiton, A.C.; Lagan, E.M.	1997	Postharvest quality of Solo papaya as affected by duration of dipping time in different temperatures of hot water.
	Tabanay, J.M.; Lagana, E.M.	1997	Postharvest quality of Solo papaya as affected by polyethylene bag and hot water treatment.
<u>Lanzones (2)</u>	Bacus, L.B.; Turnos, N.A.	1996	Effects of different storage media on the storability and quality of lanzones fruit.
	Calayco, H.P.; Calvo, A.D.	1997	Percentage take and subsequent growth of lanzones as affected by scion storage.
<u>Jackfruit (2)</u>	Pagdatu, F.M.; Lagana, E.M.	1997	Effect of different pre-sowing treatments on the germinability of jackfruit seeds.
	Valdez, M.M.; Amilbahar, A.K.	1997	Growth and graftability of jackfruit seedlings as affected by albatros foliar fertilizer.
<u>Rambutan (2)</u>	Cobol, J.C.; Calvo A.F.	1996	Effect of diff. seed treatments on the germinability of rambutan seeds.
	Gegare, E.L.; Calvo, A.D.	1997	Growth of rambutan as affected by the number of rootstocks.
<u>Calamansi (2)</u>	Baran, J.S.; Calvo, A.D.	1997	Yield of ten-year old calamansi as affected by complete and urea fertilizer application.
	Rama, L.V.; Calvo, A.D.	1997	Influence of dark condition on root development and survival of potted calamasi marcots.
<u>Mabolo (1)</u>	Albarico, A.V.; Amilbahar, A.K.	1996	Germinability and seedling growth of mabolo as affected by seed drying & foliar fertilization.
<u>Rambutan/durian (1)</u>	Uy, R.M. et. Al.	1996	Vegetative growth response of rambutan and durian trees to rice waste materials.
<u>Durian (1)</u>	Subsuban, S.R.; Payawan, A.A.	1997	Response of incharged durian seedling to varying levels of gibberellic acid.
Plt. Pathology (12)			
<u>Banana (5)</u>	Albacarin, B.R.; Silvestre, J.C.	1996	Postharvest mycoflora on 10 banana varieties after 3 wks. storage under ambient condition.
	Dequina, B.A.; Ganoy, G.A.	1996	Evaluation of efficacy on different chemicals against two pathogens causing crown rot of Cavendish banana.
	Engalgado, R.C.; Jover, E.M.	1996	Evaluation of different methods and time of NaCl applications against "bugtok" disease

	Jaquias, C.T.; Tangonan, N.G. Membreve, E.O.; Silvestre, J.C.	of cardaba banana. 1996 Utilization of six banana varieties for culture media of ten fungal pathogens. 1996 Utilization of agricultural wastes as mulching materials to control nematode in commercial banana plantation.
<u>Durian (5)</u>	Dioneso, J.B.; Jover, E.M. Torremocha, N.R.; Dionio, B.T. Ambo, A.S.; De Ley, I.T. Mapait, O.Z.; Jover, E.M. Arguelles, J.E.; Jover, E.M.	1996 Comparative efficacy of Basamid granules and kamantigue phytofungicide against Fusarium wilt of durian seedlings. 1996 The influence of zinc and calcium-boron liquid fertilizers on the incidence and severity of phytophthora disease in durian. 1997 Cultural and morphological characterizations of twelve <i>Phytophthora palmivora</i> Butl. isolates and evaluation of inoculation techniques on durian seedlings. 1997 Chemical and phytofungicidal control of rhioctonia leaf blight and durian seedlings. 1997 In vitro and in vivo bioefficacy of marigold (<i>Tagetes erecta</i>) against fusarium leaf blight of durian seedlings.
<u>Mangosteen (1)</u> <u>Rambutan</u>	Capilitan, G.S.; Tangonan, N.G. Baron, J.D.; Evangelista, R.B.	1996 Field disease profile of mangosteen in Cotabato. 1996 Reaction of eight rambutan varieties against <i>Colletotrichum gloeosporioides</i> Penz causing leaf blight.
<u>Selected fruits (1)</u> <u>Soil Science (8)</u> <u>Lanzones (3)</u>	Pagaran, J.G.; Tangonan, N.G. Engalgado, R.C.; Evangelista, C.C. Guleng, I.E.; Evangelista, C.C.	1997 Utilization of six fruit seeds in culture media for the growth of ten fungal pathogens. 1996 Assessment of some physical and chemical characteristics of Kabacan clay loam soil planted to lanzones as affected by different levels of organic and inorganic fertilizers. 1996 Assessment of micronutrients and pH of Kabacan clay loam soil grown in lanzones as affected by different levels of organic and inorganic fertilizers.
<u>Calamansi (2)</u>	Lozano, S.G.; Evangelista, C.C. Panes, D.D.; Alagano, A.C. Tan, N.B.; Alagano, A.C.	1996 Assessment of some chemical characteristics of soil grown to lanzones at USMARC. 1997 Effect of NP fertilizer placement on the growth and fruit yield of six-years old Calamansi grown on Kilada sandy loam soil. 1997 Effect of different methods of NP fertilizer application on the growth and fruit yield of six-year old calamansi grown on Kilada sandy clay loam.
<u>Chico (1)</u>	Paledin, R.M.; Alagno, A.C.	1996 Effect of different organic and inorganic fertilizer combinations on the growth and fruit yield of eight-year-old chico.
<u>Durian (1)</u> <u>Pomelo (1)</u>	Sauza, R.J.; Nicor, F.P. Sajor, J.C.; Nicor, F.P.	1996 Characterization of some soils in Cotabato grown to durian. 1997 Effect of placement and different levels of organic fertilizer (defertame) on the growth of newly planted pomelo.
Community Broadcasting (9) <u>Mango (3)</u>	Belarmino, R.M.; Ontok, O.G. Cadungog, L.S.; Ontok, O.G. Enolva, R.P.; Ontok, O.G.	1996 Broadcasting dehydrated candied mango preparation messages to mango growers in the municipality of Bansalan, Davao del Sur. 1996 Utilization of Teknogiya as a tool in communicating mango chutney technology to some mango growers of barangays Calawag, Ginatilan, and Gli-Gli in Pikit, Cotabato. 1996 Communicating mango juice preservation messages via primer to housewives of mango growers in Poblacion, Antipas, Cotabato.
<u>Durian (1)</u>	Albona, M.R.D.S.; Ontok, O.G.	1996 Utilizing Teknogiya in broadcasting durian pastillas preparation messages to some selected market vendors in Poblacion, Bansalan, Davao del Sur.
<u>Rambutan (1)</u>	Amancio, I.R.; Ontok, O.G.	1996 The effect of broadcasting rambutan jam technology via Teknogiya on the knowledge of some housewives of rambutan growers in Brgy. Bandilog, Kidapawan, Cotabato.

<u>Banana (1)</u>	Billones, R.B.; Ontok, O.G.	1996 The effect of interposed <i>sengal</i> in communicating banana chips technology on some Maguindanaon banana growers in Brgy. Crossing Simuay, Sultan Kudarat, Maguindanao.
<u>Santol (1)</u>	Casipe, S.D.; Ontok, O.G.	1996 The effect of communicating santol chutney technology via Teknogiya on some housewives in Poblacion Mlang, Cotabato.
<u>Pineapple (1)</u>	Dulay, E.C.; Ontok, O.G.	1996 Broadcasting Nata de Pina preparation messages via Teknogiya over DXND on some pineapple market vendors of Poblacion, Kabacan, Cotabato.
<u>Pomelo (1)</u>	Salvador, R.P.; Ontok, O.G.	1996 Using interposed Balitao in communicating pummelo-peel preserve preparation messages on some housewives in New Rizal, Mlang, Cotabato.
Home Econ. (10)		
<u>Durian (4)</u>	Humbe, M.E.D.; Imlan, D.C. Pahm, L.D.; Domingo, L.M. Patriarca, J.M.; Antonio, E.H. Tangalin, C.M.; Murao, F.S.	1996 Utilization of durian seed flour in making polvoron. 1996 Effect of cooking temperature on the quality of durian jam. 1996 The effect of three varieties of banana on the quality of durian jam. 1997 Acceptability of durian shake using low-grade durian pulp from different varieties of durian.
<u>Papaya (2)</u>	Adam, M.A.; Castillo, S.T.	1996 The effect of diff. Kinds of milk on papaya conserve (condensed, evaporated, and skimmed milk).
<u>Pineapple (1)</u>	Apud, E.G.; Milanese, M.M.	1996 The product quality of papaya pickles as affected by different temperatures.
<u>Calamansi (1)</u>	Cadio, A.M.M.; Castillo, S.T.	1997 Product quality of dried pineapple as affected by different levels of lime.
<u>Banana (1)</u>	Calunsag, J.A.; Domingo, L.M.	1997 Product quality of calamansi juice candy with varying proportion of vegetable gum.
<u>Mango (1)</u>	Arao-Arao, G.Q.; Sabutan, E.B.	1996 Product quality of shake as affected by cardava banana flour made under different degrees of maturity.
	Dafieltomoto, A.P.; Castillo, S.T.	1996 Comparative study of diff. mango species on the quality and acceptability of mango puree.
Entomology (1)		
<u>Durian (1)</u>	Lezada, L.V.; Evangelista, C.C.	1996 Insect control practices of durian growers in selected Municipalities of Cotabato.
Plt. Breeding and Genetics (6)		
<u>Banana (2)</u>	Amoroso, R.B.; Manceras, R.S. Cabahug, J.C.; Manceras, R.S.	1997 In vitro induction of somaclonal variation in banana. 1997 Phenotypic response of tissue culture derived banana plantlets to organic fertilizer (sea crop).
<u>Papaya (1)</u>	Castronuevo, R.R.; Manceras, A.D.	1997 Heterotic pattern evaluation offlowering and other characteristics of papaya varietal crosses.
<u>Pineapple (1)</u>	Bilog, J.M.; Manceras, A.D.	1997 Development and seedling evaluation of different F1 pineapple hybrids.
<u>Durian (1)</u>	Padayao, J.L.D.; Cena, R.L.	1997 Cluster analysis of durian strains using morphological characteristics.
<u>Rambutan (1)</u>	Mamacos, E.G. Manceras, R.S.	1997 Phenotypic variability on seedling growth of rambutan cultivars grafted in different rootstocks.
Biology (2)		
<u>Banana (1)</u>	Cijuela, J.T.; Lerios, T.E.	1997 Microbial load of banana catsup exposed to kitchen conditions.
<u>Selected fruits (1)</u>	Nadong, M.T.A.; Lerios, T.E.	1997 Bacterial load of minimally-processed fruits of public market, Kabacan, Cotabato.
Chemistry (4)		
<u>Rambutan (3)</u>	Araneta, AL. D.; Bello, V.P.	1997 Correlation of some chemical characteristics to acceptability of rambutan (<i>Nephelium lappaceum</i> , Linn) fruit pulp.
	Barte, J.B.; et. al.	1997 Quality evaluation of rambutan (<i>Nephelium lappaceum</i> , Linn) fruit pulp from twenty accessions of the USMARC germplasm collection.
	Delos Santos, J.E.; Bello, V.P.	1997 Proximate analysis and phytochemical assay of rambutan seed.
<u>Durian (1)</u>	Amando, A.G.; et. al.	1997 Proximate analysis and phytochemical assay of durian seed.
Nutrition and		

Dietetics (7)		
<u>Durian (2)</u>	Araneta, A.C.; Antonio, E.H.	1997 Product quality of durian jam as affected by different extenders (sweet potato, yawtia, and rare ripe cardava).
	Nemenio, A.B.; Imlan, D.C.	1997 Product quality of low-grade durian pulp made into bars.
<u>Guyabano (1)</u>	Cabrillos, S.R.L.; Vilorio, T.G.	1997 Sensory quality of candied Guyabano as affected by different stages of maturity.
<u>Mango (1)</u>	Escalon, R.C.; Camacho, A.P.	1997 Acceptability of vinegar made from three varieties of mango (native, Cebu, Pico).
<u>Calamansi (1)</u>	Latonio, W.M.; Antonio, E.H.	1997 The product quality of candied calamansi made from different market forms of sugar.
<u>Banana (2)</u>	Quiapo, M.G. Jr.; Antonio, E.H.	1997 The effect of different market forms of sugar on the quality of dried banana.
	Patricio, D.B.; Toledo, M.E.A.	1997 Sensory qualities of cookies from banana (cardava) flour.
Econ & Mngt. (26)		
<u>Durian (24)</u>	Aragon, T.O.; dela Pena, G.S.	1997 Marketing practices, channels, costs, and margins of durian in Davao City.
	Bardonido, R.L.; Olivia, L.P.	1997 Supply and demand analysis of durian in Davao del Norte and Davao Oriental.
	Boron, A.M.; Forteza, E.A.	1997 Analysis of marketing strategies for durian in Davao del Norte and Davao Oriental.
	Bugarin, N.B.; Olivia, L.P.	1997 Demand analysis of durian in Davao City.
	Deita, G.F.; dela Pena, G.S.	1997 Marketing practices channels, costs, and margins of durian producers and traders in Davao del Sur.
	De Predo, E.R.; Dela Pena, G.S.	1997 Marketing practices, channels, cost & margins of durian in selected municipalities of North Cotabato.
	Deles, E.P.; Oliva, L.P.	1997 Demand analysis for durian in Zamboanga and Jolo.
	Dinopol, P.D.; Valdez, L.G.	1997 The role of producer groups in durian industry in Cotabato province.
	Dugang, L.D.; Guiamal, M.A.	1997 Economics of existing and new durian technologies in Davao del Norte and Davao Oriental.
	Felipe, H.F.; Forteza, E.A.	1997 Analysis of the marketing strategies for durian in Cotabato Province.
	Jover, D.D.; Forteza, E.A.	1997 An analysis of the marketing strategies for durian in Davao City.
	Labasan, J.G.; Oliva, L.P.	1997 Supply and demand analysis for durian in North Cotabato.
	Labio, M.F.; Dela Pena, G.S.	1997 Marketing practices costs and margins of durian in Zamboanga City.
	Luma-ad, V.T.; Oliva, L.P.	1997 Financial development and price analysis of durian in Davao del Norte and Davao Oriental.
	Manero, A.P.; Oliva, L.P.	1997 Supply analysis of durian production in selected districts of Davao City.
	Matula, Z.S.; Oliva, L.P.	1997 Supply analysis of durian in Zamboanga and Jolo.
	Numos, DE.L.; dela Pena, G.S.	1997 Marketing channels, practices, costs, and margins of durian in Davao del Norte and Davao Oriental.
	Ostique, E. Jr.B.; Oliva, L.P.	1997 Financial development and price analysis of durian in North Cotabato.
	Palomar, J.T.; Oliva, L.P.	1997 Financial devt. and price analysis of durian in Davao del Sur and Parang, Maguindanao.
	Pons, R.A.; Oliva, L.P.	1997 Supply and demand for durian in North Cotabato.
	Tomas, J.S.; Forteza, E.A.	1997 Analysis of marketing strategy of durian in Jolo, Sulu.
	Uyas, G.B.; Forteza, E.A.	1997 Analysis of marketing strategies of durian traders in Zamboanga City.
	Velasco, J.M.; Guiamal, M.A.	1997 Economics of existing and new durian technologies in Cotabato province.
	Villamor, R.L.; Valdez, L.G.	1997 The role of producer groups of durian in Davao City.
<u>Mango (1)</u>	Alisoso, J.C.; Guiamal, N.A.	1997 Marketing practices of mango traders in Digos and Bansalan, Davao del Sur.
<u>Jackfruit (1)</u>	Dela Cruz, G.D.	1997 Marketing of jackfruit in Calinan district, Davao City and Digos, Davao del Sur.
	Buenaventura, E.A.	

Source: Abstract Bibliography of Undergraduate Research in the University of Southern Mindanao, Kabacac, Cotabato:1996, Vol. II and 1997, Vol III.

Appendix Table 28: List of completed and on-going researches and extension projects at USM.

Author(s)/Researcher(s)	Study Title	Period covered	Budget (P)
<u>Completed</u>			
Baluyot, Norma M.	Germplasm Collection, Evaluation and Maintenance of Promising Marang Cultivars	1987-1993	360,000
Baluyot, Norma M.	Development of Rapid Propagation Techniques in Breadfruit (Rimas and Kamansi)	1987-1990	170,000
Callano, Reynaldo S.	Germplasm Collection, Maintenance and Evaluation of Durian and Rambutan	1988-1992	630,000
Baluyot, Norma M.	Germplasm Collection, Maintenance and Evaluation of Lanzones and Avocado	1988-1997	630,000
Bello, Violeta P.	Development of Convenient Processed Foods from Selected Fleshly and Juicy Fruits in Mindanao	1989-1994	325,000
Mate, R. Samson	Economics of Production and Marketing Selected Fruits in Southern Mindanao	1989-1990	100,000
Alagano, Artemio A.	Effect of Organic Fertilizers on the growth and yield of Chico, Santol and Kalamansi	1986-1997	
Cambel, Isidro H. <i>et al</i>	Response of Guyabano to Organic and Inorganic Fertilizer under Central Mindanao Condition	1986-1991	250,000
Calvo, A.F. & Calvo, A.D.	High Density Planting of Rambutan and Mango Various Dwarfing Rootstocks	1987-1996	720,000
		Total	3,185,000
<u>On-going</u>			
Antonio, E.H. <i>et al.</i>	Postharvest Handling, Utilization and Processing of Lakatan Banana		120,000
-	Development and suitability testing of commerciable processing technology of disease-free bananas		-
-	Verification of postharvest practices for lakatan banana		-
Bangoy, Criselda C.	Development and Evaluation of Communication materials in support of the Agro-Industrial Crops R&D in the Philippines		90,000*
	Development and evaluation of communication materials through prints		
	Development and evaluation of communication materials through broadcast		
Calvo, A.D. & Calvo, A.F.	Sustaining Productivity of Selected Fruit Crops Through Multiple Rootstock Planting and Fertilization		51,000*
	Multiple Rootstock Planting and Fertilizer Studies on Durian		
	Growth and Yield of Rambutan as Affected by the Number of Rootstock and Fertilizer Levels		
Calvo, Ariston D.	Characterization of Mangoes (<i>Mangifera indica</i> L.) at USM for Accreditation as Source of Scion		60,000*
Pamplona, Pablito P.	Durian Agribusiness Development for Domestic and Export Markets: Central Mindanao	1995-1999	5,890,000
Pamplona, P. P. <i>et. al</i>	Improvement of Existing Clonal and Nursery Management Practices in Durian for the Production of Quality Planting Materials		500,000
Pamplona, Pablito P.	Mindanao Fruit Development Program	1997-1999	4,500,000
Pamplona, P. & Cabangbang, R.	Development of Advanced Propagation Techniques for Selected High Value Fruit Crops		250,000
Oliva, V.G. & Oria, D.V.	Lakatan Banana Collaborative R&D Program		30,500
Oliva, Lydia P. <i>et al</i>	Marketing Assessment of Durian in Mindanao		144,000*
	Supply/demand analysis for durian		
	Marketing practices of durian in SEA countries		

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Oliva, L.P & Jimenez, E.	Financial development and price analysis for durian	
	Marketing policy analysis for durian in SEA countries	
	Socio-economics and Marketing of Banana in North Cotabato	120,000
	Losses of banana farmers from devastation	
	Production and marketing of banana	
Oria, Demetrio, <i>et al</i>	Supply and demand analysis of banana	
	Nursery and Orchard Management in Durian	120,000
	Piloting of Rehabilitation Approaches of Lakatan Banana Enterprise in Cotabato	200,000
	Field assessment of cultural practices and major pest and disease problems	
	On-farm verification on high yield technology practices in lakatan banana	
Ontok, O.G. & Bangoy, C.C.	On-station total quality management and high yield research in lakatan banana	
	Evaluation of field approaches to manage pests and diseases	
	Development and Evaluation of Communication Strategies for Effective Transfer of	120,000
	Technologies in Bananas in Southern Philippines	
	Development and evaluation of communication materials through prints	
Roca, H.R., <i>et al</i>	Development and evaluation of communication materials through broadcast	
	Tissue Culture Systems of Producing Disease-Free Planting Materials	120,000
	Utilization of plant parts in micropropagation of disease-free bananas	
	Field evaluation of micropropagated planting materials	

Annual budget

Source: University of Southern Mindanao

Appendix Table 29. Literature/publications on mango by discipline

Author(s)	Date	Title	Publication
		<u>Crop Production and Management (47)</u>	
A Cimafranca	1995	Series 6: Production Guide for Mango	RP-German Fruit Tree Proj.Technoguide Ser.
Agati, J.A.	1937	The rate of photosynthesis of Carabao mango leaves (<i>Mangifera indica</i> L.) under field conditions	Phil. Journal of Agriculture a/
AGCOM, RFU No. 6	n.d.	Mango	Mango
Alvarez, R.C.	1983	Mango growing in Tanay, Rizal	Greenfields a/
Andam, C. J.	1980	Effects of preharvest ethephon application on fruit retention, maturity and quality of Carabao mango (<i>Mangifera indica</i> L.)	UPLB MS thesis a/
Anit, G.A.	1983	Effects of growth regulators on the ripening of Carabao mangoes sprayed with ethephon before harvest	UPLB BS thesis a/
Anonymous	1979	Chemical spray disastrous to mango trees	Anim. Husb. Agric. Journal a/
Astudillo. E.O. & N.D. Bondad	1978	Potassium nitrate induced flowering of Carabao mango shoots at different stages of maturity	Phil. Journ. of Crop Sci. a/
Bondad, N.D.	1980	Research needs to fill gaps in mango flowering technology:bagging	PCARRD, Sp. Proj. Report (unpubl.) a/
Bondad, N.D.		Chemical induction of flowering in mango	Technology a/
Bondad, N.R. & C.V. Reyes	1991	Flowering and leaf scorching in mango sprayed with ammonium and potassium nitrates	Phil. Journ. of Science b/
Bondad, N.D. <i>et al</i>	1978	Foliar sprays of KNO ₃ for flower induction in Pahutan mango shoots	Phil. Journ. of Crop Sci. a/
Bondad, N.D. <i>et al</i>	1979	Smudging and KNO ₃ spraying of mango: comparative effects and costs, Phil.	Indian Journ. Hort. a/
Bueno, B.P & R.V. Valmayor	1974	Potassium nitrate: key to mango flowering	Agri. Los Banos a/
Bugante, Jr. R.D.	1993	Pruning and fertilization	Mango Production and Processing Tech.
Bhuiyan, Md. Abdul J.	1991	Flowering, yield and quality of Carabao mango as affected by fertilizer, KNO ₃ and irrigation	CLSU Ph.D. thesis
Calvo, A.D.	1983	Response to potassium nitrate application of <i>Mangifera indica</i> L. cultivars and <i>M. odorata</i> Griff. in Digos, Davao del Sur	UPLB MS thesis a/
Covacha, S.	1982	Pruning studies in mango	PCARRD Research Highlights a/
Covacha, S.	1986	Response of Carabao mango to methods of irrigation	UPLB MS thesis
DA XII	1996	Improvement of cultural management practices for sustainable mango prod	DA Progress Rep. RIARC
Dutcher, R.D. <i>et al</i>	1972	Chemical induction of flowering in Carabao mango	Agri. Los Banos a/
Felizardo, B.C. & R.E. Coronel	1971	Some cultural practices for mango	Agri. Los Banos a/
Gonzales, L.G.	1933	Influence of smudging on the respiration and catalase activity of the mango	Philippine Agr. a/
Gonzales, L.G.	1923	The smudging of mango trees and its effects	Philippine Agr. a/

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Hapitan, J.C.	1978 On liquid fertilizer application on mangoes	Modern Agri. Ind. a/
Hapitan, J.C., Jr.	1978 On the growth of mango flower clusters	Modern Agri. Ind. a/
Hapitan, J.C. Jr.	1977 On high density planting of mango	Modern Agri. Ind. a/
Lapade, B.E.	1977 The physical, mineral and hormonal changes in developing Carabao mango fruit under different irrigation treatments	UPLB Ph.D. dissertation a/
Laude, S.S.	1980 Comparative study of the qualities of naturally-produced and chemically induced mango fruits	UPLB BS thesis a/
Lazo, F.D.	1970 The mango industry in the Philippines	Philippine Journ. Plt. Ind. a/
Llanes, V.A.	1976 How to make mango trees flower in any season	Greenfields a/
Metra, T.M.	1983 Mango fertilization for better production	Technology
Montaras, M.G.	1983 Margem Corporations Mangahan Farm: A Case Study	UPLB BS thesis
Ortaliz-Ranada, C.	1993 Bagging/Wrapping: Towards the Improvement of the Phil. Mango industry	Mango Production and Processing Tech.
PCARRD	1995 Bagging techniques for good quality mangoes	Information Bulletin
PCARR, UPLB	1979 Research needs to fill gaps in off season mango production	A Primer on Flower Ind. Tech. for Mango
Quimson, R.	1993 Management practices of the Quimara farm	Mango Production and Processing Tech.
Quirol, P.T.	1987 Carbohydrate and nitrogen levels of Carabao mango shoot sprayed with KNO ₃	UPLB MS thesis b/
Reyes, N.O.	1978 Effect of rest breaking agents on flowering of mango	UPLB BS thesis a/
Rimando, T.J.	1977 Effect of soil moisture, rainfall, light and temperature on natural flowering pattern, fruit set and development and tree response to flower-forcing treatments	Flowering and fruiting proj. in Mango UPLB-PCARR Proj. No. 149 Annual Report a/
Samala, M.T.F.	1979 Morphological changes in mango shoot apex before and after spraying with potassium nitrate	UPLB BS thesis a/
Simon, D.N.	1993 Nutritional status and productivity of Carabao mango (Mangifera indica L) trees induced regularly with potassium nitrate as influenced by fertilizer and indole acetic acid	CLSU MS thesis
Tolentino, E.P.	1977 Occurrence and development of mango flushes in selected orchards in Tagalog provinces	UPLB BS thesis a/
Thongkham, P.	1987 Effects of fertilizer and irrigation on the quality and yield of Carabao mango	CLSU MS thesis b/
Univ. of Southern Mindanao	1996 How to grow mango	USM Teknogiya
Valmayor, R.V.	1972 The Philippine mango industry - its potential and progress	Acta Hortic; Hort. Abst.; torp Abst; and Symposium on Mango and Mango Culture a/
Valmayor, R.V.	1968 The mango and cashew	Eso Agroservice Bull. No. 16 cited in Horticulture Abstracts 1973

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<u>Crop Protection (38)</u>		
Alicbusan, R.V. & L.A. Schafer	1958 Diplodia rot of mango	Phil. Agr. cited in Hort. Abst. 1973
Anonymous	1976 Anthracnose lowers mango production	Plt. Prot. News a/
Barroga, G.J.F. & L. I. Ilag	1991 Screening of microorganisms as potential biological control agents for mango anthracnose	Pest Mgt. Control Council of the Phil.
Bato, S.M.	1978 The biology, ecology and control of <i>Idioscopus clypealis</i> (Lethieri) (Cicadellidae, Homoptera)	UPLB MS thesis c/
Bato, S.M.	1981 Control of mango insect pests and fruit diseases	PCARRD Research Highlights a/
Bato, S.M., <i>et al</i>	1983 Integrated pest control for mango leafhoppers	NCPC Leaflet Series, NCPC, UPLB a/
Bergonia, H.T. & C.C. Diloy	1980 Fruitfly control on mango for export	Technology a/
Custodio, H.A. & E.D. Magallona	1980 Pesticide residue analysis of major fruits	UPLB-PCARR Proj. No. 253; PCARRD
	1981	Research Highlights a/
Dangan, J.M. & A.N. Pordesimo	Comparative efficiency of fungicides in a spray program against mango anthracnose	PCCP 14th Annual Conv. Abstr. of Papers a/
Dangan, J.M. & A.N. Pordesimo	1983 Comparative efficacy of fungicides in a spray program against mango anthracnose	Philippine Phytopathology b/
Dupo, H.F. <i>et al</i>	1993 Condifor: A novel insecticide for the control of mango hoppers	Pest Mgt. Council of the Phil. b/
Esberto, M.D.P.	1995 How to control pests on mango	USM Teknogiya
Glass, E.H. <i>et al</i>	1966 Notes on the biology of three leafhoppers on mango	Philippine Agr. cited in Hort. Abstracts 1973
Golez, H.G. & G.P. Gabrillo	1983 Studies on the biology and ecology of mango seed borer and its control	PCARRD Research Highlights a/
Golez, H.	1989 Study on the biology and ecology of mango seed borer and its control	R&D Philippines
Golez, H.G. & H.G. Bignayan	1993 Pest management for mango	Mango Productin and Processing Tech.
Hapitan, J.C. Jr.	1978 On anthracnose disease of mangoes	Modern Agri. Ind. a/
Jardine Agchem	n.d. Mangga	Payong Pansakahan
Jardine Agchem	n.d. Makabagong Teknolohiya sa Pagpuksa ng mag Peste ng Mangga	Jardine Leaflets
Manoto, E.	1981 Control of Oriental fruitfly by the sterile male release technique: studies on population dynamics, fruit infestation sequence and dispersal of <i>Dacus dorsalis</i>	PCARRD Research Highlights a/
Manzanilla, A.S. Jr.	1961 Preliminary studies on fungicidal dip for bananas and mangoes in storage against fruit decay	UPLB BS thesis cited in Hort. Abst. 1973
Marsman and Co., Inc.	n.d. Marsman Technoguide for Mango	Marsman Guides
Ocfemia G.O. & J.A. Agati	1925 The cause of the anthracnose of avocado, mango and upo in the Phil. Is.	

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Obligado, A.	1985 Evaluation of Pay-off 100-E for the control of insect pests in mango	PCARRD Research Highlights b/
Ona, H.G.	1977 The fruitfly infestation of green mangoes (<i>Dacus dorsalis</i> Hendel)	AUF BS thesis a/
Palo, M.A. & C.E. Garcia	1935 Further studies on the control of leafhoppers and tip borer on mango inflorescences	Phil. Journ. Agri a/
PNRI	1996- Integrated fruit fly management based on sterile insect technique 1998 in Guimaras Island	PNRI Progress/Annual Rep.
Pordesimo, A.N.	Development of programmed spray application for the control of anthracnose	PCARRD Research Highlights 1982 a/
Pordesimo, A.N. <i>et al</i>	1883 Pathologic reaction of twenty mango cultivars to anthracnose and diplodia stem-end rot	PCCP 14th Annual Conv. Abst. of Papers a/
Quebral, F.C.	1968 Anthracnose of mango	UPCA Plant Disease Report Series No. 6 a/
Quimio, A.J.	1979 Control of postharvest diseases of fruits III. Postharvest control of mango rots by hot fungicide suspensions	Abstract Bibl. of Researches in Agr., For., and Fisheries in the Phil.
Quimio, A.J. & T.H. Quimio	1974 Postharvest control of Philippine mango anthracnose by hot water treatment	Philippine Agr. a/
Quimio, A.J. & T.H. Quimio	1974 Postharvest control of Philippine mango anthracnose by benomyl	Philippine Agr. a/
Quimio, T.H.	1974 Mango anthracnose and low temperature storage; Postharvest	Philippine Agr. a/
	1982 handling of mango and rambutan	
Sant Ram, L.D. & S.C. Sirohi	1988 Internal fruit necrosis of mango and its control	Acta Hort. b/
Serrano, F.B.	1933 Blossom-blight of mangoes in the Philippines	Philippine Journ. Sci. a/
Tongumpal, P. <i>et al</i>	1980 Timing of benomyl potharvest treatment for the control of mango anthracnose and Diplodia stem-end rot	CLSU-PH Scient. Journ. a/
Westcott, C.	1964 Mango (<i>Mangifera indica</i>)	The gardener's bug book
	<u>Plant Ecology (10)</u>	
Dannug, D.T.	1993 Documentation of descriptive morphology of mango varieties and other fruit crops	Plant Industry Bulletin
Gauran, N.L. & A.L. Carpena	n.d. Sampling techniques for measuring selected fruit (<i>Mangifera indica</i> L.) characters in Carabao mango	UPLB MS thesis
Juliano, J.B.	1937 Embryos of Carabao mango (<i>Mangifera indica</i> Linn.)	Phil. Agr. cited in Hort. Abst. 1973
Juliano, J.B.	1934 Origin of embryos in the Strawberry mango	Phil. Journ. Sci. cited in Hort. Abstr. 1973
Juliano, J.B. and N.L. Cueva	1932 Floral morphology of the mango (<i>Mangifera indica</i> L.) with special reference to the Pico variety from the Philippines	Phil. Agr. cited in Hort. Abstracts 1973
Macaisip, A.C.	1958 Study of some chemical changes during the ripening of mango	UPLB BS thesis, cited in Hort. Abstr. 1973
Menzel, Christopher	1994 Tropical and subtropical fruit	Encyclopedia of Agr. Sci.
Taylor, Norman (ed)	1961 Mango	Taylor's Encyc. of Gardening: Hort. and

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Mukherjee, S.K.	1985 Systematic and ecogeographic studies of crop genepools: <i>Mangifera</i> L.	Landscape Desing IBPGR Systematic Studies
Valmayor, R.V.	1962 The mango, its botany and production <u>Plant Propagation and Nursery Management (17)</u>	UPCA monograph, cited in Hort. Abst. 1973
Alcala, P.E. & A.V. San Pedro Araullo, Jr. T. R.	1935 Bud differentiation in smudged mango trees 1967 A comparative study of four vegetative methods of propagating mango	Phil. Agr. cited in Hort. Abst. 1973 UPLB MS thesis cited in Hort. Abstr. 1973
Balila, C.A. & R.B. Paragas	1995 Seed germination and early seedling growth of Carabao mango as influenced by different growing media and seed treatments	CLARRDEC SOA and Abst. Bibl. of Mango Researches
Barba, R.C.	1995 Induction of flowering of the mango by chemical spray	CLARRDEC SOA and Abst. of Bibl. of Mango Researches
Fabro, N.L.	1985 Effect of alpha-naptahlene acetic acid (ANAA) on the rooting of marcotted mango	CLSU Sci. Journ. b/
Gonzales, L.G.	1933 Influence of smudging on the respiration and catalase activity of the mango (<i>Mangifera indica</i> Linn.)	Phil Agr. cited in Hort. Abst. 1973
Gonzales, L.G. Gulatera, A.B.	1923 The smudging of mango trees and its effects 1986 Graft and take response of different types of Mango (<i>Mangifera indica</i> L. cv Carabao) scion treated with indole acetic acid and kinetin	Phil Agr. cited in Hort. Abst. 1973 UPLB Ph.D.thesis cited in CLSU SOA & AB of Mango Researches
Isidro, M.C. & E.L. Mercado	1987 Germination of Carabao mango seeds extracted at varying intervals	none
Lye Tuck Thye	1978 Ethylene and the induction of flowering by potassium nitrate in mango (<i>Mangifera indica</i> L.)	MS thesis cited in Abst. of MS theses & Ph.D. diss. (1970-78) of SEARCA scholars at UPLB 1979
Lauron, H. & E.I. Mercado	1995 Seed germination and seedling growth of Carabao mango using different seed treatments and growing media	none
Pantastico, E.B. <i>et al</i>	1976 Studies on rapid asexual propagation methods; rooting techniques	UPLB NFAC Proj. Annual Report a/
Salac, S.S.	1955 The influence of four kinds of stocks on behavior of Carabao mango as scion	UPLB BS thesis cited in Hort. Abst. 1973
Sotto, R.C. & E.C. Operio, Jr.	1983 Storage, transport and graftability of scion fruit trees. Study I. Storability and graftability of scions of fruit trees	UPLB-PCARRD Proj. Mid-year Report a/
Tamondong, R.G.	1955 Topworking unproductive Philippine mango trees to Higgins, a selected C.A. seedling variety of Indian mango	UPLB BS thesis and Hort. Abst. a/
Tome, M.E.P. & N.D. Bondad	1991 Growth and flowering of Carabao mango with paclobutrazol	Phil. Agr. b/

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Valmayor, M.A.	and KNO ₃ 1987 Role of ethylene in KNO ₃ -induced flowering in mango <u>Varietal Improvement (9)</u>	UPLB MS thesis b/
Bondad, N.D. & R.V. Valmayor Coronel, R.E.	1979 It's Katchamitha, not Indian mango 1981 Mango genetic resources and varietal improvement in the Philippines	Greenfields a/ Intern. Symp. on Current Problems on Fruits and Vegetables, Mar 1980 a/ Proceedings of 2nd Nat. Fruit Crops Symp.a/ UPLB BS thesis a/
Pablo, S.J. Reyes, C.V.	1979 Varietal improvement of major fruits in the Philippines 1981 Proximate analysis and mineral composition of 18 cultivars of mango (<i>Mangifera indica</i> L.) fruit	
Rivera, Rex A.	1996 A guide to mango culture and technology fro Mindanao, Philippines	A Guide to Mango Culture and Technology for Mindanao, Philippines CA-UPLB a/ MS thesis a/
Valmayor, R.V. Villegas, V.N.	1962 The Mango: its botany and production 1979 The cytology and floral morphology of some Philippine <i>Mangifera indica</i> L.	
Wester, P.J. Wester, P.J.	1924 A descriptive list of mango varieties in India: An addenda 1920 A descriptive list of mango varieties in India <u>Postharvest Technology (33)</u>	Phil. Agr. Rev. a/ Phil. Agr. Rev. a/
Carandang, J.P. <i>et al</i>	1981 Improvement and development of crates for harvesting and transporting mangoes	FORPRIDE Digest a/
Carandang, J. <i>et al</i>	n.d. Improvement and development of crates for harvesting and transporting of mangoes: Compression and tensile strength test of bamboo baskets (kaing)	Leaflet b/
Cortez, T.L. Costales, M.B.	1972 Factors affecting firmness of some fruits 1983 Comparative effects of different leaf ripening promoters and calcium carbide ripening of mango	UPLB BS thesis a/ TCA MAT thesis
Del Mundo, C.R. <i>et al</i> Gautam, D.M.	1984 Indices of harvest maturity in Carabao mangoes 1984 Postharvest behavior of Carabao mango treated with pre harvest calcium sprays	Postharvest Research Notes a/ UPLB MS thesis a/
Gautam, D.M.&M.C.C. Lizada	1984 Internal breakdown in Carabao mango subjected to modified atmosphere I. Storage duration and severity of symptoms	Postharvest Research Notes a/
Freechagul, P.	1989 Effect of waxing on the storage of Carabao mango fruits harvested at different maturity stages	CLSU MS thesis b/
Higgins, J.E.&E.S. Punzalan Ilangantileke, S & V. Salokhe	1925 Refrigeration of mango 1990 Postharvest biotechnology to increase the storage life of mango	Phil. Agr. cited in Hort. Abst. 1973 Proc. of 2nd ASEAN Sci. & Tech. Week (DOST) a/
Ketvarapon, S.	1988 Accelerating ripening of mango fruits harvested at different	CLSU MS thesis b/

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Leong, P.C. & S.K. Lee	stages of maturity using chemical and locally available materials 1982 An investigation on the use of modified atmosphere for storage of mango	Proc.of Worksh.on Mango & Rambutan a/
Lertpruk, S.	1983 Postharvest behavior of Carabao mango fruit sprayed with ehthephon as a preharvest inducer of maturation	UPLB MS thesis a/
Lizada, C.	n.d. The postharvest physiology and biochemistry of the Carabao mango	PHTRC b/
Lizada, C. <i>et al</i>	1985 Anatomical and physiological characteristics of the Carabao mango in relation to its postharvest behavior	Proc. of Food Conference, Manila b/
Lizada, M.C.C. <i>et al</i>	1983 1-Aminocyclopropane - 1- carboxylic acid in tropical fruits and vegetables	Acta Hort. a/
Lizada, M.C.C.	1993 Harvesting and postharvest practices	Mango Production and Processing Tech.
Lizada, C. <i>et al</i>	1990 Comparative effects of gamma radiation and vapor heat treatment on the fruit quality of Carabao mangoes	Phil. Nuclear Journ. b/
Macaisip, A.C.	1958 Study of some chemical changes during the ripening of mango	UPLB MS. thesis a/
Manalo, J.A. <i>et al</i>	1968 Softening effects of radiation on mango, chico and guava fruits	SOA and Abst. Bibl. of Mango Researches Vol. 2 1986 (Crops Bibl.) Series No.12
Manoto, E.S. <i>et al</i>	1990 Irradiation as a quarantine treatment of Carabao mangoes	Phil. Nuclear Journ. b/
Maunahan, M.V.	1988 The Philippine banana industry; The Philippine mango industry	The Phil. Banana & Mango Industries. Proc.of the 2-day Nat. Workshop on Pre- & Postharvest Tech. for Banana & Mango (ed) E.C. Quisumbing)
Mendoza D.B. <i>et al</i>	1981 Postharvest handling of mangoes in the Philippines -status and problems	Internat. Symp. on Current Problems on Fruits & Vegetables, Mar. 1980 a/
Mendoza, D.B.	1978 Postharvest handling of major fruits in the Philippines. In: Aspects of Postharvest Horticulture in ASEAN. D. Graham <i>et al</i> (eds)	ADAB Australia a/
Mendoza, E.B. <i>et al</i>	1985 Mango exportation trial in Singapore: simulated evaluation of ASEAN-PHTRC	SOA and Abst. Bibl. of Mango Researches
Nuevo, P.A. <i>et al</i>	1984 Internal breakdown in Carabao mango subjected to modified atmospheres III. Starch in the spongy tissue	Postharvest Research Notes a/
Ola, T.M.	1978 Fast or slow ripening of mangoes	CLSU BS thesis; Phil. Farmers' Journ. a/
Ola, T.M.	1974 Effect of different materials on the ripening of mango fruits	CLSU Expt. Sta. Contr. a/
Pantastico, E.B. <i>et al</i>	1970 Mangoes: harvesting, marketing and storing them	Agric. Los Banos cited in Hort. Abst. 1973
PHTRC	n.d. Delaying and ripening process of fruits	Postharvest Tips
Piyarom, S.	1989 Effect of bagging and maturity at harvest on the quality of	CLSU MS thesis b/

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Zerrudo, J.V.	Carabao mango fruits during storage	SOA & Abst. of Bibl. of Mango Researches
Zerrudo, J.V. & J.P. Carandang	1985 Packaging and transport of Philippine mangoes	NSTA Tech. Journ. a/
	1983 Improved packaging for mangoes	
	<u>Processing and Utilization (19)</u>	
Anonymous	1986 Parameters for canned mango puree set	Food Technology Digest b/
Avena, R & B. Luh	1983 Sweetened mango purees preserved by canning and freezing	Journ. of Food Sci. b/
Baclig, R.V.	1979 The establishment of minimum thermal processes for canned mango (<i>Mangifera indica</i> Linn.) products	UP Diliman MS thesis c/
Carreon, F.M.	1947 Phytochemical study of mango seeds (<i>Mangifera indica</i> Linn.)	Journ. Phil. Pharm. Assoc. a/
Crisostomo, L.C.	1978 The status and problems of processing and utilization of fruits	Proc. of 1st Nat. Fruit Symp. a/
De Leon, S. & E. Bernardo	1983 Candied mangoes	Coll. of Home Econ. b/
De Leon, S.Y. & B.L. Salas	1979 Packaging and storage studies on dehydrated candied mangoes and bananas	Annual Rep. UPCHED-PCARR Proj. No. 371; Proc. of 2nd Nat. Symp. on Fruits a/
Fernandez, F.C. & T.P. Acevedo	1975 Control of decay in ripe mangoes by water blanching	UP Home Econ. Journ. a/
Mauricio, T.C. <i>et al</i>	1967 The processing of mango beverage	Phil. Agr. cited in Hort. Abst. 1973
Ouano, M.J.	1933 Pickling qualities of some Philippine fruits and vegetables	UPCA Biweekly Bull. a/
Onate, L.U.	1967 Preserving mangoes at home	Agric. Los Banos cited in Hort. Abst. 1973 a/
Pablo, L.S.	1979 Solar drier for tropical fruits and marine products for rural development	NSTA Tech. Journ. a/
PCARR, UPLB	1984 Osmotic drying of mango	Technology
Raymundo, L.C.	1993 Processing and utilization of mangoes	Mango Production and Processing Tech.
Rillo, B.R. <i>et al</i>	1985 Fermentation of selected fruits and vegetables: Softening in fermented green mangoes	Nat. Sci. and Tech. b/
Sanchez, P.C.	1979 Fermentation of fruits and vegetables II. Utilization of Philippine native fruits by fermentation	PCARRD Proj. No. 274 c/
Tocino, E.M.	1973 Freezing preservation of mango (<i>Mangifera indica</i> Linn.)	MS thesis
Yu, A.N. & M. del Valle	1979 Preparation and characterization of mango peel pectin	UP Home Econ. Journ. a/
Zamuco, C.T. & P. Lomibao	1924 Some methods of preserving mangoes	Phil Agr. cited in Hort. Abst. 1973
	<u>Mango Industry (18)</u>	
Bacani, S.	1995 The Uruguay Round's Impact on Philippine Agribusiness Competitiveness: Fruits and Vegetables	ULTREX Managers & Consultants, Inc. Final Report
BAS	1998 Development trends in agriculture: International comparisons	BAS
BAS	1997 Costs and returns surveys (CRS) of mango, cashew, potato and upland vegetables	BAS
Bondad, N.C.	1986 Year-round mango production - Its unique industry features	none but cited b/
Brown, E.	1992 Contract Vs. owner-operator schemes in mango production:	UPLB MS thesis b/

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Lantican <i>et al</i> Lizada, C. Magnaye, D.C.	motivation, efficiency and output shares of earners 1996 Commercial crops subsector: fruits, vegetables and ornamentals 1995 Assessment of the Fruits (Mango) Industry 1995 Strategic planning for the development of the mango industry in the Philippines	AGRICOM & APRAAP DOST-UNDP UPLB MS thesis
Nones, Jr. D.I.	1998 Profitability of backyard and commercial contract spraying and self-spraying in mango production in Batangas City, 1997	UPLB BS thesis
Octavio, G.G.	1988 An assessment of the Philippine mango industry: implications for R&D	The Phil. Banana and Mango Industries
Patricio, H.	1985 A study on the selected socio-economic characteristics of mango growing barangays in Guimaras	Panay Is. Cons for R&D a/
PCARRD PCARRD Ranola, R.T. <i>et al</i> Reyes, J.C.	1996 The Mango industry 1994 The Philippines Recommends for Mango 1988 Technology assessment for mango in Luzon 1985 Mango flower induction technology: A case of research and development	Information flyers The Phil. Rec. Series No. 38-A UPLB b/ UPLB MS thesis b/
Tajanlangit, M.A. Tuazon, R.	1985 Feasibility of putting up a mango drying plant in Guimaras Island 1985 Corporate strategy for E.S. Garcia Development Corp. engaged in mango production	AIM thesis a/ AIM MBA thesis
Valmayor, R.V.	1969 The Philippine mango industry	Symp. on Mango Culture in New Delhi, India cited in Hort. Abst. 1973
ASSIST	<u>Marketing, Trade, Distribution and Management (14)</u> 1994 Commodity Systems: Mango marketing in nine selected areas in the Philippines	PSA ASSIST Momograph Series
Abas, M.L.G.	1999 Postproduction operations and marketing of fresh mangoes in Zamboanga del Norte, 1998	UPLB BS thesis
Atabug, S.L. Bautista, C.L. BAEcon	1983 Mango puree for export produced in Pangasinan 1983 Marketing system of mango: trends and opportunities 1986 Standardization and inspection of Philippine mangoes and other purposes	Agri. and Ind. Bulletin Today a/ Mango Production and Processing Tech. SOA & Abst. Bibl.of Mango Researches
Cabotage, L. FRLD	1975 Mango for export 1994 The Mango marketing system in major production and demand areas in the Philippines	Anim. Husb. Journ. a/ DA-ASAP and USAID
GMTFM Macabasco, D.R.	1979 Weekly food market analysis 1993 Export performance of selected fruits and vegetables in the Philippines, 1970-90	DBP Weekly Bulletin a/ UPLB MS thesis

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Padilla, A.U. Pantastico, E.B. and E. Torres PCARR, UPLB Reyes. A. & C. Kempis Tabadero, Jr. T.N. Golez, H.G. Pamplona, P.P Librero, A.R. <i>et al</i> PCARRD	1993 Marketing system for mango exportation 1971 Marketing and handling recommendations for fruits and vegetable exports 1996 Mango statistics in the Philippines 1988 Socio-economics of mango growing and marketing at MARAFA area 1977 Trends in area planted, production and prices of fresh banana and fresh mangoes in the Philippines, 1957-1976 <u>Research, Development and Extension (4)</u> 1999 R and D/E Concern of the Philippine Mango Industry 1999 Philippine Agenda for Fruit Crops R&D 1988 Estimating returns to research investment in mango in the Philippines 1996 National Integrated R and D on mango	Mango Production and Processing Tech. Anim. Husb. Agri. Journ. a/ Mango Stat. in the Phil. Pal. Agric. Coll. b/ UPLB BS thesis a/ Fruit Crops R&D/E Network Meeting paper National Fruits R&D Team output PCARRD/DOST Book Series No. 73 Result of consultative workshop in Guimaras held July 1995 cited by Golez 1999
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a/ Cited in State of the Art and Abstract Bibliography of Mango Researches Vol. 2 1986 (Crops Bibliography Series No. 2)

b/ Cited in CLARRDEC State of the Art and Abstract of Bibliography on Mango Researches

c/ Cited in Abstract Bibliography of Philippine Researches in Agriculture, Forestry, Fisheries and Mines

Sources: Mango Information Network: Economics Component and other compilations

Appendix Table 30. Literature/publications on banana by discipline.

Author (s)	Date	Title	Publication Title
		<u>Crop Production and Cultural Mngt.</u>	
Angeles, D.E.; Ramirez C.	1984	Survey and documentation of traditional banana growing practices in the Philippines.	Terminal Report:IDRC-PCARRD Banana (Phil.) Project
De Jesus, J.G.	1967	Fertilizer guide for tropical and subtropical farming.	Centre d' Etude del l' Azote
Salaver, F.O.	1983	Banana-based farming systems.	PCARRD Book Series No. \$!
Salaver, F.O.	1983	Banana nutrition and fertilization.	Bureau of Plant Ind.
Simmonds, N.W., Sheppard, K.	1955	The taxonomy and origin of cultivated bananas.	J. Linnean Soc Botany
Twin Rivers Res. Ctr.	1977	Manual of banana operations.	Tech. Services and Extension Div. TRRC
Valmayor, R.V.; Espino R.R.C.	1974	Banana production in the Philippines.	Ext. Circular no.8 UPLB, Dept. of Horticulture
Valmayor, R.V.; Clement, I.M.; Hapitan, Jr. C.	1971	Influence of planting material on growth and crop yield of 'Lakatan' banana.	Agric. Los Banos 10(3)
Valmayor, R.V.	1970	Fertilizer researches on banana, pineapple, and papaya.	
Valmayor, R.V.; Hilomen, B.C.	1969	A technique for rapid multiplication of banana planting materials.	Agric Los Banos 8(3)
Valmayor, R.V.; Hapitan, Jr. C.; Felizardo, B.C.	1965	Influence of fertilizers on the yield of banana.	Philipp Agric 49
Valmayor, R.V.; Coronel, R.E.	1963	How to propagate fruit plants.	Farm Bulletin no. 8
		<u>Crop Protection/Pest Management</u>	
Atabug, R.G.; San Juan, M.O.; Obello, M.S.	1986	Comparative efficacy of Dicamba and Tordon 101 impregnated bamboo sticks in eradicating bunchy top-infected 'Cavendish' banana.	Paper presented at the 17th Annual Confence of the Philippine Phytopathological Soc. Iloilo City.
Boncato, A.A.; Davide, R.G.	1980	<i>Radopholus similis</i> 'Cavendish' banana in Davao del Norte: I. Host range & relative distribution.	Philipp Agric 63(2)
Boncato, A.A.; Davide, R.G.	1980	<i>Radopholus similis</i> 'Cavendish' banana in Davao del Norte: II. Culture and pathogenicity.	Philipp Agric 63(2)
Boncato, A.A.; Davide, R.G.	1980	<i>Radopholus similis</i> 'Cavendish' banana in Davao del Norte: III. Lab. & field evaluation of nematicides for <i>R. similis</i> control.	Philipp Agric 63(2)
Calpouzos, L.	1955	Studies on the Sigatoka disease of bananas and its fungus pathogen.	United Fruit Company Publication
Claudio, M.C.C.; Davide, R.G.	1967	Pathogenicity and identity of root-knot nematodes in banana.	Philipp Agric 51
Davide, R.G.; Marasigan, L.Q.	1984	Studies on the population dynamics of nematodes in relation to yield loss of banana and evaluation of banana varieties for nematode resisitance.	Terminal Report UPLB, Dept. of Plant Pathology
Davide, R.G.; Zorilla, R.	1983	Evaluation of fungus <i>Paecilomyces lilacinus</i> (Thom) Samson for the biological control of the potato cyst	Phillip Agric 55(4)

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Davide, R.G.	1980	nematodes. Influence of cultivar, age, soil texture, and pH on <i>Meloidogyne incognita</i> & <i>radopholus similis</i> on banana.	Plant Dis 64(6)
Davide, R. G., Zarate, F.A.	1977	Host-parasite relationships and control of plant parasitic nematodes associated with banana.	NSDB Tech J (12)
Davide, R.G.; Gargantiel, F.T.	1974	Survey of nematodes associated with banana in the Phil.	Philipp Phytopathol 10
Davide, R.G.	1973	Nematicidal treatment of banana suckers for the control of root-knot nematodes.	Philipp Agric 57
Dawi, N.M.; Obello, M.C.		Field evaluation of insecticides applied by bud injection technique to control banana flower thrips.	Twin Rivers Research Center
Dawi, N.M.	1983	Management and control of major pests in banana.	Phil. Concil for Agri. & Resources Res. Devt.
Dawi, N.M.	1982	Biology, ecology and control of banana scarring weevil <i>Philicoptus iliganus</i> Heller (Coleoptera: Curculionidae).	Ph.D. Dissertation, UPLB
Dawi, N.M.		Field trial of insecticide application by injection method using Decis 2.5 EC to control flower thrips in bananas.	Twin Rivers Research Center
Dawi, N.M.		Evaluation of the different integrated methods of controlling thrips, mealybugs, and other fruit-feeding insects on banana, Madaum, Tagum, Davao del Norte	Twin Rivers Research Center
Feakin, S.D.	1977	Pest control in bananas. London, England.	Pans Manual no. 1, Third Edition
Foreman, P.L.	1972	Banana weevil borer.	Kingston Jamaica, Bulletin
Generalao, L.C.; Davide, R.G.	1986	Biological control of <i>Radopholus similis</i> on banana with three nematophagous fungi.	Philipp Phytopathol 22
Guzman, R.S.; Davide, R.G.	1985	Screening of various plant extracts for toxicity to nematodes, <i>Meloidogyne incognita</i> .	Philipp Phytopathol 21
Hwang, S.C.	1985	Ecology and control of fusarial wilt of banana.	Plant Prot Bull (Tai) 27
Leach, R.	1964	A new form of banana leaf spot in Fiji, Black leaf streak.	World Crops
Magee, C.J.	1920	A new virus disease of banana.	Agri. Gazette New S. Wales 41
Magnaye, L.V.	1986	Reaction of local banana & plantain cultivars to bunchy-top & other viral diseases.	PCARRD Book Series No. 41
Magnaye, L.V.; Eloja, A.L.	1968	Banana mosaic in the Phil.: I: Transmission & initial host range studies.	Paper presented at the 5th Annual Conference of the Phil. Phytopathological Soc., Davao C.
Meredith, D.S.; Lawrence, J.S.	1969	Black leaf streak disease of bananas (<i>Mycosphaerella fijiensis</i>): symptoms of disease in Hawaii & notes on the conidial state of the casual fungus.	Transactions British Mycological Soc. 52
Meredith, D.S.	1968	Freckle disease of banana in Hawaii caused by <i>Phyllostictina musarium</i> (Cke).	Petr. Annal Applied Biology 62
Ostmark, H.E.	1974	Economic insect pests of banana.	Annu Rev Entomol 19

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Quimio, A.J. Raros, E.S. Reyes, T.T.; Davide, R.G. Rillo, A.R.	1985 Postharvest diseases of banana & their control in the Phil. 1985 Major insect pests of export in the Philippines. 1975 Fungi for biological control of plant parasitic nematodes. 1978 Strains of <i>Pseudomonas solanacearum</i> E. E. Smith infecting abaca and banana in the Philippines.	PCCARD Book Series No. 41 Philipp Phytopathol Soc Bull 3 M.S. Thesis, UPLB
Roperos, N.I.; Atabug, R.G.	1986 Status of Moko and Panama wilt diseases in the Phil.	Australian Ctr. For Intl. Agri. Res. Book Series No. 41 Outlook Agric 14(2)
San Juan, M.O.	1985 Some major diseases of banana in the Philippines and their control.	
San Juan, M.O.; Lozado, L.D. San Juan, M.O.	1978 Control of nematodes with temik 15G aldicarb and its residue in the fruit of 'Giant Cavendish' banana. 1977 Endemic diseases of banana in the Phil.	Philipp Phytopathol 14 Proceedings of the symposium on Phil. Phytopathology, 1917- Philipp Phytopathol 18
Santor, W.; Davide, R.G.	1982 Interrelationship of <i>Radopholus similis</i> and <i>Meloidogyne incognita</i> banana.	
Silva, J.P.	1983 Profile of disease mgmt. In commercial banana cultivation in Philippine setting.	Paper presented during symposium on Plant Disease mgmt. Dept. of Plant Patho. UPLB Philipp Phytopathol 68
Sun, E.J., Su, H.T.; Ko, W.H. Stephen, C.S.	1978 Identification of <i>Fusarium oxysporum</i> F. sp. <i>Cubense</i> race 4 from soil or host tissue by cultural characters. Phil. Banana-scarring weevils in Mindananao banana farms: Part II.	Mindoro Fruits Co.
Stover, R.H.; Dickson, J.D.	1976 Banana leaf spot caused by <i>Mycosphaerella musicola</i> and <i>M. fijiensis</i> var. <i>difformis</i> : a comparison of the first Central American epidemics.	FAO Crop Prot Bull 24
Stover, R.H.	1974 Effect of measured levels of Sigatoka disease of bananas on fruit quality & leaf senescence.	Trop Agric 51 (4)
Stover, R.H.	1972 Banana, plantain, and abaca diseases.	Commonwealth Mycological Ins. Kew Surrey, England Can J Bot 38
Stover, R.H.; Waite, B.H.	1960 Studies on Fusarium wilt of bananas V. Pathogenicity and distribution of <i>F. oxysporum</i> f. <i>cubense</i> Races 1 & 2.	
Tandingan, I.C.; Davide, R.G.	1986 Biological control of <i>Tylenchulus semipenetrans</i> on citrus and <i>Radopholus similis</i> on banana with <i>Paecilomyces lilacinus</i> and <i>Penicillium anaticum</i> .	Philipp Phytopathol 22
Villanueva, L.M.; Davide, R.G.	1985 Evaluation of several isolates of soil fungi for biological control of root-knot nematodes.	Philipp Agric 67
Waite, B.H.	1962 Wilt of <i>Heliconia</i> spp. caused by <i>Fusarium oxysporum</i> f. sp. <i>cubense</i> race 3.	Trop Agric 40

Varietal Improvement

De Leon, B.B.; Ramirez, D.A.; Valmayor, R.V.	1968	The cytology and morphology of eleven varieties of Philippine bananas.	Philipp Agric 52
Dolores, R.L.; Ramirez, D.A.; Valmayor, R.V.	1969	The cytology and morphology of six varieties of Philippine bananas.	Philipp Agric 53
Hwang, S.C.; Ko, W.H.	1986	Somaclonal variation of banana and screening for resistance to <i>Fusarium</i> wilt.	ACIAR Proceedings No. 12
Pascua, O.C.	1986	Status of the SE Asian Banana and Plantain Germplasm Resource Center.	PCARRD Book Series No. 41
Valmayor, R.V.; Pascua, O.C.	1985	SE Asian banana and plantain cultivar names and synonyms - A preliminary list.	Intl. Board Plant Genetic Resources Regional Comm. SE Asian Newsletter 9(1)
Valmayor, R.V.	1983	SE Asian banana resource center.	Intl. Board Plant Genetic Resources Regional Comm. SE Asian Newsletter 7(1) IPB Bulletin No.3
Valmayor, R.V.; Rivera, F.N.; Lomuljo, F.N.	1981	Philippine banana cultivars names and synonyms.	
Valmayor, R.V.	1985	Plantains and bananas in Philippine agriculture.	Proceedings of the Plantain Workshop AGCG/ITTA Ibadan, Nigeria
Zamora, A.B.; Damasco, O.P.	1987	Integrated banana studies for the small farmers.	IDRC-PCARRD Banana (Phil) Proj. Terminal Report.
<u>Post Harvest Handling</u>			
Abilay, R.M.	1968	Some factors affecting chilling injury on banana fruits.	Philipp Agric 5(9)
Acedo, A.L.; Bautista, O.K.	1987	Ripening acceleration of banana fruit with bioethylene from Gliricidia and Rain tree leaves.	Postharvest Horti. Training and Res. Ctr.
Agilon, A.B.; Artes, L.A., Lizada, M.C.C.	1987	Some physico-chemical and physiological changes in 'Latundan' & 'Lakatan' bananas subjected to modified atmosphere storage.	ACIAR Banana Postharvest Workshop
Anonymous	1969	How to keep the storage life of banana longer.	Press Release, UPLB, Col. Of Agri.
Artes, L.A.; Lizada, M.C.C.	1988	Modified atmosphere storage of 'Lakatan' bananas harvested at different maturities.	Postharvest Horti. Training and Res. Ctr.
Bautista, O.K.; Perdido, R.R.	1982	Unrefrigerated storage methods for small farmers and retailers.	ASEAN-PHTRC Extension Bulletin 4
Bautista, O.K.	1983	Transport & handling of fruits & vegetables in ASEAN: Learning from each other.	Paper presented at the Transport & Handling of Fruits & Vegetables Workshop, Thailand
Bautista, O.K.; Esguerra, E.B.	1982	Observation report of a trip to two banana packinghouses in Davao.	PHTRC, UPLB
Bondad, N.D.	1972	New methods of ripening fruits.	Anim Husb Agric J (8)
Bondad, N.D.	1971	Effects of Ethrel on the ripening of banana fruits.	Dept. of Horti., UPLB
Bondad, N.D.; Pantastico, Er.B.; Mendoza, Jr. D.B.	1970	Ethrel, a new ripening stimulant for bananas.	Agric Los Banos 10

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Brena, S.B.		Modified atmosphere storage of 'Senorita' bananas with C ₂ H ₄ scrubbers.	PHTRC, UPLB
Espanto, L.H.	1984	Handling, storage, and ripening of 'Saba'.	BS Thesis, UPLB
Food Terminal Inc.	1988	Standards for 'Bungulan', 'Lakatan', and 'Latundan' bananas.	FTI Report
Food Terminal Inc.	1981	Quality and Grade specifications for bananas.	Directorate for Economic Research and Stat., National Food Authority
Lizada, M.C.C.; Esguerra, E.B.; Amorsolo, E.E.; Brown, E.O.; Brionesa, J.P.; Uy, W.T.	1986	Postharvest handling of 'Saba'.	Australian Center for Intl. Agri. Research, Book Series No.41
Lizada, M.M.C.; Uy, W.T.; Tiangco, E.L.	1987	Evaluation of locally fabricated ethylene scrubbers for use as an adjunct to modified atmosphere packaging of 'Saba' ban.	Paper presented in ACIAR Banana Postharv. Workshop, Kuala Lumpur, Malaysia
Mendodza, Jr. D.B.; Pantastico, Er. B.	1980	Controlled atmosphere storage of fruits and vegetables.	NRCP Project No. IE-73
Mendoza, Jr. D.B.; Pantastico, Er. B.	1980	Postharvest physiology, handling and storage of fruits. II. Semi-commercial trials.	UPLB, Dept. of Horti.
Nermal, S.; Munasque, V.S.; Baluyot, N.	1983	The effect of varying Ethrei concentraion on the ripening of 'Latundan' banana.	SMARC Monitor 4(1)
Pantastico, Er. B.; Mendoza, Jr. D.B.; Hapitan, J.C.	1975	Harvest Indices. In: Postharvest Physiology, Handling and Utilization of Tropical and Subtropical Fruits and Vegetables.	AVI Publishing Co. Inc. Westport Connecticut
Pator, R.L.; Pantastico, Er. B.; Mendoza, Jr. D.B.; Zerrudo, J.V.; Bautista, O.K.; Reyes, M.U.	1985	Evaluation of some fruit and vegetable containers in the Phil.	ASEAN-PHTRC Tech. Bulletin No. 2
	1986	Philippine Report on Trials Conducted in Conjunction with the Fruits and Veg. Expo. In Hong Kong	Report of the 19th meeting of the Postharv. Horticulture Working Group of the ASEAN SubCommittee on Food Handling
		Ripening instructions for all banana: Tropic boxed and stem banana ripening rules.	Banana Ripening Manual, United Fruit Co.
Scott, K.J.; Mendoza, Jr. D.B.; Lizada, M.C.C.	1983	Polyethylene bags and Prolong for delaying the ripening of bananas in the Philippines.	Singapore J Primary Industries 2(2)
Smock, R.M.	1967	Methods of storing bananas.	Philipp Agric 51(6)
Thompson, A.K.; Bhatti, M.B.; Rubio, P.P.	1975	Harvesting.	AVI Publishing Co., Inc. Westport, Connec.
		<u>Utilization</u>	
Adeva, L.V.; Gopez, M.D.; Payumo, E.M.	1968	Studies on the preparation of banana spread.	Philipp J Nutr 21
Adeva, L.V.; Gopez, M.D.; Payumo, E.M.	1968	Studies on the preparation and storage qualities of banana chips.	Philipp J Sci 97
Bai, S.G.; Rao, M.N.	1969	The use of packaging and antioxidants in banana chipping.	J Food Sci Technol. 6

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Crowther, P.C.	1979	The processing of banana products for food use.	Tropical Prod. Ins., London, Eng.
De Leon, S.Y.; Diokno, M.V.M.	1973	Philippine fruits and vegetables processing guide. Banana Fiber. A review of its properties and small-scale extraction and processing.	UP Diliman, Col. Of Home Economics Fiber Industry Dev. Authority
Hapitan, J.C.	1969	Flour from green bananas.	Agric Los Banos, 8(3)
Hernandez, I.	1973	Preparation and acceptability of banana nectar.	J Agric Univ (Panama Republic) 57
Kay, D.E.	1967	The processing of banana products.	South Pac Bull 17(2)
Kay, D.E.	1967	Banana products.	England Publications, Pub. Rel. Sec., TPI
Mariano, L.A.; Gonzales, O.N.; Pablo, I.S.	1969	Effect of maturity of dehydration of the quality of chips prepared from 'Saba' banana (<i>Musa sapientum</i> Linn. Var. Compresa).	Philipp J Nutr
Salting, D.S.; Gorres, D.; Calub, A.B.; Montealto, A.M.	1978	The feeding value of banana rejects for beef cattle.	Phillip J Veterinar Animal Science 4
Sanchez, P.C.; Dizon, E.I.	1979	Fruit wine production in the Philippines.	Technical Bulletin
Zamora, R.G.	1986	Utilization of banana surplus for animal feeds.	Australian Ctr. for Intl. Agric. Res. Bk. Ser. #41
Zamora, R.G.; Flores, L.; Dantes, F.; Villegas, M.; Villareal, L.		Feeding value of banana meal reject for growing-finishing pigs.	Philipp J Veterinary Animal Science 11
<u>Industry and Market Development</u>			
Board of Investment	1985	Fresh and processed fruit and vegetables: Business and investment opportunities with emphasis on exports.	Ministry of Trade & Industry, Makati
Bureau of Agricultural Economics	1985	Market price bulletin: Selected food and agricultural commodities, AMNEWS.	Bureau of Agri. Econ., Ministry of Agri.
Dosayla, E.D.	1986	Banana marketing in the Philippines.	Australian Ctr. for Intl. Agri. Res. Bk. Ser. #41
Gorres, D.G.	1986	Domestic trade on bananas.	Australian Ctr. for Intl. Agri. Res. Bk. Ser. #41
Segura, R.R.	1986	Banana export trade of the Philippines.	Australian Ctr. for Intl. Agri. Res. PCARRD Book Series No. 41

Source: Philippines Recommends for Banana, 1992 ed.

Appendix Table 31. Literature/publications on papaya by discipline.

Author (s)	Date	Title	Publication Title
		<u>Crop Production and Cultural Mngt.</u>	
Acland, J.D.	1971	East African crops: An introduction to the production of field and plantation crops in Kenya, Tanzania, and Uganda.	London, Longman Group Inc.
Agdeppa, F.T.; Millares, B.G.	1972	A handbook on the pH, lime and soil requirements of various plants.	Manila: Bureau of Soils
Bass, L.N.	1975	Seed storage of <i>Carica papaya</i> L.	Hort. Science 10(3)
Davey, J.B.	1959	It's wise to grow papayas from local strains.	Qld. J. Agr. 85(2)
Hamilton, R.A.	1954	Papayas grown in shallow clay soil.	Hawaii Farm Sci. 2(3)
Harkness, R.W.	1967	Papaya growing in Florida.	Univ. Florida Agr. Expt. Sta. Circ. S-180.
Ko, W.H.	1971	A promising solution for the papaya replant problem.	Hawaii Farm Sci. 20(4)
Malo, S.E.; Campbell, C.W.		The papaya.	Florida Coop. Fruit Crops Fact Sheet II
Morada, E.K.	1929	Papaya culture.	Phil. Agr. Rev. 22(2)
Mortensen, E.; Buliard, E.T.	1968	Handbook of tropical and subtropical horticulture.	Washington, D.C.; Agency for Intl. Devel.
Storve, W.B.	1937	The primary flower types of papaya and fruit types that develop from them.	Pro. Amer. Soc. Hort. Sci. 35
		<u>Crop Protection/Pest Management</u>	
Alimagno, L.J.	1960	A comparison of the effect of four fungicides for seed treatment of papaya.	BSA Thesis, AUF
Brogdon, J.E.; Wolfenbarger, D.D.	1967	Papaya insect control.	Florida Agr. Ext.Serv. Circ. 136-B
Celino, C.S.; Panaligan, D.R.	1970	Study on the control of citrus fruit fly <i>Dacus dorsalis</i> var. <i>occipitalis</i> Bezzi by annihilating the male population with the use of methyl eugenol as attractant.	An Husb. Agr. J. 5(8)
Cook, A.A.	1972	Virus diseases of papaya.	Florida Agr. Ept. Sta. Tech. Bull. 750
Davide, R.G.	1972	Nematodes of Philippine crops and their control.	Phil. Phytopath. Soc. Bull. 2
Gavarra, M.R.	1981	The biology, ecology and control of spider mite <i>Tetranychus kanzawai</i> . Kishida (Tetranychidae: Acarina) on papaya.	Ph.D Theis, UPLB
Glass, E.H.; Calora, F.B; Vega, M.R.; Quebral, F.C.	1968	A manual of pesticides.	Col. Of Agri., UPLB
Haramoto, F.H.; Yee, W.Y.J.	1966	Control of some common insect and mite pests of fruit crops in Hawaii.	Univ. Hawaii Coop. Ext. Serv. Circ. 409
Hine, R.B.; Trujillo, E.E.; Stanghellini, M.E.	1964	Stem-end rots and other fruit rots of papaya.	Hawaii Farm Sci. 13(4)
Holtzman, O.V.; Yee, W.Y.J.	1965	Control of diseases of fruits and nuts in Hawaii.	Univ. Hawaii Coop. Ext. Serv. Circ. 408
Raabe, R.D.; Holtzmann, O.V.	1964	Studies on the control of papaya anthracnose.	Hawaii Farm Sci. 13(4)
Ramirez, B.N.; Mitchell, D.J.	1975	Relationship of density of chlamydospores and zoospores of <i>Phytophthora palmivora</i> in soil to infection of papaya.	Phytopathology 65
Simmonds, J.H.	1965	Papaw diseases.	Qld. J. Agr. 91(11)

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Yee, W.Y.J.; Romanowski, R.R.; Fukunaga, E.T.	1968	A guide to chemical weed control in tropical and subtropical fruit and nuts crops in Hawaii.	Univ. Hawaii Coop. Ext. Serv. Circ. 423
		<u>Varietal Improvement</u>	
Storey, W.B.	1937	Segregations of sex types in Solo papaya and their application to selection of seed.	Proc. Amer. Soc. Hort. Sci. 35
		<u>Post Harvest Handling</u>	
Bureau of Standards	1969	Standards Administrative Order No. 37. Standardization of Philippine fresh ripe papaya and other products.	Phil. Trade Standards No. 051-12.00
Pantastico, Er.B.	1970	Buying and storing fresh fruits.	Agr. Los Banos. 9(4)
Pantastico, Er.B.; Mendoza, D.B.; Hapitan, Jr. J.C.	1971	Better harvesting and storing will increase marketability of papaya.	Agr. Los Banos 11(1)
		<u>Utilization</u>	
Abejuela, R.E.	1979	Papaya latex extraction for papain production.	Proceedings. 2nd Natl. Fruit Crop Symposium Cebu. City
Bureau of Plant Industry		Preservation of fruits and vegetables.	Bureau of Plant Industry
Hiyane, J.; Hamilton, R.A.	1960	Comparison of flavor and sweetness of papayas from female and hermaphrodite plants.	Hawaii Farm Sci. 8(4)
Leon, Sonia Y. de	1973	Philippine fruit and vegetable processing guide.	UP Diliman
Pratt, D.S.	1915	Papain: Its commercial preparation and digestive properties.	Phil. J. Sci. 10A(1)
Santos. A.C.	1973	Terminal report: The preparation and use of plant enzymes (papain, chymopapain, bromelin) for the production of protein concentrates (Feb. 1970-July 1972).	NRCP Res. Bull. 28(2)
Santos, A.C.; Hernandez, A.R.; Strength, D.R.	1968	The preparation and use of papain for the production of fish hydrolysates.	Phil. Agr. 52(2)
		<u>Industry and Market Development</u>	
Becker, S.	1958	The production of papain - an agricultural industry for tropical America.	Econ. Bot. 12(1)
Flynn, G.	1975	The market potential of papain.	Tropical Products Institute Report No. G 99
Javier, M.V.; Mariano, E.P.;	1973	Papaya marketing.	Dept. of Agri., Spcl. Studies Div. Publ. # 73-12
Darrah, L.B.			
Mendiola, N.B.	1960	Industrial crops of the Philippines.	Araneta University Press, Araneta Univ.
Nakasone, H.Y.	1975	Papaya development in Hawaii.	Hort. Sci. 10(3)
Pratt, D.D.; del Rosario, J.J.	1913	Philippine fruits: Their composition and characteristics.	Phil. J. Sci. 8A(1)
Roperos, N.I.	1978	The status and problems of the papaya industry.	Proceedings. 1st Natl. Workshop Symposium on Fruits, Davao City
Seelig, R.A.	1970	Fruit and vegetable facts and pointers - papayas.	Washington, D.C.: Untd. Fresh fruit and Veg. Assoc.
Valmayor, R.V.; Geonzon, W.;	1971	A pre-investment study on dollar earning and dollar saving	

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Dangilan, V.; Martinez, M. Yee, W.Y.J.; Romanowski, Jr. R.R.; Fukunag, E.T.	fruit industries: General industry situation. 1968 A guide to chemical weed control in tropical and subtropical fruit and nuts crops in Hawaii.	Univ. Hawaii Coop. Ext. Serv. Cir. 423
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Source: Philippines Recommends for Papaya, 1984 ed.

Appendix Table 32. Literature/publications on citrus by discipline.

Author (s)	Date	Title	Publication Title
		<u>Crop Production and Cultural Mngt.</u>	
Deomampo, N.R.; Matienzo, R.	1962	Citrus Farm mngt. in selected areas in Batangas, 1960-61.	Phil. Agric. 46(5)
Felizardo, B.C.; Valmayor, R.V.; Nazareno, N.B.; Hapitan, Jr. J.C.	1965	Influence of fertilizers on the growth and yield of calamondin (<i>Citrus mitis</i> Blanco).	Phil. Agric. 47(8)
Felizardo, B.C.; Galvez, N.L.; Davide, P.S.	1961	Response of citrus to fertilization.	Phil. Agric. 45
Francia, F.R.	1954	Study of outstanding varieties and forms of pummelo, <i>Citrus grandis</i> (L.) Osbeck, in some towns of Nueva Ecija.	Phil. Agric. 38(4-5)
Gomez, L.G.; Gonzales, L.G.	1954	Outstanding varieties and forms of pummelo <i>Citrus grandis</i> (L.) Osbeck in nine towns of the Mountain Prov.	Phil. Agric. 37
Gonzales, C.I.	1972	Proper procedure in citrus nursery management.	Anim. Husb. Agric. J. 7(4)
Hermoso, C.E.; Gonzales, L.G.	1954	Outstanding varieties and forms of pummelo <i>Citrus grandis</i> (L.) Osbeck in some towns of Batangas.	Phil. Agric. 38
Jamora, D.S.	1975	Citrus culture.	Agric. How-to Series No. 15, Agris Publ. Corp.
Maramba, F.D.	1954	Farm mngmt. & res. & investigation in citrus orchard.	Aranet J. Agric. 2(1)
Matienzo, R.M.	1962	Farm mngmt. & res. & investigation in citrus farms in Lipa City, 1960-1962.	Phil. Agric. 46
Orillos, M.O.	1953	The effects of diff. Methods of building citrus on the development of the scion.	Araneta J. Agric. 1(2)
Radan, R.R.; de los Reyes, R.	1975	Citrus.	Greenfields 5(2)
Valmayor, R.V.; Bugante, Jr. R.O.;	1975	Growth, maturation and chemical composition of 'Valencia' orange grown under tropical conditions in Los Banos, Phil.	Phil. Agric. 58(7-3)
Curvong, S.; Lataoen, H.L.	1971	Performance of 'Skinkom' mandarin budded in five kind of rootstocks (results of 14 years study).	Agric. Los Banos 11(1)
Valmayor, R.V.; French, J.O.	1962	Citrus growing in Florida.	Univ. of Florida Press, Gainesville
Ziegler, L.W.; Wolfe, H.S.		<u>Crop Protection/Pest Management</u>	
Barroga, S.F.	1968	Biological notes and control of citrus leaf miner (<i>Phyllocnistis citrella</i> Stainton) affecting citrus seedlings.	Phil. J. Plant Ind. 33(1-2)
Martinez, A.L.; Sebastian, N.M.	1968	Exocortis virus of citrus in the Philippines.	Phil. J. Plant Ind. 33(3-4)
Martinez, A.L.; Wallace, J.M.	1968	Citrus leaf mottle-yellow disease in the Philippines.	Phil. J. Plant Ind. 33(1-2)
Nora, D.M.	1978	Major diseases and pests of citrus in the Philippines and their control.	Proc. 1st Natl. Workshop-Symposium on Fruits, 1978, Davao City.
Rosario, Ma. S. del.	1967	Citrus diseases.	UPCA Tech. Bull. No. 34
Salibe, A.A; Cortez, R.E.	1968	Studies on the leaf mottling virus diseases of citrus.	Phil. J. Plant Ind. 33(3-4)
Tucker, D.P.; Philips, R.L.;	1976	Weed control guide for Florida citrus.	Univ of Florida
Oswalt, T.W.		<u>Varietal Improvement</u>	
Cabba, A.C.; Soliven, F.A.	1938	The proximate physical and chemical composition of twenty-six species of citrus and twelve non-citrus fruits grown in the Philippines.	Phil. Agric 26
Margate, L.Z.; Tawatao, R.M.;	1969	Study of citrus stock-scion combination suited for Bukidnon.	CMU J. Sci. Tech. 2(1)

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Callejo, J.B.		
Mendoza, Jr. D.B.; Pantastico, Er. B.; Fortuna, T.C.; Esguerra, E.S.	<u>Post Harvest Handling</u> 1977 Postharvest physiology, handling, and storage of fruits and vegetables .	NSDB-UP Integrated Research Program Annual Report
Pantastico, Er. B.; Mendoza, D.B.; Hapitan, Jr. J.C.	1970 Harvesting, handling and storage of leading Phil. fruits.	UPLB Tech. Bull. No. 28
Pantastico, Er. B.; Chattopadhyay, T.K.; Subramanyam, H.	1975 Storgae and commercial storage operations.	Postharvest physiology, handling and utilization of tropical and subtropical fruita and veg.
Abarientos, E.P.	<u>Industry and Market Development</u> 1962 Production estimates and trend of citrus production in Batangas.	M.S. Thesis , UPCA
Gonzales, C.I.; Cortez, R.E.; Honrade, M.L.	1970 The Phil. Citrus industry as of 1970 - an analysis of its problems and basic steps for improvement.	Anim. Husb. Agric. J. 5(8)
Lanuz, E.A.; Magnaye, A.B.	1968 The citrus industry in the Bicol region.	Phil. J. Plant Ind. 33(1-2)
Median, J.P.	1974 Citrus marketing.	NFAC
Reuther, W.; Webber, H.J.; Batchelor, L.D.	1967 The citrus industry.	The citrus Ind. Vol. 1

Source: Philippines Recommends for Citrus, 1980 ed.

Appendix Table 33. Publications/papers presented by staff of IPB-UPLB by commodity, 1990-1997.

Author	Date	Title	Publication Title
Banana (26)			
Damasco, O.P.; <i>et al</i>	1990	<i>In vitro</i> storage of bananas and plantains. (Poster)	
Zamora, A.B.; Ramos, C.S.	1990	Elimination of banana bunchy top infection from banana (Musa spp. cv Lakatan) by heat pretreatment and meristem culture (one of the CSSP seven best papers).	Presented at the Intl. Congress on Plant Tissue and Cell Culture, Amsterdam, The Netherlands
Zamora, A.B.; <i>et al</i>	1990	Tissue culture of banana, project under the program, "Banana research and development in the Philippines."	
Zamora, A.B.; Ramos, C.S.	1990	Elimination of banana bunchy top infection from banana cv 'Lakatan' by heat pre-treatment and meristem culture.	Philipp. J. Crop Sci. 15(1)
Ramos, C.S.; Zamora, A.B.	1990	Elimination of the killer virus of banana.	Agribusiness Weekly. 17-23 July
Pimentel, R.B. <i>et al</i>	1990	RFLP's fingerprinting of plantain (<i>Musa acuminata</i> and <i>Musa balbisiana</i>) cultivars.	10th Symp. On Devt. And Applic. of New Tech. For Varietal Ident. Iowa, State Univ. Iowa
Espino, R.R.C.; Pimentel, R.B.	1990	Electrophoretic analysis and selected isozymes in BB cultivars of Philippine bananas. : Jaret, R.L. 1990. Identification of genetic diversity in the genus <i>Musa</i> .	Proc. Int. Workshop, PCARRD, Los Banos, Laguna
Uritani, I.; <i>et al</i>	1990	The relation of polyphenols and polyphenol oxidase to the food quality of banana bud.	Nippon Shokuhin Kogyo Gakkaishi 37
Patena, L.F.; Avenido, R.A.	1991	Micropropagation of banana and rattan for mass distribution.	
Patena, L. F.; <i>et al</i>	1991	Micropropagation of banana (Musa spp.) cv Lakatan, rattan (<i>Calamus manillensis</i>) and potato (<i>Solanum manillensis</i>) and potato (<i>Solanum tuberosum</i> L.) cv Banahaw for mass distribution. (Poster)	
Jarret, R.L.; <i>et al</i>	1993	Detecting genetic diversity in diploid bananas using PCR and primers from a highly repetitive DNA sequence.	Euphytica 68: 69-76
Mendoza, E.M.T.; <i>et al</i>	1992	Polyphenols in cooking banana - Changes during ripening and cooking and relation to astringency.	Phil. J. Crop Sci. 17
Mendoza, E.M.T.; <i>et al</i>	1994	Astringency and Polyphenols in banana.	Japan Scientific Soc. Press
Patena, L.F.; <i>et al</i>	1994	Lilak, and New Banana Selection from Tissue Culture.	
Zamora, A.B.; <i>et al</i>	1994	Isolation of Plantlets Freed of Banana Bract Mosaic Virus from Infected Banana cv. Senorita.	
Dizon, T.O.; <i>et al</i>	1995	Black leaf streak of banana.	
Zamora, A.B.; Ramos, C.S.	1997	Propagation of banana by tissue culture brochure, IPB, UPLB.	
Molina, G.C.	1997	Integrated management of 'tigablon', a bacterial disease of cooking bananas 'Saba'.	Phil. Phytopath
Damasco, O.P.; <i>et al</i>	1997	Molecular methods for early detection of dwarf somaclonal variants in banana (Musa spp. AAA).	
Molina, G.C.	1997	Integrated management of 'tigablon', a bacterial disease of cooking bananas 'Saba'.	

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Perez, E.A.; <i>et al</i>	1997 Somatic embryogenesis in banana (<i>Musa</i> spp) cvs. Lacatan and Latundan.	
Damasco, O.P.; <i>et al</i>	1997 Somatic embryogenesis in <i>Musa</i> spp.	
Patena, L.F.; Zamora, A.B.	1997 NPGRL <i>In vitro</i> Unit (NPGRL-IVU) protocols for <i>in vitro</i> maintenance in <i>Musa</i> (abaca and banana).	
Sotto, R.C.; <i>et al</i>	1997 Less known banana and plantain cultivars of the Philippines.	
Patena, L.F.; Avenido, R.A.	1990 Rapid propagation of selected crops (banana and rattan) for mass production.	
Patena, L.F.;	1997 <i>In vitro</i> Genebank report (garlic, shallot, banana, cassava, sugarcane, potato).	
<u>Papaya</u> (14)		
Bayot, R.G.; <i>et al</i>	1990 Seed transmissibility of papaya ringspot virus.	Phil. J. Crop Sci. (Suppl. 1)
Magdalita, P.M.; <i>et al</i>	1990 <i>Diplocyclos palmatus</i> L.: A new weed host of papaya ringspot virus.	Phil. J. Crop Sci.
Ros, L.B.; <i>et al</i>	1990 Pythium rot of papaya.	
Villegas, V.N.; Magdalita, P.M.	1991 Embryo culture in <i>Carica Papaya</i> .	
Villegas, V.N.; <i>et al</i>	1993 Wide hybridization in papaya.	
Villegas, V.N.; <i>et al</i>	1994 Preliminary evaluation of promising papaya (<i>Carica papaya</i> L.) hybrids.	
Drew, R.A.; Magdalita, P.M.	1997 Development of interspecific <i>Carica</i> hybrids.	
Magdalita, P.M.; <i>et al</i>	1997 RAPD assessment of <i>Carica papaya</i> X <i>C. cauliflora</i> hybrid.	
Villegas, V.N.; <i>et al</i>	1997 Production technoguide for Sinta papaya, IPB, UPLB.	
Geronimo, S.B.N.; <i>et al</i>	1997 Cytology of <i>Carica papaya</i> X <i>C. cauliflora</i> interspecific hybrids.	
Villegas, V.N.; <i>et al</i>	1997 Development of ringspot virus resistant papaya.	
Villegas, V.N.; <i>et al</i>	1997 Delayed PRSV-P symptom expression among asexually propagated papaya.	
Villegas, V.N.	1997 Papaya breeding in the Philippines.	Univ. of Hawaii
Villegas, V.N.	1997 Interspecific hybridization between <i>Carica papaya</i> and other <i>C. species</i> .	
<u>Citrus</u> (10)		
Barba, R.C.; <i>et al</i>	1990 Citrus improvement through biotechnology.	
Pimentel, R.B.; <i>et al</i>	1990 Non-conventional breeding technique in citrus: citrus protoplast technology.	
Pimentel, R.B.; Villegas, V.N.	1991 Protoplast isolation from leaf and embryonic callus of calamansi (x <i>Citro fortunella mitis</i>).	
Pimentel, R.B.; Villegas, V.N.	1991 Unaseptic shoot tip grafting technique for citrus.	
Patena, L.F.; Barba, R.C.	1991 Endosperm culture of calamansi: a progress report.	
Villegas, V.N.; <i>et al</i>	1993 Cytology of three indigenous citrus species.	Philippine Agriculturist
Pimentel, R.B.; Villegas, V.N.	1993 Induction of somatic embryogenesis in selected citrus species.	Phil. J. Crop Sci. 18 (Supp. #1): 38
Pimentel, R.B.; Villegas, V.N.	1993 Protoplast isolation from embryogenic callus of calamansi.	

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Patena, L.F.; <i>et al</i>	1993 Induction of long-term maintenance of callus from endosperm tissue of calamansi (<i>X Citrofortunella mitis</i> J.) Ingram and H.E. Moore).	
Patena, L.F.; <i>et al</i>	1994 Cytological Investigation of Endosperm Explants and Long-Term Maintenance of Endosperm Calli of Calamansi.	
<u>Mango (8)</u>		
Dizon, T.O.; Lapitan, L.C.	1994 Mango diseases in the Philippines.	
Coronel, R.E.	1996 The mango in the Philippines: cultivars, propagation and flower forming.	Fruit Gardener, 28(4)
Coronel, R.E.; <i>et al</i>	1997 A catalogue of germplasm resources of Mango at the Institute of Plant Breeding.	
Coronel, R.E.; <i>et al</i>	1997 Mango production brochure, IPB-UPLB.	
Coronel, R.E.; <i>et al</i>	1997 Grafting carabao mango brochure, IPB, UPLB.	
Coronel, R.E.	1997 The carabao mango and Philippine fruits.	Trop. Fruit News 31(6)
Baldiviano, P.F.; <i>et al</i>	1997 Phenolic compounds in coconut (<i>Cocos nucifera</i> L.) and Mango (<i>Mangifera indica</i>).	Bulletin of the Phil. Society of Biochemistry and Molecular Biology Volume 16
Coronel, R.E.	1995 Ang Konserbasyon ng Mga Henetikong Yaman ng Mangga at mga Kalahing Ispis.	
<u>Bago (2)</u>		
Coronel, R.E.	1997 Minor fruits of Southeast Asia: The Bago.	Trop. Fruit News. 31(5)
dela Cruz, Jr. F.S.	1997 A snack food from Bago.	NCPGR Newsletter
<u>Passionfruit (4)</u>		
Pimentel, R.B.; Villegas, V.N.	1993 Pollination studies in passionfruit.	Phil. J. Crop Sci. 18 (Supp. #1): 43
Rocamora, J.C.; Ocampo, E.M.	1995 Yield and morphology of Passionfruit under rainfed conditions.	Phil. J. Crop Sci. Vol. 20, sup. #1
Rocamora, J.C.; Abilay, R.M.	1995 Yield of Passionfruit under two levels of shade and trellis.	Phil. J. Crop Sci. Vol. 20, sup. #1
Tisalona, L.F.A.; <i>et al</i>	1995 Purification and characteristics of a virus isolated from Passionfruit (<i>Passiflora edulis f. flavicarpa</i>).	
<u>Unspecified fruits (and nuts) (20)</u>		
dela Cruz, Jr. F.S.	1997 Asexual propagation of fruit trees.	
Coronel, R.E.	1997 On-farm conservation of fruits and nuts.	Trop. Fruit News 31(4)
Coronel, R.E.	1997 Rare fruits for the home garden.	Fruit Gardener. 29(1)
Coronel, R.E.	1997 Rare Philippine fruits for home gardens.	Quandong. 23(1)
Coronel, R.E.; <i>et al</i>	1994 A catalogue of germplasm collections of fruits and nuts.	
Coronel, R.E.	1994 Status report on Fruit Tree Germplasm Conservation and Utilization in Southeast Asia.	
Coronel, R.E.	1994 Rare Fruits in the Philippines.	
Coronel, R.E.	1994 Thinning of Fruits in the Philippines.	
Coronel, R.E.	1994 Characterization of Fruit and Nut Trees During Fruit Collection.	
Coronel, R.E.	1995 Growing exotic fruits.	

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Coronel, R.E.	1995 Some minor fruits in the Philippines with processing potential.	
Coronel, R.E.	1995 Ang kontribusyon ng Tropikong Amerika sa mga kayamanang prutas ng Pilipinas.	
Coronel, R.E.; <i>et al</i>	1995 A new fruit with commercial potential in the Philippines.	
Coronel, R.E.; Sotto, R.C.	1995 Miscellaneous fruits and nuts.	
Coronel, R.E.	1995 Tropical fruits and nuts in the Philippines.	
Coronel, R.E.	1995 Important fruit species in the Philippines and their propagation.	
Coronel, R.E.	1995 Mga Nakakaing Prutas at Nuwes.	Plant resources of SEAsia 2
Coronel, R.E.	1995 Status report on fruit species germplasm conservation and utilization in Southeast Asia.	Proc. Expert Consultaion on
Coronel, R.E.	1996 Rare fruits for the home garden.	Tropical Fruit Species of Asia
Coronel, R.E.	1997 Training manual on fruit crops nursery establishment, IPB-UPLB.	Fruit Gardener
Mejico, A.P.	1997 Training manual on asexual propagation of fruit crops, IPB-UPLB.	
<u>Avocado</u> (5)		
Tisalona, L.F.; <i>et al</i>	1997 Induction of somatic embryogenesis from avocado (<i>Persea americana</i>) callus.	
Villegas, V.N.	1997 Status of USAID-CDR Avocado Project in the Philippines.	
Avenido, R.A.; <i>et al</i>	1997 Development of plant regeneration systems in avocado <i>Persea americana</i> Mill.	
Dizon, T.O.; <i>et al</i>	1996 Isolation, growth and sporangial production of <i>Phytophthora cinnamomi</i> from avocado.	
Avenido, R.A.; Tisalona, L.F.A.	1996 Initiation of avocado tissue cultures.	Phil. J. Crop Sci. 21(S1):63
<u>Jackfruit</u> (2)		
Verzola, A.; <i>et al</i>	1997 Jackfruit cultivation in Asia.	
Coronel, R.E.	1996 Minor fruits of Southeast Asia: the monkey jackfruit.	Trop. Fruit News. 30(2)
<u>Apple</u> (1)		
Patena, L.F.; <i>et al</i>	1990 Advetitious root induction in the <i>in vitro</i> grown shoots of 'Golden Delicious' apple (<i>Malus domestica</i> Borkh.) using <i>Agrobacterium rhizogenes</i> .	
<u>Pineapple</u> (1)		
Magdalita, P.M.; Villegas, V.N.	1990 Fruit crops breeding III. Pineapple breeding: Induction of somaclonal variation.	
<u>Strawberry</u> (1)		
Villegas, V.N.; <i>et al</i>	1990 Fruit crops breeding III. Strawberry breeding: micropropagation.	
<u>Guava</u> (1)		
Villegas, V.N.; <i>et al</i>	1993 Selecting for processing-type guava.	Phil. J. Crop Sci. 18 (Supp. #1): 38
<u>Durian</u> (1)		
Coronel, R.E.	1995 Establishment and management of a durian nursery.	
<u>Longan, lychee, alupag</u> (1)		

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<u>Sotto, R.C.; et al</u>	1997 Morphological investigations on three Sapindaceous species: longan (<i>Dimocarpus longan</i> Lour. Ssp. <i>Longan</i> var. <i>longan</i>), lychee (<i>Litchi chinensis</i> Sonn. Ssp. <i>Chinensis</i>) and alupag (<i>L. chinensis</i> Sonn ssp <i>philippinensis</i> (Radik.) Leenh.).	
<u>Banana and mango</u> (1)		
<u>Alvarez, T.M.H. et al</u>	1997 Molecular markers for clonal fingerprinting in banana and mango.	
<u>Kubili</u> (1)		
<u>Coronel, R.E.</u>	1996 Minor fruits of Southeast Asia: the kubili.	Trop. Fruit News. 30(2):30(3)
<u>Galo</u> (1)		
<u>Coronel, R.E.</u>	1996 Minor fruits of Southeast Asia: the galo	Trop. Fruit News

Source: Annual Reports of IPB, UPLB (1990-1997)