4.5 Fruit Seedling Supply Conditions

In Indonesia, farmers usually buy fruit seedlings in local markets or private nurseries when they intend to plant new fruit trees in their home yards. But such demand is too small to support the financial condition of private nurseries, resulting in few opportunity for their technology improvement and over reliance on business channels to horticultural development programs implemented with public investment.

Avocado: It is well known that plantlets from seeds tend to grow tall vigorously and it becomes difficult to control trees. Propagation by seeds is also recognized to resort only to the production of rootstocks for seedlings. In 1987, MOA recommended two varieties of green avocado originating in East Java. Recently, some nurseries in West Java and East Java are propagating seedlings by grafting and budding methods, but no seedling supply source is available in South Sulawesi.

Banana: Seedlings commonly used are suckers and rhizomes in the southern part of East Java. Local varieties "Susu", "Raja" and "Kepok" as well as "Ambon" are mainly grown by using suckers and rhizomes. Banana plants have been successfully propagated through tissue culture method by private nursery company. The "Giant Cavendish" variety grown by farmers is extending over East Java. Farmers pay Rp.2,000 per plantlet propagated by the tissue culture method from a private company. In the southern part of East Java, one private nursery company is also producing seedling of the "Giant Cavendish" variety by the rhizome propagation method.

Duku: Propagation by seeds has been done by farmers themselves since very ancient times in the southern part of West Java and central part of East Java where agro-ecological conditions are suitable for growing duku. But, MOA has not recommended any variety originating in both West and East Java. Recently, it has been well known that productivity of seedlings produced by both methods of grafting and budding is better than the plantlets propagated from seeds. One big private nursery company in East Java is now producing about 25,000 seedlings of the recommended varieties a year. Another big private nursery company is also multiplying the improved seedlings.

Durian: Farmers know that the use of plantlets from seeds is not recommended for new planting of durian trees because of uncertainty in the quality and longer period required until first fruit bearing. They are also understanding that plantlets from seeds have the tendency to grow into large trees. For these reasons, the improved varieties have been propagated asexually by private nursery companies. Durian responds very well to cleft grafting and budding. Furthermore, both treatments can be used for commercial propagation of recommended cultivars at private nurseries under the support of BBI. Among the 26 varieties

recommended by MOA, six originate from West Java. Big nursery companies in West Java have good mother plants of recommended varieties, "Hepi" and "Matahari", and are selling scions of these mother plants to farmers. Although no MOA's recommended variety is available in North Sumatra and East Java, some private nurseries have practiced vegetative propagation methods.

Mango: There is enormous variation in the plantlets from seeds even from the fruits of a single tree, as mango is a highly cross-pollinated fruit tree. The plants from seeds produce heavy fruits but the fruit size and quality are, in general, much inferior. Other disadvantages are a long juvenile period and vigorous growth habit which make adoption of mango plant protection measures and fruit harvesting difficult. Fruits of the plants propagated from seeds especially do not mature simultaneously, thereby affecting their marketing. Therefore, a monoembryonic variety will have to be propagated asexually. MOA recommended one variety originating in West Java, three including popular "Armanis" in East Java, and two in South Sulawesi. There are two big private nursery companies in East Java. One of them is propagating 600,000 mango seedlings a year by grafting and budding. In private nurseries in South Sulawesi, "Armanis" and "Golek" varieties have been propagated by the cleft grafting method.

Mangosteen: No recommended variety is available in the Study Area. Plantlets of mangosteen from seeds bear fruit at 10 to 15 years old, while the vegetative by propagated seedlings can bear fruit in five to six years. The cleft grafting method is used in North Sumatra. One nurseryman in West Java is now propagating about 10,000 grafted seedlings a year, and selling one plantlet for Rp.3,500. But the problem is to get seeds for rootstocks and scions.

Marquisa: Plantlets from seeds of the recommended Malino variety originating in North Sumatra are commonly used. Marquisa vines of 35 to 60 cm high are transplanted, after germinated from dropped fruits. Marquisa propagation has not yet been done by means of cutting. It is necessary to carry out multiplication work by vegetative propagation methods using the improved cultivars in North Sumatra and South Sulawesi.

Rambutan: Private nurseries know well that it is not advisable to raise rambutan from seeds. Recently, they are propagating seedlings by budding and air-layering in North Sumatra and South Sulawesi. "Binjai" plantlets are propagated by grafting and budding methods, and sold to farmers at a price of Rp.2,000 per seedling.

Salak: Cross seedlings from seeds of salak often present individual fluctuations of plant and fruit characteristics due to cross hybridization between plants. Private nurseries recognize that both suckers and air-layering are the form of vegetative propagation and practice these methods for commercial production of salak seedlings. The following varieties are recommended by the respective Provincial authorities: "Padang Sidempuang" in North Sumatra, "Nglumut" in West

Java, and "Suwaru" and "Pondoh" in East Java. As salak has been newly introduced in North Sumatra, it is still difficult to supply a good deal of its seedlings.

4.6 Fruit Production and Harvesting Season

The average annual harvesting area and yield of the nine target fruits from 1991 to 1995 are shown in Tables 4.7 and 4.8, respectively, while average production data are presented in Figures A-3-3 to A-3-11. Annual harvest and production records are compiled in Tables A-4-9 and A-4-10, respectively. The production of six of the nine target fruits - avocado, banana, mango, marquisa, rambutan, and salak - in the four Provinces represents more than 50% of the total production of Indonesia.

Table 4.7 Average Annual Harvesting Area for Target Fruits by Province (1991-1995)

(Unit : ha)

Province	North Sumatra	West Java	East Java	South Sulawesi	Indonesia
Avocado	532	6,911	5,452	2,326	21,607
Banana	2,358	19,625	11,670	2,614	76,281
Durian	3,388	5,636	3,123	2,371	42,562
Duku	512	1,568	718	1,972	14,166
Mango	1,773	23,905	58,915	10,272	150,979
Mangosteen	755	1,454	478	83	5,162
Marquisa	939	-	-	33,881	1,656
Rambutan	2,213	17,146	9,920	1,418	72,817
Salak	1,473	3,825	1,496	428	14,812

Source: Directorate of Programming Development, DGFCH

Table 4.8 Average Annual Yield for Target Fruits by Province (1991-1995)

(Unit : ton/ha)

Province	North Sumatra	West Java	East Java	South Sulawesi	Indonesia
Avocado	5.3	7.1	4.6	2.8	5.0
Banana	39.8	42.5	43.4	83.8	38.4
Durian	9.2	6.7	5.8	3.2	5.1
Duku	7.4	9.2	8.1	7.3	6.4
Mango	2.4	5.8	4.4	2.9	4.2
Mangosteen	4.1	4.5	14.4	2.4	7.0
Marquisa	1.0	-	-	1.0	21.0
Rambutan	3.5	6.2	4.7	3.4	4.3
Salak	32.5	44.0	15.6	27.0	22.8

Source: Directorate of Programming Development, DGFCH

The peak season of fruit harvesting in the Study Area reflects the climatic condition which shifts in the west-east direction in the country. Figure AT-4-1 indicates the peak harvesting season of each target fruit in the four Provinces.

4.7 Post-harvest and Processing Condition

(1) Post-harvest Handling Condition

In North Sumatra, very few farmers practice grading, sorting and washing of their fruits before selling them to traders/collectors. More than 80 % of farmers grow fruits as a side business and this is one of the reasons why they do not practice post-harvest activities by themselves. As for packaging, only mangosteen collectors use plastic baskets of 10 kg durable for long distance transportation and returnable. Salak collectors use bags of 25 kg made of plant fiber. Small-scale collection centers are operated in two villages for handling salak and rambutan.

In West Java, sorting and grading are carried out by village collectors instead of farmers. No collection center and storage are available for fruits. All collectors transport fresh fruits to local markets just after harvesting. They are well aware of the fact that fruit has a short shelf life and is a sensitive commodity. One trader exported 60 tons of mangosteen by air cargo from Soekarno-Hatta International Airport to Hong Kong in 1996. This trader used plastic basket of 10 kg without attachment of brand name.

In East Java, post-harvest handling operations like sorting, grading and washing are seldom carried out by farmers. Village collectors are responsible for doing such jobs by themselves. As for packaging, a 5-kg carton container is used for nationwide distribution of salak as a souvenir from Malang with a leaflet showing specification and features of salak.

In South Sulawesi, most farmers sell their fruits to collectors/traders without grading, sorting and washing. This is because fruit growing is a side business of rural farmers or it is considered as one alternative to diversify their production.

(2) Processing Condition

In North Sumatra, four processors and 17 exporters of horticultural commodities are listed by the Provincial Agricultural Services Office. All the processors are marquisa syrup manufacturers, including one small scale processor operated by 35 farm family members and P.T. Pyramid Unta delivering their intermediary products to P.T. Pint Besar Selatan in Medan for production of final marketable products. Their processing capacities are 1 ton/day and 8.5 ton/day, respectively.

In West Java, 12 fruit processing firms are producing fruit juice, including a famous juice manufacturer using small paper box package. Since fruit production in West Java occupies a fairly large portion in the national production, the development of processing industry seems indispensable for the treatment of excess produce so as to stabilize the market prices of fresh fruits.

In East Java, one big processing factory is operating based on the nucleus concept of producing banana puree. To ensure collection of raw materials, this company has offered a contract system to farmers' groups who intend to grow the Cavendish variety of banana.

In South Sulawesi, about 30 marquisa syrup and several tomato sauce manufacturers are under operation, but most marquisa syrup manufacturers have small processing capacity. Their bottled products are sold in supermarkets and souvenir shops in Ujung Pandang. One big syrup manufacturer has a capacity of treatment of 4 ton/hr and juice production of 1 ton/hr. The product is packed in aluminum coated polyethylene bags and contained in 200-kg steel drums. This manufacturer exports the product to Australia at a FOB price of A$1,600/ton. Brazil is an international competitor for this product.

4.8 Market Condition

In North Sumatra, most fruits are transported to the markets in Medan by traders/collectors or buyers. Some fruits, particularly salak, are transported to Jakarta.

In West Java, the export volumes of major fruits in 1996 were 221 tons of mangosteen, 53 tons of mango, 27 tons of rambutan, and 4 tons of banana. As seen in North Sumatra, most of them are exported by air cargo from Jakarta. A good deal of fruits are transported by traders/ collectors or buyers to the vegetable and fruit markets in Jakarta and Bandung where the largest consumers are living.

From East Java, 163 tons of mango were exported in 1996. Most fruits have been transported to the fresh markets in Surabaya and its neighboring cities by village collectors or wholesalers. Salak produced in Malang is conveyed not only to Surabaya but also to Jakarta.

In South Sulawesi, most fruits produced in the Province (except marquisa) are marketed in East Kalimantan.

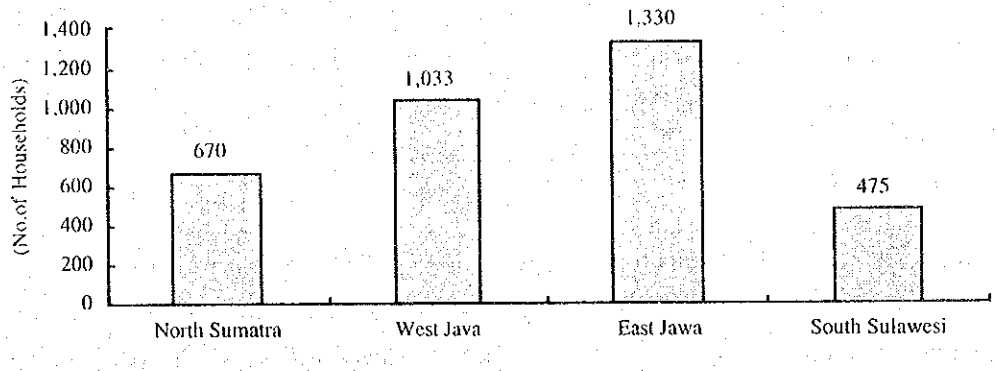
4.9 Agricultural Extension and Food Crops Extension Services

The present condition of extension staff assignment is 96 PPS and 1,669 PPL for 11 BIPP and 96 BPP in North Sumatra, 190 PPS and 3,408 PPL for 20 BIPP and 236 BPP in West Java, 226 PPS and 3,191 PPL for 29 BIPP and 224 BPP in East Java, and 136 PPS and 1,996 PPL for 21 BIPP and 120 BPP in South Sulawesi.

Figure 4.7 shows the number of farm households per PPL in the Study Area. There is no special PPL on fruit growing. Each PPL is getting difficulty to contact farmers and has nothing to discuss with them, therefore key farmers in West Java consider that BPP's function could

only be realized in the place where the farmer can get information and extension. Further, there are too much additional jobs for PPL. No special training courses on fruit growing for both PPS and PPL are available. Each PPS is responsible for training PPL at BIPP, but the training cannot run well because of limited budget.

Figure 4.7 Numbers of Farm Households per PPL by Province



Source: Center for Agricultural Extension, 1997

The on-going IHDUA Project starts to prepare the epoch-making extension services. This Project included the human resource development program aiming at establishing a comprehensive extension system for farmers, carrying out a systematic capability building to the staff in charge of farmers' training, and providing periodical training courses to farmers, nurserymen and project management staff. To assure a new on-farm level extension services to farmers, one field inspection coordinator is assigned for each development area, and one inspector is posted per 100 participating farm-households. As to the qualification required for their recruitment, the field inspection coordinator should be in principle a graduate of agricultural university or college, while the contact farmer be a graduate of senior high school or a person experienced in agricultural business. All staff newly recruited attends duly the training courses prepared by the Project Management Office (PMO-DGFCH) and begins to fulfill their duties.

4.10 Rural Community and Gender

(1) Rural Community

In Indonesia, there are six types of rural community as categorized below:

- Food gathering community (Masyarakat Peramu);
- Fishing community (Masyarakat Nelayan);
- Rainfed agriculture community (Masyarakat Peladang);
- Pastoral community (Masyarakat Peternak);
- Garden and plantation community (Masyarakat Pekebun); and

- Irrigated cultivation community (Masarakat Pertanian Sawah).

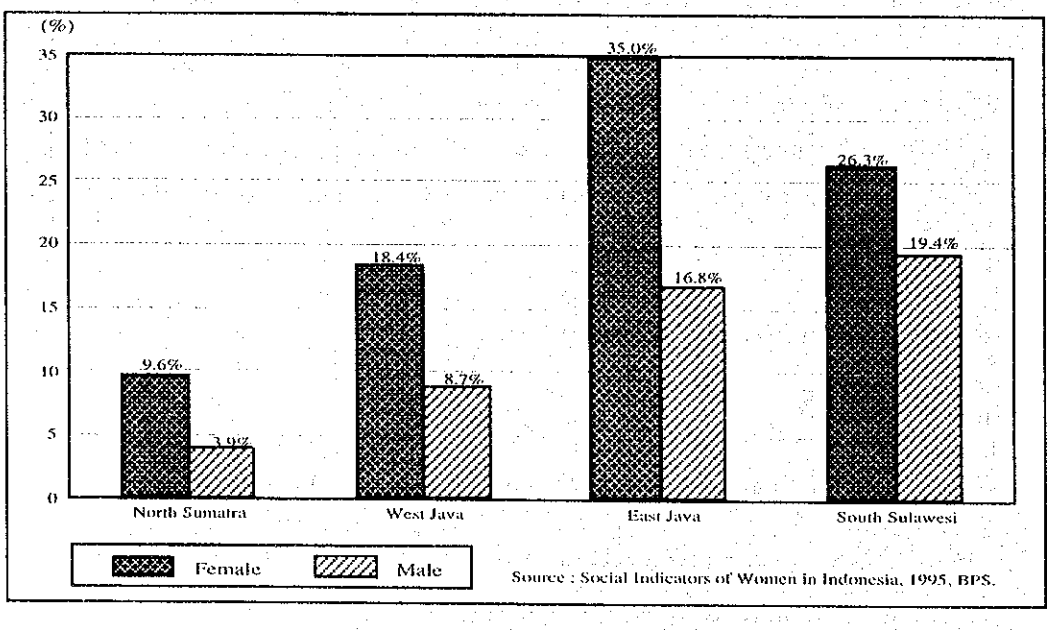
In the Study Area, most of the target farmers or fruit growers belong to the types of rainfed agriculture, garden and plantation, and irrigation cultivation communities. With reference to USAID Agribusiness Development Project, rainfed agricultural community is generally characterized by reciprocal relationship among members. Garden and plantation community respects reciprocal and pioneer spirit as well as sharing of labor and functions. Irrigated cultivation community respect social compatibility. No impediments to orchard development are derived from the socio-cultural backgrounds of the above community.

(2) Women's Role

A gender analysis shows that women are relatively disadvantaged in terms of social, economic, and financial opportunities. Undertaking extensive household responsibilities together with farm activities, women are left with very little time to develop their skills. Many women are engaged in activities of a temporary or seasonal nature, and hence contribute directly to the family budget.

In the fruit production, women play an important role by participating in the planting, weeding and harvesting. Increased fruit production is expected to lead to improved house income and family nutrition. As shown in Figure 4.8, access to education is very limited for women.

Figure 4.8 Ratios of Illiterate Population (10 Years Old and Over) in Four Provinces, 1995



As to the average monthly wages in farming work, that of male workers amounted to Rp.22,625, while that of female workers was only Rp.11,362, accounting to about 50% of the male (refer to G-3-8 in Appendix G). Since women are always disadvantaged especially in

rural areas, the orchard development should be planned to open up opportunities for them so as to address their critical needs. In this respect, it is recommended to establish female community organizations specializing in post-harvest handling and processing of fresh fruits, where the women can undertake activities separately from the male-dominated groups.

(3) Farmers' Organization

Compared with the national average of 53.3%, the ratio of Desas where one or more Kelompok Tani exit is very high in Java Island and reaches 72.7% in West Java, and 85.1% in East Java. On the other hand, it declines to 25.9% in North Sumatra and 25.0% in South Sulawesi. The main reason is that Kelompok Tani was principally organized linking up with the implementation of BIMAS/INMAS programs to realize rice self-sufficiency. No farmers' organizations engaging in fruit production are yet established.

(4) Village Unit Cooperatives (KUD)

According to the 1993 Agricultural Census, the establishment rates of KUD in the Study Area were considerably low: 457 units or 11.8% in North Sumatra, 757 units or 12.3% in West Java, 702 units or 9.3% in East Java, and 463 units or 25.2% in South Sulawesi. The share of KUD Mandiri in the Study Area was 32.3% in North Sumatra, 92.6% in West Java, 87.7% in East Java, and 68.9% in South Sulawesi. As for the number of members per active KUD, the majority of KUD in North Sumatra had 101 to 1,000 members, while those in West Java and East Java had a larger membership of 1,001 to 5,000. In South Sulawesi, the KUD's membership ranged from 101 to 2,500. No KUD engaging in fruit production is yet established.

4.11 Infrastructure

(1) North Sumatra Province

The total length of State, Provincial, District and Municipality roads is estimated at 30,990 km in 1996. The road density and road ratio were 438 m/km^2 and 2.74 km/1,000 persons, respectively, and both were higher than the national level of 202 m/km^2 and 1.95 km/1,000 persons. The well maintained Aceh-Jakarta state road via Medan runs longitudinally across the Province.

Six commercial seaports and 15 non-commercial seaports are operating for inter-island transportation, out of which four commercial and two non-commercial seaports handled international trade in 1995. The largest seaport is Belawan located about 30 km north of Medan, which dealt with about 50 % of inter-island cargo and 80 % of international cargo in

North Sumatra in 1995. All the seaports are not equipped with cold storage, and only Belawan can handle loading and unloading of refrigerated containers. Medan airport is the second largest airport in Indonesia after Soekarno-Hatta International airport in Jakarta in terms of import and export freights.

No watering facilities for fruit trees are provided, and water supply is highly dependent on rainfall. But, some areas do not require watering facilities thanks to adequate rainfall volume and distribution, but drainage facilities are needed. Water sources enabling gravity flow to production areas are rather difficult to be developed. Farm roads are not sufficiently developed and are not in a good condition. Some sites presently planted with upland crops, Palawija, or fruit trees have earthen farm roads, but the roads are hardly practicable for vehicles, especially in the rainy season. No collection houses or packing houses for the target fruits are available in all the proposed sites, while one home industry processing factory for marquisa is being operated by the farmers' group in Karo District.

Drinking water in the proposed sites is secured from groundwater in lowland areas, and spring water by gravity in mountainous and hilly areas. All the proposed sites are electrified from the national power grid.

(2) West Java Province

The total length of roads was 28,329 km in 1996, and the road density and ratio were 612 m/km^2 and 0.71 km/1,000 persons, respectively. The road density is quite high in Indonesia, but the road ratio is very low because of its large population. The State road network extending from D.K.I. Jakarta to both the western and eastern parts is well established and maintained. Access roads are generally in a fair condition.

Two commercial seaports at Cigadeng and Cirebon are operating for inter-island and international trades, while five non-commercial seaports handled only commodities for inter-island trade in 1995. Besides, two commercial seaports located in Jakarta, i.e. Tanjung Priok and Sunda Kelapa, also function as sea gates of West Java Province. Domestic and international trades by air are made through the largest Soekarno-Hatta International airport located in Jakarta, which handles about 60% of international air freight recently.

Some advanced farmers own watering facilities for fruit trees, but in general, no watering facilities are provided, and water supply is highly dependent on rainfall. Water sources with gravity flow are available in a few mountainous areas, but exploitation of groundwater is generally needed. As for farm roads, in spite of a high road density, farm roads are still insufficient for smooth access and transportation. No collection houses or packing houses for target fruits are available in all the proposed sites.

Drinking water in the proposed sites is secured from groundwater in lowland areas and spring water by gravity in mountainous and hilly areas. All the proposed sites except a part of the Bogor durian site are electrified from the national power grid.

(3) East Java Province

The total road length is 33,066 km and, like in West Java Province, the road density is high (690 m/km^2), while the road ratio is low (0.98 km/1,000 persons). The State road network down to village roads are sufficiently established and maintained in good condition. The road and access conditions in Districts are generally satisfactory.

Seven commercial seaports and eight non-commercial seaports are operating for inter-island trade, four of which dealing with international freight in 1995. The largest seaport is Tanjung Perak located in Surabaya city, handling more than 70% of inter-island and international freights. Juanda Surabaya airport deals with the third largest volume of international air freight in Indonesia after Medan airport .

A distinct contrast concerning water availability is observed between eastern Districts and western Districts. The eastern Districts have a longer dry season, and only deep groundwater is available causing high operation cost of pumping. The western Districts, however, are blessed with shallow groundwater in lowland enabling low operation cost of pumping, and spring water in mountain and hillland with gravity flow for watering of fruit trees. In Jombang District, some farmers are carrying out rotational watering of banana plantationa even in the dry season using wheeled pumps and engines managed by the farmers' group. No cultivation is observed in Pasuruan District. Although the road network is well established, farm roads still need extension or rehabilitation for smooth access and transportation. No collection houses or packing houses for the target fruits are available in all the proposed sites.

Drinking water in the proposed sites is secured from groundwater in lowland areas and spring water by gravity through pipelins in mountainous and hilly areas. All the proposed sites are electrified from the national power grid.

(4) South Sulawesi Province

The total road length is 27,772 km, and the road density and ratio are 382 m/km^2 and 3.6 km/1,000 persons respectively, which are similar to North Sumatra Province. The roads connecting the capitals of potential Districts are asphalted and well established. The road condition is good except in Mamuju District, in which about 20 km of the State road before capital Mamuju are severely deteriorated. Generally access roads in the Districts are not asphalt paved.

Two commercial seaports at Makassar and Pare-Pare and 16 non-commercial seaports are operational for inter-island trade, of which two commercial ports and seven non-commercial seaports handled international freights in 1995. The largest seaport is Makassar located in Ujung Pandang city, dealing with about 40% of inter-island cargo and about 15% of international cargo in 1995. Hasanuddin airport located in the suburbs of Ujung Pandang recently handles the sixth largest volume of international freight in Indonesia after Bali airport.

In whole South Sulawesi except the mountainous area, the duration of the dry season is rather longer, and from the viewpoint of plant physiology, watering can contribute to faster growth of fruit seedlings. However, at present watering for fruit trees is highly dependent on rainfall, and no watering facilities are commonly found. Actually, the water resources are not sufficient even for domestic and animal uses and, consequently, a conjunctive use of available water resources is inevitable. Water sources will be secured by exploiting rather deep groundwater or pumping water from intakes to be constructed on rivers. No farm roads are commonly provided for orchards. No collection houses or packing houses for the target fruits are available. Some home industry processing factories for marquisa are being operated by the farmers' group in Gowa District.

Much effort to secure drinking water is made by farmers in the proposed site except the mountainous area. The main water source is groundwater. In Wajo District, farmers buy drinking water transported by tank trucks, in Maros District farmers use water from a river, but in Bone District, they can get water only from a spring far away. Some areas in Wajo, Tana Toraja, and Bone Districts are not electrified from the national power grid.

4.12 Environment

The sites proposed for orchard development are generally located in upland areas, i.e. at the feet or slopes of mountains or hills. Land development by clearing trees, shrub or bush may easily lead to soil erosion by intensive rainfall during the wet season if no slope protection measures are taken. In Jombang and Trengalek Districts in West Java Province, large-scale sloped land development by constructing terraces and planting legume trees or grasses along slopes is carried out by farmers themselves under the guidance of the Provincial Agricultural Service. In South Sulawesi and West Java Provinces, small scale terrace lands are also developed to some extent. In steeply sloped areas, deep cutting is required for terracing, resulting in exposure of infertile sub-soil, and thus poor growth of fruit trees as well as covering plants.

Generally, small landholding farmers seldom apply agro-chemicals such as fertilizer and insecticide to their fruit trees, due to the small share of fruit in their income, less attention to

fruit trees, and financial difficulty in purchasing agro-chemicals. No negative impact of the use of agro-chemicals on the natural environment is observed.

In the Study Area, the main diseases are dengue fever, malaria, and diarrhea. Dengue fever and malaria are transmitted by mosquitoes which dwell in stagnant water bodies, and diarrhea is caused mainly by poor quality of drinking water.

Wastewater from the existing home industry processing factory, is not treated at all under the pretext of its small scale.

4.13 Orchard Development Performance

(1) Previous Realization

Under the horticultural development programs such as Fruit Crops Production Center (Sentra Produksi Buah-Buahan), Farm Operation in Special Area (Usahatani di Wilayah Khusus), Integrated Farm Operation in Marginal Area (Usahatani Terpadu di Lahan Marginal), and Integrated Rural Agricultural Project (Proyek Pertanian Rakyat Terpadn) implemented during the period of Repelita V, the orchard development areas opened so far amount to 27,302 ha in the Study Area. The developed areas by target fruit are summarized in Table 4.9.

Table 4.9 Orchard Development Realized in the Study Area

(Unit: ha)

Commodity	North Sumatra	West Java	East Java	South Sulawesi	Total
Banana	95	110	275	100	580
Citrus	700	20	100	1,270	2,270
Duku	65	200	-	-	265
Durian	970	2,101	750	-	3,821
Jackfruit	-	360	-	-	360
Mango	1,100	1,425	4,680	5,180	11,485
Mangosteen	160	250	-	-	410
Melinjo	700	-	-	-	700
Pineapple	-	50	-	-	50
Rambutan	660	1,874	500	800	3,834
Salak	300	-	376	-	676
Soursop	-	-		-	
Mixed Crops	500	2,201	-	-	2,701
Total	5,250	8,591	6,831	7,350	27,302

Source: DGFCH

(2) On-going IHDUA Project

Since April 1997, DGFCH has implemented the IHDUA/P2AH in 31 sites of 15 Provinces. In the Study Area, 17 Sub-projects as shown in Table 4.10 are under development with a total target area of 12,000 ha.

Table 4.10 On-going IHDUA Project in the Study Area

Province	District	Commodity	Area (ha)
North Sumatra	Tapanuli Utara	Citrus	1,000
	Karo	Marquisa	500
	Langkat	Rambutan	500
West Java	Cirebon	Mango	1,000
	Majalengka	Mango	500
	Indramayu	Mango	1,000
East Java	Ponorogo	Citrus	500
	Situbondo	Mango	1,000
	Mojokerto	Banana	1,000
South Sulawesi	Selayar	Citrus	500
	Bulukumba	Citrus	500
	Bantaeng	Citrus	1,000
	Jeneponto Takalar	Mango	500
	Takalar	Mango	500
	Sinjai	Marquisa	1,000
	Luwu	Rambutan	500
	Polewali Mamasa	Marquisa	500
Total			12,000

Source: DGFCH

CHAPTER 5 CONSTRAINTS TO FRUIT PRODUCTION DEVELOPMENT THROUGH FRUIT QUALITY IMPROVEMENT IN THE STUDY AREA

5.1 Impediments Identified in the Past Fruit Production Development Projects

Various impediments identified in the past fruit production development activities are itemized as follows:

- The commodities produced are not yet of first quality;
- The quality of commodities produced is not homogenous and therefore not suitable for export;
- The volume of commodities produced is small and constant supply is not guaranteed;
- The capacity of processing, sorting and packing of fruit is small;
- The number of producers which can produce high quality fruit seedlings in large amounts is limited;
- Capability and skills of farmers are limited;
- The number of processing factories is limited;
- The personnel and facilities for agricultural extension in the horticultural sub-sector are inadequate;
- Limited infrastructure and scarcity of population outside Java cause difficulties in agricultural development, especially in Eastern Indonesia; and
- Development fund in the form of budget and subsidy is insufficient.

5.2 Constraints to Fruit Production Development through Fruit Quality Improvement

To formulate the basic orchard development plan, the existing problems and constraints need to be duly scrutinized. The geographic location of Indonesia in the tropics and equatorial area presents the advantages for growing perennial tree crops. However, the disadvantage is that the land is scattered over 13,665 islands with different infrastructural conditions and population density, resulting in various transportation and marketing problems.

(1) Physical Constraints

The physical infrastructure on which the economy depends is generally weak. In the remote and isolated area, the main problem resides in the lack and poor maintenance of infrastructure.

Weakness in the transport system in particular restrains domestic circulation of goods and supplies as well as import and export activities.

Many areas, especially outside Java where new orchard development is promising, do not have adequate infrastructure to support the proposed development. Such infrastructure as access road to production site and facilities for water supply, drainage and post-harvest is an essential prerequisite for successful implementation of orchard development. In reality, the lack of public support in developing such facilities constitutes one of restrictive factors for further expansion of fruit production.

To develop an economically sizable orchard consisting of many individual farming lots, there exist several difficulties to be solved, especially land and water resources arrangements. Orchard development is to be designed aiming at intensive and effective utilization of the existing dry uplands and wetlands under cultivated or temporarily fallow condition. Because of traditional land ownership in rural areas, procurement of consecutive land plots is nowadays a challenging work and the plot size is usually limited to a certain extent.

In the eastern part of East Java and whole South Sulawesi except mountainous areas, the duration of the dry season is longer compared with other regions in the country. From the viewpoint of plant physiology, irrigation water supply can contribute to faster growth of fruit seedlings under such climatic condition. Such dry weather zone runs short of water for domestic and animal husbandry use. As a result, priority is given to meet basic human needs followed by crop water use. In this respect, optimal use of water resources should be considered in formulating the orchard development plan.

(2) Seedling Supply Issues

The shortage of high quality seedlings is a major constraint to orchard development in the Study Area. Main suppliers of fruit seedlings are private nurseries of which business activities depend on selling of plantlets to public investment projects. They are producing fruit seedlings of variable quality and selling low quality ones at cheap prices to farmers who are used to buy one or two trees only. Major constraints are as follows:

- Insufficient technical knowledge on seed and seedling production and propagation;
- Lack of experiences in evaluation, exploration and determination in preparing/ introducing new varieties;
- Less knowledge about advanced technology like tissue culture and limited practice to distribute such technology to private nurseries;

- Lack of an effective and disease-free maintenance system for the registered mother plants of recommended varieties;
- Poor facilities and equipment in BBI and BBU;
- Lack of an information service system on new and qualified seedlings in BBI;
- Limited capability of BPSB in service, control and guidance to seedling producers; and
- Limited methods and facilities for certification of fruit seedlings.

(3) Technical Problems in Farm Management

The fruit production in the Study Area depends mostly on a large number of smallholders who practice a type of "mixed gardening" in their home yards, and with traditional fruit growing techniques or without any special farming care after planting. Fruit trees are planted in between various perennial and annual crops, so it is sometimes not clear which is the main crop for the farmers' livelihood. Most of farmers cultivate for self consumption and not yet for commercial purpose. More importantly, the orchard development know-how is probably not yet disseminated to the public officers in charge of extension services to the interested farmers.

From the viewpoint of fruit tree maintenance, the lack of knowledge or experience in pruning and thinning treatment causes alternate fruit bearing, especially for avocado, duku, durian, mangosteen, and rambutan. Such alternate bearing leads to the imbalance in fruit supply and demand and fluctuation of market prices. Even though diseases-free plantlets of banana and marquisa are used, the outbreak of diseases under unfavorable microbiological soil condition causes serious damage to plants. The main cultural techniques required for farm management of the target fruit trees concern the knowledges about planting distance, fertilization (volume and timing), watering and harvesting timing, pest and disease control (selection of countermeasures to be applied), and so on.

(4) Post-harvest and Processing Issues

Due to the perishable nature and small volume of marketable fruits, it is almost impossible for individual smallholders to secure their market outlets. Post-harvest activities including cleaning, sorting, grading, packing, and transportation can only preserve the quality of fresh fruits for a certain period of time after harvesting. Although the four Provinces are advanced fruit growing areas in Indonesia, these activities are still poor and result in considerable post-harvest losses. Most smallholders growing a few trees of a specific kind do not know the importance of supplying fruits with consistent quality to the markets. Under such circumstances, the collectors/middlemen take the initiative in determining the trading prices of fruits, on condition that they shoulder various marketing risks.

The issues facing agro-processing industry are: (i) unreliable sources of raw materials both in quantity and quality; (ii) limited facilities or equipment for fruit processing; and (iii) non-availability of term credit.

(5) Marketing Constraints

Most of fruit growers do not have the expertise or desire to sell their fruits other than to nearby local markets. Therefore, a special transaction system between buyers/collectors and smallholders has developed. In this system, smallholders sell their fruits at the farm gate to buyers who collect fruits from a number of smallholders and transport fruits to another market for resale. The smallholders are used to be at the end of a long market chain and have limited bargaining power. Payment is made in cash and the buyer takes any risk with the perishable products after the farm gate. Consequently, most of fruit growers sell their products with relatively low prices and are deprived of bargaining power.

(6) Institutional Problems

In line with decentralization policy, most of the responsibilities for basic planning and management activities fall onto Provincial and District governments. However, local governments rarely have well-trained experts in planning and management activities. Such institutional weakness is a hurdle to promote the fruit production development.

In the decentralization process, the majority of extension workers were placed under the control of the District authorities, but their status is not yet clearly institutionalized. Besides, the extension services related to fruit growing are carried out concurrently by the extension workers in charge of food crops production. To these extension workers, any training program for fruit growing is not yet prepared by the Agency for Agricultural Extension and Training (AAET), except for a few cases in which the Provincial Agricultural Services (PRAS) Office provided them with a short-training course.

(7) Financial Constraints

The Government of Indonesia (GOI) adopts a single-year budget disbursement system and its annual development budget plays an important part in the government's management of development investment. For the fruit production development in particular which needs continued investments for several years, it is prerequisite to secure duly the development funds until the project becomes sustainable.

However, the lack of well-established credit system constitutes a major constraint to this long-term fruit production development. Another reason why the private sector is reluctant to invest in such long-range project is due to its potential high risk. In addition, it is difficult to introduce

and enforce a low-interest financing system in Indonesia where the higher-interest lending is prevailing. The lack of longer-term credit corresponding to the periods from planting to harvesting of perennial tree crops presents a real constraint or issue to be solved for further promotion of the fruit production development in this country.

Constraints mentioned above to fruit production development through fruit quality improvement are categorized into three aspects such as i) institution and finance, ii) human resource development, and iii) basic infrastructure as shown in Table 5.1.

5.3 Problem Structure for Regional Economy

(1) Problem Structure Analysis

According to broad indicators, Indonesia's economy has performed very well until 1996. GDP increased 7.8% in 1996 and inflation rate dropped to 6.6%. Despite this strong performance, significant risks still remain domestically and externally. As pointed out in the country report prepared by the World Bank, the following five issues are considered as "key factors" to sustain Indonesia's high growth with equity:

- Sound macro-economic fundamentals, including rapid adjustment to shocks;
- High investment and domestic savings, which reflect sound macro-economic fundamentals ad high public savings rates;
- Sound human resource development that leads to higher wages, lower population growth, and improvement in the status of women;
- More attention to international competitiveness and less interference with markets than most countries; and
- Improved institutions, including the central and local governments.

The above key factors suggest that when performance declines in these areas, growth slows, efficiency drops, and equity deteriorates. New challenges threatening Indonesia's ability to grow and increase equity include globalization, scarcity of skills, an aging population, natural resource depletion, environmental degradation, and lack of infrastructure to maintain rapid growth. Although successful challenging will depend on the realization of the above five factors, the pressing needs to reinforce Indonesia's economy are bold reforms to sweep away structural rigidities, improve fiscal transparency, and restore banking system back to financial health.

Table 5.1 Major Constraints and Issues for the Fruit Production Development

Major Constraints	Major Issues	Organizations
1. Institutions and Finance		
- Lack of cooperation among the agencies concerned, especially between DGFCH and other related ministries and agencies due to their vertical administrative structure	Formation and strengthening of the cooperation system among the agencies concerned for promotion of the fruit production development projects	MOA, BAPPENAS, Ministry of Industry, Ministry of Migration, MPW, MOCSED
- Shortage of the public institutions which take charge of fruit production development from the central-level through farm-level	Establishment and consolidation of the implementing agencies (including project management offices, coordination committees, etc.) for smooth implementation of the fruit production development projects	DGFCH
- Limited development funds and difficulties to secure and allocate them throughout the project implementation	Continued allocation of the goverament's development funds (APBD) to complete the project implementation	DGFCH
- Lack of communication and partnership linkage between public institutions and private sector in regard to fruit production development	Formation of the cooperation and partnership linkage with the private sector	DGFCH, Agency for Agribusiness, PRAS
- Difficulty in introducing a low-interest financing system in Indonesia where the higher-interest lending is prevailing	Foundation of the rural credit system including a long-term credit service to farmers engaging in the perennial crops farming	Agency for Agribusiness
- Poor recognition of the importance to strengthen the R&D activities for introduction of new varieties and assess the adaptability of new technologies to be introduced	Strengthening of the new technology adaptability trial operation system in AARD and BPTP	AARD
- Underdeveloped information system to provide the accurate and timely information to those who are interested and/or engaged in fruit production and its agribusiness	Upgrading of the two-way information system which enables the producers to send information to the markets and consumers	PRAS, Agency for Agribusiness
- Non organization of fruit growers' groups and their credibility in KUD	Institutional arrangements for formation of the fruit growers' groups and provision of the supporting services to assist them in organizational, financial and operational aspects	Agency for Agribusiness, DGFCH, PRAS, DAS
- Weak position of fruit producers in the markets and marketing system, and lack of supporting services to them	Institutional development of the established fruit growers' groups and strengthening by uniting them into associations and federation	Agency for Agribusiness, PRAS
2. Human Resource Development and Training		
- Lack of the planning staff at provincial level, especially in PRAS	Capability building of the Provincial staff in-charge of the project planning	PRAS, BAPPEDA
- Shortage of the staff in the local governments (both at provincial and district levels) well versed in the orchard development and management	Capability building of the Provincial staff in charge of the project implementation and management	PRAS
- Limited number of the staff specialized in introducing and propagating the new fruit varieties at BBIs and BBUs	Upgrading of the staff capacity to strengthen the research and development activities for introduction and breeding of the new high quality fruit varieties	AARD, PRAS, BBI, BBU
- Non existence of the extension workers who have highly specialized knowledge and technology in fruit cultivation and its farm management, and poor training facilities and materials	Preparation of the farm management manuals for fruit production subsequent to introduction of the new fruit growing technologies, and upgrading of the extension workers' capabilities	AARD(BPTP)
- Lack of the staff in charge of seedling inspection and their practical training	Upgrading of the staff capability to strengthen the fruit seedling inspection system in BPSB	DGFCH (BPSB)
- Poor knowledge of the staff in charge of plant quarantine and pest control in CAQ, and limited number of the expert in this field	Capability building of the staff in charge of the plant quarantine, and insect and pest control to strengthen the plant quarantine system in CAQ	CAQ
- Insufficient knowledge and technical level of the staff in charge of introduction and propagation of the high quality seedlings at BBIs and BBUs	Upgrading of the staff's knowledge and technical level to improve the high quality seedling propagation and distribution system	PRAS, BBI, BBU
- Weak capability of the private nurseries in producing and supplying the high quality seedlings	Capability building of the private nurseries to upgrade their propagation capacity of quality seedlings	PRAS, DAS, BBI, BBU
- Lack of training and reeducation opportunities to the staff in charge of extension services to fruit growers	Upgrading of the extension workers' capacities and knowledge about farm management, post-harvest handling and marketing for promotion of the market-oriented fruit production development	PRAS, DAS
- Insufficient knowledge and experience of farmers about fruit production and post-harvest handling technologies	Dissemination of the knowledge and technology about the market-oriented farm management, post-harvest handling and marketing to the participating farmers	PRAS
- Poor experience of farmers in group operations and activities, and lack of management capabilities	Provision of the guidance services to the established fruit growers' groups to strengthen their operations and management	PRAS
3. Basic Infrastructure and Facilities		
- Increase of the small landholding farmers and impoverishment of rural areas	Establishment of the orchards with properly prepared fruit farms	PRAS
- Deficiency of the basic infrastructure in rural areas due to the limited development fund	Construction and/or improvement of the basic infrastructure such as access roads, watering and drainage facilities, etc.	PRAS
- Lack of the facilities and equipment to undertake the R&D activities for introduction and propagation of new high quality fruit varieties in BBIs & BBUs and others	Installation and/or rehabilitation of the facilities and equipment required for research and development activities in introducing and breeding the new high quality fruit varieties	PRAS
- Insufficient facilities and equipment to carry out the new technology adaptability tests in AARD and BPTP	Construction and/or rehabilitation of the facilities and equipment in AARD and BPTP necessary for strengthening the new technology adaptability trial operation system	AARD(BPTP)
- Overage and poor facilities and equipment for seedling inspection in BPSB	Improvement of the facilities and equipment in the BPSB necessary for physical, chemical and botanical examinations of the fruit seedlings	DGFCH (BPSB)
- Lack of the facilities and equipment for plant quarantine activities and pest control in CAQ	Improvement of the facilities and equipment for strengthening of the plant quarantine system	CAQ
- Insufficient and overage facilities and equipment for propagation and distribution of the high quality seedlings at BBIs and BBUs	Rehabilitation of the facilities and equipment in BBIs and BBUs to improve and strengthen the high quality seedling propagation and distribution system	PRAS, BBI, BBU
- Deficiency of the facilities for post-harvest handling and processing which are indispensable for the market-oriented fruit production development	Installation of the post-harvest handling facilities for collecting, cleaning, sorting, packaging, processing, etc. with a view to producing the high quality value-added fruit products	PRAS
- Poor marketing and processing system and facilities for dealing with the harvested fruits	Installation and/or rehabilitation of the facilities required for improvement of the fresh fruit collection, storage and distribution system in the local markets	PRAS

Note : For abbreviations, refer to "ABBREVIATIONS AND GLOSSARY."
Source : JICA Study Team

Although the four Provinces selected for the Study can be considered as economic growth centers of the country, the Study Area also faces a variety of problems which would work as constraints to further development of the regional economy. Many of these problems are inter-related to cause various undesirable phenomena as observed.

The problem structure analysis is a method to clarify these inter-linkages in a macroscopic way. The analysis would allow to maintain a broad perspective without getting into details to identify more important and essential factors and major problems to be alleviated through planned development efforts.

A problem structure in the Study Area is analyzed as illustrated in Figure AT-5-1, showing more important factors and phenomena as well as main inter-relationships among them. Main factors may be classified into two categories: external (macro-economic) and internal (regional socio-economic) factors. The external factor is more fundamental, and much concerns the financial and national policy/institutional issues. This is largely beyond control at a regional level, but major institutional issues are to be tackled by local authorities at the Provincial and District levels in line with the recent decentralization policy of GOI. The regional socio-economic factor mainly concerns the natural/physical factors.

(2) Main Factors Causing Problems

In the Study Area, fundamental or general constraints which limit the growth of the agricultural sector might be attributed to the following:

- Socio-economic distortions derived from the recent high economic growth;
- Developing regional economic structure;
- Prevailing rainfed farming directly affected by droughts;
- Existence of numerous small landholding farmers with an uneconomic land size, fragmented due to the current inheritance rule in Java island;
- Limited availability of new land resources in Java caused by the land use conversion to other purposes;
- Lack of skilled or well-experienced human resources in other islands for agricultural development; and
- Insufficient infrastructure in remote rural areas.

In addition to the general constraints mentioned above, the specific constraints to development of the agricultural sector could be summarized as below.

It is true that compared to other regions in the country, the Study Area has much potentials and

advantages, but much is needed to solve the above constraints and problems for ensuring more bright agricultural development. All these problems have serious implications on the Study Area. Other problems to be noted include the high poverty incidence in some remote/isolated areas of the four Provinces and widening regional disparities within the Provinces. The poverty is a result, rather than a cause, of poor economic performance in depressed areas or less developed villages. In conclusion, the balanced and sustainable regional development is a "key issue" not only within the Study Area but also in the whole country .

5.4 Socio-economic and Cultural Constraints

Due to the latest financial crisis of the country with currency turmoil, the issue of job creation becomes an important subject of discussion in formulating the socio-economic development strategy. Another issue to be strongly addressed is poverty or disparity in wealth which widespreads throughout the country and results in regional disparities.

In fruit production, women play an important role in farming practices and contribute considerably to the family income. However, women are disadvantaged in terms of social, economic ad financial opportunities. Because of the lack of social infrastructure or institutions, there still remain difficulties for women to take advantage of educational opportunities, and women are left with very little time to develop their skills.

The impediments to orchard development seem to derive mostly from the socio-cultural backgrounds of the respective communities and growers themselves. Major socio-institutional problems and constraints identified in North Sumatra could be summarized as follows:

- Conflict on land use between estate crop planting and orchard development;
- Poor cooperation among growers and village traders;
- Lack of knowledge of farming practice and quality control;
- Absence of reliable and timely market information;
- Recognition of fruit growing as an additional job for most of farmers; and
- Lack of confidence in KUD due to its inefficiency.

The impediments prevailing in West Java are:

- Limited land suitable for orchard development due mainly to the existence of a lot of lands belonging to absentees;
- Weak marketing system;
- Regional disparities and existence of remote isolated villages destitute of basic infrastructure;

- Lack of supporting services to promote orchard development; and
- Absence of reliable and timely market information.

Predominant problems and constraints in East Java are:

- Sideline activities for most fruit growers;
- Very limited training occasions for both extension workers and farmers;
- No established marketing channel for the products;
- Lack of fund to improve farming practice;
- Demographic pressure and fragmented farm lots due to the inheritance rule;
- Lack of information and no knowledge of fruit quality in terms of color, size, and taste; and
- Poor basic infrastructure in some poverty-stricken or less developed areas.

In South Sulawesi, the following problems are common:

- Additional job for most of farmers when they grow fruit;
- Lack of skills in better farming and post-harvest technology;
- Shortage of skilled agricultural extension workers;
- Shortage of manpower for expansion of fruit growing in some remote areas;
- Lack of basic infrastructure for farmers' living and also for orchard development such as water supply facilities; and
- Bad condition of roads leading to some isolated villages.

CHAPTER 6 BASIC PLAN FOR FRUIT PRODUCTION DEVELOPMENT THROUGH FRUIT QUALITY IMPROVEMENT IN THE STUDY AREA

6.1 Development Objectives and Basic Plan

(1) Objectives of the Fruit Production Development Plan

The objectives or targets of fruit production development are to challenge and overcome the constraints clarified in Chapter 5, in line with the existing national development policy and strategies of horticultural agribusiness development.

The objectives of fruit quality improvement and orchard development in the Study Area are:

- To increase farmers' income and welfare, especially those of the small landholding farmers, by establishing intensive fruit production areas and improving the quality of the target fruits;
- To produce sufficient fruit to meet the people's need; for supply firstly to regional markets and secondly to urban and overseas markets to earn cash income;
- To improve people's nutrition and health through diversification of food consumption and promotion of fruit consumption;
- To create more job opportunities by developing agro-processing industries in the rural areas, preferably in the less-developed "Desa";
- To establish a dynamic agribusiness system by developing the linkage of its strong sub-systems in production input supply, processing, marketing, etc., and the partnership or active participation of the private sector;
- To strengthen the activities of farmers' groups in order to empower them to make better market competition with tough bargaining power; and
- To broaden the market share, domestic as well as abroad, and increase foreign exchange.

(2) Key Issues in Formulating the Basic Development Plan

When formulating the basic development plan aimed at increasing small landholding farmers' income through the improvement in quality of the target tropical fruits, it is essential to fully scrutinize the causes and/or factors which impede its sound promotion or sustainable development, on the basis of the characteristics of the respective fruits. The analyses of problem structure and impediments to fruit quality improvement and orchard development have

clarified the following key issues to be addressed and challenged through well-planned and integrated development efforts in the respective fields concerned.

Land resources

- Need for intensified land use because of fragmentation of land size due to the current demographic pressure and inheritance rule;
- Arrangement of cadastral survey to ensure easier access to land resources suitable for orchard development; and
- Assessment of the land suitability for orchard development based on the agro-ecological criteria (refer to Table 6.2) and social acceptability indicated by landholding farmers' willingness to participate in business-oriented group farming.

Planting materials

- Strengthening of the institutes concerned focusing on both institutional and financial aspects to improve/upgrade their research and propagation activities;
- Upgrading and modernization of propagation of high quality seedlings, especially through the introduction of improved new varieties and vegetative multiplication techniques including tissue culture as well as cutting, root suckers, copping, grafting, air-layering, and budding by using designated mother plants as a source of scions and selecting good rootstocks;
- Improvement of the certification system to guarantee qualified seedlings;
- Development of well-managed commercial nurseries to propagate good seedlings; and
- Strengthening of the management system to improve seedling quality, through appropriate input application and farming practices.

Farming system and technology

- Improvement of the traditional cultivation system practiced in "small landholdings" where farming technologies have been neglected, resulting in low productivity, poor quality, and expensive collection;
- Shift from the prevailing farming practice mostly for subsistence to the commercial or higher value-added production;
- Capability building of extension personnel, not only PPL but also field level staff, specializing in fruit growing;
- Betterment of facilities for dissemination of know-how and technologies on fruit

growing to farmers; and

- Leveling-up of farmers' capabilities in practicing what they learn about pre- and post-harvest activities through daily extension works and/or organized training.

Infrastructure and facilities

- Increase of public investment in infrastructure and support services in the areas proposed or designated for orchard development;
- Enhancement of support services by the public sector to promote private sector investment in agribusiness; and
- Reinforcement of inadequate infrastructure and limited facilities causing difficulties in production of higher value commodities and large losses of harvests.

Credit

- Development of the formal credit system designated for small landholders with attractive interest rates and without requiring any complex procedure;
- Increase of farmers' access channels to credit services and improvement of rural organization's efficiency to support small landholding fruit growers; and
- Introduction of a long-term credit system corresponding to the non-bearing period of perennial tree crops.

Marketing and post-harvest activities

- Structural reformation of the disorganized and inefficient marketing system for fresh fruits on both local and export markets;
- Organization of participatory small landholding farmers into fruit growers' groups and then forming an association of these groups to empower them to acquire a "bargaining power" over traders and processors;
- Promotion of institutional linkage in marketing and processing aspects between fruit growers' groups and traders/processors with public assistance and support;
- Increase of women participation in post-harvest handling, processing and marketing activities through fruit growers' groups or associations;
- Establishment of reliable and timely market information for small landholding fruit growers' groups;
- Arrangements of policy issues relating to the country's transport cost disadvantage, export promotion programs with administrative and information support for exporters, and licensing or deregulation in trade; and

- Accommodation to globalization of the Indonesian economy and intensification of international competitiveness in world trade owing to application/obedience of the treaties of GATT/WTO, Uruguay Round, and AFTA.

Environment

- Contribution to the natural resources conservation through forestation and agro-forestry development;
- Attention on slope protection by planting legumes as intercrops as well as green manure to avoid soil erosion;
- Adoption of an environment-friendly farming system paying attention to the selection of varieties, plant density, and introduction of the proper inter-cropping practices as well as proper use of agro-chemicals; and
- Proper control and management of wastewater and garbage by installing facilities for their treatment in processing facilities;

6.2 Strategies for Fruit Production Development through Fruit Quality Improvement

The basic strategies for fruit production development through establishing orchards are to be formulated focusing on the following major items : selection of the varieties taking into consideration the marketing of the target fruits, determination of orchard development scale, preparatory works for economic farming, supporting services for orchard development and its management, establishment of marketing system, human resources development and others.

Selection of the Varieties

Based on the assessment results of the National Seed Board, the Ministry of Agriculture (MOA) selects and announces the recommended varieties of various crops. In selecting and designating the recommended varieties of fruits, the MOA attaches importance to their marketability aspects as well as respective specific characteristics. When establishing an orchard with a large amount of fund, the planters select the recommended variety and also pay attention to the most popular one in the market. The fruit varieties whose salability is not yet proved are put out of use. In view of the above, the Study Team selected fifteen varieties in total as to the nine target fruits to be cultivated in each of the four Provinces. Table 6.1 shows the recommended varieties of the target fruits by province. As to the characteristics of target fruits by variety, the detailed information is given in Table A-3-5 of Appendix A.

Table 6.1 Recommended Varieties of the Target Fruits by Province

Fruit	North Sumatra	West Java	East Java	South Sulawesi
1. Avocado	-	Ijo Bundar	Ijo Panjang	Ijo Bundar, Ijo Panjang
2. Banana	-	-	Cavendish	-
3. Duku	-	Palembang	Palembang	-
4. Durian	Kani, Otong	Otong, Hepi Matahari	Otong	-
5. Mango	-	Arumanis 143, Manalagi 69	Arumanis 143, Manalagi 69	Arumanis 143
6. Mangosteen	Kaligesing	Kaligesing	-	Kaligesing
7. Marquisa	Asam Brastagi	-	-	Malino
8. Rambutan	Binjai	-	-	Binjai
9. Salak	Padang Sidempuang	Nglumut	Suwaru, Pondoh	-

Source : JICA Study Team

Development Scale

To acquire a reputation of the fruit product in markets, it is essential to supply constantly good quality fruit in conformity with the market requirements. At first, the distribution volume to the market will be determined by the local market's trading size. However, according as its reputation is increased, it is possible to expand gradually its marketing network to major cities or markets. On the other hand, when investing in the post-harvest facilities and relevant infrastructure development, it is important to keep an eye on the linkage or balance between the upstream and downstream enterprises, especially supply and demand. Besides, as to the maximum lot size per beneficiary farm-household, it is limited to 1 ha in view of the objective of this Master Plan which aims to increase the income of small landholding farmers. Based on the above, the development unit for one area is determined at 500 ha in this study at Master Plan stage. The demarcation of the respective orchard development areas will be determined in the detailed study after deciding on its implementation.

Preparatory Works for Economic Farming

Firstly, it is important to check the availability of mother plants and supply capacity of scions of the recommended varieties in BBIs/ BBUs of each Province. As to the target fruit trees whose scion propagation system is not established yet, a proper countermeasure should be taken so as to enable its economic farming prior to the orchard development. The preparatory works needed for each target fruit tree are summarized below.

- Avocado : The scions of avocado will taken up from two kinds of the mother plants

of recommended variety existing in East Java and they will be transplanted in the BBI of South Sulawesi. Some scions will be also transplanted in the experimental farm of South Sulawesi's BPTP to conduct its adaptability trial. From these grown up scions or new mother plants, avocado seedlings will be produced and propagated to supply them to the BBUs and private nurseries. In South Sulawesi, it will be necessary to start the seedling production after checking the results of adaptability trials. For establishment of a seedling supply system of avocado to produce its required number of seedlings, it will take about 5 years in West Java and East Java, and 7 years in South Sulawesi. Consequently, the avocado trees will be planted from the 6th year after starting the preparatory work in each orchard in West Java and East Java, and from 8th year in South Sulawesi.

- Duku : The scions of duku will taken up from the mother plants of recommended variety existing in South Sumatra and West Kalimantan, and they will be transplanted in the BBIs of West Java and East Java. Some scions will be also transplanted in the experimental farms of the BPTPs to conduct its adaptability trial. After checking the results of its adaptability trial, the scions for seedling production will be taken up from the grown up scions or new mother plants. To produce the required number of its seedlings, it will take about 7 years in both West Java and East Java. In these two Provinces, the duku trees will be planted from the 8th year after starting the preparatory work in each orchard.

- Mangosteen : The scions of mangosteen will taken up from the only mother plant of recommended variety existing in Central Java, and they will be transplanted in the BBIs of North Sumatra and West Java. Although two young scions are already transplanted in BBU at Ujung Pandang (South Sulawesi), it is needed to strengthen further its seedling production system by improving the technical and financial services. For adaptability trials of its varieties to be introduced, it will take about 3 years. Waiting for the results of its trials, scions for seedling production will be taken up from the new mother plants. In West Java and East Java, the mangosteen trees could be planted from the 9th year after starting the preparatory work in each orchard.

Supporting Services for Orchard Development and its Management

Orchard development will be implemented with the following steps:

- Implementation of social design or social preparation study aiming at identifying the farmers' participation as well as demarcation of development site and its area;
- Formulation of definite implementation program, detailed design, and cost estimate for the development of production and related infrastructure;

- Tendering and construction of production and related infrastructure;
- Procurement and distribution of agricultural inputs including fruit seedlings, fertilizer, agro-chemical, etc. as well as planting of inter-crops; and
- Procurement and distribution of agricultural inputs necessary for fruit crop cultivation.

To assure the supporting services for orchard development, District government will establish a "Project Management Unit (PMU)" under the District Agricultural Services Office for each development area. This PMU is responsible to provide the participatory farmers with supporting services in administrative and technical aspects. In addition, in order to support the existing agricultural extension system and to strengthen extension services at the on-farm level, one Field Inspector for every 100 participating farmer and one Field Inspector Coordinator for every 500 ha will be newly recruited by PMU. Their main activity is to provide the contact farmers, each of them will be selected from every 20 participatory farmers, with intensive extension services regarding the farm management, post-harvest handling, marketing, and operation and management of farmers' group.

Marketing System

Market development and expansion will be carried out and promoted by fruit growers' groups, which will be newly established in each development area with constituent members of small landholding participatory farmers by receiving advice and support from PMU and Provincial Agricultural Services Office as well as collaborating with private sector dealing with distribution, marketing, and sales The establishment of an orchard or production center of fruit should be accompanied with marketing development and promotion based on the analysis of market demand. For that purpose, marketing services are to be strengthened under the initiative of the government agencies concerned. These services comprise the supply of market information on trend of domestic fruit market trading, rationalization of trading and account settlement system, market analysis and strengthening of advertisement for export promotion, and strengthening of plant quarantine system meeting quarantine regulations and requirement of importing countries. In case that fruit production is more than the local consumption, efforts will be made to improve the fruit production and post-harvest system and satisfy the demand of markets and consumers.

Human Resources Development

Comprehensive training program will be prepared for not only farmers participating in orchard development but also government staff and private firm employees relating to the fruit production development. Based on this program, individual training program with specific object will be carried out at Central, Provincial and District levels by allotting budget in the fruit

production development programs.

The training programs to be executed at District level will focus on "field training" for contact farmers and individual farmers rather than lecture in room concerning fruit cultivation technique to meet the market requirement.

Target trainees at Provincial level will be Field Inspector Coordinators and Field Inspectors, deployed at each development site. The training program includes seedling propagation, farming practice, post-harvest handling, distribution and marketing for each target fruit. In addition, training will be provided to private nurseries aiming at raising propagation technique of quality fruit seedlings. Training program for government staff engaging in fruit production development will focus on capability strengthening for project planning, monitoring, post-evaluation, and feed-back to the planning.

The training program at Central level will be implemented for Sub-project manager and Field Inspector Coordinator in respect to technical and administrative aspects for smooth implementation of the orchard development programs.

Others

The strengthening of research and development activities for introduction and breeding of the new high quality and disease tolerable fruit varieties as well as rationalization of credit facilities will play an essential and important role in fruit production development. Therefore, both aspects will be taken up in the frame of orchard development programs.

6.3 Basic Plan for Fruit Production Development in North Sumatra Province

The profile of the four Provinces is summarized in Table AT-6-1, indicating major factors in relation to the formulation of the orchard development plan in each Province. Figure A-6-1 schematically shows the major characteristics, key themes, development focuses, and the conceptual development framework for orchard development in the respective Provinces, including the promising development areas and basic development concepts and strategies.

(1) Development Targets

To realize the development objectives, the orchard development targets in North Sumatra are set as follows:

- Development of the western and central Districts of the Province, especially those located in the marginal or remote plateaus and foothills;
- Upgrading of the fruit seedling production system to supply high quality plantlets;

- Promotion of high value-added fruit production or small-scale agro-processing industry;
- Provision of access roads and related facilities to fruit growing areas;
- Establishment of a distribution network linking with high potential markets in major cities and abroad;
- Development of human resources and fruit growers' organization; and
- Strengthening and enhancement of agricultural support services.

(2) Development Concept

The development concept for North Sumatra Province is to market fresh fruits of durian, mangosteen and rambutan to Medan and the international tourism zone near the Lake Toba. Foreign market development will be continued to export mangosteen and rambutan. Excess durian, rambutan and salak fruits in the peak harvest season are expected to be processed by home industry, while marquisa will be grown as raw material for the fruit juice manufacturing industry.

As salak is a new face in North Sumatra, special attention is to be paid to a sizable development coupled with effective promotion activities to open up new local markets and expand market share in Jakarta. Combination with other target fruits is also a possible alternative.

To encourage small landholding farmers to develop orchards of the target fruits, the basic development concept is prepared as shown in Table AT-6-2 and summarized below.

Durian and mangosteen

The focal points of North Sumatra's basic development plan are as follows:

- Economically sizable orchards are to be developed through farmers' participation from the planning stage as special attention needs to be paid to the creation of cash income sources by means of inter-cropping or combination with other fruits or covering a longer period until the first harvest;
- Strengthening of the existing fruit seedling production and certification system through rehabilitation and renewal of BBI/BBU and BPSB;
- A farm management system based on proper tree maintenance works and coupled with post-harvest handling technology is to be introduced to ensure productivity and profitability of orchards;
- Intensive extension services are to be secured through the application of a special

support staff system as one of project components practiced for the implementation of the on-going IHDUA/P2AH Project;

- Provision of systematic training programs including sufficient on-the job training opportunities to project support staff, extension workers, and key farmers;
- Easy access to credit facility is to be secured by way of in-kind revolving concept; and
- Marketing development is to be left to the preference of markets and consumers in terms of quality and price by spreading fruit brands marketed by specific fruit growers' groups.

Marquisa

Marquisa is cultivated as processing fruit in North Sumatra. In this respect, further attention is to be paid to the following points:

- Increase in constant supply capacity of raw materials to fruit juice producing manufacturers;
- Upgrading and rehabilitation of the access road network to orchard sites; and
- Bargaining power against the downstream industry is to be strengthened by grouping marquisa growers.

Rambutan

Rambutan is exported to EC markets, therefore the main planning points are as follows:

- Economically sizable orchards are to be developed through farmers' participation from the planning stage as special attention needs to be paid to the utilization of the existing paddy fields;
- Strengthening of the existing fruit seedling production and certification system through rehabilitation and renewal of BBI/BBU and BPSB;
- Farm management system based on proper tree maintenance works and coupled with inter-cropping of paddy and palawija crops is to be introduced to ensure productivity and profitability of orchards;
- Improvement of the drainage control system;
- Easy access to credit facility is to be secured by way of in-kind revolving concept; and
- Marketing promotion is to be directed towards expansion of export markets in supporting the public export promotion programs.

Salak

Salak is a quite new fruit crop in North Sumatra. Although the basic development plan for salak

is quite similar to that of durian and mangosteen, special consideration of the following items is required:

- Establishment of a seedling production and supply system;
- Preparation and practice of the standard of farm input use; and
- Market development targeting consumers in the Province and other regional cities.

(3) Potential Area for Orchard Development

Large-scale commercial estates growing industrial crops are main players in the agricultural sector in this Province. As for orchard development, it is planned to utilize dry upland fields on highland plateaus and hillside slopes in the western and central parts of North Sumatra as well as wet paddy fields in lowlying areas.

The orchard development areas or projects for five target fruits are listed up in Table AT-6-3. The potential areas total 5,850 ha consisting of 1,550 ha for durian (split into three areas), 1,300 ha for mangosteen (two areas), 1,000 ha for marquisa (one area), 500 ha for rambutan (one area), and 1,500 ha for salak (one area).

6.4 Basic Plan for Fruit Production Development in West Java Province

(1) Development Targets

To realize the development objectives, the orchard development targets in West Java are set as follows:

- Improvement in livelihood of small landholding farmers living in central mountainous and southern foothill areas;
- Promotion of agro-processing industry to generate employment opportunities; and
- Establishment of a systematic marketing system to cope with the increasing inflow of food crops .

(2) Development Concept

The development concept for West Java Province is to market all the target fruits in fresh state to Jakarta, Bandung and many new satellite industrial and housing estates in the outskirts of Jakarta. In addition to processing by home industry of excess fruits of durian, mango and salak in the peak harvest season, the basic scenario is to provide private processing factories with raw materials in constant manner under a mutual agreement system.

To encourage small landholding farmers to develop orchards of the target fruits, the basic

development plan is prepared as shown in Table AT-6-4 and summarized below.

Avocado and duku

Focal points of West Java's basic development plan are as follows:

- Economically sizable orchards are to be developed through farmers' participation from the planning stage as special attention needs to be paid to marketability and profitability;
- Strengthening of the existing fruit seedling production and certification system through rehabilitation and renewal of BBI/BBU and BPSB, taking into account features of the specific local varieties;
- A farm management system based on proper tree maintenance works and coupled with post-harvest handling technology is to be introduced to ensure productivity and profitability of orchards;
- Intensive extension services are to be secured through the application of special support staff system as one of project components practiced for the implementation of the on-going IHDUA/P2AH Project;
- Provision of systematic training programs including sufficient on-the job training opportunities to project support staff, extension workers, and key farmers;
- Easy access to credit facility is to be secured by way of in-kind revolving concept; and
- Marketing development is to be left to the preference of markets and consumers in terms of quality and price by spreading fruit brands marketed by specific fruit growers' groups.

Durian

Durian is one of popular fruits and preferred in various markets in Jakarta and West Java. Taking this advantage into account, further consideration of the following points in addition to the focal points for avocado and duku is required:

- Orchard development is to increase quality fresh fruit supply to the existing markets for strengthening market competitiveness;
- Upgrading and renovation of the farm management and post-harvest handling system; and
- Promotion of linkage between fruit growers' groups and the private sector for creating direct marketing channel to supermarkets.

Mango, mangosteen and salak

These crops are also very common and popular in the markets, therefore the main planning

points are as follows:

- Economically sizable orchards are to be developed through farmers' participation from the planning stage as special attention needs to be paid to the utilization of the existing paddy field;
- Strengthening of the existing fruit seedling production and certification system through rehabilitation and renewal of BBI/BBU and BPSB, taking into account features of the specific local varieties;
- A farm management system based on proper tree maintenance works and coupled with inter-cropping of paddy and palawija crops is to be introduced to ensure productivity and profitability of orchards;
- Easy access to credit facility is to be secured by way of in-kind revolving concept; and
- Marketing promotion is to be directed towards expansion of the present markets.

(3) Potential Area for Orchard Development

Vegetable cultivation and fruit growing have been encouraged in West Java because of the existence of the largest demand centers consisting of Jakarta, Bandung and many satellite towns and housing complexes.

The orchard development areas or projects for six target fruits are listed up in Table AT-6-5. These areas are distributed in central highlands and gentle hill slopes facing the south. The potential areas amount to 4,000 ha including 500 ha for avocado, 500 ha for duku, 500 ha for durian, 1,000 ha for mango, 500 ha for mangosteen, and 1,000 ha for salak in each area.

6.5 Basic Plan for Fruit Production Development in East Java Province

(1) Development Targets

To realize the development objectives, the orchard development targets in East Java are set as follows:

- Increase of small landholding farmers' income through orchard development, especially in central mountainous and southern dissected plateaus and foothills;
- Promotion of small scale or home agro-industry to produce value-added fruit commodities; and
- Strengthening of the farmers' organization.

(2) Development Concept

The development concept for East Java Province is to be designed to market all of fresh fruits. In this respect, it is required to establish an equal partnership between fruit growers' groups and the existing fruit marketing association in order to ensure sound orchard development in this Province.

In view of the fact that excess durian, mango and salak fruits are being processed only by home industry in their peak harvest seasons, it is essential, in addition to the above, to scheme the provision of banana as raw material to the private processing factories.

To encourage small landholding farmers to develop orchards of the target fruits, the basic development concept is prepared as shown in Table AT-6-6 an d summarized below.

Avocado and duku

The focal points of East Java's basic development plan are as follows:

- Economically sizable orchards are to be developed through farmers' participation from the planning stage as special attention needs to be paid to marketability and profitability;
- Strengthening of the existing fruit seedling production and certification system through rehabilitation and renewal of BBI/BBU and BPSB, taking into account features of the specific local varieties;
- A farm management system based on proper tree maintenance works and coupled with post-harvest handling technology is to be introduced to ensure productivity and profitability of orchards;
- Intensive extension services are to be secured through application of a special support staff system as one of project components practiced for the implementation of the on-going IHDUA/P2AH Project;
- Easy access to credit facility is to be secured by way of in-kind revolving concept; and
- Marketing development is to be focused on the preference of markets and consumers in terms of quality and price by spreading fruit brands marketed by specific fruit growers' groups.

Banana

Banana is the most popular fruit not only in East Java but also elsewhere in the country. Noting this, the basic development plan of this crop is to be focused on the following points:

- Selection of the varieties in demand in fresh fruit markets;

- Improvement of the seedling production and supply system in the aspect of disease tolerance;
- Immediate upgrading of post-harvest handling facilities; and
- Establishment of the linkage between fruit growers' groups and the private sector to assure a more harmonized and reliable marketing system.

Durian, mango and salak

These crops are also very common and popular in the markets, therefore the main planning points are to be set on the following:

- Economically sizable orchard is to be developed through farmers' participation from the planning stage as special attention needs to be paid to the utilization of the limited production area;
- Strengthening of the existing fruit seedling production and certification system through rehabilitation and renewal of BBI/BBU and BPSB;
- A farm management system based on proper tree maintenance works and coupled with inter-cropping of paddy and palawija crops is to be introduced to ensure productivity and profitability of orchards;
- Improvement of the drainage control system;
- Easy access to credit facility is to be secured by way of in-kind revolving concept; and
- Marketing promotion is to be directed towards expansion of the present markets.

(3) Potential Area for Orchard Development

This Province is the most advanced pioneer area in Indonesia in respect of fruit growing on a commercial basis. Joint efforts of the Provincial Government and private sector are devoted to encourage farmers to grow fruits and to market them in Surabaya and abroad.

The orchard development areas or projects for six target fruits selected by the Provincial Government are listed up in Table AT-6-7. Most of the potential areas to be exploited extend over the uplands on central mountains, dissected plateaus and mountain foothills. The potential areas total 7,600 ha consisting of 1,000 ha for avocado (one area), 1,000 ha for banana (two areas), 1,000 ha for duku (one area), 2,150 ha for durian (two areas), 750 ha for mango (one area), and 1,700 ha for salak (one area).

6.6 Basic Plan for Fruit Production Development in South Sulawesi Province

(1) Development Targets

To realize the development objectives, the orchard development targets in South Sulawesi are set as follows:

- Improvement in the living standards of small landholding farmers in the marginal upland areas;
- Enhancement of the processing capacity to treat the surplus products;
- Promotion of inter-islands trade and transportation system; and
- Strengthening of the extension system.

(2) Development Concept

The orchard development concept for South Sulawesi is to market fresh fruits of avocado, mango, mangosteen and rambutan, to process excess mango and rambutan fruits by home industry, and to use marquisa as raw material for producing mixed fruit or pure marquisa juice.

In case the potential project sites are located in remote areas, it is prerequisite to confirm the possibility of introducing the integrated development approach covering planting to primary processing.

To encourage small landholding farmers to develop orchards of the target fruits, the basic development concept is prepared as shown in Table AT-6-8 and summarized below.

Avocado, mango and mangosteen

Avocado, mango and mangosteen orchards are not yet well developed in the potential areas, therefore the basic development plan is to be formulated focusing on the following points:

- Economically sizable orchards are to be developed through farmers' participation from the planning stage as special attention needs to be paid to marketability and profitability;
- Strengthening of the existing fruit seedling production and certification system through rehabilitation and renewal of BBI/BBU and BPSB, taking into account features of the specific local varieties;
- A farm management system based on proper tree maintenance works and coupled with post-harvest handling technology is to be introduced to ensure productivity and profitability of orchards;
- Intensive extension services are to be secured through application of a special support

staff system as one of project components practiced for the implementation of the on-going IHDUA/P2AH Project;

- Easy access to credit facility is to be secured by way of in-kind revolving concept; and
- Marketing development is to be focused on preference of markets and consumers in terms of quality and price by spreading fruit brands marketed by specific fruit growers' groups.

Marquisa

In South Sulawesi, marquisa is cultivated for processing. In this respect, further attention is to be paid to the following points:

- Increase in constant supply capacity of raw material to fruit juice manufacturers;
- Installation of processing facilities, especially at remote project sites to reduce post-harvest losses and transportation cost;
- Upgrading and rehabilitation of the access road network to orchard sites; and
- Bargaining power against the downstream industry is to be strengthened by grouping marquisa growers.

Rambutan

Rambutan is rather a new crop in the Province, therefore the main planning points are to be set on the following:

- Economically sizable orchards are to be developed through farmers' participation from the planning stage as special attention needs to be paid to the utilization of the existing paddy fields;
- Strengthening of the existing fruit seedling production and certification system through rehabilitation and renewal of BBI/BBU and BPSB;
- A farm management system based on proper tree maintenance works and coupled with inter-cropping of paddy and palawija crops is to be introduced to ensure productivity and profitability of orchards;
- Easy access to credit facility is to be secured by way of in-kind revolving concept; and
- Marketing promotion is to be directed towards expansion of export markets in supporting the public export promotion programs.

(3) Potential Area for Orchard Development

With a large surplus of paddy and palawija, this Province has played a very important role in supplying staple food to the eastern part of Indonesia. Orchard development has been actively

promoted in recent years and is expected to extend over the peripheral low hills in the central rice bowl zone, northern mountains, and central hilly areas.

The orchard development areas or projects for five target fruits are listed up in Table AT-6-9. The potential areas amount to 12,550 ha consisting of 1,000 ha for avocado (two areas), 2,500 ha for mango (five areas), 1,000 ha for mangosteen (two areas), 4,000 ha for marquisa (two areas), and 4,050 ha for rambutan (four areas).

6.7 Strategies for Orchard Development

(1) Development Scenario

The most desirable yet realistic alternative for orchard development in the four Provinces may be defined by combining the three alternatives in time and space. The sequence of activities to develop and events to take place over the planning period are described here by phase as the orchard development scenario. The planning period up to the year 2018 is divided into three phases: Phase I up to 2003 (Repelita VII), Phase II for 2004 - 2008 (Repelita VIII), and Phase III for 2009 - 2018 (Repelita IX & X).

To realize the objectives of this Master Plan Study, it is prerequisite to increase small landholding farmers' income through the improvement in quality of the target fruits. Thus, the orchard development direction and spatial scenario is illustrated in Figure AT-6-2.

The development activities should be implemented in the following sequence:

1) Select the potential development areas and confirm the farmers' participation in orchard development;
2) Establish the core market-oriented orchard development areas and consolidate the fruit growers' groups;
3) Expand the fruit growing areas around the core and their marketing channels from local markets to inter-regional trading and establish the fruit growers' associations; and
4) Accelerate exports and agro-industries of fruits and their products, and federate the fruit growers' associations.

(2) Development Alternatives

To plan long-term orchard development in the Study Area, the following three broad alternatives may be conceived:

- Alternative I : Local market-based development
- Alternative II : Regional and urban market-oriented development
- Alternative III : Export- and agro-industry-driven development

These alternatives are conceptually distinct but not mutually exclusive. Certain socio-economic activities may fall under two alternatives and step progressively following the above order (I to III). They are detailed below to provide a range of choices for orchard development in the four Study Provinces.

1) Local market-based development

The basic concept of this alternative is to make the most of the existing local or indigenous resources for the benefits of small landholding farmers and communities. This seems to be the most authentic approach to orchard development. This alternative naturally fits best to local conditions, but calls for the introduction of some innovative elements for establishment of agribusiness-oriented development areas.

Most essential indigenous resources, other than human resources, are land and water resources that constitute bases for orchard development. Although each of the four Provinces has already been recognized as the advanced fruit growing area in the country, there still remain constraints to agribusiness development based on tropical fruit production. In particular, lack of a business sense in farmers is the most critical issue coupled with the fact that they know almost nothing about how to produce marketable fruit. To overcome such hurdles for promoting target fruit production, potential development areas with available land and water resources are primarily selected and farmers' willingness to participate in orchard development are also confirmed.

In the selected potential development areas, intensive and more systematic fruit production will have to be practiced in an integrated manner. This alternative covers supply of planting materials including qualified seedlings and development of infrastructure in one package for establishment of well-managed orchards as the core of the target fruit growing area. With provision of staff and farmer training programs focusing on production, post-harvest handling and marketing activities as a package component, this alternative aims at marketing of upgraded quality products to local markets and realization of farmers' income increase.

2) Regional and urban market-oriented development

Under this alternative, intensive and more systematic fruit production will be continued along with improvement of post-harvest and marketing systems to gain the recognition of quality and

brand names in regional and urban markets.

This alternative would therefore require stronger linkage with other regions and major cities to activate inter-regional trade. In addition to the institutional and human resources development, infrastructure development would be important to strengthen the intra- and inter-regional network.

3) Export- and agro-industry-driven development

The basic concept of this alternative is to introduce external resources to promote agribusiness mainly as a driving force for regional development, and to produce higher-quality and/or value-added products primarily for exports. This would generate employment opportunities, but may not induce much the development of local industries and related services.

This alternative would require not only much time but also large amount of investments to improve various infrastructure facilities in growth centers with high potentials. This alternative may entail more serious social and environmental problems.

The three development alternatives are compared as summarized in Table 6.2.

Table 6.2 Comparison of Three Alternative Development Scenarios

Characteristic	**Alternative I (A-I)** Local Market-based Development	**Alternative II (A-II)** Regional & Urban Market Oriented Development	**Alternative III (A-III)** Export- & Agro-industry-driven Development
Basic Direction	To utilize local or indigenous resources for establishment of a development core area	To make stronger linkage with other regions and major cities to activate the intra- & inter-regional trades	To introduce external resources to promote mainly export & agribusiness as a driving force for regional development
Advantages (+) and Disadvantages (-)	+ Natural + Benefit a wide range of small landholding farmers - Low growth without innovations	+ Higher growth than A-I + Socially and environmentally more desirable than A-III - Volatile against changes in external conditions	+ High growth + Large employment opportunities - Limited linkage effects - Undesirable natural environmental effects
Typical Activities	* Business-oriented farming * Simple agro-processing * Simple post-harvest handling & local market-related services	* Market networking * Post-harvest handling * Linkage with industries dev. * Intra- and Inter-regional trades	* Commercial production of fruit crops * Footloose & port/airport-oriented industries * Agribusinss-related services
Spatial Development	Dispersed orchard nucleuses development	Stronger links with other regions and cities (mega-markets)	Concentration in a few urban centers

Source: JICA Study Team

Each alternative has advantages and disadvantages. Income disparities between farmers and non-farmers would be reduced most significantly under Alternative I. Natural environmental problems like water pollution would be most serious under Alternative III in proportion to

agro-industry development, and most manageable under Alternative I. Alternative II may call for higher levels of development management in the form of better planning and coordination of inter-related development activities.

6.8 Assessment of Orchard Development Potential

(1) Agro-climatic Suitability

With the purpose of confirming potential development areas ecologically suitable for cultivation of the specific products, the Directorate of Horticulture Production Development of DGFCH recently prepared a "matrix of criteria" indicating the agro-climatic suitability (altitude and dry months) for growing the respective crops. This matrix is now used by each Provincial Agriculture Services (PRAS) Office as basic guideline when selecting the development areas and fruit crops to be cultivated.

In addition, according to the "Horticultural Development Policy" drawn up by the Director of Horticulture Production Development in December 1996, all the nine target fruits taken up in this Master Plan are included in the "priority fruit crops" to be developed in Indonesia, in view of their bright prospects in regional and international markets.

Although there exist significant regional variations in its natural/physical conditions, each Province covers a wide variety of agro-ecological zones ranging from coastal lowlands to high altitude mountains and plateaus. Extreme conditions occur in some limited areas, but most of the Study Area enjoys a moist tropical climate, with relatively abundant rain and high temperature. Based on the "matrix of agro-climatic conditions and fruit tree growing" (see Table 6.3), the agro-ecological suitability for each of the nine target fruits was preliminarily assessed for all the Districts of the four Provinces: 11 Districts in North Sumatra, 20 in West Java, 29 in East Java, and 21 in South Sulawesi. This matrix was modified by the Study Team by adding the factor of groundwater table in the dry season, and climate types (A to D) referring to Section 2.2 of Appendix B. As far as the agro-climatic conditions are concerned, all potential development sites are in general suitable for cultivation of the respective target fruits designated for each of the four Provinces.

Table 6.3 Matrix of Agro-Ecological Conditions and Growing Suitability of the Target Fruit Trees

Target Fruits	Highland (≧ 700 m)						Lowland (< 700 m)					
	Climate Type *				Groundwater Table in Dry Season		Climate Type *				Groundwater Table in Dry Season	
	Wet		Dry				Wet		Dry			
	A	B	C	D	Up to 3 m	Below 3 m	A	B	C	D	Up to 3 m	Below 3 m
1. Avocado	◎	○	○	×	○	△	◎	○	○	×	○	△
2. Banana	◎	○	○	×	○	△	◎	○	○	×	○	△
3. Duku	×	×	×	×	×	×	◎	○	×	×	○	△
4. Durian	×	×	×	×	×	×	◎	○	×	×	○	△
5. Mango	×	×	×	×	×	×	×	×	◎	○	◎	◎
6. Mangosteen	×	×	×	×	×	×	◎	○	○	×	○	△
7. Marquisa	◎	○	×	×	○	△	×	×	×	×	×	×
8. Rambutan	×	×	×	×	×	×	◎	○	×	×	○	△
9. Salak	×	×	×	×	×	×	◎	○	○	×	○	△

Notes : ◎ = Highly suitable
○ = Suitable
△ = Suitable under irrigated condition
× = Not suitalbe

* Schmidt and Fergusson

Highland = higher than 700 m above sea level
Lowland = lower than 700 m above sea level
Wet = 0 to 4 dry months (Climate type : A & B)
type A : 0 dry month
type B : 1 to 4 dry months
Dry = More than 4 dry months (Climate type : C & D)
type C : 4 to 6 dry months
type D : more than 6 dry months
Wet month = more than 100 mm of monthly rainfall
Dry month = less than 60 mm of monthly rainfall

Source: JICA Study Team and Directorate of Horticulture Production Development (DGFCH)

(2) Criteria for Assessment of Development Potential and Priority

In formulating the orchard development plans for each of the four Provinces, it is prerequisite to assess the potentials of the land resources and identify the impediments to further development, based on the results of overall investigations on the respective physical and socio-economic conditions. The promising development sites for the respective target fruits in each Province were selected among the potential areas comprising both the actually producing and schemed ones.

The factors to be used as evaluation criteria could be classified broadly into two categories: (i) agro-ecological indicators; and (ii) socio-economic and cultural indicators. At the first step of selection of the potential areas for orchard development, the agro-ecological indicators would be weighed, while in the following second step of selection of the priority development areas, much importance would be attached to the socio-economic and cultural factors or aspects.

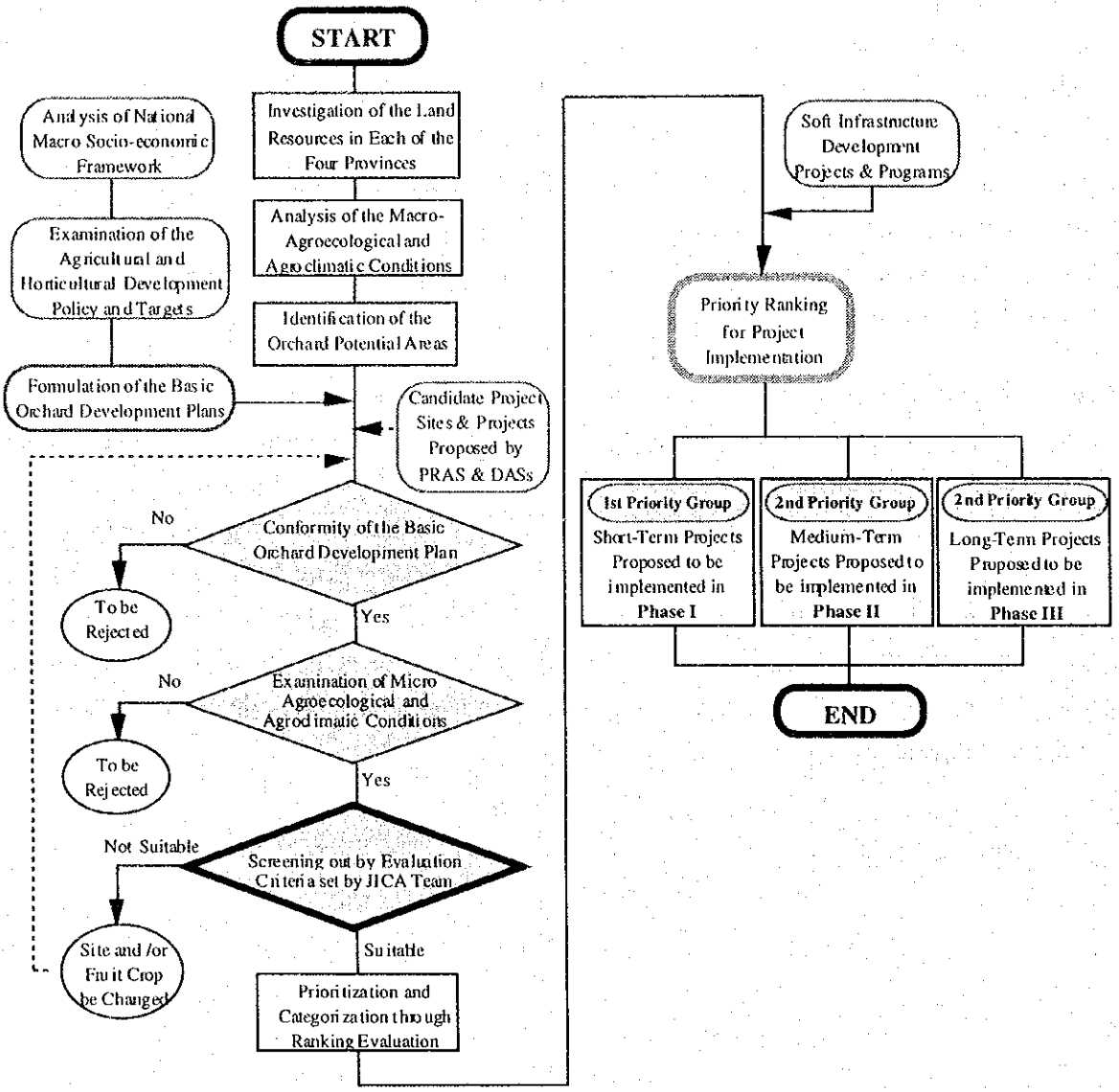
The key assessment factors and criteria for selection of the promising orchard development areas are summarized in Figure AT-6-3.

To screen out the priority development sites among the potential ones, the detailed criteria for

prioritization of the potential areas prescribed in Table AT-6-10 were established and used, referring to the formulated basic development plans and through discussion with the authorities concerned. In the criteria, 7 key assessment factors and 29 evaluation indicators were set out. Evaluation was done based on the four grades of scored points ranging from " Very good" (3 points), "Good" (2 points), "Not good" (1 point) to "None" (0 point). To ensure more impartial and substantial evaluation, the scores accumulated at each key assessment factor level were weighted by allocating the following ratios to the respective 7 factors: Natural condition (20%), Development needs (18%), Crop marketability (17%), Social acceptability (15%), Crop profitability (15%), Institutional capability (10%), and Seedling Production (5%).

Figure 6.1 diagrammatizes the selection and prioritization flow of the orchard development projects proposed in the Master Plan. Based on the evaluation results (total points), the respective 37 orchard development projects (ODPs) are classified into three groups: (i) "First Priority" or Action Plan Projects to be implemented in Phase I; (ii) "Second Priority" or Medium-term Projects to be commenced in Phase II; and (iii) "Third Priority" or Long-term Projects to be realized in Phase III. Such grouping is made taking into consideration various factors such as present financial situation, time constraints to the establishment of a quality seedling supply system, limitation of marketability, and social maturity for implementation of fruit orchard development.

Figure 6.1 Selection and Prioritization Flow of the Orchard Development Projects



Source: JICA Study Team

The development potentials and priority were evaluated referring to the project profiles presented in Appendix K. The evaluation results for prioritization of the potential orchard development sites and projects in each of the four Provinces are presented in Tables A-6-11 to A-6-14, and summarized in Tables A-6-15 and A-6-16. Table 6.4 shows orchard development area by fruit crops in phase. With reference to Section 6.5, the development scenarios of the respective orchard development sites are presented in Table AT-6-17.

Table 6.4 Phased Development Area by Fruit Crops

(Unit : ha)

Fruit Crops	Phase I	Phase II	Phase III	Total
Avocado	0	500	1,500	2,000
Banana	1,000	0	0	1,000
Duku	0	500	500	1,000
Durian	1,500	1,300	0	2,800
Mango	500	1,500	1,500	3,500
Mangosteen	0	500	2,000	2,500
Marquisa	500	500	500	1,500
Rambutan	1,500	500	500	2,500
Salak	1,000	500	0	1,500
Total	6,000	5,800	6,500	18,300

Source : JICA Study Team

6.9 Supply and Demand Analyses of the Target Fruits and Their Price Prospects

(1) Supply and Demand Analyses of Fruits

The fruit production development projects started on a full scale in 1991/1992 using public development funds, and the developed areas begin to produce fruits, though it is reported that they do not succeed as expected at the initial planning stage. In addition to the above, fruit productions from the on-going IHDUA Project are expected to be added after 5 years. Based on the available statistical data, the supply and demand analyses of fruits in this Study were carried out with the following premises and methods :

- The production statistics of fruits in Indonesia are prepared at every quarter of the year, in multiplying the yield per grown tree selected at random by the total number of fruit trees. These statistics include the number of trees planted in backyards of the respective farm-households, and several conversion coefficients which vary with the Province are used to estimate the cultivated areas. Considering such conditions, the future fruit productions of the planted fruit trees are estimated by deducting 5% of household consumptions from the statistical data from 1984 to 1993, and based on the rates of increase in productions calculated using the approximate values. Besides, in view of the economic life of fruit trees, their productions are supposed to reach the uppermost limits since the year of 2006.
- The productions of the fruit trees planted in the on-going projects and the new ones proposed in this Study are estimated based on the "anticipated yields" determined for each of the target fruits, while those for the projects which were implemented during the period of 1991 to 1995 are calculated assuming that their total harvested area

reduced to a half (50%) of the planted area in the light of low survival rate of the planted seedlings. As for their yields, they are estimated based on the average figures in the statistical data, in view of the fact that most of orchards are out of proper farm management.

- The supply volumes to markets are estimated by deducting 25% of loss from the total productions mentioned above.
- As to the per capita consumptions by target fruit, they are estimated based on the results of the National Economic Household surveys which were conducted in 1993 and 1996. In addition to this, the consumptions in eating houses and processing industries are added as follows ; 10% for avocado, banana, durian and mango, 5% for salak, and 2% for duku.
- The fruit consumptions in future are estimated in multiplying the per capita fruit consumptions anticipated in each year by the population projected every year up to the year of 2018. This annual per capita consumption is computed based on its annual growth rate which is worked out as a product of the income growth rate and its elasticity. The population by urban-rural is based on the national population census in 1995.
- As to the two target fruits of mangosteen and marquisa, their supply and demand analysis was not carried out by the reason of non-existence of the basic statistical data on their productions at national level and per capita consumption.

According to the results of the supply and demand analyses carried out based on the above conditions (see Table 6.5), the demand exceeds from the first the supply as to such crops as banana and rambutan. As regards the supply and demand of durian and salak, they are at first balanced, but their demand will exceed the supply until the year of 2005. On the other hand, the supplies of the other crops like avocado, duku and mango will exceed at the beginning their respective demands, but their relations will be reversed until the year 2010.

Table 6.5 Supply-Demand Balance by Fruit Crops

Fruit Crops	1996	1998	2003	2008	2013	2018
Avocado	+	+	+	-	-	-
Banana	-	-	-	-	-	-
Duku	+	+	+	-	-	-
Durian	+	-	-	-	-	-
Mango	+	+	+	+	-	-
Mangosteen	-	-	-	-	-	-
Salak	-	-	+	-	-	-

Note : (+) = surplus (-) = deficit
Source : JICA Study Team

(2) Price Prospects in the Markets

To assure the marketability of fresh fruits and their price stability in the markets, it is essential to open up new markets for their surpluses in the neighboring regional and urban cities, and promote their processing industries and exports. The market prices of fresh fruits are commonly determined by their trading volumes and qualities. In this Study, the regression analysis was carried out with a view to examining the correlation of annual fruit productions with annual average market prices, and assessing the impacts of variant fruit forwarding volumes in each of the four Study Provinces on their fluctuations in market prices. The input data used in this regression analysis include those of annual productions and figures which were worked out by adjusting the annual average prices with the price increase rate. The said annual average prices were calculated based on the monthly price data by fruit in the last ten years 1987 to 1996 which had been collected at the major markets of the four Study Provinces. The price prospects in each of the four Provinces are summarized below :

- In North Sumatra Province, the market prices of the five target fruits consisting of durian, mangosteen, marquisa, rambutan and salak are supposed to show an increasing tendency, even though their forwarding volumes are augmented in the future through opening up new markets.
- Among the six target fruits in West Java Province, the market price of avocado is forecasted to increase gradually by generally new demand, even if its forwarding volume to markets increases in the future. To the contrary, the market prices of duku, durian, mango and mangosteen are supposed to reach the uppermost limits of the respective fruit values, because the market capacity of the Province is limited to absorb all the products. Consequently, it is important to develop their markets, especially in the neighboring Jakarta metropolitan area so as to keep the increasing trend of their market prices. As for the salak, its market is saturated. It is however possible to keep its market price by strengthening sales promotion in Jakarta metropolitan area and arousing new demand in agribusiness.
- Among the six target fruits in East Java Province, the market prices of banana and avocado are forecasted to increase gradually, even if their forwarding volumes to markets are augmented in the future. As to the remaining four target fruits like duku, durian, and salak, their market prices are supposed to increase for the time being, because there is still a room to absorb their products. As for mango, considering the fact that its market has been saturated, it is necessary to take now a proper countermeasure in order to maintain its price in the markets through opening up new markets and promoting processing industries and export.
- Among the five target fruits in South Sulawesi Province, the market prices of mango

and rambutan are forecasted to increase gradually, even if their forwarding volumes to markets are augmented in the future. The market prices of avocado and mangosteen are supposed to reach the uppermost limits of the respective fruit values, because the market capacity of the Province is limited to absorb all the products. Consequently, it is required to open up new markets, especially outside the Province, and to strengthen its marketing structure through improving fruit quality, so as to be more competitive in pricing the products by overcoming its geographically disadvantaged location. As the trading volume of fresh marquisa is limited, it is required to stabilize its market price by making contract with the agro-processing firms within the Province.

6.10 Strategies for Market Development

(1) Target Market

The three development alternatives describes in the Section 6.7 are related to the stepwise market strategies: (i) local markets, (ii) regional and urban markets, and (iii) export and agro-industry, respectively. Local markets consist of those in the respective urban areas at District level, while regional and urban markets are those of more larger scale existing mostly in the Provincial capitals. Although no clear definition exists for mega-cities (or big markets), the following eight cities would fall on this category with the population in parentheses : D.K.I. Jakarta (9.11 million), Surabaya (2.69 million), Bandung (2.36 million), Medan (1.90 million), Palembang (1.37 million), Sumarang (1.35 million), Tangerang (1.19 million) and Ujung Pandang (1.09 million).

The five cities cited in the above : Medan (North Sumatra), Bandung and Tanggerang (West Java), Surabaya (East Java) and Ujung Pandang (South Sulawesi) are located in the four Study Provinces. In each of these five cities, there exist more than ten large-scale supermarkets which are dealing in the high quality fresh fruits. In the DKI Jakarta which is adjacent to West Java Province, there are about 60 stores which are selling the high quality fresh fruits. Some chainstores are handling the fruits of good quality produced making a contract with a specified farmers' group.

(2) Saturation Degrees in the Markets

Table 6.6 indicates the demand and supply balances of the target fruits by Province. These balances were estimated based on the following data and assumptions:

- Average annual fruit consumption volume by urban and rural areas in 1996;
- Population by urban and rural areas in 1995;
- Fruit production (volumes) by Province in last five years from 1991 to 1995;

- Losses of fruit products during the post-harvest and marketing processes (estimated at 25 % of the total productions for every fruit concerned)
- The demand used in this balance estimate excludes the marketed volume in other Provinces, and for processing and export as well.

Table 6.6 Supply-Demand Balance of the Target Fruits by Province

(Unit : ton)

Fruit Crops*	North Sumatra	West Java	East Java	South Sulawesi
1. Avocado	-	+28,226	+11,792	+3,302
2. Banaana	-	+279,755	+68,723	-
3. Duku	-	+3,750	-1,220	-
4. Durian	+17,448	+7,007	-4,462	-
5. Mango	-	+19,460	+121,476	+6,766
6. Rambutan	-22,236	-	-	-14,252
7. Salak	+22,148	+77,348	-23,399	-

Notes: (+) = surplus (-) = deficit
* As to the mangosteen and marquisa, no data are available.
Source : Statistical Year Book of Indonesia, 1995 & 1996; SUPAS 1995; and Population Census 1995

In North Sumatra, rambutan is in short supply, while durian and salak are supplied in surplus. The excess fruit crops like avocado, duku, durian, mango and salak in West Java are mostly forwarded to the markets in Jakarta. In East Java, avocado, banana, and mango are in surplus. The surpluses of banana and mango in this Province are relatively large and are marketed in other regions. On the contrary, the demand and supply balance of duku, durian and salak in East Java shows minuses. In South Sulawesi, avocado and mango are overproduced and shipped to other regions, while rambutan for which production center is not established yet, is in short supply. Although the above table indicates the surplus supplies fro certain fruits, it may be possible to absorb their surpluses through improvement of fruit quality, expansion of markets, and promotion of processing industries and export.

(3) Strategies for Market Development by Target Fruit

For implementation of the orchard development project which aims to open up "local market" at the initial stage, it is prerequisite to start with preparing a development strategy to arouse the fruit demand, especially in regard to the fruit whose marketed volume is already over its consumption in all markets of the province. In such case, it is required for the producers to supply the fruit products which satisfy the consumers' preference so as to generate new demands, and enlarge their market shares by providing the consumers with a good deal of the quality low-priced fruits. If there is still a room to supply fruits in the local markets, it is

advised to establish as early as possible an orchard in order to make up for its deficiency and then get a footing in the market. The strategies for market development by target fruit are as shown below.

- Avocado : As to avocado, even though its orchard is developed by planting/ cultivating the existing local varieties, it will be hard to obtain the expected profitability, because fruits of these local varieties have no comparative attraction nor predominance. In consequence, it is firstly proposed to produce and propagate high quality seedlings from the mother plants of recommended varieties. Then, after establishing the certified seedling production system, the orchard development will be initiated. For production on a large scale of the good quality avocado seedlings, it will take at least five years in West Java and East Java, and seven years in South Sulawesi. Therefore, the avocado orchard and its market development will be commenced subsequently to mass production of its seedlings and taking account of its nationwide supply and demand prospects.
- Banana : For the two banana orchard development projects in East Java, it is advised to start, from the first stage, with a strategy aiming at regional and urban market and/ or export and agro-industry development. To ensure the smooth implementation of these projects, it is necessary to select/ decide on the varieties to be planted and the market strategy to be adopted. These will be clarified in the definite development plan and before setting about the projects.
- Duku : As to the two duku orchard development projects in West Java and East Java, the same market strategy as that for avocado is recommended to start with opening up the local, regional and urban markets. To produce the quality duku seedlings, it will take seven years. Therefore, the duku orchard development will be commenced subsequently. Its sales promotion in markets is set to start at the year of 2008 when the nationwide demand is forecasted to exceed the supply.
- Durian : In the two Provinces in Java (West and East), there is still a room for marketing durian crops. For the three durian orchard development projects in West Java and East Java, it is therefore proposed to set up a stable production and market system which is capable to supply constantly durian products with the quantity and quality required in the regional and urban markets. On the other hand, durian is already saturated in the regional and urban markets of North Sumatra Province. Hence, it is required to produce and market more higher quality durian products which are much competitive in both quality and price, and to enlarge gradually its market share.
- Mango : The mango orchard development project in West Java has to be promoted

aiming to open up markets in Jakarta. As to the mango productions in East Java and South Sulawesi, they reach already the saturation point in every local and regional/ urban markets. As such, it is necessary to produce and market more quality mango products which are much competitive in both quality and price, and to enlarge its market share. For the mango orchard development project in East Java, its market strategy is to be set for opening up overseas markets (for export) from the first stage. For this, it is important to produce the standardized products required by the importers or consumers of the importing countries, in closer cooperation with the private sector specialized in overseas marketing operations.

- Mangosteen : The four mangosteen orchard development projects in North Sumatra and South Sulawesi Provinces are suggested to aim at opening up the local and regional/ urban markets based on the same market development strategy as that for avocado ad duku. For production on a large scale of the quality mangosteen seedlings, it will take about eight years and afterward its market development will be undertaken.

- Marquisa : As to the three marquisa orchard development projects in North Sumatra and South Sulawesi Provinces, it is required to adopt the agro-industry driven development strategy, focusing on the production and supply of agro-processed raw materials (e.g. juice, paste, puree, etc.). It is also indispensable to establish and build up a closer cooperation with the agro-processing industries for marketing the marquisa products. Such preparatory works or arrangements concerning the contract farming and terms of raw material supply are to be done prior to starting the orchard development.

- Rambutan : Rambutan is in short supply in its five orchard development areas in North Sumatra and South Sulawesi Provinces. It is therefore suggested to adopt the local and regional/ urban market development strategies at the initial stage. As rambutan is a relatively new crop in South Sulawesi, it is necessary to carry out its adaptability tests in various places of the Province prior to implementation of its orchard development. Besides, for its orchards located in remote areas, it is also important to pay attention to the transportation means and measures so as to reduce its loss. Considering such circumstances in South Sulawesi, the rambutan orchard development of this Province should be prepared by sparing enough time.

- Salak : The salak orchard development project in East Java is recommended to be implemented, from the first stage, taking aim at markets in Surabaya. As to the salak productions in North Sumatra and West Java Provinces, they reach already the saturation point in local and regional/ urban markets. In view of the fact that there is no more large room in markets of Jakarta, it is required to produce and market more quality salak products which are much competitive in both quality and price, and to enlarge its share.