

THE STUDY ON THE IMPROVEMENT
IN QUALITY OF THE TROPICAL FRUITS

Appendix H
Farm Economy and
Project Sustainability

**APPENDIX II
FARM ECONOMY AND PROJECT SUSTAINABILITY**

Table of Contents

	<u>Page</u>
1. BASIC ASSUMPTIONS.....	H-1
1.1 Anticipated Yield.....	H-1
1.2 Production Prospect.....	H-1
1.3 Basic Assumption for Project Assessment.....	H-1
2. PROJECT SUSTAINABILITY ASSESSMENT.....	H-2
2.1 Farm Economy.....	H-2
2.2 Financial Evaluation.....	H-3

List of Tables

(Tables in Text)

Table H1.1 Anticipated Fruit Yield at Peak Production Stage.....	H - 1
Table H2.1 Assumed Farm Gate Prices of Fresh Fruits.....	H - 2
Table H2.2 Key Indicators for Evaluating the Incomes of Fruit Growers.....	H - 3
Table H2.3 Summary of Farm Budget Analyses.....	H - 4

(Tables in Annex)

Table H-1-1 Annual Expected Yields of the Target Fruits and Inter-crops.....	H - 5
Table H-1-2 Annual Production Outputs of the Target Every Orchard.....	H - 6
Table H-1-3 Fruit Production Prospect and Market Supply.....	H - 7
Table H-2-1 Present Farm Gate Prices in the Study Provinces.....	H - 9
Table H-2-2 Unit Price of Inputs at Farm Level.....	H - 10
Table H-2-3 Annual Farm Input and Budget Requirements per Hectare (1/9-9/9).....	H - 11
Table H-2-4 Annual Farm Budget and Increment Net Income (1/9-9/9).....	H - 20

**APPENDIX II
FARM ECONOMY AND
PROJECT SUSTAINABILITY**

1. BASIC ASSUMPTIONS

1.1 Anticipated Yield

The annual anticipated yields of the respective target fruits are indicated in Table H-1-1, taking into account the present yield level and the future fertilizer dosage. Its yield at the peak production stage is summarized below (Table III.1).

Table III.1 Anticipated Fruit Yield at Peak Production Stage

Fruit Crops	Anticipated Yield		Peak Year after Planting
	(kg/ tree)	(ton/ ha)	
1. Avocado	80.0	8.0	11
2. Banana	20.0	20.0	3
3. Duku	85.0	8.5	11
4. Durian	80.0	8.0	10
5. Mango	135.0	13.5	10
6. Mangosteen	85.0	8.5	11
7. Marquisa	18.0	9.0	6
8. Rambutan	100.0	10.0	10
9. Salak	5.0	10.0	8

Source : Data from Direktorat Bina Program and IHDUA Project.

1.2 Production Prospect

Based on the anticipated annual yield and development schedule of each orchard, typical production output is estimated as shown in Table H-1-2. There will still remain some losses in the course of harvesting and post-harvesting practice as well as transportation and distribution to markets. Such losses and home consumption by farmers need to be taken into account in estimating marketable quantity of produce. Under this Study, therefore, it is assumed that 80% of the total production output for each target fruit is marketable as shown in Table H-1-3.

1.3 Basic Assumption for Project Assessment

In order to justify profitability of the respective target fruits and impact on farm economy the financial analysis has been carried out. The financial evaluation is made based on farm budget analysis of the average size farm. In addition, indirect benefits and socio-economic impacts to be expected from the orchard development is also studied.

The financial evaluation is based on the following basic assumptions:

- Economic life of the project is 25 years;
- All prices are expressed in February 1998 price level;
- Exchange rate is US\$1.00 = Rp.9,000 = Yen 125; and
- Only the direct benefits to be derived from incremental farm products in the project area are considered in the evaluation.

2. PROJECT SUSTAINABILITY ASSESSMENT

2.1 Farm Economy

(1) Farm Gate Price

As a result of the marketing survey under this Study, the farm gate prices of each target fruit clarified to vary place by place as shown in Table H2-1, depending on location, economic scale of producing area, product quality, marketable quantity and accessibility to markets. For the project evaluation purposes, therefore, unit farm gate prices are assumed considering the present price variation and the future marketable quantity of each fresh fruit crop. The farm gate prices assumed are shown in Table H2.1.

Table H2.1 Assumed Farm Gate Prices of Fresh Fruits

Fruit Crops	Farm Gate Price (Rp./kg)
1. Avocado	1300
2. Banana	650
3. Duku	900
4. Durian	1,200
5. Mango	850
6. Mangosteen	1,100
7. Marquisa	1,350
8. Rambutan	750
9. Salak	1,500

Source : JICA Study Team.

(2) Farm Inputs and Budget Requirements

To estimate the required volume of farm inputs and their expenditures subsequent to implementation of the orchard development projects proposed in this Study, a farm economy analysis on expenditure side was made assuming that the participated farmers hold 1.0 ha of land on an average for cultivating each target fruit. The unit prices of farm inputs are presented in Table H-2-2. The annual financial expenses for farm input requirements are compiled by target fruit tree in Table H-2-3.

2.2 Financial Evaluation

With a view to assessing the implementation effects of the orchard development proposed in this Study, a farm budget analysis was conducted by comparing the two cases of “with” and “without” fruit growing conditions and based on the following assumptions :

- Financial comparison is done with a maximum development unit of 1.0 ha per participating fruit growing farmer;
- Marketed volumes of the target fruits and inter-crops are estimated using the annual expected yields indicated in Table H-1-1;
- The farm gate prices of fresh fruits shown in Table H2.2 were assumed referring to their actual average trading prices and applied in calculating the respective fruit productions for all the four Provinces. In these prices, the differential factors like the grade and size of fruits, distance to markets, price fluctuations are taken into account.
- Production costs include the expenditures for planting the fruit trees and inter-crops, farm management, and harvesting of fruit crops, but exclude the indirect costs like membership fees for fruit growers’ groups and expenses required for construction and O&M of the post-harvest handling facilities;
- The costs for annual farming practices of the perennial crops (or fruit trees) increase in proportion as they grow. These expenditures continue to augment until their yields come up to the respective peaks.
- To compare the profitability of (perennial) fruit crops with that of annual inter-crops under the same conditions, the increment net incomes by target fruit are calculated converting the agricultural incomes from both fruit and inter-crop productions over 25 years into the net present values.

As compiled in Table H2.2, the annual net on-farm income of farmers with 1.0 ha of unit farm size is expected to increase by 10.1 times in the case of banana, 7.1 times for salak, 5.5 times for marquisa, 5.1 times for mango, 4.2 times for durian, 3.4 times for rambutan, 2.7 times for avocado, 2.2 times for mangosteen, and 1.8 times for duku, in comparison with the case of “without fruit growing condition” where maize is cultivated in wet season and groundnut in dry season. Such increments in net incomes from fruit growing will be more larger at the harvesting peak times and bring about a good deal of positive effects on the living of participating fruit growers.

Table H2.2 Key Indicators for Evaluating the Incomes of Fruit Growers

Fruit Crops	Planted Area of Intercrop (ha)	Farm Gate Price (Rp./kg)	Annual Net Income of Target Fruit (Rp.'000)	Total Annual Net Income (Rp.'000)	NPV for 25 years (Rp.'000)	Increase Rate (%)
Avocado	0.60	1,300	5,240	5,680	17,982	2.7
Banana	0.30	650	9,500	9,647	67,236	10.1
Duku	0.60	900	4,252	4,692	12,060	1.8
Durian	0.60	1,200	6,803	7,243	27,745	4.2
Mango	0.60	850	8,407	8,847	33,668	5.1
Mangosteen	0.60	1,100	4,255	4,695	14,872	2.2
Marquisa	0.45	1,350	7,531	7,861	36,631	5.5
Rambutan	0.60	750	6,305	6,745	22,910	3.4
Salak	0.15	1,500	12,390	12,500	47,349	7.1
Intercrop	1.00	1,100	0	733	6,653	-

Source : JICA Study Team

However, if the yields of fruit productions fall by more than 45% in the case of avocado, duku and mangosteen, 50% for marquisa, and 70% for banana, durian, mango and salak, and 80% for rambutan as a result of damages due to the outbreak of the pests and diseases and/or abnormal weather, their annual net income balances at peak times go into the red. In addition, it is supposed that the above incidents cause some subsidiary negative impacts like degradation of fruit quality and price decrease of the products as a result of severe sales competitions among the producing areas. The minimum farm gate prices at profit and loss points for each of the nine target fruits are at Rp.750 per kg for avocado, Rp.215 per kg for banana, Rp.530 per kg for duku, Rp.390 per kg for durian, Rp.260 per kg for mango, Rp.640 per kg for mangosteen, Rp.710 per kg for marquisa, Rp.160 per kg for rambutan, and Rp.560 per kg for salak.

The fruit growers can not expect any income from fruit growing during the non-fruit bearing yeras which vary with the respective target fruits. When the farmers participate in the fruit production project proposed in this Study, it is estimated that their invested amount by target fruit will be recovered after 2 years for banana, 4 years for mangosteen, 5 years for durian, mango and marquisa, 6 years for rambutan and salak, and 9 years for duku, respectively. In case the orchard is used for inter-cropping with a view to supplementing their income during the on-fruit bearing period, the invested amount in a single year balance will be recovered after 1 year for banana, durian, mango, mangosteen and rambutan, 2 years for duku, 3 years for marquisa and salak, and 4 years for avocado. To assure the above income increase of farmers, it is required to give them the loans of agricultural inputs in kind which are equivalent to those estimated in Table H2.3. With such financial supporting services at the initial stage, the bases for farm management of fruit growers could be strengthened.

Table H2.3 Summary of Farm Budget Analyses

Fruit Crops	Period to Compensate Cumulative Deficit (year)	Period to Compensate Cumulative Deficit with Intercropping (year)	Period to Compensate Single Year Deficit with Intercropping (year)	Period to Loan Agricultural Input (year)	Amount to Procure Agricultural Input (Rp.1,000)
Avocado	7	5	4	4	2,353
Banana	2	2	1	1	3,212
Duku	9	6	2	4	2,784
Durian	5	4	1	4	1,258
Mango	5	4	1	4	2,003
Mangosteen	4	4	1	4	1,471
Marquisa	5	5	3	1	3,193
Rambutan	6	4	1	4	1,203
Salak	6	6	3	3	14,157
Intercrop					

Source : JICA Study Team

Table H-1-1 Annual Expected Yields of the Target Fruits and Inter-crops

(Unit : ton / ha)

Year No.	Fruit Crops										Inter-crops	
	Avocado	Banana	Duku	Durian	Mango	Mangosteen	Marquisa	Rambutan	Salak	Groundnut	Maize	
1.	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	1.2 (1.0)	2.4 (2.0)	
2.	0.00	10.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	1.2 (1.0)	2.4 (2.0)	
3.	0.00	20.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	1.2 (1.0)	2.4 (2.0)	
4.	0.00	20.00	0.00	0.0	0.0	0.0	0.0	3.6	0.0	1.2 (1.0)	2.4 (2.0)	
5.	0.75	20.00	0.50	1.0	0.9	0.5	7.2	0.4	2.5	1.2 (1.0)	2.4 (2.0)	
6.	1.50	0.00	1.00	2.0	2.7	1.0	9.0	1.0	4.5	1.2 (1.0)	2.4 (2.0)	
7.	2.50	10.00	1.50	3.0	4.5	1.5	9.0	2.2	7.0	1.2 (1.0)	2.4 (2.0)	
8.	4.00	20.00	3.00	4.0	7.5	3.0	9.0	4.0	10.0	1.2 (1.0)	2.4 (2.0)	
9.	5.50	20.00	4.50	6.0	10.5	4.5	9.0	6.0	10.0	1.2 (1.0)	2.4 (2.0)	
10.	7.50	20.00	6.50	8.0	13.5	6.5	9.0	8.0	10.0	1.2 (1.0)	2.4 (2.0)	
11.	8.00	0.00	8.50	8.0	13.5	8.5	9.0	10.0	10.0	1.2 (1.0)	2.4 (2.0)	
12.	8.00	10.00	8.50	8.0	13.5	8.5	9.0	10.0	10.0	1.2 (1.0)	2.4 (2.0)	
13.	8.00	20.00	8.50	8.0	13.5	8.5	9.0	10.0	10.0	1.2 (1.0)	2.4 (2.0)	
14.	8.00	20.00	8.50	8.0	13.5	8.5	9.0	10.0	10.0	1.2 (1.0)	2.4 (2.0)	
15.	8.00	20.00	8.50	8.0	13.5	8.5	9.0	10.0	10.0	1.2 (1.0)	2.4 (2.0)	
16.	8.00	0.00	8.50	8.0	13.5	8.5	9.0	10.0	10.0	1.2 (1.0)	2.4 (2.0)	
17.	8.00	10.00	8.50	8.0	13.5	8.5	9.0	10.0	10.0	1.2 (1.0)	2.4 (2.0)	
18.	8.00	20.00	8.50	8.0	13.5	8.5	9.0	10.0	10.0	1.2 (1.0)	2.4 (2.0)	
19.	8.00	20.00	8.50	8.0	13.5	8.5	9.0	10.0	10.0	1.2 (1.0)	2.4 (2.0)	
20.	8.00	20.00	8.50	8.0	13.5	8.5	9.0	10.0	10.0	1.2 (1.0)	2.4 (2.0)	

Note : Figures in parentheses () indicate annual target yield under Without-project condition.

Source : JICA Study Team

Table H-1-2 Annual Production Outputs of the Target Every Orchard

(Unit: ton/500ha)

Year No.	Fruit Crops									
	Avocado	Banana	Duku	Durian	Mango	Mangosteen	Marquisa	Rambutan	Salak	
1.	0	0	0	0	0	0	0	0	0	0
2.	0	0	0	0	0	0	0	0	0	0
3.	0	500	0	0	0	0	0	0	0	0
4.	0	3,000	0	0	0	0	180	0	0	50
5.	38	7,500	25	50	45	25	1,080	20	325	
6.	225	10,000	150	300	315	150	2,790	130	975	
7.	612	9,000	400	800	990	400	4,050	410	1,875	
8.	1,075	5,500	700	1,300	1,950	700	4,500	890	3,025	
9.	1,700	3,000	1,200	1,850	3,150	1,200	4,500	1,650	4,250	
10.	2,450	7,500	1,975	2,600	4,650	1,975	4,500	2,600	5,000	
11.	3,175	10,000	2,850	3,500	6,000	2,850	4,500	3,600	5,000	
12.	3,750	9,000	3,750	4,000	6,750	3,750	4,500	4,500	5,000	
13.	4,000	5,500	4,250	4,000	6,750	4,250	4,500	5,000	5,000	
14.	4,000	3,000	4,250	4,000	6,750	4,250	4,500	5,000	5,000	
15.	4,000	7,500	4,250	4,000	6,750	4,250	4,500	5,000	5,000	
16.	4,000	10,000	4,250	4,000	6,750	4,250	4,500	5,000	5,000	
17.	4,000	9,000	4,250	4,000	6,750	4,250	4,500	5,000	5,000	
18.	4,000	5,500	4,250	4,000	6,750	4,250	4,500	5,000	5,000	
19.	4,000	3,000	4,250	4,000	6,750	4,250	4,500	5,000	5,000	
20.	4,000	7,500	4,250	4,000	6,750	4,250	4,500	5,000	5,000	

Note : Figures in parentheses () indicate annual target yield under Without-project condition.

Source : JICA Study Team

Table II-1-3 Fruit Production Prospect and Market Supply

Project Code Development Districts	Planted Area (ha)	Anticipated Production (ton)	Anticipated Market Supply * (ton)
1 North Sumatra			
<i>(1) Durian</i>			
NS(DR)-1 Dairi	300	2,400	1,920
NS(DR)-2 Tapanuli Tengah	750	6,000	4,800
NS(DR)-3 Tapanuli Utara	500	4,000	3,200
<i>(2) Mangosteen</i>			
NS(MN)-1 Tapanuli Selatan	800	8,000	6,400
NS(MN)-2 Tapanuli Utara	500	5,000	4,000
<i>(3) Marquisa</i>			
NS(MA)-1 Karo	1,000	9,000	7,200
<i>(4) Rambutan</i>			
NS(RB)-1 Langkat	500	5,000	4,000
<i>(5) Salak</i>			
NS(SK)-1 Tapanuli Selatan	1,500	15,000	12,000
2. West Java			
<i>(1) Avocado</i>			
WJ(AV)-1 Bandung	500	2,000	1,600
<i>(2) Duku</i>			
WJ(DK)-1 Ciamis	500	4,500	3,600
<i>(3) Durian</i>			
WJ(DR)-1 Bogor	500	4,000	3,200
<i>(4) Mango</i>			
WJ(MO)-1 Sumedang	1,000	13,500	10,800
<i>(5) Mangosteen</i>			
WJ(MN)-1 Purwakarta	500	5,000	4,000
<i>(6) Salak</i>			
WJ(SK)-1 Tasikmalaya	1,000	10,000	8,000
3. East Java			
<i>(1) Avocado</i>			
EJ(AV)-1 Lumajang	1,000	4,000	3,200
<i>(2) Banana</i>			
EJ(BA)-1 Jombang	500	10,000	8,000
EJ(BA)-2 Lumajang	500	10,000	8,000
<i>(3) Duku</i>			
EJ(DK)-1 Tulungagung	1,000	9,000	7,200
<i>(4) Durian</i>			
EJ(DR)-1 Jombang	1,150	9,200	7,360
EJ(DR)-2 Trenggalek	1,000	8,000	6,400

Project Code Development Districts	Planted Area (ha)	Anticipated Production (ton)	Anticipated Market Supply (ton)
<i>(5) Mango</i>			
EJ(MO)-1 Pasuruan	750	10,125	8,100
<i>(6) Salak</i>			
EJ(SK)-1 Malang	1,700	17,000	13,600
4. South Sulawesi			
<i>(1) Avocado</i>			
SS(AV)-1 Gowa	500	2,000	1,600
SS(AV)-2 Soppeng	500	2,000	1,600
<i>(2) Mango</i>			
SS(MO)-1 Sidenreng Rappang	500	6,750	5,400
SS(MO)-2 Majene	500	6,750	5,400
SS(MO)-3 Bone	500	6,750	5,400
SS(MO)-4 Maros	500	6,750	5,400
SS(MO)-5 Wajo	500	6,750	5,400
<i>(3) Mangosteen</i>			
SS(MN)-1 Tana Toraja	500	5,000	4,000
SS(MN)-2 Polewali Mamasa	500	5,000	4,000
<i>(4) Marquisa</i>			
SS(MA)-1 Gowa	1,000	9,000	7,200
SS(MA)-2 Tana Toraja	3,000	27,000	21,600
<i>(5) Rambutan</i>			
SS(RB)-1 Mamuju	2,350	23,500	18,800
SS(RB)-2 Enrekang	500	5,000	4,000
SS(RB)-3 Pinrang	500	5,000	4,000
SS(RB)-4 Barru	700	7,000	5,600

Note : Losses and home consumption are estimated at 20% of the total production output.
Source : JICA Study Team

Table H-2-1 Present Farm Gate Prices in the Study Provinces

(Unit : Rp./kg)

Target Fruits / Provinces	North Sumatra	West Java	East Java	South Sulawesi
1. Avocado	-	200 - 500	750	750
2. Banana	-	-	250 <i>(Cavendish)</i>	-
3. Duku	-	500	2,000	-
4. Durian	1,250	2,500	1,000	-
5. Mango	-	1,000 - 5,000 <i>(Gedong)</i> 1,000 - 3,000 <i>(Arumanis)</i> 800 - 2,000 <i>(Local)</i>	1,250 <i>(Arumanis)</i>	1,250 <i>(Arumanis)</i>
6. Mangosteen	2,000 <i>(for Export)</i>	2,500 <i>(for Export)</i>	-	2,000
7. Marquisa	400	-	-	450
8. Rambutan	600 <i>(Binjai)</i> 400 <i>(Local)</i>	-	-	1,000 <i>(Aceh)</i>
9. Salak	1,000	400 - 700 <i>(Manon Jaya)</i>	800 <i>(Suvaru)</i>	-

Source : JICA Study Team (Price information collected during August - December 1997)

Table H-2-2 Unit Price of Inputs at Farm Level

Item	Unit	Farm Gate Price
- Seedling of Fruit Trees		
• Avocado	piece	5,000
• Banana	piece	1,000
• Duku	piece	5,000
• Durian	piece	6,000
• Mango	piece	4,000
• Mangosteen	piece	5,000
• Marquisa	piece	1,000
• Rambutan	piece	5,000
• Salak	piece	5,000
- Inter-crops		
• Maize	kg	12,000
• Groundnut	kg	4,000
- Fertilizers		
• Urea	kg	500
• TSP	kg	700
• KCl	kg	1,300
• Organic manure	kg	50
• Organic material	liter	20,000
- Agro-chemicals		
• Pesticide	liter	27,000
• Fungicide	kg	55,000
- Others		
• Plastic cover for banana bunch	piece	1,000
- Labor		
• Hired	man-day	6,500

Source : JICA Study Team

Table H-2-3 Annual Farm Input and Budget Requirements per Hectare (1/9)

Crops / Inputs		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th
		unit											
Avocado													
1. Input Requirement													
* Seedling		100.0	20.0	-	-	-	-	-	-	-	-	-	-
- Purchased seed													
* Fertilizer		20.0	28.0	38.0	48.0	186.0	244.0	266.0	286.0	306.0	326.0	346.0	350.0
- Urea													
- TSP		50.0	62.0	79.0	96.5	144.0	199.0	254.0	309.0	320.0	320.0	320.0	320.0
- KCl		20.0	24.0	31.0	38.5	112.0	202.0	292.0	382.0	400.0	400.0	400.0	400.0
* Agro-chemicals		1.0	1.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
- Pesticide													
- Fungicide													
* Other materials		4.0	0.8	-	-	-	-	-	-	-	-	-	-
- Organic manure													
- Organic materials		-	1.6	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
- Plastic cover		-	-	-	-	-	-	-	-	-	-	-	-
* Labor		10.6	52.1	32.8	37.2	75.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0
- Family													
- Hired		48.0	24.6	8.0	8.0	8.0	0.0	118.0	228.0	338.0	448.0	518.0	518.0
2. Budget Requirement (Rp.1.000)													
* Seedling		500	100	-	-	-	-	-	-	-	-	-	-
- Purchased seed													
* Fertilizer		500	14	19	24	93	122	133	143	153	163	173	175
- Urea													
- TSP		700	43	55	68	101	139	178	216	224	224	224	224
- KCl		1,300	31	40	50	146	263	380	497	520	520	520	520
* Agro-chemicals		27,000	27	540	540	540	540	540	540	540	540	540	540
- Pesticide													
- Fungicide		55,000	-	-	-	-	-	-	-	-	-	-	-
* Other materials		50,000	40	-	-	-	-	-	-	-	-	-	-
- Organic manure													
- Organic materials		20,000	32	40	40	40	40	40	40	40	40	40	40
- Plastic cover		1,000	-	-	-	-	-	-	-	-	-	-	-
* Labor		0	0	0	0	0	0	0	0	0	0	0	0
- Family													
- Hired		6,500	312	160	52	52	0	767	1,482	2,197	2,912	3,367	3,367
Total Budget Requirement		1,110	448	747	774	971	1,104	2,057	2,918	3,674	4,399	4,864	4,866

Source : JICA Study Team

Table H-2-3 Annual Farm Input and Budget Requirements per Hectare (2/9)

Banana		Crops / Inputs											
	unit	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th
1. Input Requirement													
* Seedling	no.	1000.0	-	-	-	-	-	-	-	-	1000.0	-	-
- Purchased seed													
* Fertilizer	kg	50.0	250.0	350.0	375.0	325.0	300.0	375.0	325.0	300.0	375.0	325.0	300.0
- Urea	kg	50.0	100.0	100.0	125.0	125.0	100.0	125.0	125.0	100.0	125.0	125.0	100.0
- TSP	kg	50.0	150.0	250.0	300.0	300.0	200.0	275.0	300.0	200.0	275.0	300.0	200.0
- KCl													
* Agro-chemicals	lit	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
- Pesticide	kg	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
- Fungicide													
* Other materials	ton	40.0	-	-	20.0	20.0	-	20.0	20.0	-	20.0	20.0	-
- Organic manure	kg	-	20.0	20.0	15.0	15.0	20.0	15.0	15.0	20.0	15.0	15.0	20.0
- Organic materials	no.	-	1000.0	2000.0	2000.0	2000.0	-	1000.0	2000.0	2000.0	2000.0	-	1000.0
- Plastic cover													
* Labor	m/d	196.0	391.5	485.0	485.0	560.0	365.5	391.5	485.0	485.0	560.0	365.5	391.5
- Family	m/d	380.0	80.0	40.0	40.0	40.0	80.0	80.0	40.0	40.0	40.0	80.0	80.0
- Hired													
2. Budget Requirement (Rp. 1,000)													
* Seedling	1,000	1,000	-	-	-	-	-	-	-	-	1,000	-	-
- Purchased seed													
* Fertilizer	500	25	125	175	188	163	150	188	163	150	188	163	150
- Urea	700	35	70	70	88	88	70	88	88	70	88	88	70
- TSP	1,300	65	195	325	390	390	260	358	390	260	358	390	260
- KCl													
* Agro-chemicals	27,000	27	27	27	27	27	27	27	27	27	27	27	27
- Pesticide	55,000	55	55	55	55	55	55	55	55	55	55	55	55
- Fungicide													
* Other materials	50,000	2,000	-	-	1,000	1,000	-	1,000	1,000	-	1,000	1,000	-
- Organic manure	20,000	-	400	400	300	300	400	300	300	400	300	300	400
- Organic materials	1,000	-	-	2,000	2,000	2,000	-	1,000	2,000	2,000	2,000	-	1,000
- Plastic cover													
* Labor	0	0	0	0	0	0	0	0	0	0	0	0	0
- Family	6,500	2,470	520	260	260	260	520	520	260	260	260	520	520
- Hired													
Total Budget Requirement		5,677	1,392	3,312	4,307	5,282	1,482	3,535	4,282	3,222	5,275	2,542	2,432

Source : JICA Study Team

Table H-2-3 Annual Farm Input and Budget Requirements per Hectare (3/9)

Crops/Inputs	unit	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th
1. Input Requirement													
* Seedling	no.	100.0	20.0	-	-	-	-	-	-	-	-	-	-
- Purchased seed													
* Fertilizer	kg	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0
- Compound	kg	-	-	-	-	-	-	-	-	-	-	-	-
- TSP	kg	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
- KCl	kg	-	-	-	-	-	-	-	-	-	-	-	-
* Agro-chemicals	lit	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
- Pesticide	kg	-	-	-	-	-	-	-	-	-	-	-	-
- Fungicide	kg	-	-	-	-	-	-	-	-	-	-	-	-
* Other materials	ton	20.0	0.4	-	-	-	-	-	-	-	-	-	-
- Organic manure	kg	-	0.8	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
- Organic materials	no.	-	-	-	-	-	-	-	-	-	-	-	-
- Plastic cover													
* Labor	m/d	12.8	32.2	36.4	27.0	48.8	78.8	93.8	93.8	93.8	93.8	93.8	93.8
- Family	m/d	48.0	20.8	8.0	8.0	8.0	8.0	23.0	113.0	203.0	323.0	443.0	443.0
- Hired													
2. Budget Requirement (Rp.1,000)	Rp.												
* Seedling	5,000	500	100	-	-	-	-	-	-	-	-	-	-
- Purchased seed													
* Fertilizer	500	100	100	100	100	100	100	100	100	100	100	100	100
- Compound	700	-	-	-	-	-	-	-	-	-	-	-	-
- TSP	1,300	130	130	130	130	130	130	130	130	130	130	130	130
- KCl													
* Agro-chemicals	27,000	27	27	27	27	27	27	27	27	27	27	27	27
- Pesticide	55,000	-	-	-	-	-	-	-	-	-	-	-	-
- Fungicide													
* Other materials	50,000	1,000	20	-	-	-	-	-	-	-	-	-	-
- Organic manure	20,000	-	16	20	20	20	20	20	20	20	20	20	20
- Organic materials	1,000	-	-	-	-	-	-	-	-	-	-	-	-
- Plastic cover													
* Labor	0	0	0	0	0	0	0	0	0	0	0	0	0
- Family	6,500	312	135	52	52	52	52	150	735	1,320	2,100	2,880	2,880
- Hired													
Total Budget Requirement		2,069	528	329	329	329	329	427	1,012	1,597	2,377	3,157	3,157

Source : JICA Study Team

Table H-2-3 Annual Farm Input and Budget Requirements per Hectare (4/9)

Durian	Crops / Inputs	unit	1st															
			1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th				
	1. Input Requirement																	
	* Seedling	no.	100.0	20.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	- Purchased seed																	
	* Fertilizer	kg	1.6	5.1	10.8	12.0	18.4	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
	- Urea	kg	3.2	10.2	21.6	24.0	36.8	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
	- TSP	kg	3.2	10.2	21.6	24.0	36.8	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
	- KCl	kg																
	* Agro-chemicals	lit	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	- Pesticide	kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	- Fungicide	ton	4.0	0.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	* Other materials	kg	-	-	-	-	-	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	- Organic manure	no.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	- Organic materials	m/d	10.6	52.1	33.8	2.0	75.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0
	- Plastic cover	m/d	48.0	24.6	8.0	8.0	80.0	28.0	98.0	28.0	153.0	373.0	373.0	373.0	373.0	373.0	373.0	373.0
	* Labor	Rp.																
	- Family		600	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	- Hired																	
	2. Budget Requirement (Rp.1.000)																	
	* Seedling	6,000	600	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	- Purchased seed																	
	* Fertilizer	500	1	3	5	6	9	10	10	10	10	10	10	10	10	10	10	10
	- Urea	700	2	7	15	17	26	28	28	28	28	28	28	28	28	28	28	28
	- TSP	1,300	4	13	28	31	48	52	52	52	52	52	52	52	52	52	52	52
	- KCl																	
	* Agro-chemicals	27,000	27	27	54	54	54	54	54	54	54	54	54	54	54	54	54	54
	- Pesticide	55,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	- Fungicide	50,000	200	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	* Other materials	20,000	-	-	-	-	40	40	40	40	40	40	40	40	40	40	40	40
	- Organic manure	1,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	- Organic materials																	
	- Plastic cover																	
	* Labor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	- Family	6,500	312	160	52	52	182	637	995	1,515	2,425	2,425	2,425	2,425	2,425	2,425	2,425	2,425
	- Hired																	
	Total Budget Requirement		1,146	370	155	160	657	366	821	1,179	1,699	2,609	2,609	2,609	2,609	2,609	2,609	2,609

Source : JICA Study Team

Table H-2-3 Annual Farm Input and Budget Requirements per Hectare (5/9)

Mango		Crops / Inputs											
	unit	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th
1. Input Requirement													
* Seedling	no.	100.0	20.0	-	-	-	-	-	-	-	-	-	-
- Purchased seed													
* Fertilizer	kg	20.0	24.0	29.0	38.0	56.0	81.6	87.0	87.0	87.0	87.0	87.0	87.0
- Urea	kg	5.0	9.0	14.0	15.0	27.0	40.8	43.5	43.5	43.5	43.5	43.5	43.5
- TSP	kg	20.0	24.0	29.0	30.0	70.0	108.8	116.0	116.0	116.0	116.0	116.0	116.0
- KCl	kg												
* Agro-chemicals	lit	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
- Pesticide	kg	-	-	-	-	-	-	-	-	-	-	-	-
- Fungicide	ton	20.0	0.4	-	-	-	-	-	-	-	-	-	-
* Other materials	kg	-	1.2	1.9	2.4	3.3	4.7	5.0	5.0	5.0	5.0	5.0	5.0
- Organic manure	no.	-	-	-	-	-	-	-	-	-	-	-	-
- Organic materials	m/d	12.8	32.2	36.4	27.0	48.8	93.8	93.8	93.8	93.8	93.8	93.8	93.8
- Plastic cover	m/d	48.0	20.8	8.0	8.0	8.0	23.0	83.0	158.0	233.0	293.0	383.0	383.0
* Labor	Rp.												
- Family		400	80	-	-	-	-	-	-	-	-	-	-
- Hired													
2. Budget Requirement (Rp.1,000)													
* Seedling	4,000	400	80	-	-	-	-	-	-	-	-	-	-
- Purchased seed													
* Fertilizer	500	10	12	15	19	28	41	44	44	44	44	44	44
- Urea	700	4	6	10	11	19	29	30	30	30	30	30	30
- TSP	1,300	26	31	38	39	91	141	151	151	151	151	151	151
- KCl													
* Agro-chemicals	27,000	27	27	54	54	54	54	54	54	54	54	54	54
- Pesticide	55,000	-	-	-	-	-	-	-	-	-	-	-	-
- Fungicide													
* Other materials	50,000	1,000	20	-	-	-	-	-	-	-	-	-	-
- Organic manure	20,000	-	24	38	48	66	94	100	100	100	100	100	100
- Organic materials	1,000	-	-	-	-	-	-	-	-	-	-	-	-
- Plastic cover													
* Labor	0	0	0	0	0	0	0	0	0	0	0	0	0
- Family	6,500	312	135	52	52	52	150	540	1,027	1,515	1,905	2,490	2,490
- Hired													
Total Budget Requirement		1,779	336	206	223	310	508	918	1,406	1,893	2,283	2,868	2,868

Source : JICA Study Team

Table H-2-3 Annual Farm Input and Budget Requirements per Hectare (6/9)

Crops / Inputs	unit	Mangosteen												
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	
1. Input Requirement														
* Seedling	no.	100.0	20.0	-	-	-	-	-	-	-	-	-	-	-
- Purchased seed														
* Fertilizer														
- Urea	kg	36.0	26.4	24.0	36.8	56.0	68.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0
- TSP	kg	16.0	12.8	26.4	30.0	46.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
- KCl	kg	28.0	29.6	30.0	34.0	47.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
* Agro-chemicals														
- Pesticide	lit	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
- Fungicide	kg	-	-	-	-	-	-	-	-	-	-	-	-	-
* Other materials														
- Organic manure	ton	6.0	1.2	-	-	-	-	-	-	-	-	-	-	-
- Organic materials	kg	-	1.6	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
- Plastic cover	no.	-	-	-	-	-	-	-	-	-	-	-	-	-
* Labor														
- Family	m/d	12.8	32.2	36.4	27.0	63.8	93.8	93.8	93.8	93.8	93.8	93.8	93.8	93.8
- Hired	m/d	48.0	20.8	8.0	8.0	8.0	23.0	68.0	203.0	338.0	518.0	698.0	698.0	
2. Budget Requirement (Rp.1,000)														
* Seedling	Rp.	500	100	-	-	-	-	-	-	-	-	-	-	-
- Purchased seed	5,000													
* Fertilizer														
- Urea	500	18	13	12	18	28	34	35	35	35	35	35	35	35
- TSP	700	11	9	18	21	32	35	35	35	35	35	35	35	35
- KCl	1,300	36	38	39	44	61	65	65	65	65	65	65	65	65
* Agro-chemicals														
- Pesticide	27,000	27	27	27	27	27	27	27	27	27	27	27	27	27
- Fungicide	55,000	-	-	-	-	-	-	-	-	-	-	-	-	-
* Other materials														
- Organic manure	50,000	300	60	-	-	-	-	-	-	-	-	-	-	-
- Organic materials	20,000	-	32	40	40	40	40	40	40	40	40	40	40	40
- Plastic cover	1,000	-	-	-	-	-	-	-	-	-	-	-	-	-
* Labor														
- Family	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- Hired	6,500	312	135	52	52	52	150	442	1,320	2,197	3,367	4,537	4,537	
Total Budget Requirement		1,205	415	188	203	240	351	644	1,522	2,399	3,569	4,759	4,759	

Source : JICA Study Team

Table H-2-3 Annual Farm Input and Budget Requirements per Hectare (7/9)

Crops / Inputs	unit	Marquisa												
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	
1. Input Requirement														
* Seedling	no.	500.0	100.0	-	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
- Purchased seed	kg	800.0	800.0	800.0	800.0	800.0	800.0	800.0	800.0	800.0	800.0	800.0	800.0	800.0
* Fertilizer	kg	-	-	-	-	-	-	-	-	-	-	-	-	-
- ZA + DS + ZK	kg	-	-	-	-	-	-	-	-	-	-	-	-	-
- TSP	kg	-	-	-	-	-	-	-	-	-	-	-	-	-
- KCl	kg	-	-	-	-	-	-	-	-	-	-	-	-	-
* Agro-chemicals	lit	12.5	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
- Pesticide	kg	25.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
- Fungicide	kg	-	-	-	-	-	-	-	-	-	-	-	-	-
* Other materials	ton	10.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
- Organic manure	kg	-	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
- Organic materials	no.	-	-	-	-	-	-	-	-	-	-	-	-	-
- Plastic cover	m/d	79.2	85.6	113.2	243.2	321.2	321.2	321.2	321.2	321.2	321.2	321.2	321.2	321.2
* Labor	m/d	94.0	70.8	32.0	32.0	32.0	62.0	62.0	62.0	62.0	62.0	62.0	62.0	62.0
- Family	Rp.	-	-	-	-	-	-	-	-	-	-	-	-	-
- Hired	Rp.	550	110	110	110	110	110	110	110	110	110	110	110	110
2. Budget Requirement (Rp. 1,000)														
* Seedling	1,100	550	110	-	110	110	110	110	110	110	110	110	110	110
- Purchased seed	500	400	400	400	400	400	400	400	400	400	400	400	400	400
* Fertilizer	700	-	-	-	-	-	-	-	-	-	-	-	-	-
- ZA + DS + ZK	1,300	-	-	-	-	-	-	-	-	-	-	-	-	-
- TSP	27,000	338	675	675	675	675	675	675	675	675	675	675	675	675
- KCl	55,000	1,375	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750	2,750
* Agro-chemicals	50,000	500	100	-	100	100	100	100	100	100	100	100	100	100
- Pesticide	20,000	-	80	100	80	80	80	80	80	80	80	80	80	80
- Fungicide	1,000	-	-	-	-	-	-	-	-	-	-	-	-	-
* Other materials	6,500	0	0	0	0	0	0	0	0	0	0	0	0	0
- Organic manure	6,500	611	460	208	208	208	208	208	208	208	208	208	208	208
- Organic materials														
- Plastic cover														
* Labor														
- Family														
- Hired														
Total Budget Requirement		3,774	4,575	4,133	4,323	4,323	4,518	4,518	4,518	4,518	4,518	4,518	4,518	4,518

Source : JICA Study Team

Table H-2-3 Annual Farm Input and Budget Requirements per Hectare (8/9)

Rambutan		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th
Crops/Inputs													
1. Input Requirement													
* Seeding	no.	100.0	20.0	-	-	-	-	-	-	-	-	-	-
- Purchased seed													
* Fertilizer	kg	10.0	12.0	14.5	17.0	19.5	24.0	31.0	40.5	52.5	67.0	94.0	100.0
- Urea													
- TSP	kg	5.0	7.0	9.5	12.0	14.5	16.6	18.6	20.6	22.6	24.6	45.0	50.0
- KCl	kg	15.0	17.0	19.5	22.0	24.5	29.0	34.0	39.0	44.0	49.0	50.0	50.0
* Agro-chemicals	lit	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
- Pesticide	kg	-	-	-	-	-	-	-	-	-	-	-	-
- Fungicide													
* Other materials	ton	2.0	0.4	-	-	-	-	-	-	-	-	-	-
- Organic manure	kg	-	1.2	1.9	2.4	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
- Organic materials	no.	-	-	-	-	-	-	-	-	-	-	-	-
- Plastic cover													
* Labor	m/d	10.2	45.9	34.1	14.4	14.2	26.2	50.2	81.2	81.2	81.2	81.2	81.2
- Family	m/d	56.0	18.1	8.0	8.0	8.0	8.0	8.0	13.0	53.0	93.0	133.0	133.0
- Hired													
2. Budget Requirement (Rp.1,000)													
* Seeding	Rp.	500	100	-	-	-	-	-	-	-	-	-	-
- Purchased seed	5,000												
* Fertilizer	500	5	6	7	9	10	12	16	20	26	34	47	50
- Urea	700	4	5	7	8	10	12	13	14	16	17	32	35
- TSP	1,300	20	22	25	29	32	38	44	51	57	64	65	65
- KCl													
* Agro-chemicals	27,000	27	27	54	54	54	54	54	54	54	54	54	54
- Pesticide	55,000	-	-	-	-	-	-	-	-	-	-	-	-
- Fungicide													
* Other materials	50,000	100	20	-	-	-	-	-	-	-	-	-	-
- Organic manure	20,000	-	24	38	48	50	50	50	50	50	50	50	50
- Organic materials	1,000	-	-	-	-	-	-	-	-	-	-	-	-
- Plastic cover													
* Labor	0	0	0	0	0	0	0	0	0	0	0	0	0
- Family	6,500	364	118	52	52	52	52	52	85	345	605	865	865
- Hired													
Total Budget Requirement		1,019	322	183	200	208	217	229	274	548	823	1,112	1,119

Source : JICA Study Team

Table H-2-3 Annual Farm Input and Budget Requirements per Hectare (9/9)

Crops / Inputs	unit	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th
1. Input Requirement													
* Seedling	no.	2000.0	400.0	-	-	-	-	-	-	-	-	-	-
- Purchased seed													
* Fertilizer	kg	50.0	50.0	50.0	90.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
- Urea	kg	40.0	40.0	40.0	72.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
- TSP	kg	60.0	60.0	60.0	108.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0
- KCl													
* Agro-chemicals	lit	1.0	2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
- Pesticide	kg	-	-	-	-	-	-	-	-	-	-	-	-
- Fungicide													
* Other materials	ton	20.0	4.0	-	-	-	-	-	-	-	-	-	-
- Organic manure	kg	-	8.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
- Organic materials	no.	-	-	-	-	-	-	-	-	-	-	-	-
- Plastic cover													
* Labor	m/d	52.0	143.0	158.0	238.0	308.0	308.0	308.0	308.0	308.0	308.0	308.0	308.0
- Family	m/d	190.0	125.0	40.0	40.0	70.0	70.0	170.0	290.0	290.0	290.0	290.0	290.0
- Hired													
2. Budget Requirement (Rp. 1,000)													
* Seedling	Rp.	10,000	2,000	-	-	-	-	-	-	-	-	-	-
- Purchased seed	5,000												
* Fertilizer	500	25	25	25	45	50	50	50	50	50	50	50	50
- Urea	700	28	28	28	50	56	56	56	56	56	56	56	56
- TSP	1,300	78	78	78	140	156	156	156	156	156	156	156	156
- KCl													
* Agro-chemicals	27,000	27	54	108	108	108	108	108	108	108	108	108	108
- Pesticide	55,000	-	-	-	-	-	-	-	-	-	-	-	-
- Fungicide													
* Other materials	50,000	1,000	200	-	-	-	-	-	-	-	-	-	-
- Organic manure	20,000	-	160	200	200	200	200	200	200	200	200	200	200
- Organic materials	1,000	-	-	-	-	-	-	-	-	-	-	-	-
- Plastic cover													
* Labor	0	0	0	0	0	0	0	0	0	0	0	0	0
- Family	6,500	1,235	813	260	260	455	455	1,105	1,885	1,885	1,885	1,885	1,885
- Hired													
Total Budget Requirement		12,393	3,358	699	804	830	1,025	1,675	2,455	2,455	2,455	2,455	2,455

Sources : JICA Study Team

Table H-2-4 Annual Farm Budget and Increment Net Income (1/9)
(Target Fruit : Avocado)

Unit : Rp.1.000

Year in Order	With Project										Without Project				
	Target Fruit (Avocado)					Intercropping (0.60 ha)					Total		Dry Upland Cropping		Annual Increment Net Income
	Annual Fruit Yield (kg/ha)	Annual Gross Income	Annual Prod'n Cost	Annual Net Income	Cumulative Net Income	Annual Gross Income	Annual Prod'n Cost	Annual Net Income	Annual Gross Income	Annual Prod'n Cost	Annual Net Income	Annual Gross Income	Annual Prod'n Cost	Annual Net Income	
1	0	0	1,136	-1,136	-1,136	1,062	622	440	1,770	1,037	733	1,770	1,037	733	-1,429
2	0	0	463	-463	-1,599	1,062	622	440	1,770	1,037	733	1,770	1,037	733	-756
3	0	0	754	-754	-2,353	1,062	622	440	1,770	1,037	733	1,770	1,037	733	-1,047
4	0	0	782	-782	-3,135	1,062	622	440	1,770	1,037	733	1,770	1,037	733	-1,075
5	750	975	994	-19	-3,154	1,062	622	440	1,770	1,037	733	1,770	1,037	733	-312
6	1,500	1,950	1,128	822	-2,332	1,062	622	440	1,770	1,037	733	1,770	1,037	733	529
7	2,500	3,250	2,123	1,127	-1,205	1,062	622	440	1,770	1,037	733	1,770	1,037	733	834
8	4,000	5,200	3,061	2,139	934	1,062	622	440	1,770	1,037	733	1,770	1,037	733	1,846
9	5,500	7,150	3,874	3,276	4,210	1,062	622	440	1,770	1,037	733	1,770	1,037	733	2,983
10	7,000	9,100	4,656	4,444	8,654	1,062	622	440	1,770	1,037	733	1,770	1,037	733	4,151
11	8,000	10,400	5,158	5,242	13,896	1,062	622	440	1,770	1,037	733	1,770	1,037	733	4,949
12	8,000	10,400	5,160	5,240	19,136	1,062	622	440	1,770	1,037	733	1,770	1,037	733	4,947
13	8,000	10,400	5,160	5,240	24,376	1,062	622	440	1,770	1,037	733	1,770	1,037	733	4,947
14	8,000	10,400	5,160	5,240	29,616	1,062	622	440	1,770	1,037	733	1,770	1,037	733	4,947
15	8,000	10,400	5,160	5,240	34,856	1,062	622	440	1,770	1,037	733	1,770	1,037	733	4,947
16	8,000	10,400	5,160	5,240	40,096	1,062	622	440	1,770	1,037	733	1,770	1,037	733	4,947
17	8,000	10,400	5,160	5,240	45,336	1,062	622	440	1,770	1,037	733	1,770	1,037	733	4,947
18	8,000	10,400	5,160	5,240	50,576	1,062	622	440	1,770	1,037	733	1,770	1,037	733	4,947
19	8,000	10,400	5,160	5,240	55,816	1,062	622	440	1,770	1,037	733	1,770	1,037	733	4,947
20	8,000	10,400	5,160	5,240	61,056	1,062	622	440	1,770	1,037	733	1,770	1,037	733	4,947
21	8,000	10,400	5,160	5,240	66,296	1,062	622	440	1,770	1,037	733	1,770	1,037	733	4,947
22	8,000	10,400	5,160	5,240	71,536	1,062	622	440	1,770	1,037	733	1,770	1,037	733	4,947
23	8,000	10,400	5,160	5,240	76,776	1,062	622	440	1,770	1,037	733	1,770	1,037	733	4,947
24	8,000	10,400	5,160	5,240	82,016	1,062	622	440	1,770	1,037	733	1,770	1,037	733	4,947
25	8,000	10,400	5,160	5,240	87,256	1,062	622	440	1,770	1,037	733	1,770	1,037	733	4,947

Source : JICA Study Team

Table H-2-4 Annual Farm Budget and Increment Net Income (2/9)
(Target Fruit : Banana)

Unit : Rp.1.000

Year in Order	With Project										Without Project					
	Target Fruit (Banana)					Intercropping (0.30 ha)					Total		Dry Upland Cropping		Annual Increment Net Income	
	Annual Fruit Yield (kg/ha)	Annual Gross Income	Annual Net Income	Cumulative Net Income	Annual Gross Income	Annual Production Cost	Annual Net Income	Annual Gross Income	Annual Production Cost	Annual Net Income	Annual Gross Income	Annual Production Cost	Annual Net Income	Annual Gross Income		Annual Production Cost
1	0	0	-5,872	-5,872	531	311	220	-5,652	1,770	1,037	733	-6,385				
2	10,000	6,500	5,043	-829	531	311	220	5,263	1,770	1,037	733	4,530				
3	20,000	13,000	9,633	8,804	531	311	220	9,853	1,770	1,037	733	9,120				
4	20,000	13,000	8,635	17,439	531	311	220	8,855	1,770	1,037	733	8,122				
5	20,000	13,000	7,665	25,104	531	311	220	7,885	1,770	1,037	733	7,152				
6	20,000	13,000	11,448	36,552	531	311	220	11,668	1,770	1,037	733	10,935				
7	20,000	13,000	9,388	45,940	531	311	220	9,608	1,770	1,037	733	8,875				
8	20,000	13,000	8,665	54,605	531	311	220	8,885	1,770	1,037	733	8,152				
9	20,000	13,000	9,728	64,333	531	311	220	9,948	1,770	1,037	733	9,215				
10	20,000	13,000	7,668	72,001	531	311	220	7,888	1,770	1,037	733	7,155				
11	20,000	13,000	10,385	82,386	531	311	220	10,605	1,770	1,037	733	9,872				
12	20,000	13,000	10,448	92,834	531	311	220	10,668	1,770	1,037	733	9,935				
13	20,000	13,000	7,668	100,502	531	311	220	7,888	1,770	1,037	733	7,155				
14	20,000	13,000	10,385	110,887	531	311	220	10,605	1,770	1,037	733	9,872				
15	20,000	13,000	10,448	121,335	531	311	220	10,668	1,770	1,037	733	9,935				
16	20,000	13,000	7,668	129,003	531	311	220	7,888	1,770	1,037	733	7,155				
17	20,000	13,000	10,385	139,388	531	311	220	10,605	1,770	1,037	733	9,872				
18	20,000	13,000	10,448	149,836	531	311	220	10,668	1,770	1,037	733	9,935				
19	20,000	13,000	7,668	157,504	531	311	220	7,888	1,770	1,037	733	7,155				
20	20,000	13,000	10,385	167,889	531	311	220	10,605	1,770	1,037	733	9,872				
21	20,000	13,000	10,448	178,337	531	311	220	10,668	1,770	1,037	733	9,935				
22	20,000	13,000	7,668	186,005	531	311	220	7,888	1,770	1,037	733	7,155				
23	20,000	13,000	10,385	196,390	531	311	220	10,605	1,770	1,037	733	9,872				
24	20,000	13,000	10,448	206,838	531	311	220	10,668	1,770	1,037	733	9,935				
25	20,000	13,000	7,668	214,506	531	531	0	7,668	1,770	1,037	733	6,935				

Source : JICA Study Team

Table H-2-4 Annual Farm Budget and Increment Net Income (3/9)
(Target Fruit : Duku)

Unit : Rp.1,000

Year in Order	With Project										Without Project			
	Target Fruit (Duku)				Intercropping (0.60 ha)				Total		Dry Upland Cropping		Annual Increment	
	Annual Fruit Yield (kg/ha)	Annual Gross Income	Annual Production Cost	Annual Net Income	Cumulative Net Income	Annual Gross Income	Annual Production Cost	Annual Net Income	Annual Gross Income	Annual Production Cost	Annual Gross Income	Annual Production Cost	Annual Net Income	Annual Net Income
1	0	0	2,113	-2,113	-2,113	1,062	622	440	1,770	1,037	1,770	1,037	733	-2,406
2	0	0	559	-2,672	-2,672	1,062	622	440	1,770	1,037	1,770	1,037	733	-852
3	0	0	353	-3,025	-3,025	1,062	622	440	1,770	1,037	1,770	1,037	733	-646
4	0	0	353	-3,378	-3,378	1,062	622	440	1,770	1,037	1,770	1,037	733	-646
5	500	450	353	97	-3,281	1,062	622	440	1,770	1,037	1,770	1,037	733	-196
6	1,000	900	458	442	-2,839	1,062	622	440	1,770	1,037	1,770	1,037	733	149
7	1,500	1,350	1,088	262	-2,577	1,062	622	440	1,770	1,037	1,770	1,037	733	-31
8	3,000	2,700	1,718	982	-1,595	1,062	622	440	1,770	1,037	1,770	1,037	733	689
9	4,500	4,050	2,558	1,492	-103	1,062	622	440	1,770	1,037	1,770	1,037	733	1,199
10	6,500	5,850	3,398	2,452	2,349	1,062	622	440	1,770	1,037	1,770	1,037	733	2,159
11	8,500	7,650	3,398	4,252	6,601	1,062	622	440	1,770	1,037	1,770	1,037	733	3,959
12	8,500	7,650	3,398	4,252	10,853	1,062	622	440	1,770	1,037	1,770	1,037	733	3,959
13	8,500	7,650	3,398	4,252	15,105	1,062	622	440	1,770	1,037	1,770	1,037	733	3,959
14	8,500	7,650	3,398	4,252	19,357	1,062	622	440	1,770	1,037	1,770	1,037	733	3,959
15	8,500	7,650	3,398	4,252	23,609	1,062	622	440	1,770	1,037	1,770	1,037	733	3,959
16	8,500	7,650	3,398	4,252	27,861	1,062	622	440	1,770	1,037	1,770	1,037	733	3,959
17	8,500	7,650	3,398	4,252	32,113	1,062	622	440	1,770	1,037	1,770	1,037	733	3,959
18	8,500	7,650	3,398	4,252	36,365	1,062	622	440	1,770	1,037	1,770	1,037	733	3,959
19	8,500	7,650	3,398	4,252	40,617	1,062	622	440	1,770	1,037	1,770	1,037	733	3,959
20	8,500	7,650	3,398	4,252	44,869	1,062	622	440	1,770	1,037	1,770	1,037	733	3,959
21	8,500	7,650	3,398	4,252	49,121	1,062	622	440	1,770	1,037	1,770	1,037	733	3,959
22	8,500	7,650	3,398	4,252	53,373	1,062	622	440	1,770	1,037	1,770	1,037	733	3,959
23	8,500	7,650	3,398	4,252	57,625	1,062	622	440	1,770	1,037	1,770	1,037	733	3,959
24	8,500	7,650	3,398	4,252	61,877	1,062	622	440	1,770	1,037	1,770	1,037	733	3,959
25	8,500	7,650	3,398	4,252	66,129	1,062	622	440	1,770	1,037	1,770	1,037	733	3,959

Source : JICA Study Team

Table H-2-4 Annual Farm Budget and Increment Net Income (4/9)
(Target Fruit : Durian)

Unit : Rp.1,000

Year in Order	With Project										Without Project						
	Target Fruit (Durian)					Intercropping (0.60 ha)					Dry Upland Cropping						
	Annual Fruit Yield (kg/ha)	Annual Gross Income	Annual Production Cost	Annual Net Income	Cumulative Net Income	Annual Gross Income	Annual Production Cost	Annual Net Income	Annual Gross Income	Annual Production Cost	Annual Net Income	Annual Gross Income	Annual Production Cost	Annual Net Income	Annual Gross Income	Annual Production Cost	Annual Net Income
1	0	0	1,170	-1,170	-1,170	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	-1,463
2	0	0	383	-383	-1,553	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	-676
3	0	0	160	-160	-1,713	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	-453
4	0	0	165	-165	-1,878	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	-458
5	1,000	1,200	699	501	-1,377	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	208
6	2,000	2,400	382	2,018	641	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	1,725
7	3,000	3,600	872	2,728	3,369	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	2,455
8	4,000	4,800	1,257	3,543	6,912	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	3,250
9	6,000	7,200	1,817	5,383	12,295	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	5,090
10	8,000	9,600	2,797	6,803	19,098	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	6,510
11	8,000	9,600	2,797	6,803	25,901	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	6,510
12	8,000	9,600	2,797	6,803	32,704	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	6,510
13	8,000	9,600	2,797	6,803	39,507	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	6,510
14	8,000	9,600	2,797	6,803	46,310	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	6,510
15	8,000	9,600	2,797	6,803	53,113	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	6,510
16	8,000	9,600	2,797	6,803	59,916	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	6,510
17	8,000	9,600	2,797	6,803	66,719	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	6,510
18	8,000	9,600	2,797	6,803	73,522	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	6,510
19	8,000	9,600	2,797	6,803	80,325	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	6,510
20	8,000	9,600	2,797	6,803	87,128	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	6,510
21	8,000	9,600	2,797	6,803	93,931	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	6,510
22	8,000	9,600	2,797	6,803	100,734	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	6,510
23	8,000	9,600	2,797	6,803	107,537	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	6,510
24	8,000	9,600	2,797	6,803	114,340	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	6,510
25	8,000	9,600	2,797	6,803	121,143	1,062	622	440	1,062	1,770	1,037	1,770	1,037	733	1,770	1,037	6,510

Source : JICA Study Team

Table H-2-4 Annual Farm Budget and Increment Net Income (5/9)
(Target Fruit : Mango)

Unit : Rp.1.000

Year in Order	With Project										Without Project			
	Target Fruit (Mango)				Intercropping (0.60 ha)			Total Annual Net Income	Dry Upland Cropping			Annual Increment Net Income		
	Annual Fruit Yield (kg/ha)	Annual Gross Income	Annual Production Cost	Annual Net Income	Annual Gross Income	Annual Production Cost	Annual Net Income		Annual Gross Income	Annual Production Cost	Annual Net Income			
1	0	0	1,805	-1,805	1,062	622	440	-1,365	1,770	1,037	733	-2,098		
2	0	0	349	-349	1,062	622	440	91	1,770	1,037	733	-642		
3	0	0	213	-213	1,062	622	440	227	1,770	1,037	733	-506		
4	0	0	230	-230	1,062	622	440	210	1,770	1,037	733	-523		
5	900	765	320	445	1,062	622	440	885	1,770	1,037	733	152		
6	2,700	2,295	528	1,767	1,062	622	440	2,207	1,770	1,037	733	1,474		
7	4,500	3,825	968	2,857	1,062	622	440	3,297	1,770	1,037	733	2,564		
8	6,800	5,780	1,493	4,287	1,062	622	440	4,727	1,770	1,037	733	3,994		
9	10,800	9,180	2,018	7,162	1,062	622	440	7,602	1,770	1,037	733	6,869		
10	13,500	11,475	2,438	9,037	1,062	622	440	9,477	1,770	1,037	733	8,744		
11	13,500	11,475	3,068	8,407	1,062	622	440	8,847	1,770	1,037	733	8,114		
12	13,500	11,475	3,068	8,407	1,062	622	440	8,847	1,770	1,037	733	8,114		
13	13,500	11,475	3,068	8,407	1,062	622	440	8,847	1,770	1,037	733	8,114		
14	13,500	11,475	3,068	8,407	1,062	622	440	8,847	1,770	1,037	733	8,114		
15	13,500	11,475	3,068	8,407	1,062	622	440	8,847	1,770	1,037	733	8,114		
16	13,500	11,475	3,068	8,407	1,062	622	440	8,847	1,770	1,037	733	8,114		
17	13,500	11,475	3,068	8,407	1,062	622	440	8,847	1,770	1,037	733	8,114		
18	13,500	11,475	3,068	8,407	1,062	622	440	8,847	1,770	1,037	733	8,114		
19	13,500	11,475	3,068	8,407	1,062	622	440	8,847	1,770	1,037	733	8,114		
20	13,500	11,475	3,068	8,407	1,062	622	440	8,847	1,770	1,037	733	8,114		
21	13,500	11,475	3,068	8,407	1,062	622	440	8,847	1,770	1,037	733	8,114		
22	13,500	11,475	3,068	8,407	1,062	622	440	8,847	1,770	1,037	733	8,114		
23	13,500	11,475	3,068	8,407	1,062	622	440	8,847	1,770	1,037	733	8,114		
24	13,500	11,475	3,068	8,407	1,062	622	440	8,847	1,770	1,037	733	8,114		
25	13,500	11,475	3,068	8,407	1,062	622	440	8,847	1,770	1,037	733	8,114		

Source : JICA Study Team

Table H-2-4 Annual Farm Budget and Increment Net Income (6/9)
(Target Fruit : Mangosteen)

Unit : Rp./1,000

Year in Order	With Project											Without Project						
	Target Fruit (Mangosteen)						Intercropping (0.60 ha)					Total			Dry Upland Cropping			
	Annual Fruit Yield (kg/ha)	Annual Gross Income	Annual Production Cost	Annual Net Income	Cumulative Net Income	Annual Gross Income	Annual Production Cost	Annual Net Income	Annual Gross Income	Annual Production Cost	Annual Net Income	Annual Gross Income	Annual Production Cost	Annual Net Income	Annual Gross Income	Annual Production Cost	Annual Net Income	Annual Increment Net Income
1	0	0	1,232	-1,232	-1,232	1,062	622	440	-792	1,770	1,037	733	-1,525					
2	0	0	428	-1,660	-1,660	1,062	622	440	12	1,770	1,037	733	-721					
3	0	0	195	-1,855	-1,855	1,062	622	440	245	1,770	1,037	733	-488					
4	0	0	210	-2,065	-2,065	1,062	622	440	230	1,770	1,037	733	-503					
5	500	550	300	-1,765	-1,765	1,062	622	440	740	1,770	1,037	733	7					
6	1,000	1,100	369	-1,034	-1,034	1,062	622	440	1,171	1,770	1,037	733	438					
7	1,500	1,650	685	-69	-69	1,062	622	440	1,405	1,770	1,037	733	672					
8	3,000	3,300	1,630	1,670	1,601	1,062	622	440	2,110	1,770	1,037	733	1,377					
9	4,500	4,950	2,575	3,375	3,976	1,062	622	440	2,815	1,770	1,037	733	2,082					
10	6,500	7,150	3,835	5,095	7,291	1,062	622	440	3,755	1,770	1,037	733	3,022					
11	8,500	9,350	5,095	4,255	11,546	1,062	622	440	4,695	1,770	1,037	733	3,962					
12	8,500	9,350	5,095	4,255	15,801	1,062	622	440	4,695	1,770	1,037	733	3,962					
13	8,500	9,350	5,095	4,255	20,056	1,062	622	440	4,695	1,770	1,037	733	3,962					
14	8,500	9,350	5,095	4,255	24,311	1,062	622	440	4,695	1,770	1,037	733	3,962					
15	8,500	9,350	5,095	4,255	28,566	1,062	622	440	4,695	1,770	1,037	733	3,962					
16	8,500	9,350	5,095	4,255	32,821	1,062	622	440	4,695	1,770	1,037	733	3,962					
17	8,500	9,350	5,095	4,255	37,076	1,062	622	440	4,695	1,770	1,037	733	3,962					
18	8,500	9,350	5,095	4,255	41,331	1,062	622	440	4,695	1,770	1,037	733	3,962					
19	8,500	9,350	5,095	4,255	45,586	1,062	622	440	4,695	1,770	1,037	733	3,962					
20	8,500	9,350	5,095	4,255	49,841	1,062	622	440	4,695	1,770	1,037	733	3,962					
21	8,500	9,350	5,095	4,255	54,096	1,062	622	440	4,695	1,770	1,037	733	3,962					
22	8,500	9,350	5,095	4,255	58,351	1,062	622	440	4,695	1,770	1,037	733	3,962					
23	8,500	9,350	5,095	4,255	62,606	1,062	622	440	4,695	1,770	1,037	733	3,962					
24	8,500	9,350	5,095	4,255	66,861	1,062	622	440	4,695	1,770	1,037	733	3,962					
25	8,500	9,350	5,095	4,255	71,116	1,062	622	440	4,695	1,770	1,037	733	3,962					

Source : JICA Study Team

Table H-2-4 Annual Farm Budget and Increment Net Income (7/9)
(Target Fruit : Marquisa)

Unit : Rp.1.000

Year in Order	With Project										Without Project						
	Target Fruit (Marquisa)					Intercropping (0.45 ha)					Total			Dry Upland Cropping			
	Annual Fruit Yield (kg/ha)	Annual Gross Income	Annual Production Cost	Annual Net Income	Cumulative Net Income	Annual Gross Income	Annual Production Cost	Annual Net Income	Annual Gross Income	Annual Production Cost	Annual Net Income	Annual Gross Income	Annual Production Cost	Annual Net Income	Annual Gross Income	Annual Production Cost	Annual Net Income
1	0	0	3,991	-3,991	-3,991	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
2	1,200	1,620	4,541	-2,921	-6,912	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
3	2,400	3,240	4,229	-989	-7,901	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
4	3,600	4,860	4,409	451	-7,450	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
5	7,200	9,720	4,409	5,311	-2,139	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
6	9,000	12,150	4,619	7,531	5,392	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
7	9,000	12,150	4,619	7,531	12,923	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
8	9,000	12,150	4,619	7,531	20,454	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
9	9,000	12,150	4,619	7,531	27,985	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
10	9,000	12,150	4,619	7,531	35,516	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
11	9,000	12,150	4,619	7,531	43,047	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
12	9,000	12,150	4,619	7,531	50,578	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
13	9,000	12,150	4,619	7,531	58,109	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
14	9,000	12,150	4,619	7,531	65,640	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
15	9,000	12,150	4,619	7,531	73,171	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
16	9,000	12,150	4,619	7,531	80,702	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
17	9,000	12,150	4,619	7,531	88,233	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
18	9,000	12,150	4,619	7,531	95,764	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
19	9,000	12,150	4,619	7,531	103,295	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
20	9,000	12,150	4,619	7,531	110,826	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
21	9,000	12,150	4,619	7,531	118,357	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
22	9,000	12,150	4,619	7,531	125,888	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
23	9,000	12,150	4,619	7,531	133,419	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
24	9,000	12,150	4,619	7,531	140,950	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733
25	9,000	12,150	4,619	7,531	148,481	797	467	330	797	467	330	1,770	1,037	733	1,770	1,037	733

Source : JICA Study Team

Table H-2-4 Annual Farm Budget and Increment Net Income (8/9)
(Target Fruit : Rambutan)

Unit : Rp.1.000

Year in Order	With Project										Without Project			Annual Increment Net Income	
	Target Fruit (Rambutan)					Intercropping (0.6 ha)					Dry Upland Cropping				
	Annual Fruit Yield (kg/ha)	Annual Gross Income	Annual Production Cost	Annual Net Income	Cumulative Net Income	Annual Gross Income	Annual Production Cost	Annual Net Income	Annual Gross Income	Annual Production Cost	Annual Net Income	Annual Gross Income	Annual Production Cost		Annual Net Income
1	0	0	1,098	-1,098	-1,098	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	-1,391
2	0	0	342	-342	-1,440	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	-635
3	0	0	189	-189	-1,629	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	-482
4	0	0	205	-205	-1,834	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	-498
5	400	300	214	86	-1,748	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	-207
6	1,000	750	224	526	-1,222	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	233
7	2,200	1,650	236	1,414	192	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	1,121
8	4,000	3,000	284	2,716	2,908	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	2,423
9	6,000	4,500	580	3,920	6,828	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	3,627
10	8,000	6,000	876	5,124	11,952	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	4,831
11	10,000	7,500	1,188	6,312	18,264	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	6,019
12	10,000	7,500	1,195	6,305	24,569	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	6,012
13	10,000	7,500	1,195	6,305	30,874	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	6,012
14	10,000	7,500	1,195	6,305	37,179	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	6,012
15	10,000	7,500	1,195	6,305	43,484	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	6,012
16	10,000	7,500	1,195	6,305	49,789	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	6,012
17	10,000	7,500	1,195	6,305	56,094	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	6,012
18	10,000	7,500	1,195	6,305	62,399	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	6,012
19	10,000	7,500	1,195	6,305	68,704	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	6,012
20	10,000	7,500	1,195	6,305	75,009	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	6,012
21	10,000	7,500	1,195	6,305	81,314	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	6,012
22	10,000	7,500	1,195	6,305	87,619	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	6,012
23	10,000	7,500	1,195	6,305	93,924	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	6,012
24	10,000	7,500	1,195	6,305	100,229	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	6,012
25	10,000	7,500	1,195	6,305	106,534	1,062	622	440	1,062	1,037	1,770	1,770	1,037	733	6,012

Source : JICA Study Team

Table H-2-4 Annual Farm Budget and Increment Net Income (9/9)
(Target Fruit : Salak)

Unit : Rp.1.000

Year in Order	With Project										Without Project				
	Target Fruit (Salak)					Intercropping (0.15 ha)					Dry Upland Cropping				
	Annual Fruit Yield (kg/ha)	Annual Gross Income	Annual Production Cost	Annual Net Income	Cumulative Net Income	Annual Gross Income	Annual Production Cost	Annual Net Income	Total Annual Net Income	Annual Gross Income	Annual Production Cost	Annual Net Income	Annual Increment Net Income		
1	0	0	12,493	-12,493	-12,493	266	156	110	-12,383	1,770	1,037	733	-13,116		
2	0	0	3,425	-3,425	-15,918	266	156	110	-3,315	1,770	1,037	733	-4,048		
3	0	0	724	-724	-16,642	266	156	110	-614	1,770	1,037	733	-1,347		
4	1,000	1,500	833	667	-15,975	266	156	110	777	1,770	1,037	733	44		
5	2,500	3,750	860	2,890	-13,085	266	156	110	3,000	1,770	1,037	733	2,267		
6	4,500	6,750	1,070	5,680	-7,405	266	156	110	5,790	1,770	1,037	733	5,057		
7	7,000	10,500	1,770	8,730	1,325	266	156	110	8,840	1,770	1,037	733	8,107		
8	10,000	15,000	2,610	12,390	13,715	266	156	110	12,500	1,770	1,037	733	11,767		
9	10,000	15,000	2,610	12,390	26,105	266	156	110	12,500	1,770	1,037	733	11,767		
10	10,000	15,000	2,610	12,390	38,495	266	156	110	12,500	1,770	1,037	733	11,767		
11	10,000	15,000	2,610	12,390	50,885	266	156	110	12,500	1,770	1,037	733	11,767		
12	10,000	15,000	2,610	12,390	63,275	266	156	110	12,500	1,770	1,037	733	11,767		
13	10,000	15,000	2,610	12,390	75,665	266	156	110	12,500	1,770	1,037	733	11,767		
14	10,000	15,000	2,610	12,390	88,055	266	156	110	12,500	1,770	1,037	733	11,767		
15	10,000	15,000	2,610	12,390	100,445	266	156	110	12,500	1,770	1,037	733	11,767		
16	10,000	15,000	2,610	12,390	112,835	266	156	110	12,500	1,770	1,037	733	11,767		
17	10,000	15,000	2,610	12,390	125,225	266	156	110	12,500	1,770	1,037	733	11,767		
18	10,000	15,000	2,610	12,390	137,615	266	156	110	12,500	1,770	1,037	733	11,767		
19	10,000	15,000	2,610	12,390	150,005	266	156	110	12,500	1,770	1,037	733	11,767		
20	10,000	15,000	2,610	12,390	162,395	266	156	110	12,500	1,770	1,037	733	11,767		
21	10,000	15,000	2,610	12,390	174,785	266	156	110	12,500	1,770	1,037	733	11,767		
22	10,000	15,000	2,610	12,390	187,175	266	156	110	12,500	1,770	1,037	733	11,767		
23	10,000	15,000	2,610	12,390	199,565	266	156	110	12,500	1,770	1,037	733	11,767		
24	10,000	15,000	2,610	12,390	211,955	266	156	110	12,500	1,770	1,037	733	11,767		
25	10,000	15,000	2,610	12,390	224,345	266	156	110	12,500	1,770	1,037	733	11,767		

**THE STUDY ON THE IMPROVEMENT
IN QUALITY OF THE TROPICAL FRUITS**

Appendix I

Institutional and Human Resources Development

**APPENDIX I
INSTITUTIONAL AND HUMAN RESOURCES DEVELOPMENT**

Table of Contents

	<u>Page</u>
1. ADMINISTRATION OF HORTICULTURE DEVELOPMENT.....	I-1
1.1 Administration at Central Level.....	I-1
1.2 Administration at Local Level.....	I-2
2. SUPPORTING SERVICES FOR HORTICULTURE DEVELOPMENT.....	I-2
2.1 Extension and Training.....	I-2
2.2 Farmers' Organization.....	I-3
2.3 Village Unit Cooperatives	I-3
2.4 Credit Facilities.....	I-4
3. SUPPORTING SERVICE SITUATION IN THE STUDY AREA	I-4
3.1 Extension Services.....	I-4
3.2 Farmer's Organization.....	I-5
3.3 KUD.....	I-5
4. INSTITUTIONAL AND FINANCIAL CONSTRAINTS FOR ORCHARD DEVELOPMENT	I-5
4.1 Institutional Problems	I-5
4.2 Extension Problems.....	I-5
4.3 Financial Problems.....	I-6
5. ACTION PROGRAM FOR INSTITUTIONAL AND HUMAN RESOURCES DEVELOPMENT.....	I-6
5.1 Strengthening of the Organization Structure	I-6
5.2 Institutional Strengthening of Fruit Growers.....	I-7
5.3 Strengthening of the Extension System	I-8
5.4 Establishment of the Human Resource Development.....	I-8
5.5 Establishment of the Credit and Revolving System.....	I-9

List of Tables

(Tables in Text)

Table II.1	Number of Staff by Directorate in DGFCH.....	I-1
------------	--	-----

(Table in Annex)

Table I-1-1	Number of Staff by Subdirectorates relating to the Fruit Production in DGFCH.....	I-10
Table I-2-1	Current Condition of SPPs and APPs, 1997.....	I-11
Table I-5-1	Number of Required On-farm Extension Staff.....	I-12
Table I-5-2	Outline of Provisional Training Programs.....	I-13

List of Figures

(Figures in Annex)

Figure I-1-1	Organization Structure of Ministry of Agriculture.....	I-14
Figure I-1-2	Organization of DGFCH, MOA.....	I-15
Figure I-1-3	Administrative Structure in Indonesia.....	I-16
Figure I-2-1	Organization of CAE, MOA.....	I-17
Figure I-2-2	Organization of AAET, MOA.....	I-18
Figure I-5-1	Implementation Organization.....	I-19
Figure I-5-2	Flow of Extension and Human Resource Development.....	I-20

APPENDIX I INSTITUTIONAL AND HUMAN RESOURCES DEVELOPMENT

1. ADMINISTRATION OF HORTICULTURE DEVELOPMENT

1.1 Administration at Central Level

At national level, the Directorate General of Food Crops and Horticulture (DGFCH) under the Ministry of Agriculture (MOA) is primarily responsible for orchard development as shown in Figure I-1-1. Based on the Decision Letter of the MOA No.96/Kpts/OT. 210/2/1/1994, the DGFCH is obliged to assist the Minister for Agriculture in formulating and implementing policies for the development of food crops and horticulture sub-sector.

In principle, the DGFCH implements a series of technical services to cover planning and programming of food crops and horticultural development, guiding and monitoring on the use of seed, optimizing rice and secondary crops production, and utilization of agricultural tools and machinery. Moreover, the DGFCH takes charges of developing and optimizing the production of fruit, vegetables, ornamental and medical crops as well as guiding and improving agribusiness and farmer's entrepreneurship. The DGFCH also executes farmland development and rehabilitation, and water management and integrated pest management.

To assume the above tasks and duties, the DGFCH is composed of the Secretariat of Directorate General and seven Technical Directorates as illustrated in Figure I-1-2. Among the seven Directorates, the Directorate of Horticulture Production is mainly responsible for technical and administrative assistance to horticulture development using the national development budget. The total number of staff of this Directorate is 101 as of October 1997.

Table II.1 Number of Staff by Directorate in DGFCH

(Unit: person)

Unit of Directorate	Official Echelon		Non Official Echelon			Total	
	III	IV	IV	III	II		I
Secretary of Directorate General	5	16	10	55	124	36	246
Directorate of Program	4	13	-	55	46	8	126
Directorate of Seed	4	16	2	51	36	8	117
Directorate of Food Crops Production	4	14	1	51	51	10	131
Directorate of Horticulture Production	4	14	4	39	31	9	101
Directorate of Land Rehabilitation and Development	4	14	3	43	55	9	128
Directorate of Farm Business and Processing	5	20	4	60	35	5	129
Directorate of Plant Protection	4	16	5	47	41	7	120
Total	34	123	29	401	419	92	1,098

Note: Not including functional structural employees.
Source: JUMIAH PEGAWAI REPUBLIC INDONESIA

The Sub-Directorate of Fruit Production under the Directorate of Horticulture Production is responsible for the provision of guidance in optimizing fruit production through efficient use of land, production input, facilities and technology. This Sub-Directorate has 11 staffs in total comprising one Head, four staffs for the Land Utilization Section, three for the Production Input and Facilities Section, and three for the Technology Application Section.

As the tasks and functions of the DGFCH related to orchard development cover a wide scope of activities in several specific fields, another three Directorates under the DGFCH are involved in technical and administrative activities related to horticultural development. These are the Sub-directorate of Horticulture Seeds under the Directorate of Seeds, the Sub-Directorate of Horticulture Post-harvest under the Directorate of Farm Business and Processing, and the Sub-directorate of Integrated Pest Control for Horticulture under the Directorate of Plant Protection.

Table I-1-1 shows allocation of staff for the respective Sub-directorates related to fruit production in the DGFCII.

1.2 Administration at Local Level

Administratively, the Provincial Agricultural Services Office (Dinas Pertanian Tingkat I) is in charge of planning and monitoring of horticulture development and project under the direction of the Governor of each Province. Each Provincial Agricultural Services Office has divisions (Subdinas) that correspond to Directorates of the DGFCII. Between the DGFCII and the respective Provincial Agricultural Services Offices, there are two channels for keeping technical and administrative coordination. The one is a direct linkage, while the other is through the Regional Office (Kantor Wilayah Departemen Pertanian, KANWIL) of the MOA as illustrated in Figure I-1-3.

At the District (Kabupaten) level, the chief called Bupati has the administrative authority on overall development issues. Under the direction of Bupati, the District Agricultural Services Office (Dinas Pertanian Tingkat II) is responsible for the implementation and management of development programs and projects. Each District Agricultural Service Office also has sections equivalent to the Provincial Agricultural Services Office.

At the Sub-district (Kecamatan) level, the chief called Camat is responsible for coordination activities between the Bupati and each village head call Kepala Desa under the direction of the Bupati. At the village level, the Kepala Desa is used to play a role as an intermediate for smooth implementation of the programs and projects, and disseminate the information from Bupati and Camat farmers.

2. SUPPORTING SERVICES FOR HORTICULTURE DEVELOPMENT

2.1 Extension and Training

Institutionally, the Ministry of Home Affairs has jurisdiction over provision of agricultural extension services to farmers and each of Provincial and District authorities under the control of the Ministry of Home Affairs is responsible for management of extension activities at field level. On the other hand, the MOA functions as an supporting agency to provide technical assistant services to extension workers at field level.

In the MOA, the Center for Agricultural Extension (CAE) under the Secretariat General mainly takes charge of designing the extension policies, planning the extension activities, and improving the extension methodology and working system as well as upgrading human resource and institutional development of three Directorate Generals as illustrated in Figure I-2-1. While, the Agency for Agricultural Education and Training (AAET) is responsible for management of agricultural training and education activities through its three Centers for Agricultural Education Development, Personnel Training and Education as well as Extension Training and Education as depicted in Figure I-2-2. Regular training services are provided through Regional Training and Education Centers established at 33 locations throughout the country. To develop human resources for the agricultural sector, 10 Agricultural Extension Academies and 20 Agricultural High-Schools have been established in representing Provinces as listed up in Table I-2-1.

Every Provincial Agricultural Services Office is responsible for supporting daily agricultural extension activities done by the respective District Government Offices. At District level, Rural Agricultural Extension Offices are established as operational bases for extension services to cover food crops, estate crops, livestock and fisheries in separate manner. To strengthen and enhance extension services of these Offices in response to practical needs at field level, the

Rural Agricultural Information and Extension Office is under setup by each District Government Office.

A total of 32,771 Field Workers (Pemandu Lapang II, PL-2) attached to 1,718 Rural Agricultural Extension Offices and 247 District Government Offices are engaged in general extension activities under the Bupati's direction throughout the country. Field Specialist (Pemandu Lapang I, PL-1) who are positioned in the CAI are spread to Regional Offices and Assessment Institutes for Agricultural Technology of the MOA, Agricultural, Estate, Livestock and Fisheries Service Offices of Provincial and District Governments as well as Rural Agricultural Information and Extension Offices at District level. Basically, one to 16 PL-1 are assigned to each District Government for dissemination of agricultural information to both PL-2 and farmers' groups. Another duties of PL-1 cover the conduct of staff training as well as upgrading courses and seminars for PL-2 at Rural Agricultural Information and Extension Offices. The courses provided at these Offices usually range from one to three days at maximum.

In general, one PL-2 takes care of 16 farmers groups covering an area of two to five villages (Desa), depending on the farming intensity of the area. This is equivalent to about 1,600 farmers per PL-2. Each PL-2 is responsible for calling on each group once every two weeks. Extension services are mostly provided on the basis of the "Training and Visit model" advocated by World Bank as known LAKU system in Indonesia. This system takes three steps so as to provide the farming techniques to the majority of farmers:

- Step 1: Each PL-2 gives technical instructions to a contact farmer (Kontak Tani) who is usually the representative of village or farmers group;
- Step 2: Each Kontak Tani instructs key members of farmers' groups (Kelompok Tani) in their acquired techniques; and
- Step 3: These group representatives disseminate the acquired techniques to the remainder of their groups.

Extension services for fruit growing are the responsibility of PL-2 who are principally in charge of extension services for food crops. In general, however, very few of PL-1 and PL-2 are specialized in horticulture, inclusive of fruit growing and post-harvest handling activities.

2.2 Farmers' Organization

Usually farmers' group is a commune-based non-administrative unit organized at village level. Each farmers group consists of approximately 5 to 35 paddy farmers who have participated in voluntarily. One of the most important functions of farmers group is to keep contact with PL-2. Although one or more farmers group exist at the 53.3% of villages in total, no farmers' group specialized in fruit production and trading is yet organized in the Indonesia.

Besides farmer's organization, some social groups are active to promote a rural development at village level. The Rural Community Institution (Lembaga Ketahanan Masyarakat Desa, LKMD) is one of the village administrative bodies to unite voluntary social groups and control a wide range of public activities. With its realistic and sound activities up to date, LKMD has been exerting big influences on life and living of the farmers in rural areas. From this respect, the social groups like LKMD are expected to play an important role in bottom-up or grass-root typed rural development.

2.3 Village Unit Cooperatives

Village Unit Cooperatives (Koperasi Unit Desa, KUD) have been established as the Central Government sponsored institutions rather than voluntary grass-root associations. The activity of KUD is under the control of the Ministry of Cooperatives and Small Enterprises Development. According to the 1993 Agricultural Census, the total number of KUDs in Indonesia was 7,707 units, which is still below the Ministry's target of 18,206 units. Based on status of activities, KUDs are classified into three types; Autonomous Village (KUD Mandiri),

Village Unit Cooperative with Autonomous Potential (KUD Mandiri Potensi) and Village Unit Cooperative without autonomy (KUD Belum Mandiri). Of these, KUD Mandiri stands for self-reliant KUD. As of 1993, total number of active KUD Mandiri in Indonesia was 4,092, accounting for 61.0% of the total active KUDs of 6,699.

The cooperative law which was revised in 1992 in accordance with the national policy requests KUDs to make their cooperative operations more market-oriented. To realize this objectives, Repelita VI directs to strengthen KUD's activities including marketing and human resources development.

2.4 Credit Facilities

In Indonesia, two types of farm credit facilities handled by KUD are available. The one is Small Traders Credit Program (Kredit Candak Kulak, KCK) to low income groups and petty traders with loan repayment period of one year. This credit service started from 1976 and restarted in 1995 after 10-year suspension due to accumulation of bad debts. The other is Farm Management Credit (Kredit Usaha Tani, KUT) to farmers with loan repayment period of seven months and interest rate of 14% per annum. The finance source of this credit facility is the People's Bank of Indonesia (Bank Rakyat Indonesia, BRI) which is one of state banks. The credit is disbursed to farmers through KUDs designated by the BRI as short-term working capital to purchase seeds, fertilizers and agro-chemicals as well as living expenses for the period from planting to harvesting.

Another credit menu financed by the Central Bank of Indonesia (Bank Indonesia, BI) are provided to KUDs called Village Unit Cooperatives Credit (Kredit Koperasi Unit Desa, KKUD) and to members of KUDs called Village Unit Cooperative Members Credit (Kredit Koperasi Primer Untuk Anggota, KKPA). The former offers short-term working capital with the same loan condition as KUT, while the latter provides one-year short term working capital and 10-year long term investment fund up to Rp.50 million. Similar type to the latter credit facility is State-owned Company Profit Fund which started its services from 1990.

3. SUPPORTING SERVICE SITUATION IN THE STUDY AREA

3.1 Extension Services

In North Sumatra, a total of 96 Food Crops PL-1 and 1,127 Food Crops PL-2 are assigned to 11 Rural Agricultural Information and Extension offices and 96 Rural Agricultural Extension offices. Each PL-1 is responsible for training PL-2. Actually PL-1 can not run the training well because of limited budget coupled with time limitation of PL-2 caused by their additional jobs.

In West Java, some 98 Food Crops PL-1 and 2,310 Food Crops PL-2 are assigned to 20 Rural Agricultural Information and Extension Offices and 236 Rural Agricultural Extension Offices. Special PL-2 on fruit growing is available. Each PL-2 is getting difficult to contact farmers and has nothing to discuss with them. As a result, PL-2 gives such impressions to farmers that the Rural Agricultural Extension Office is a place to get information and advice when visited.

In East Java, 29 Rural Agricultural Information and Extension Offices and 224 Rural Agricultural Extension Offices are in operation with 150 Food Crops PL-1 and 1,557 Food Crops PL-2. As a new organization, the former is still in consolidation process in respect of manpower, tool and infrastructure.

In South Sulawesi, 21 Rural Agricultural Information and Extension Offices and 120 Rural Agricultural Extension Offices are operated with 106 Food Crops PL-1 and 2,008 Food Crops PL-2.

3.2 Farmer's Organization

Compared with the national average of 53.3%, the ratio of villages where one or more Kelompok Tani exist 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 has been principally organized linking up with implementation of BIMAS/INMAS programs to realize rice self-sufficiency.

3.3 KUD

According to the 1993 Agricultural Census, the number and establishment rate 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, respectively. 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 member per active KUD, the majority of North Sumatra ranges from 101 to 1,000, while that of West Java and East Java increased to the ranges from 1,001 to 5,000. In South Sulawesi, the number is concentrated on the ranges from 101 to 2,500.

4. INSTITUTIONAL AND FINANCIAL CONSTRAINTS FOR ORCHARD DEVELOPMENT

4.1 Institutional Problems

To promote orchard development, institutional setups within the DGFCH has directed towards policy frameworks, budget envelopes, better practice standards, and monitoring and guidance of implementation. While, those in local authorities are more anticipated to have more autonomy for smooth implementation of development activities.

In line with decentralization policy, most of the responsibilities for operation and maintenance activities fall onto Provincial and District Governments. However, policy formation and planning activities are still burdens to these local authorities due to limitation of well-trained experts in this field, even though coordination among agencies concerned can be smoothly made under the strong leadership of Governors and Bupati compared with inflexible bureaucracy among ministries or inter-ministry at central level. Such institutional weakness is a hurdle to new investment in development activities.

4.2 Extension Problems

The relationship between the research department and the extension department is not yet clearly defined. Thus, the activities and functions of both institutions are necessarily limited. Nevertheless, not a few research results and developed techniques have been transferred up to date through extension workers to the small farmers. On the other hand, the information obtained by the extension workers from farmers together with their needs have been seldom or never feed-backed.

The extension workers rarely or never have opportunities to study and acquire the advanced techniques on the orchard development. As knowledge and techniques on fruit growing are progressing day by day, most PL-2 inclusive of some PL-1 are confronted with the difficulty to catch up such rapidly advancing know-how and techniques. Under such condition, PL-2 are unable to disseminate appropriate techniques on fruit growing to farmers groups.

Farmers who intend to participate in orchard development have also no experience, knowledge and skills regarding how to produce market and consumer preferable fruits. Therefore, they

have to learn a wide range of techniques through intensive transfer of knowledge which should be done step by step following their capability and adaptability levels.

4.3 Financial Problems

The development budget is a key and selection of adequate budget allocation system is another important issue to implement market-oriented development activities like orchard development which need well-organized coordination and well-established integration among agencies concerned.

In addition to the above, lack of well-established credit system is a major constraint to long-term development. The lack of long-term credit corresponding to the periods between planting and harvesting of perennial tree crops represents a real constraint. In spite of the liberalized money market, this situation still continues and causes a great risk under the market condition of keeping high rated interest. In order to improve such situation, however, the mismatch between the money market structure and the smallest capital demanders must be settled first. Otherwise, this issue would relate to insufficient access to the formal credit system.

5. ACTION PROGRAM FOR INSTITUTIONAL AND HUMAN RESOURCES DEVELOPMENT

5.1 Strengthening of the Organization Structure

To implement institutional and human resources development effectively for orchard development in an integrated manner, it is indispensable to establish a closely tied-up system among all institutions concerned for orchard development from central level to fruit grower's level. The structural organization needs however to be simplified as illustrated in Figure I-5-1.

(1) Project Organization at Central Level

The implementation of the proposed action program falls within the jurisdiction of the DGFCH. For smooth coordination of overall development activities, the Project Management Office (PMO) is to be established under the DGFCH at central level. The full responsibility for technical guidance and administrative supports to PMO is claimed by the Director General of the DGFCH with the assistance of the Director of Horticulture Production. To collaborate with relevant inner- and outer-ministerial agencies of the MOA, a coordination committee will be established in the DGFCH with members to be invited from those agencies concerned.

The primary objectives of the recommended program are as follows;

NP-1: Formation of Institutional Linkage for Horticulture Agribusiness Development

- To establish a closer linkage connecting the MOA and other relevant ministries and agencies as well as private sector focusing upon promotion of downstream activities of horticulture agribusiness development; and
- This program is conducted after establishment of the PMO according to normal procedure of the MOA.

NP-2: Strengthening of Inter-ministerial Coordination System for Orchard Development

- To extend the ongoing efforts to upgrade coordination activities between the DGFCH and other Directorate Generals including Agencies under MOA as well as among Directorates within the DGFCH in respect to technical and administrative aspects; and
- This program is also conducted together with Program NP-1.

(2) Project Organization at Provincial Level

To play an important role as a coordinator of relevant administrative units of Provincial Governments, Project Coordination Units (PCUs) are established under the direction of the Governor. The PCUs will coordinate implementation agencies of proposed programs at Provincial levels in close collaboration with the Provincial Agricultural Services Office. The PCUs will also manage staff training program.

The primary objectives of the recommended program are as follows:

PP-1: Strengthening of Project Planning Capacity at Provincial Level

- To upgrade capability and skills of Provincial Government staff on horticulture agribusiness development planning; and
- This program is to be conducted at initial stage of program implementation.

PP-2: Strengthening of Management Capability Building of Provincial Staff

- To provide Provincial Government staff with management training programs to improve their monitoring and management capacity; and
- This program is to be conducted at the initial stage of program implementation.

(3) Project Organization at District Level

As a responsible organization for implementing development works at field level, the Project Management Units (PMUs) are to be established under the direction of Bupati and with coordination of District Agricultural Services Offices. Each PMU will be operated by a Sub-project Manager and his assistants and staff and further recruit on-farm level extension staffs on a contract base. All PMUs are directly linked with the PMO in terms of budget planning and implementation, monitoring and evaluation of development programs at District levels.

5.2 Institutional Strengthening of Fruit Growers

Fruit Growers to be participated in the orchard development programs need to make a group in order to have stronger bargaining power in marketing their products. To do so, all the participants have to be organized into a new group called fruit growers' group in each development site at District level.

A maximum unit of orchard development is 500 ha in which at least 500 fruit growers can participate. Their willingness to participate in the orchard development is to be confirmed through the social design or social preparation study with cadastral survey conducted at the preparatory stage prior to project implementation. Then they will be requested to organize themselves as fruit grower group.

After each fruit grower's group establishes and stabilizes at each site, some groups are to be united a fruit growers' association at Provincial level in sequence and to strengthen the functions for further orchard development.

The primary objectives of the recommended programs are as follows:

DP-7: Institutional Strengthening of Smallholding Fruit Growers

- To assure the better bargaining position through recognition of the brand name of fruits in the market; and
- This program is to be conducted before implementing development.

PP-7: Institutional Development for Association of Fruit Grower's Group

- To generate the better bargaining power to fresh fruit markets and processing industry; and
- This is to be implemented after each orchard operation is stabilized.

5.3 Strengthening of the Extension System

Under the current scrap and build system of Government staff, it is impossible to increase the net number of PL-1 and PL-2 and furthermore to allocate the available extension staff to specific development activities in a certain area. Therefore, it is also unable to provide intensive extension services to participatory farmers although they definitely require such services for implementation of orchard development.

In this regard, the minimum requirements for strengthening extension services are to provide systematic training opportunities to PL-1 and PL-2. Furthermore, on-farm extension staff will be recruited by every PMO and trained as technical staff by allocating development budget.

The flow of extension system is illustrated in Figure I-5-2. The PMUs' on-farm extension staffs transfer their acquired knowledge and techniques on orchard management to the key farmers of each group in cooperation with PL-1 and PL-2. Then, key farmers of each group can teach their members through internal training.

The primary objectives of the recommended program are as follows:

DP-3: Establishment of On-farm Level Extension Service System

- To establish new on-farm level extension service system taking into account the limitation of PL-2; and
- To be implemented for a year together with the PP-5 program after six months since each Phase starts by district, and continuously implemented the DP-2 program.

5.4 Establishment of the Human Resource Development

Staff training for capability building is essential to upgrade management of development activities by local authorities and to promote further decentralization. Aiming at effective performance of staff training in relation to fruit growing, all the training programs should be executed in a package form by using development budget specially allocated for training component.

It is necessary to improve knowledge of PL-2 about fruit growing, handling and marketing as well as their capability in training conducting transfer of technology growers. The training courses for PL-2 are arranged and implemented under the PMO.

On-farm level extension staffs who will be recruited by PMUs for implementation of orchard development are to be trained at the initial stage in an intensive manner with regard to all the aspects of production, post-harvest handling and marketing of fruits. They are responsible for daily operation of monitoring and technical assistance at field level. Therefore, they should take highly practical training to meet fruit growers' requirements. Provisional training programs for various target groups at orchard development sites, to be trained in over the five-year period are presented in Table I-5-2. A training course is defined as having curriculum (an organized set of objectives, learning modules, lessons, or activities, and materials; formulated in a Terms of References) which is delivered by qualified instructors over a designated number of days through classroom and on-the-job-training instruction.

The primary objectives of the recommended programs are as follows:

PP-5: Enhancement of Extension Staffs Knowledge on Horticulture Agribusiness Development

- To provide a series of training opportunities to subject matter specialist (PL-1), food crop extension workers (PL-2), and on-farm extension staff of PMOs; and
- To conduct training programs in the initial stage of orchard development.

5.5 Establishment of the Credit and Revolving System

The availability of long-term credit will play an important role in forming management foundation of orchard. Such long-term credit is also needed by agricultural and agro-industrial enterprises which are involved in processing and export activities. Under the present financial condition and trade globalization, however, enforcement of subsidy program for export promotion is rather difficult. For orchard development in the Study Area, therefore, credit facilities are to be offered as an essential prerequisite in kind during a quite long non-fruit bearing period.

In the initial stage, all participatory farmers will be supported with provision of planting materials and land preparation services as credit in kind for establishment of orchard. Instead of credit repayment, they will have to save a part of their income gained by selling their products as group dues. Thus, they will be able to utilize these surplus as revolving fund aiming to extend their orchard as well as maintenance and modernization of their own equipment and facilities in the future.

The primary objectives of the recommended program are as follows:

NP-3: Rationalization of Supporting Services for Credit Facilities and Marketing Promotion

- To strengthen financial and marketing mechanism for the benefit of small-holding fruit growers; and
- To design or prepare a practical program from the long-term viewpoint in harmony with the new policy to be taken up in Repelita VII.

Table 1-1-1 Number of Staff by Subdirectorate relating to the Fruit Production in DGFCH

(Unit: Person)

	Number of Head	Number of Staff	Total
[Directorate of Horticulture Production]			
Subdirectorate of Fruit Production:	1	10	11
– Head of Subdirectorate	1		1
• Section of Land Cultivation	1	3	4
• Section of Production Input & Facilities	1	2	3
• Section of Technology Application	1	2	3
Total	4	7	11
[Directorate of Seeds]			
[Subdirectorate of Horticulture Seeds]			
Head of Subdirectorate	1		1
• Section of Fruit	1	2	3
• Section of Vegetables	1	2	3
• Section of Ornamental	1	2	3
• Section of Medical Plants	1	2	3
Total	5	8	13
[Directorate of Plant Protection]			
Subdirectorate of Integrated Pest			
Head of Subdirectorate	1		1
• Section of Pest Control	1	1	2
• Section of Disease Control	1	2	3
• Section of Storage Pest	1	2	3
• Section of Weed Control	1	1	2
Total	5	6	11
[Directorate of Farm Business and Processing]			
[Subdirectorate of Horticulture Post Harvest]			
Head of Subdirectorate	1		1
• Section of Quality	1	3	4
• Section of Processing Technique	1	2	3
• Section of Post Harvest	1	2	3
• Section of Machine and Infrastructure Technique	1	1	2
Total	5	8	13

Source: DGFCH, 1997

Table I-2-1 Current Condition of SPPs and APPs, 1997

(Unit: person)

Agricultural High-School (SPP)				Num of Teachers	Number of Students			
Province	District	Department	Grade I		Grade II	Grade III	Total	
1)	D.I. Aceh	Banda Aceh	Fisheries	13	115	83	89	287
2)	D.I. Aceh	Banda Aceh	Animal husbandry	18	83	85	108	276
3)	West Sumatra	Padang	Animal husbandry	14	139	87	123	349
4)	West Sumatra	Limapuluh Kota	Agriculture	18	99	62	68	229
5)	West Sumatra	Pandangpariaman	Fisheries	15	100	81	75	256
6)	South Sumatra	Palembang	Agriculture	25	202	187	177	566
7)	Central Java	Tegal	Fisheries	30	128	137	116	381
8)	Timor Timur	Mataram	Agriculture	20	155	141	168	464
9)	Nusa Tenggara Timur	Kupang	Animal husbandry	14	137	120	87	344
10)	Nusa Tenggara Timur	Nataibora	Agriculture	14	83	66	84	233
11)	West Kalimantan	Pontianak	Fisheries	14	109	102	100	311
12)	South Kalimantan	Banjarbaru	Agriculture	22	170	145	144	459
13)	South Kalimantan	Tanahlaut	Animal husbandry	14	66	82	68	216
14)	North Sulawesi	Bitung	Fisheries	26	197	149	80	426
15)	South Sulawesi	Bone	Fisheries	13	104	80	75	259
16)	South Sulawesi	Sidenreng Rappang	Animal husbandry	12	101	87	75	263
17)	Maluku	Ambon	Agriculture	19	161	146	119	426
18)	Maluku	Ambon	Fisheries	13	105	107	81	293
19)	Irianjaya	Manokwari	Agriculture	14	131	110	110	351
20)	Irianjaya	Sorong	Fisheries	13	140	120	96	356
Total				341	2,525	2,177	2,043	6,745
Agricultural Extension Academy (APP)				Num of Teachers	Number of Students			
Province	District	Department	Grade I		Grade II	Grade III	Total	
1)	North Sumatra	Medan	Agri+Animal+Fish	16	66	70	67	203
2)	West Java	Bogor	Agri+Animal+Fish	52	195	205	192	592
3)	West Java	Bogor	Fisheries					
4)	West Java	Bogor	Animal husbandry					
5)	Central Java	Magelang	Agri+Animal+Fish	22	56	61	57	174
6)	D.I. Yogyakarta	D.I. Yogyakarta	Agri+Animal+Fish	17	70	70	68	208
7)	East Java	Malang	Agri+Animal+Fish	55	182	210	194	586
8)	East Java	Sidoarjo	Fisheries					
9)	East Java	Malang	Animal husbandry					
10)	South Sulawesi	Gowa	Agri+Animal+Fish	16	70	70	70	210
Total				178	639	686	648	1,973

Note 1) Agri+Animal+Fish stands for "Agriculture+Animal husbandry+Fisheries".

2) The numbers of teachers & students of APPs in West Java & East Java are total number of three schools' teachers & students in those area.

Source: Agency for Agricultural Education and Training

Table I-5-1 Number of Required On-farm Extension Staff

Province	District	Target Fruit	Target Area (ha)			No. of Required Field Inspector Coordinators (person)			No. of Minimum Field Inspectors (person)			No. of Minimum Key Fruit Growers (person)			
			Phase I	Phase II/Phase III	Total	Phase I	Phase II/Phase III	Total	Phase I	Phase II/Phase III	Total	Phase I	Phase II/Phase III	Total	
North Sumatra	Dairi	Durian		300			1							15	
	Tapanuli Tengah	Durian	500				1							25	
	Tapanuli Utara	Durian	500				1							25	
	Tapanuli Utara	Mangosteen	500											25	
	Tapanuli Selatan	Mangosteen	500											25	
	Tapanuli Selatan	Salak	500											25	
	Karo	Marquisa	500				1							25	
	Langkat	Rambutan	500											25	
				1,500	2,400	3,800	3	5	8	15	23	38	75	115	190
	Sub-total														
West Java	Bandung	Avocado	500				1							25	
	Ciamis	Duku	500											25	
	Bogor	Durian	500				1							25	
	Sumedang	Mango	500											25	
	Purwakarta	Mangosteen	500											25	
	Tasikmalaya	Salak	500				1							25	
				1,500	1,500	3,000	3	3	6	15	15	30	75	75	150
	Sub-total														
East Java	Lumajang	Banana	500				1							25	
	Lumajang	Avocado	500											25	
	Jombang	Durian	500				1							25	
	Jombang	Banana	500											25	
	Tulungagung	Duku	500											25	
	Trenggalek	Durian	500				1							25	
	Pasuruan	Mango	500											25	
	Malang	Salak	500				1							25	
				2,000	2,000	4,000	4	4	8	20	20	40	100	100	200
	Sub-total														
South Sulawesi	Gowa	Marquisa	500				1							25	
	Gowa	Avocado	500											25	
	Soppeng	Avocado	500				1							25	
	Sidenreng Rappang	Mango	500											25	
	Manene	Mango	500				1							25	
	Bone	Mango	500											25	
	Mares	Mango	500				1							25	
	Wajo	Mango	500											25	
	Tana Toraja	Marquisa	500				1							25	
	Tana Toraja	Mangosteen	500											25	
	Polewali Mamasa	Mangosteen	500											25	
	Mamuju	Rambutan	500				1							25	
	Enrekang	Rambutan	500											25	
	Pinrang	Rambutan	500				1							25	
	Baru	Rambutan	500											25	
				1,000	6,500	7,500	2	13	15	10	65	75	50	325	375
	Sub-total														
	Total														

Note: 1) | Field Inspector Coordinator for each 500 ha.
2) | Field Inspector for each 100 participatory farmers
3) | Contact Fruit Grower for each Group and 1 Key Fruit Grower for every 20 Fruit Growers
4) | Fruit Grower with the maximum of 1 ha.

Table I-5-2 Outline of Provisional Training Programs

Target Group	Description	WHAT ; Title of Training Course
1. Field Inspector Coordinators (FIC)	- overall management of technical guidance services to fruit growers - under the Project Management Unit	Course A Training in Agribusiness for FIC Course B Human Resource Development and Orchard Management Course C Post-Harvest and Marketing of Fruits Course D Field Problem Solving and New Technologies in Orchard Development
2. Field Inspectors (FI)	- technical guidance staff - to conduct on-farm level extension to key farmers representing one unit of fruit growers' group consisting of 2- member farmers	Course E Training in Agribusiness for FI (1st yr title) or Regional Training for FI (2nd yr title) Course F Post-Harvest and Marketing of Fruits Course G Tools and Methods of Participatory Extension Course H Field Problem Solving and New Technologies in Orchard Development
3. Contact Farmers (CF)	- to be selected among 20 member farmers - to have to support contact farmer as the representative of fruit growers' group	Course I Training in Agribusiness for CF Management for CF (1st yr title) or Training in Fruit Agribusiness Management (2nd yr title) Course J Production and Post-Harvest Technologies and Practices for Farmer Orchards Course K Entrepreneurship and Business Management in Fruit Growers' Group
4. Members of Farmers' Groups (MFG)	- participant farmer to the orchard development program	Course L Training in Farmer and Fruit Agribusiness Group Development (1st yr title and 2nd yr title)
5. Seedling Growers (SG)	- technical staff of private nurseries propagating fruit seedling	Course M Training in Fruit Seedling Production/ Seedling Nursery and Seed Quality Control Course N Seed Distribution and Marketing
6. Farm Women	-wives, family members or relatives of the MFG	Course O Income Generation and Managing Household Finances
7. Relevant Leaders (RL)	- formal and informal leaders at village, Sub-district and District levels	Course P Progress and Challenges in orchard development

Source : JICA Study Team

Figure I-1-1 ORGANIZATION STRUCTURE OF MINISTRY OF AGRICULTURE

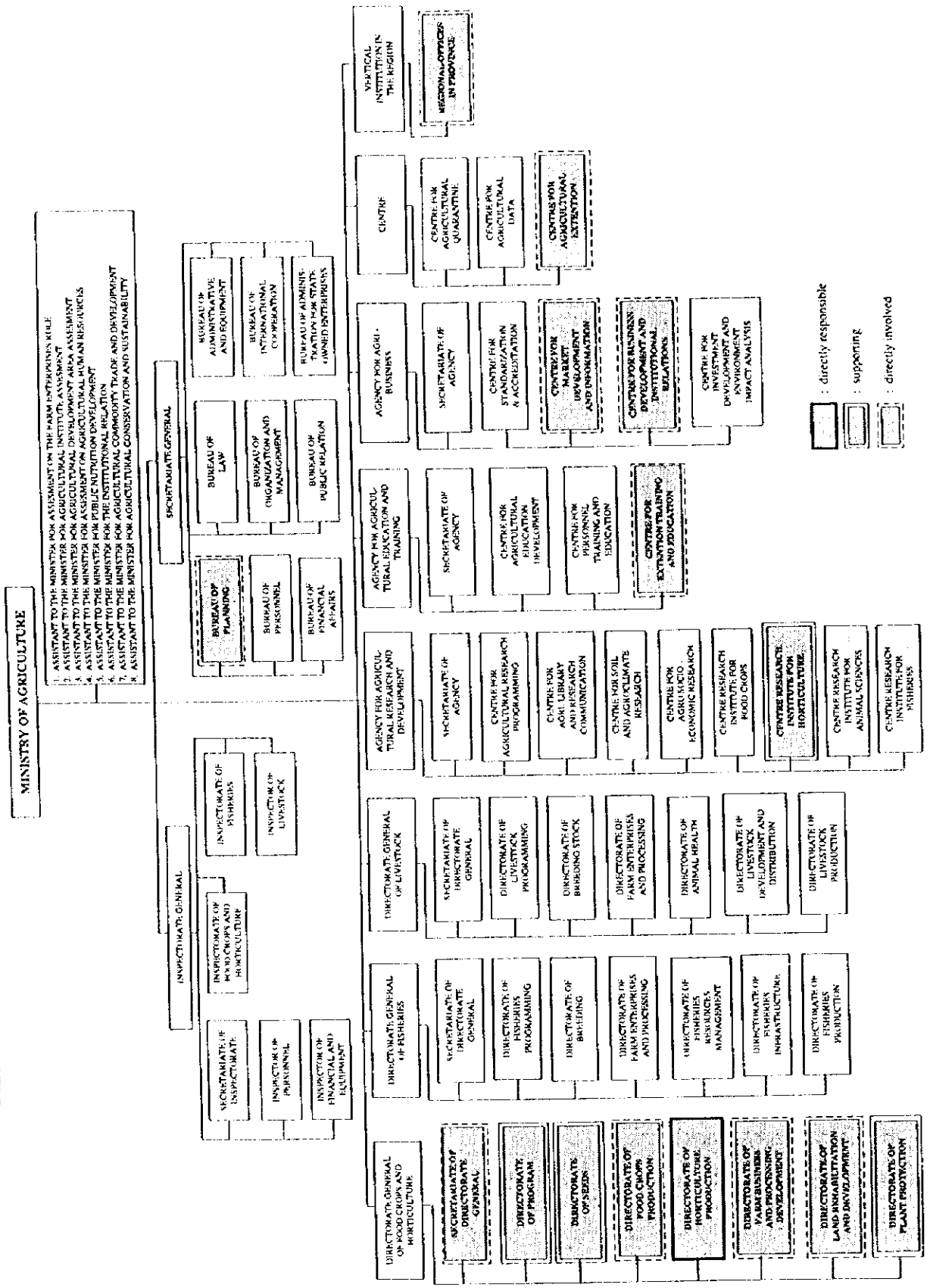


Figure I-1-2 ORGANIZATION OF DGFCH, MOA

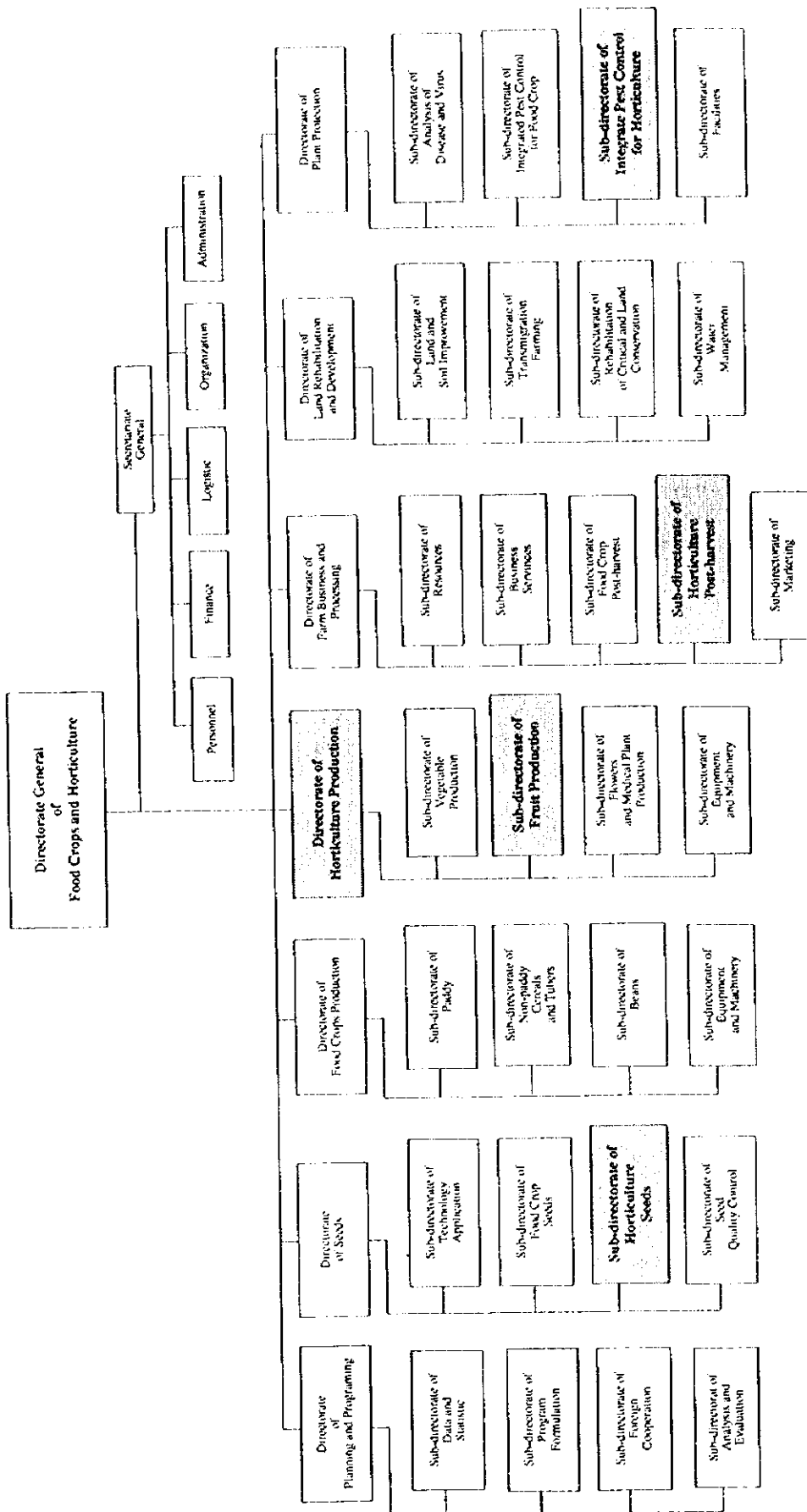
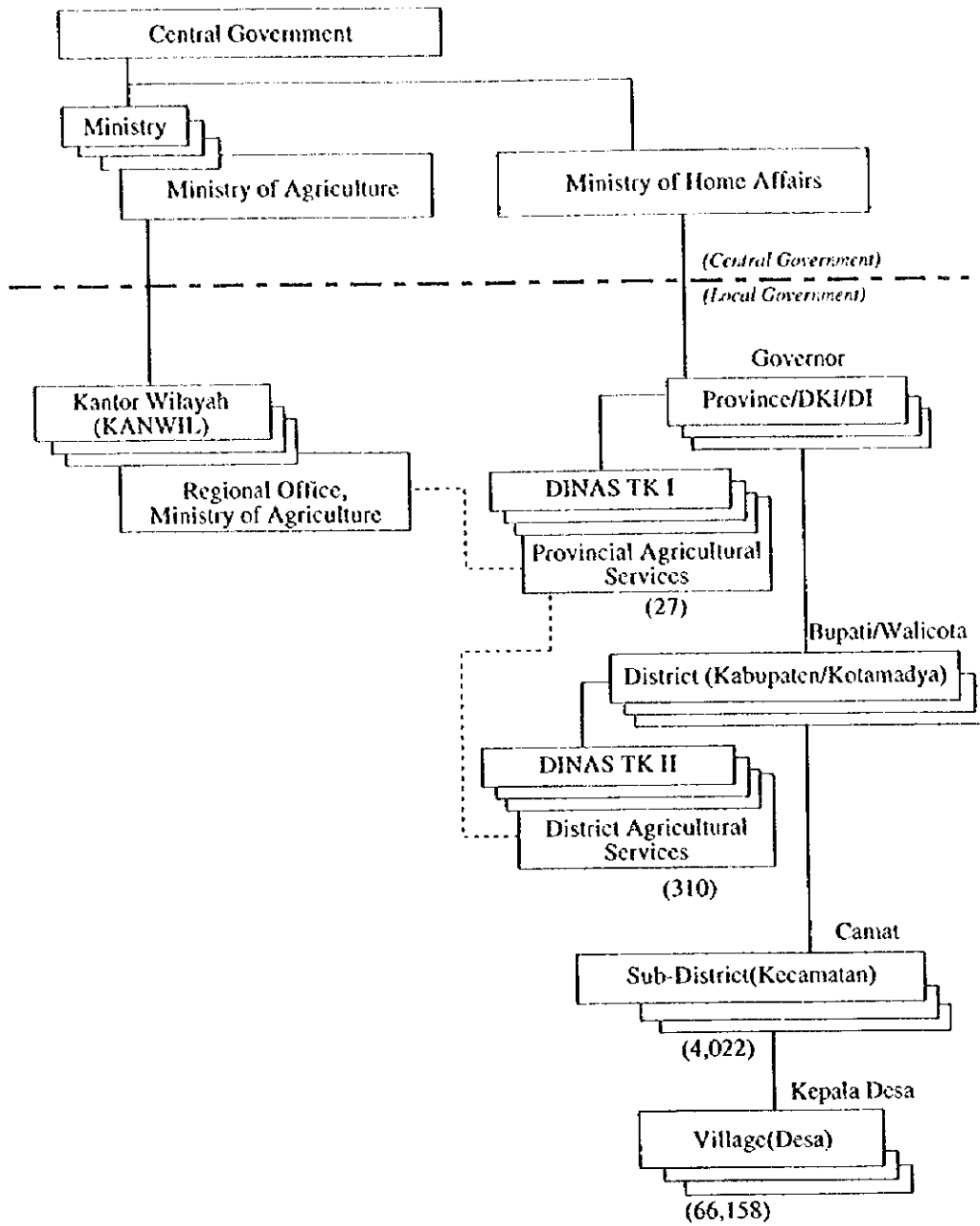
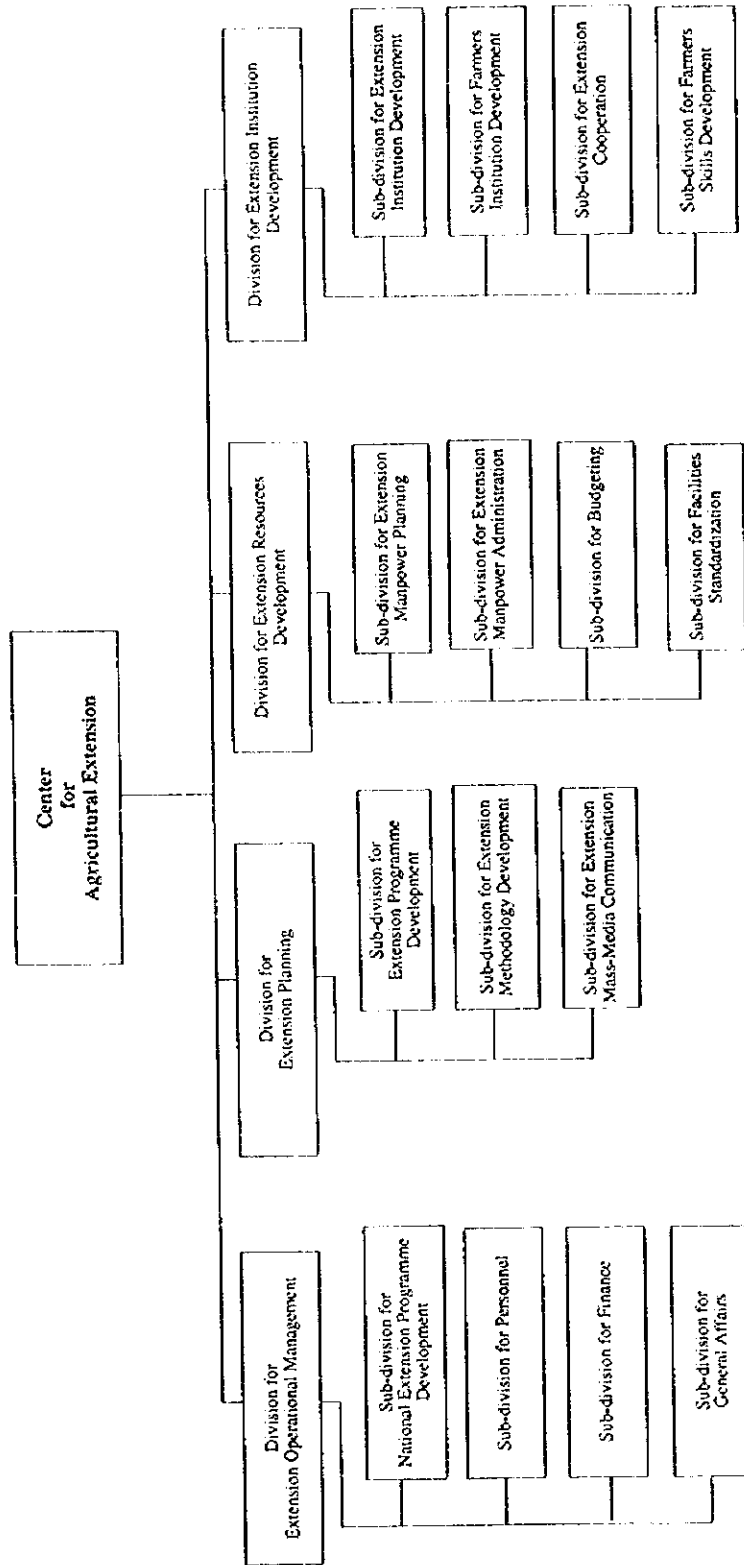


Figure I-1-3 ADMINISTRATIVE STRUCTURE IN INDONESIA



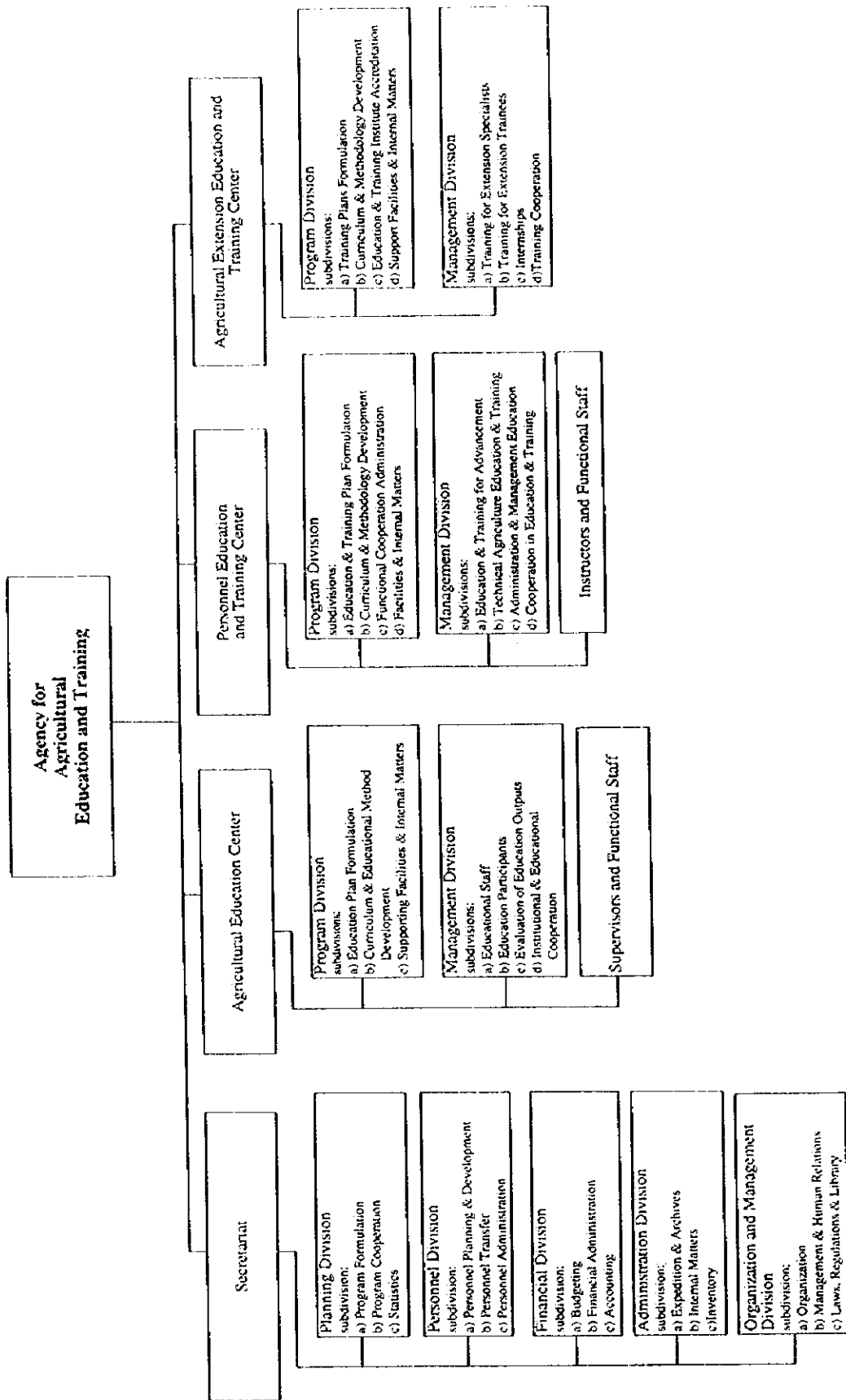
————— Command
 Coordination
 *() is the total number of institutions in the country.

Figure I-2-1 ORGANIZATION OF CAE, MOA



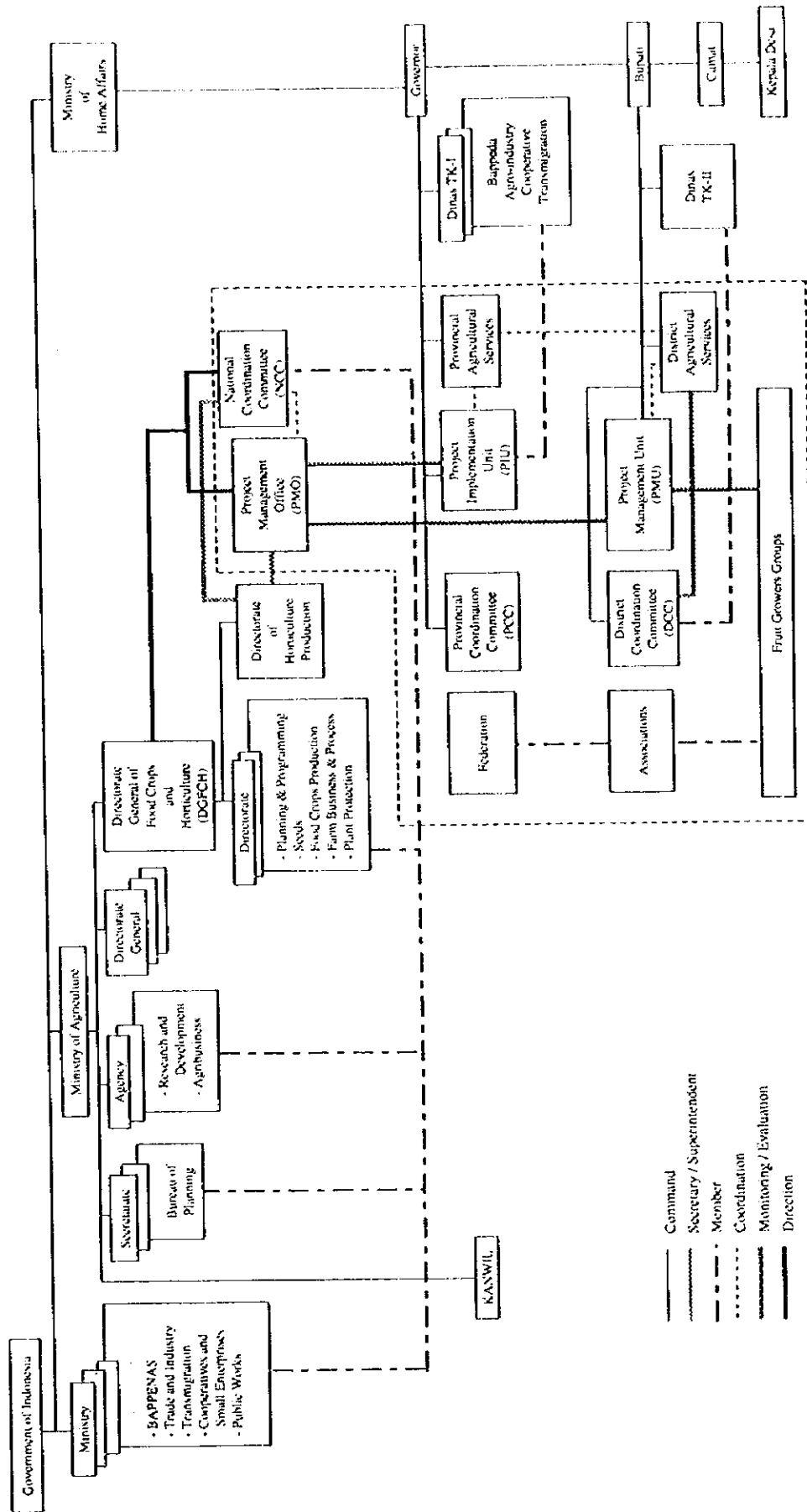
Source: CAE, MOA, 1997

Figure I-2-2 ORGANIZATION OF AAET, MOA



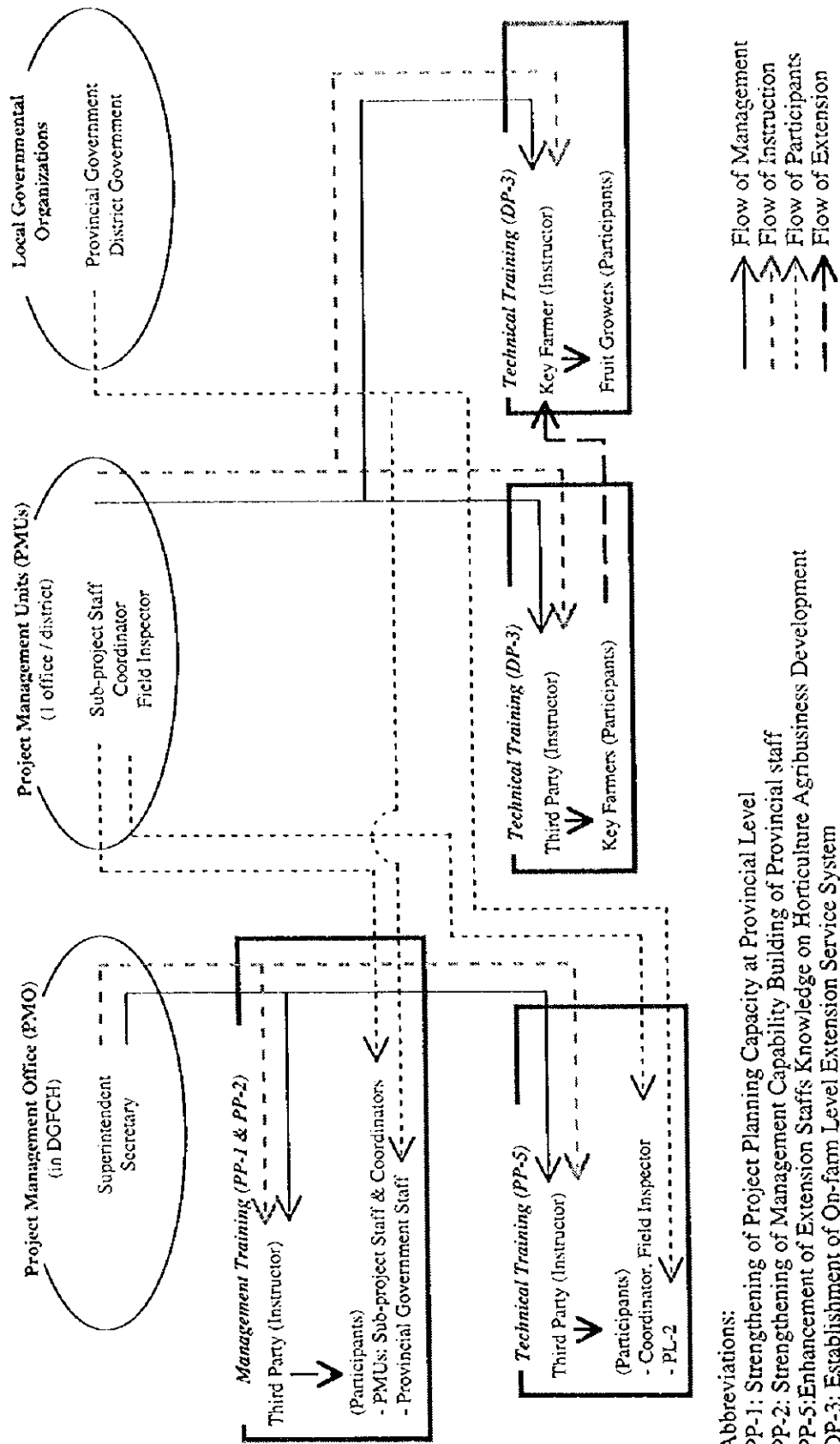
Source: AAET, MOA, 1997

Figure I-S-1 IMPLEMENTATION ORGANIZATION



Source: JICA Study Team

Figure I-5-2 FLOW OF EXTENSION AND HUMAN RESOURCE DEVELOPMENT



**THE STUDY ON THE IMPROVEMENT
IN QUALITY OF THE TROPICAL FRUITS**

Appendix J
Environmental Assessment

**APPENDIX J
ENVIRONMENTAL ASSESSMENT**

Table of Contents

	<u>Page</u>
1. PHYSICAL IMPACTS.....	J-1
2. SOCIO-ECONOMIC AND CULTURAL IMPACTS.....	J-1
3. ISSUES IN LAND USE AND ENVIRONMENT CONSERVATION.....	J-2
3.1 Issues on Land Use.....	J-2
3.2 Environmental Problems.....	J-3
4. POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT ACTIVITIES..	J-4

List of Tables

Table J-4-1	Element of Environmental Impact Assessment.....	J-6
Table J-4-2	Possible Environmental Impact Matrix for the Orchard Development Sites (by District) in North Sumatra.....	J-7
Table J-4-3	Possible Environmental Impact Matrix for the Orchard Development Sites (by District) in West Java.....	J-8
Table J-4-4	Possible Environmental Impact Matrix for the Orchard Development Sites (by District) in East Java.....	J-9
Table J-4-5	Possible Environmental Impact Matrix for the Orchard Development Sites (by District) in South Sulawesi.....	J-10

APPENDIX J ENVIRONMENTAL ASSESSMENT

1. PHYSICAL IMPACTS

The current laws and regulations promulgated by the Government of Indonesia regarding the environmental conservation in case of implementation of the development projects are the following :

- GOI Regulation No. 51, 1993;
- Ministry of Environmental Decree No.11 and No.12, 1994;
- Ministry of Agriculture Decree No.752, 1994.

According to the Ministry of Agriculture Decree No.752 (1994) relating to the criteria on the necessity of Environmental Impact Assessment (AMDAL) for the proposed project and the guideline to implement AMDAL, the report to AMDAL is only required for large plantation project by which more than 10,000 ha of land is developed in one site.

Experiences have shown that previous horticulture development activities did not have significant negative impact as such developments have been done on the existing dry upland fields, former secondary forests, grass lands and/or shrub areas. On the contrary, planting of perennial fruit trees have positive environmental impacts on land conservation in the long run because of the more dense plantings. Measures to reduce the negative environmental impacts, if any, should be practiced through adopting the zero tillage system when the field has a certain degree of steepness instead of terracing works.

In addition to its role of afforestation contributing to soil conservation especially in upland areas with less coverage of woods, the orchard development proposed in this Master Plan will generally have a positive impact on the environment, as the rehabilitation and improvement of rural roads, and watering facilities are designated to improve environmental conditions in the development area. The improvement of such infrastructures will reduce soil erosion, water losses, waterlogging, and so on. Improvement of the rural roads will not only enhance transportation of goods and commodities, but also improve the environmental conditions of areas adjacent to the roads by installing culverts and drainage structures.

2. SOCIO-ECONOMIC AND CULTURAL IMPACTS

1) Improvement of farmer's living standard

Small landholding farmers in each orchard development area live with the limited and unstable agricultural outputs of annual crops which usually fluctuate from year to year, depending on endowed rainfalls. With the implementation of orchard development, farmers' net income will be drastically increased by marketing target fruits. This consequently will lead to uplift of their living standard or quality of life and open the way to well-being, education and so on.

2) Increase in employment opportunities

Increase in employment opportunities could be expected with the implementation of orchard development. This would also contribute to improvement of the local and regional economy. In addition, capabilities of the participant workers and laborers will be upgraded through engaging in the development works and activities. Such occasions and experiences to acquire more leveled-up skills will allow them to explore new and/or higher income-generating opportunities.

3) Expansion of business chances

In proportion as the fruit growers are grouped, their purchasing power will be strengthened in the local markets. Particularly, their empowerment in fresh fruit markets will give more active impacts on rural communities and economy as well. The establishment of specific fruit production center will also expand business chances to fruit growers themselves and set up a stronger linkage with the private sector.

4) Women in development (WID)

The women of the small landholding families in the proposed development areas usually attend to the household chores and farming activities. In these activities, women play an important role not only in planting, weeding and harvesting, but also in post-harvest handling of crops.

To produce higher quality fruits in the proposed development areas, it is a matter of great importance to apply properly the farm management technologies by mobilizing enough labors including family members. The labor force required in harvesting fruits is much bigger than that for annual upland crops such as maize and groundnut. From this respect, most of family members are expected to participate in such farming activities. For example, the annual average farm labor requirements per hectare are 130 man-days for maize and 75 man-days for groundnut, while those at peak productive age increase to 214 man-days for rambutan, 383 man-days for marquisa, 468 man-days for durian, 477 man-days for mango, 535 man-days for duku, 598 man-days for salak, 600 days for banana, 613 man-days for avocado and 792 man-days for mangosteen. These variations are due to the deference of fruit bearing condition coupled with the yield.

In designing the orchard development program, it is therefore important to pay attention not to charge women with more burden like onerous farm activities, and to provide them enough time to develop their capabilities and engage in the household-related matters so as to ensure better quality of life of the family.

Taking into consideration women's specific position and tasks in households, it is recommended to introduce a "work-sharing system" in implementing the proposed orchard development. In this system being practiced in successfully operated orchard development farms in Central Java, women (mainly house wives) take charge of crop management and conduct such works during day time according to their own daily work schedule.

5) Other socio-economic impacts

In addition to the above impacts, the following socio-economic effects will be brought about subsequent to implementation of the orchard development :

- Contribution to national food security and public health;
- Promotion of regional development by activating the local marketing system including farm inputs and outputs;
- Acceleration of agribusiness development in rural areas; and
- Alleviation of regional disparities.

3. ISSUES IN LAND USE AND ENVIRONMENT CONSERVATION

3.1 Issues on Land Use

There exist some difficulties in land use of mountainous and hilly areas mainly due to the following reasons:

- High erosion rate during the wet season in denuded areas, soil loss reaches 200 to 300 ton/ha per year ;
- Low moisture content during the dry season;
- Low humus content due to high erosion ; and
- Poor soil structure with its high compactness.

To the contrary, some areas in lowlands are vulnerable to floods, salinity intrusion, acidification and waterlogging. Areas fertilized by riverain silt are considered as fertile.

The title and ownership of land is also a complex issue which has deferred the implementation of many investment projects. The definition of boundaries and the legal owners limit often investors' access to the necessary resource.

As to the use of land for orchard development, there is often a compromise between the land condition needed to grow a particular fruit tree and the availability of sufficient land area meeting that requirement. The idle (sleeping) land often has inherent problems associated with soil type or prevailing climatic conditions. It is therefore important for growers to study characteristics of the land to be used and its agronomic requirements, when selecting a fruit tree and its variety as well.

3.2 Environmental Problems

The environmental problems in main agricultural sub-sectors can be pointed out as follows:

1) Horticultural sub-sector

In each of the four Provinces, there are the "dry land" or "upland" areas (used as a meaning of "*tidak sawah*" = not wet rice field) scattered at the altitudes ranging from 1 m to 1,000 m above the mean sea level, and most of these lands are suitable for growing perennial (fruit) trees and vegetables. However, deforestation for reclaiming new land for cultivation and disorderly logging is causing negative impacts on the environment.

Such environmental degradation due to the demographic pressure has a decisive impact on fauna, flora, human habitat and living conditions in the Study Area, especially the two Provinces in Java.

2) Agro-forestry sub-sector

Agro-forestry including estate crop development has an undisputed role to play in Indonesia, not only where it has been traditionally practiced (where there is great scope for improvement), but also in the vast tracts of the country where increasingly serious environmental problems are occurring through unwise land use. These problems - erosion, devegetation, salinization - often occur as a result of one of two actions : people moving to a more marginal environment without altering their land-use practices, or people remaining in the same environment but who try to radically change and intensify the use of the land.

In Indonesia, it is possible to find examples of both these actions and their intermediary forms, as well as problems caused by other factors, such as decreasing access to land and water resources.

Typical environmental issues of this sub-sector are :

- Rapid decrease of natural forest ;
- Use of sloping land for agricultural practices ;
- Development of the upland and sloping agricultural technology to sustain a livelihood (multi-story farming, inter-cropping, agro-forestry, integrated and bio-intensive farming, etc.) ;

- Widespread forest denudation by clearing, burning and decease, causing the erosion and soil loss, and
- Unstable plant rotation due to fluctuated demand and variable cost.

3) Agro-industry and agribusiness sub-sector

With the high pace of industrialization and urbanization, the problem of pollution is becoming serious in several industrial/urban areas. Contamination of water is the most important problem in these areas, both surface and groundwater.

Domestic and industrial water in the Study Area is mostly drawn from the rivers and groundwater. Compared to the extent or degree of water pollution in heavy and chemical and other manufacturing industries, the agro-processing industry of fruit crops produces less the negative environmental impacts.

As one of the major constituents (land - water - people), water is also critically important for orchard development; both for irrigation and post-harvest processing purposes. To meet the requirements for the further development of agriculture, industry and daily needs, water should be considered as one of the most essential resources for socio-economic development. Its optimum management, which is to ensure required quantity, quality and balanced allocation among the sectors, is "must" to promote further the orchard development and also from the viewpoint of environmental conservation.

4. POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT ACTIVITIES

In this Master Plan Study, the Initial Environmental Examination (IEE) was carried out for 37 proposed orchard development sites by two elements regarding social environment and natural environment. The former is broadly classified into four elements, namely i) social life, ii) public health condition, iii) historic or cultural areas and landscapes and iv) community facilities and services, and further divided into 23 sub-elements. The latter is classified into three elements, namely v) biological an ecological condition, vi) soil and land, and vii) hydrological condition. The element and its possible impact is briefly mentioned in Table J-3-1. The result of the Initial Environmental Examination (IEE) is as summarized in Tables J-3-2 to J-3-5.

The orchard development proposed in this Master Plan will generally have a positive impact on the environment. The rehabilitation and construction works of rural roads, watering facilities, and village infrastructure are mostly designed to improve environmental conditions in the development area. The improvement of such basic village infrastructure is expected to reduce soil erosion, water loss, waterlogging and so on.

Prior to implementation of the proposed orchard development, an Environmental Impact Assessment (EIA) would be prepared in accordance with the national environmental laws and regulations. Although the respective proposed development activities will cover a wide area and involve interventions in several sectors, there will be no major impacts, owing largely to the small scale of the interventions, the low technology and low intensity of construction works, and the environmental character of each area that had little remaining natural environment. Therefore, the orchard development will not create significant adverse changes in the social, physical, and biological environment, and any environmental impact can readily be mitigated.

The potential impacts of the major components are primarily construction-related. The access road construction periods are expected to be short, with little if any land acquisition, since the nature of road construction will be entirely rehabilitation or improvement of the existing alignments, and widening of roads will fall within the existing road reserve. Construction will generate some noise and dust, but it is expected that this disturbance will be within acceptable

levels. Construction of the watering facilities will have no significant adverse impacts because sites will be properly selected; i.e., they will not displace families, disrupt wildlife, cause significant hydrological changes, or increase flooding or drainage hazards.

Watering facilities construction will create a more efficient distribution system and increase the reliability of supply to communities.

Table J-4-1 Element of Environmental Impact Assessment

Environmental Element	Possible Impact
I. Social Environment	
1 Social Life	
(1) Habitat's Life	
- Transmigration for the Project	Occurrence of conflict with former occupants
- Involuntary resettlement	Compulsory evacuation from land
- Life style	Changing of conventional life style, or role of women and old generations
- Collision between habitants	Occurrence of conflicting interests
- Racial, ethnic distribution	Effect on social environment for minorities
(2) Population	
- Population	Deterioration of habitat's life, or natural condition
- Generation structure	Deterioration of habitat's life, or natural condition
(3) Economic Activities	
- Economic activities	Changing of conventional production style leading to deterioration of natural condition around
- Employment	Decreasing of job opportunity
- Income differential	Increasing of poverty or landless farmer
(4) Institution and Custom	
- Water Right	Violation of water right, occurrence of water shortage
- Social structure	Collision of habitats, Cracking relation of habitats
- Institution and custom	Changing of institution and custom
2 Public Health Condition	
- Dosage of agro-chemical	Accumulation of residual toxic in soil
- Disease	Occurrence of endemic or infectious disease
- Solid wastes	Deterioration of sanitation condition
- Noise	Occurrence of noise by heavy equipment, operation of factory
3 Historic or Cultural Areas and Landscape	
- Historic or cultural property	Indirect or direct damage of historic or cultural property
- Harmony with landscape	Deterioration of landscape
- Mining and energy resources	Inability in development of mining or other underground resources
4 Facilities and Services	
- Community facilities and services	Activation of rural community
- Infrastructure	Activation of rural community, upgrading of rural life
- Transportation	Occurrence of traffic jam, passing of heavy equipment activation of rural community
II. Natural Environment	
5 Biological and Ecological	
- Natural vegetation	Soil erosion,
- Indigenous plants and animals	Extirmination or decreasing of indigenous plants and animals
- Noxious insects and pests	Occurrence of noxious insects and pests
- Swampy or peat area	Decreasing of swampy area or peat area
- Deforestation	Decreasing of tropical forest
6 Soil and Land	
(1) Soil	
- Soil erosion	Decreasing of productivity due to soil erosion
- Saline	Decreasing of productivity due to accumulation of salt
- Soil fertility	Changing of productivity, weakened of ecological system
- Contamination of soil	Accumulation of residual toxic in soil
(2) Land	
- Land	Deterioration of land
- Hinterland	Deterioration of hinterland
- Land settlement	Land settlement due to drying of swampy and peat land or excessive exploitation of groundwater
7 Hydrological Condition	
(1) Hydrological	
- Surface water	Effect to downstream by drought or flood, or for fishing
- Groundwater	Change of groundwater potential due to excessive exploitation of groundwater
- Waterlogging and flood	Damage to habitats and livestock
- Sedimentation	Decreasing of water flow capacity
- Position of river bed	Lowering of river bed by reducing supply of soil and sand to downstream
(2) Water Quality and Temperature	
- Deterioration of water quality	Due to erosion, agro-chemical, wastes
- Excessive nutrition	Growth of water grass and moss
- Changing of water temperature	Damage of crop by low temperature water
(3) Air	
- Air pollution	Bad odor by processing facilities, agro-chemical, dust during construction, transportation

Table J-4-2 Possible Environmental Impact Matrix for the Orchard Development Sites (by District) in North Sumatra

Environmental Element	SOCIAL ENVIRONMENT							NATURAL ENVIRONMENT																				
	Class I		Class II		Class III		Class IV		Class V		Class VI		Class VII		Class VIII		Class IX											
	Community facilities and services	Biological and Ecological Condition	Soil and Land	Hydrological Condition	Historic or cultural property	Harmony with landscape	Mining and energy resources	Infrastructure	Natural vegetation	Indigenous plants and animals	Noxious insects and pests	Sanitary or pest area	Degradation	Soil erosion	Soil fertility	Contamination of soil	Land	Thirdland	Surface water	Groundwater	Weathering and land	Sedimentation	Position of the land	Water quality	Excessive pollution	Water temperature	Air pollution	
Project Code No. (District/Project) NS(DR)1 (Dairi / Durian)	Project Stage																											
	Pre-Construction Stage	X																										
	Construction Stage	X																										
NS(DR)2 (Tapanuli Tengah / Durian)	Project Stage																											
	Pre-Construction Stage	X																										
	Construction Stage	X																										
NS(DR)3 (Tapanuli Utara / Durian)	Project Stage																											
	Pre-Construction Stage	X																										
	Construction Stage	X																										
NS(MN)1 (Tapanuli Selatan / Mangrove)	Project Stage																											
	Pre-Construction Stage	X																										
	Construction Stage	X																										
NS(MN)2 (Tapanuli Utara / Mangrove)	Project Stage																											
	Pre-Construction Stage	X																										
	Construction Stage	X																										
NS(MA)1 (Karoli / Marqusa)	Project Stage																											
	Pre-Construction Stage	X																										
	Construction Stage	X																										
NS(RB)1 (Langkat / Rambuan)	Project Stage																											
	Pre-Construction Stage	X																										
	Construction Stage	X																										
NS(SK)1 (Tapanuli Selatan / Saluki)	Project Stage																											
	Pre-Construction Stage	X																										
	Construction Stage	X																										

Environmental Elements

I Social Life
 II Public Health Condition
 III Historic or Cultural Area and Landscape
 IV Community Facilities and Services
 V Biological and Ecological Condition
 VI Soil and Land
 VII Hydrological Condition

Impact

++ Positive Impact
 + No negative impact
 - Negligible negative impact
 B- Moderately negative impact
 C- Significant negative impact
 D- Unbearable
 X Not applicable

Table J-4.5 Possible Environmental Impact Matrix for the Orchard Development Sites (by District) in South Sulawesi

Environmental Element	SOCIAL ENVIRONMENT							NATURAL ENVIRONMENT						
	Class I	Class II	Class III	Class IV	Class V	Class VI	Class VII	Class VIII	Class IX	Class X	Class XI	Class XII		
Project Stage:														
SNIAV-1 (Gowa / Awaqah)														
SNIAV-2 (Soppeng / Awaqah)														
SNIMD-1 (Subereng Rappang / Marang)														
SNIMD-2 (Wajale / Marang)														
SNIMD-3 (Bone / Marang)														
SNIMD-4 (Marau / Marang)														
SNIMD-5 (Wajo / Marang)														
SNIMN-1 (Tana Toraja / Marang)														
SNIMN-2 (Polewali Mamata / Marang)														
SNIMAP-1 (Gowa / Marang)														
SNIMAP-2 (Tana Toraja / Marang)														
SNIRB-1 (Mamuju / Rantabatu)														
SNIRB-2 (Parengkang / Rantabatu)														
SNIRB-3 (Pangkajene / Rantabatu)														
SNIRB-4 (Barru / Rantabatu)														

Environmental Element
 I: Socio-Lite
 II: Demographic Condition
 III: Hours of Cultural Area and Landscape
 IV: Community Facilities and Services
 V: Historical and Ecological Condition
 VI: Soil and Land
 VII: Hydrological Condition

Environmental Impact
 +: Positive Impact
 -: No negative impact
 A: Negligible negative impact
 B: Moderately negative impact
 C: Significant negative impact
 D: Unclear
 X: Not applicable